

NOTICE INVITING TENDER (NIT)

FOR

TURNKEY PACKAGE FOR AUGMENTATION OF 2
NOS. 66/11 kV POWER TRANSFORMERS FROM 20
MVA TO 31.5 MVA AT BHAGIRATHI GRID SUBSTATION WITH REPLACEMENT OF TWO NOS. 11 KV
SWITCHBOARD ALONG WITH ASSOCIATED CIVIL
WORKS

NIT NO CMC/BY/22-23/RS/SV/25

Due Date for Submission: 18.07.2022, 14:00 HRS

BSES YAMUNA POWER LIMITED (BYPL)
CONTRACTS & MATERIALS DEPT.,
SHAKTI KIRAN BUILDING, KARKARDOOMA,
DELHI-110032
CIN: U40109DL2001PLC111525

WEBSITE: www.bsesdelhi.com

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VOLUME – I: INFORMATION TO BIDDER (ITB)

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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 (₹)
	TURNKEY PACKAGE FOR AUGMENTATION OF 2		
	NOS. 66/11 kV POWER TRANSFORMERS FROM 20		
4	MVA TO 31.5 MVA AT BHAGIRATHI GRID SUB-	12.30	12.30
1	STATION WITH REPLACEMENT OF TWO NOS. 11	Crore	Lakh
	KV SWITCHBOARD ALONG WITH ASSOCIATED		
	CIVIL WORKS		

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/SV/25 - TURNKEY PACKAGE FOR AUGMENTATION OF 2 NOS. 66/11 kV POWER TRANSFORMERS FROM 20 MVA TO 31.5 MVA AT BHAGIRATHI GRID SUB-STATION WITH REPLACEMENT OF TWO NOS. 11 KV SWITCHBOARD ALONG WITH ASSOCIATED CIVIL WORKS"

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 NEFT/ RTGS. The tender documents & detail terms and conditions can also be downloaded from the website 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 **18.07.2022, 14:00 PM.** at the address given below. Part A of the Bid shall be opened on **19.07.2022, 11:00 AM**.

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.

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- 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 any one major equipment out of two – 66/11KV 31.5MVA MVA Power Transformer and 11KV AIS.	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.	i. Details of manufacturing units ii. details of service units
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 11KV AIS 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.	i. Turnkey Purchase order/Work order copy ii. Work completion certificate copy
4	Performance certificate for 2 years satisfactory performance from at least 2 executed projects of 11KV AIS or higher voltage rating Grid substations during the last 5 years from at least two utilities/ SEB/ PSUs / reputed firm wherein the end user shall be Utility/SEB's/PSU's. 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

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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 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.	Undertaking for Back up support by OEM's
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.	License Copy

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 2018-19, 2019-20 & 2020-21)	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 statuary 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.

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3.01 BID SUBMISSION

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

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	
Comme	ercial :		
1	Tender Fee - Demand Draft (Rs.1180/-) (Incl GST)	Non-refundable demand draft for Rs 1180/- in case the forms are downloaded from website	
2	EMD	In prescribed format	
3	Power-of-Attorney	In prescribed stamp paper & format	
4	PQR Compliances	Documentary evidence in support of qualifying criteria like: 1. Details of constitution of the compar (Proprietary/Limited/etc along with the details Memorandum of Association of the company 2. Bidders shall submit the certified annual Balance sheets for the last completed three (3) financial years. Supportive document on Positive Net worth. Creci rating/solvency certificate from competent authority. Copies of Orders, Execution /Performance Certificate & Other Documents to support qualification Criteria.	
5	Signed Tender document	Original Tender documents duly stamped & signed on each page as token of acceptance	

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Sr. No	Descriptions	Type of Documents
6	Black listing undertaking	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.
7	No litigation Certificate	Duly signed No Litigation Certificate as per attached format.
8	Commercial Terms and Conditions	Acceptance on Commercial Terms and Conditions viz Delivery schedule/period, Payment terms, PBG etc.
9	Acceptance on Reverse Auction	Duly signed Acceptance Form For Participation In Reverse Auction Event as per attached format
10	Bid Form (Unpriced) Duly Signed	Duly Signed Bid Form as per attached format
11	Un price Bid Duly Signed	Duly Signed Un price Bid as per attached format
Technic		
12	Technical Details/ Filled in GTP/Drawings	Bidder shall submit duly filled GTP with all Technical documents and Drawings.
13	Field Quality and assurance Plan (QAP)	Bidder shall submit the detailed QAP plan in their technical proposal.
14	Type Test Reports	Bidders shall submit the copy of type test reports in their technical bids in support of PQR conditions
15	Project Implementation Plan and Methodology	Bidder shall submit detail Project Implementation plan and methodology in their technical bid.
16	Testing Facilities	Bidder shall submit the details of testing facilities available at their works/factory.
17	Organization Chart & Manpower Details.	Bidder shall submit the details of Manpower to be deployed for project management with qualification and experience.
18	List of Current Commitments/ Work In Progress.	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. N	Events	Due date & Time
1	Date of sale/ availability of tender documents from BYPL Website	upto 18.07.2022, 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: https://zoom.us/meeting/register/tJErf-2vqD4vE90SnJdGQodJS2LZ-r6kpOkC	04.07.2022, 11:00 Hours

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NII NO. CMC/DI/22-23/R3/34/23		

S. No.	Events	Due date & Time
	After registering, you will receive a confirmation email containing information about joining the meeting.	
3	Last Date of receipt of pre-bid queries, if any (Queries to be submitted via e-mail)	06.07.2022 up to 17:00 Hours
4	Last Date of replies to all the pre-bid queries as received	11.07.2022 up to 18:00 Hours
5	Last date and time of receipt of Complete Bids (Tender Fees, EMD, Part A & Part B)	18.07.2022, 14:00HRS
6	Date & Time of Opening of PART A – EMD and Technical Bid	19.07.2022, 11:00HRS
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.

<u>Part – A</u>:: 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.

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- 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.
- 4.05 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.
- 4.06 Oty 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	
Technical			
CES Dept. 3 rd Floor, B-Block,	Abhishek Harsh DGM (CES)	abhishek.harsh@relianceada.com	
BSES Yamuna Power Ltd Shaktikiran Building, Karkardooma, Delhi 110032	Srinivas Gopu GM (CES)	srinivas.gopu@relianceada.com	
	Gaurav Sharma AVP (HOD-CES)	gaurav.a.sharma@relianceada.com	
Commercial			

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C&M Dept. 3 rd Floor, A-Block, BSES Yamuna Power Ltd Shaktikiran Building,	Sumit Verma GM (C&M)	sumit.ra.verma@relianceada.com
	Santosh Singh Addl. VP (Head- Procurement)	santosh.kum.singh@relianceada.com
Karkardooma, Delhi 110032	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 a rising 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.

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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.bsesdelhi.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.bsesdelhi.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.

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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 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.

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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 Clause12.01 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-Attorney 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**

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- 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**

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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

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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:

(a) Belines, for the purposes of this provision, the terms see forth below as follows:					
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- (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.

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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 DE	OPLE by these presents that WE [name of bank] at [<i>Branch Name and address</i>],having our
register unto BS (herein	ed offic ES Yam af	ce at[address of the registered office of the bank](herein after called the "Bank"), are bound nuna Power Ltd., with it's Corporate Office at Shaktikiran Building, Karkardooma, Delhi -110032, ter called —the "Purchaser")in the sum of Rs
		Bank binds itself, its successors, and assigns by these presents.
Sealed v	with the	e Common Seal of the said Bank this day of
The con	ditions	of this obligation are:
1 ; or	If the I	Bidder withdraws its Bid during the period of bid validity specified by the Bidder on the Bid Form
2. If the validity:	e Bidde	er, having been notified of the acceptance of its Bid by the Purchaser during the period of bid
· andicy i	(a) (b)	fails or refuses to execute the Contract Form ,if required; or fails or refuses to furnish the performance security, In accordance with the Instructions to Bidders/ Terms and Conditions;
the Puro amount	chaser claime	to pay to the Purchaser up to the above amount upon receipt of its first written demand, without having to substantiate its demand, provided that is its demand the purchaser will note that d by it is due to it, owing to the occurrence of one or both of the two condition(s), specifying ondition or condition(s).
		e will remain in force up to and including One Hundred Eighty (180) days after the due date of , 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 it's licensed distribution network area in Delhi
- 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.
- 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.
- 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.
- 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.
- 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	. dav of		20
Signature	In the o	capacity of	
	duly	y authorized to sign fo	r 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 20-21	FY 19-20	FY 18-19	FY 17-18	FY 16-17
Total assets					
Current assets					
Total Liability					
Current Liability					
Profit before taxes					
Profit after taxes					

ANNEXURE - SCHEDULE OF DEVIATIONS

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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.

Sea	l of	the	Bid	der:
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Signature:

Name:

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Technical Bid Submission Check List

S. No.	Description	BYPL Requirement	Bidder's Compliance
1	Tender No.	Required	
2	Technical Specification reference number	Required	
3	Communication Details		
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	
4	Document Submission Format		
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	
5	Qualifying Requirement Compliance		
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	
6	Drawings/ Documents as per Technical Specification.		
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	
7	Soft copy of complete technical bid in pen drive	Required	
8	Samples as per technical specification.	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.

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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/ragout), 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 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



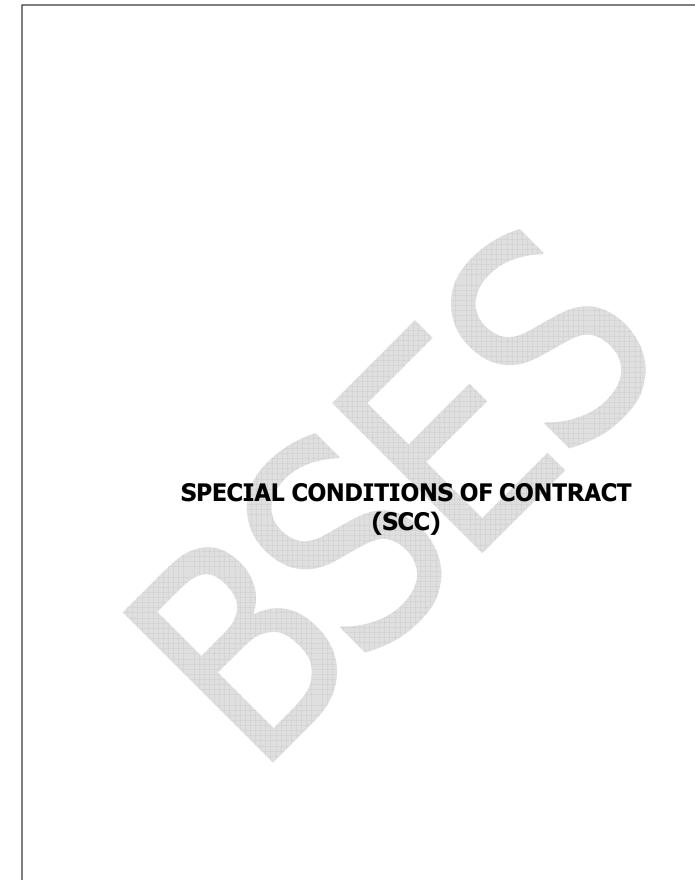


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SPECIAL CONDITIONS OF CONTRACT

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.

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- 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 <u>CONTRACT PRICES:</u>

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).

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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.

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 AUGMENTATION OF 2 NOS. 66/11 kV POWER TRANSFORMERS FROM 20 MVA TO 31.5 MVA AT BHAGIRATHI GRID SUB-STATION WITH REPLACEMENT OF TWO NOS. 11 KV SWITCHBOARD ALONG WITH ASSOCIATED CIVIL WORKS		180 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.

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

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.

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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

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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
- I) 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.

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- (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 UNFORESEEBLE 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:

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- 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.

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- (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.

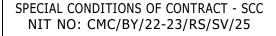
For an aggregate suspension period of less than Six (6) months the Contractor shall not claim any reimbursement. Any necessary and demonstrable costs incurred by the Contractor, as a result of suspension of the Works beyond the above period, will be paid by The Purchaser, provided such costs are substantiated 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 subcontractor. 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

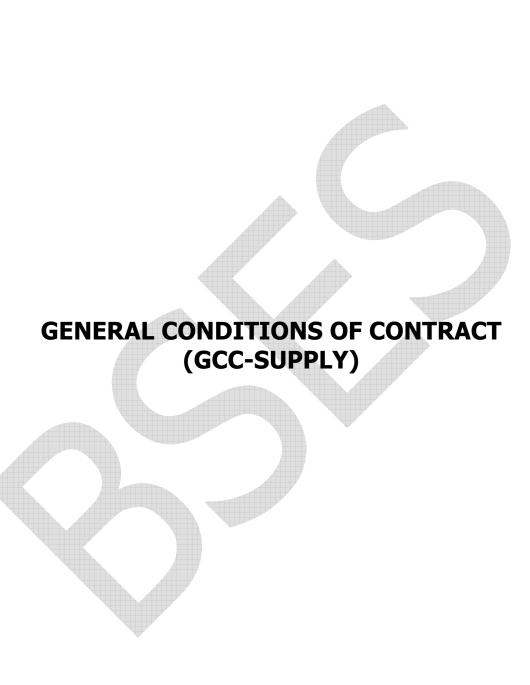
EXECUTION SCHEDULE

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	110 days from Zero Date
6	Procurement/Supplies	120 days from Zero Date
7	Equipment Erection	140 days from Zero Date
8	Commissioning of 1 st Power Transformer	150 days from Zero Date
9	Commissioning of 2nd Power Transformer	160 days from Zero Date
10	Testing & Commissioning of entire substation	170 days from Zero Date
11	Handing Over	180 days from Zero Date

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BIDDERS SEAL & SIGNATURE

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GENERAL CONDITIONS OF CONTRACT –GCC
SUPPLY
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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
- 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.

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- 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

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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, extremeoutside 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

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 <u>CONSEQUENCES OF DEFAULT:</u>

- (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 <u>TERMINATION FOR CONVENIENCE OF BYPL:</u>

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.

35 **LIQUIDATED DAMAGES:**

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

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.

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.

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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

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)

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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.



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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.

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- 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.
- 2.14CHANGE 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
- 2.15EPC 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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- 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:**

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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.

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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

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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.

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- iv. The existence of these sites shall be clearly & visibly marked by the display of signboards/ signages.
- 7. 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 <u>COMMISSIONING & ACCEPTANCE TEST</u>:

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 causalities, extent of properly 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.

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- 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

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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.

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- 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.

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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

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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 of fails to execute the work as per specification / as per the direction of Engineer's In-change within the scheduled period and even after the extended period, the contract shall got 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

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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. <u>SECRECY CLAUSE</u>:

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 EOMPLOYER 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 14 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.

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- 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. PROGESS 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

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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 / AMENDEMENTS:

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.

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<u> Annexure - I</u>

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 A ct 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"

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Criteria	Small Contracts	Major Contracts
Value of Contract	< Rs. 20,000,00/- (less	>= Rs. 20,000,00/-
	than Rs. Twenty Lac)	(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.

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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.

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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 incharge 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.

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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

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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 wavier 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

Conseque Observe accident	d (Not related to incident /						
SI No	Safety Violations	1st	2nd	3rd	4th	Subsequent violations	Action required
1	Working without PPE	A	A	В	В	Will attract	
2	Working without proper tools and tackles	A	В	В	С	same penalty as applicable	Take risk
3	Working without creation of proper safety zone	В	В	С	D	in 4th violation	reduction measure
4	Improper supervision at worksite	В	С	D	E		
5	Working without PTW process	С	D	E			Intolerable
Legand	Action to be taken	Amount in			The number v to be cale cummulativ	culated	

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



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Con	sequence of an Incident/Accident (in case of MAJOR contract)		Incident/	Acciden	t	
SI No	Safety Violations	1st	2nd	3rd	4th	Action required
1	Slight injury (First Aid Case)	(STRI	F ENTHENING		CESS)	
2	Moinor injury (No or Hospitilization less then 48 Hrs)	F	G	G	н	Take risk
3	Major injury (Bone injury or burn or Hospitalization more than 48 hrs)	G	G	Н	I	reduction measure
4	Single Fatality	J	К			
5	Multiple fatalities (Two or more fatalities during one event)	K				Intolorable
Legand	Action to be taken	Respo	nsibility		nalty nt in Rs	
F	Issue memo and levy of penalty	Enginee	r incharge	INR	5,000	
G	Issue memo and levy of penalty	Enginee	r incharge	INR 2	20,000	The number
Н	Issue memo and levy of penalty	Circle He	ead	INR !	50,000	violations are to be calculated
I	Issue memo and levy of penalty	Head of Departm		INR 2	00,000	cumnulative on the contract
J	Issue memo and levy of penalty	Head of Departm		INR 5	00,000	period or on the anual basis
K	Issue memo, levy of penalty, termination of contract and black listing of contractor	Function	n Head	INR 1,	000,000	(which ever is less).

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

Con	sequence of an Incident/Accident (in case of SMALL contract)		Incident/	Acciden	t	
SI No	Safety Violations	1st	2nd	3rd	4th	Action required
1	Slight injury (First Aid Case)	(STR	L ENTHENING	OF PRO	CESS)	•
2	Moinor injury (No or Hospitilization less then 48 Hrs)	L	М	М	N	Take risk
3	Major injury (Bone injury or burn or Hospitalization more than 48 hrs)	М	М	N	0	reduction measure
4	Single Fatality	P	Q			
5	Multiple fatalities (Two or more fatalities during one event)	Q				Intolorable
Legand	Action to be taken	Respo	nsibility		nalty nt in Rs	The number
L	Issue memo and levy of penalty	Enginee	r incharge	INR	5,000	violations are to
M	Issue memo and levy of penalty	Enginee	r incharge	INR	10,000	be calculated
N	Issue memo and levy of penalty	Circle H	ead	INR	25,000	cumnulative on the contract
0	Issue memo and levy of penalty	Head of Departr		INR 1	.00,000	period or on the anual basis

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P	Issue memo and levy of penalty	Head of Department	INR 200,000	(whichever is less).
Q	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	 With 4 Point Fas Trac Ratchet Suspension sewn headband Textile straps made from polyester Suspension point fixing: good positioning,stability, better air circulation due tolimited contact areas with the head Easy clean sweatband 	
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	

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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	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.

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Technical Specification:

recinical opecineation.	
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.

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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.



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BSES YAMUNA POWER LIMITED (Name of Site)

Safety Appreciation / Violation Memo

DIV	ISION/Area:			Date & Ti	me:	
Nan	ne of Contractor:			Activity: -		
Nan	ne of Division Head:					
Арр	reciation/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						
Saf	ety Appreciation/Viola	tion Note:				
		To a				
Pac	ommended By: Na	ame:	Decig	nation:		
		Me	Desigi	Iduon	· -	
Sign	n/Date:					
	proved By (Division Head): n/Date:	Name:		Designation:		
			Annexure #3			
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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:
<u>s</u>	atus 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

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(Name of Site)

Monthly Status - Accident / Incident

Locati	on/Area:				Date &	Time:	
Name	of Contractor:						
Table	– 1: Summary of Accident /Incid	ent / Neai	Miss / Da	angerous Occ	curences / F	irst Aid:	
S.N	Type of Accident / Incident / Near Miss / Dangerous Occurences / First Aid	Person	Injured		Brie	f Discription	
1			4	> 1			
2							
3							
4							
5							
Table	- 2: Learning from Incidents:						
S.N	Brief Discription		Root Ca	ause		Recommendation	
	Brief Discription		Root Ca	ause		Recommendation	
1	Brief Discription		Root Ca	ause		Recommendation	
1 2	Brief Discription		Root Ca	ause		Recommendation	
1 2	Brief Discription		Root Ca	ause		Recommendation	
1 2 3	Brief Discription		Root Ca	ause		Recommendation	
1 2 3 4 5	- 3: Summary of Person Injured		Root Ca	ause		Recommendation	
1 2 3 4 5		Emp	o. ID / gnation	Type of	f Injury	Duration of Medical Rest	

		From	То
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	A		
2			
3			
4			
5			

Measures to avoid r required)	ecourrences	for all above	e mentioned (discrepancies (Attach relevan	t documents if	

Signature / Date

Annexure #5

BSES YAMUNA POWER LIMITED

CONTRACT HEALTH AND SAFETY PLAN NIT NO: CMC/BY/22-23/RS/SV/25	Page 15 of 16	BIDDERS SEAL & SIGNATURE

(Name of Site)

Format - PPE's Receipt by workers

_		-			
n		716		วท	•
$\boldsymbol{\mathcal{L}}$	ıv	4 1	эι.	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	

Name of Contractor:

					4				
S. NO	NAME	DESI.	Safety Helmet	Electrical Insulating Hand gloves	Full Body Harness	Safety Shoes	Safety Goggle	Reflective Jacket	SIGNATU RE

Signature of Contractor / Date.....

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APPENDIX II

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

FORMAT OF ADVANCE BANK GUARANTEE

	FORMAT OF	ADVANCE BANK GUA	KANTEE
This G	fuarantee made at this [_] day of [] 20X	X
1.	of Companies Act, 1956 having Delhi 110032, India hereinafter re	its Registered Office at eferred to as the "Own	y incorporated under the provisions Shaktikiran Building, Karkardooma, er ", (which expression shall unless accessors, administrators, executors
2.	nature of contract here) vide referred to as the "Contract") wit Suppliers", which expression sha	Contract No th M/s th unless repugnant to th of their respective su	r(Please specify the(hereinafter
3.	the Suppliers has agreed to fur	nish a Bank Guarantee	se of conditions of Contract, for an amount equivalent to the ner to the Supplier for the faithful
4.	to accept the Advance Bank Guar from [] (pl. s at [] through its which B.G is issued) hereinafter	antee for percent of percen	e Owner and the Owner has agreed (%) of the total Contract Value (k) having its head/registered office specify the name of Branch through k", (which expression shall unless it emed to include its successors and
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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. Owner may assign this Guarantee to any Person or body whether natural, incorporated or otherwise under intimation to the Bank. The Bank shall be discharged of its obligations

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hereunder by performance in accordance with the terms hereof to such assignee without verifying the validity / legality / enforceability of the assignment.

17. 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 of20XX 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 G	suarantee 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
3.	AND WHEREAS as per clauseof 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.]

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BIDDERS SEAL & SIGNATURE

APPENDIX II

NIT NO: CMC/BY/22-23/RS/SV/25

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. Owner may assign this Guarantee to any Person or body whether natural, incorporated or otherwise under intimation to the Bank. The Bank shall be discharged of its obligations hereunder by performance in accordance with the terms hereof to such assignee without verifying the validity / legality / enforceability of the assignment.

APPENDIX II NIT NO: CMC/BY/22-23/RS/SV/25	Page 7 of 12	BIDDERS SEAL & SIGNATURE

16.	arising out of,	connected with, c	ed by the laws of India. Any suit, action, or other proceeding or related to this Guarantee or the subject matter hereof shall diction 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

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

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BIDDERS SEAL & SIGNATURE

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

APPENDIX II NIT NO: CMC/BY/22-23/RS/SV/25	Page 10 of 12	BIDDERS SEAL & SIGNATURE

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

To ,	d on letterhead of Contractor)
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 hereby acknowledge and confirm that w	// (Contractor) do // (Rs
WO/PO/Contract No.: ########. Dated. #### our entire satisfaction and we further confi Yamuna Power Limited under or in respect o Notwithstanding any protest, note or objection measurement books and / or final bills etc. (a) we confirm that BSES Yamuna Power Lin (b) we shall make no claim of any nature personnel, and	SES Yamuna Power Limited, in respect of the aforesaid #. including all amendments, if any, to the said Contract, to rm that we have no claim whatsoever pending with BSES
connection with the above-mentioned Contengaged by us including our contractors, supending or unpaid and we have no (and shal regard. No refund has been received/ is envisaged account of taxes, duties or any other payme corresponding to any amount paid or reimburthe same will be passed on to BSES Yamuna in this regard. We are issuing this "NO DEMAND CERTIF	ies, taxes and statutory and other amounts payable by us in ract and amounts payable to or in relation to third parties ppliers, employees and labour. No payment in this regard is I have no) claim against BSES Yamuna Power Limited in this to be received or reasonably believed to be receivable on int made by us in respect of the Contract. In case any refund sed by BSES Yamuna Power Limited is received in the future, a Power Limited promptly and without any demand from them FICATE" in favor of BSES Yamuna Power Limited with full onsent without any influence, misrepresentation, coercion etc.
Date: Place:	Signature: Name: Designation: (Company Seal)

APPENDIX II NIT NO: CMC/BY/22-23/RS/SV/25 Page **11** of **12**

BIDDERS SEAL & SIGNATURE

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: BSES Yamuna Power Limited, Shaktikiran Building, Karkardooma, Delhi -110032. Dear Sirs, WO/PO/Contract No. ______Dated _/__/_ 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, 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
NIT NO: CMC/BY/22-23/RS/SV/25

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 AUGMENTATION OF 2 NOS.		
66/11 kV POWER		
TRANSFORMERS FROM 20 MVA		
TO 31.5 MVA AT BHAGIRATHI		
GRID SUB-STATION WITH		
REPLACEMENT OF TWO NOS. 11 KV SWITCHBOARD ALONG		
WITH ASSOCIATED CIVIL		
WORKS		
Grand Total [A+B+C]		
Grand Total (In words)	TAID C 41 41	

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

PRICE BID NIT NO: CMC/BY/22-23/RS/SV/25	Page 2 of 9	BIDDERS SEAL & SIGNATURE
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- 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.



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 Mand atory)	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C) % AMT	UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
1	31.5 MVA, 66 /11 kV Power Transformer		Nos	2				
	11 kV Switchboard							
2	Incoming panel (with Line PT)		Nos	2				
3	Adaptor for Incomer Panel		Nos	2				
4	Bus Coupler Panel		Nos	1				
5	Adaptor for Bus Coupling Through Cables		Nos	1				
6	Bus Riser Cum Bus PT Panel		Nos	1				
7	Bus PT Panel		Nos	1				
8	Capacitor Panel		Nos	2				
9	Outgoing Panel		Nos	16				
10	Station Transformer Panel		Nos	1				
11	Earthing Truck for Bus bar Side Earthing		Nos	2				
12	Earthing Truck for Cable Side Earthing		Nos	2				
	End Termination Kits			1				
13	End termination kit for 11kV, 1c x 1000sqmm cable		Set	54				
14	End Termination kit for 11kV, 3C x 300 sqmm cable		Nos	8				
15	End termination kit for 11kV, 3C x 300 sqmm cable		Nos	2				
16	End Termination kit for 0.415 kV 4C X 300 sqmm cable		Nos	4				
	Cable and Associated Items							
17	11 kV 1CX1000 sqmm XLPE insulated, stranded Aluminium conductor, PVC outer sheath cable		Lot	1				
18	11 kV 3CX300 sqmm XLPE insulated, stranded aluminum conductor, PVC outer sheath Power cable		Lot	1				
19	11 kV 3CX300 sqmm XLPE insulated, stranded		Lot	1				

		,
PRICE BID	Page 4 of 9	BIDDERS SEAL & SIGNATURE
NIT NO: CMC/BY/22-23/RS/SV/25		

S. No.	DESCRIPTION OF GOODS	HSN CODE (8 Digit Mand atory)	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	APF () SGST	IT GST & TESS AS PLICABLE CGST & T/UTGST or IGST) (₹) (C) AMT	UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
	aluminum conductor, PVC outer sheath Power cable								
20	0.415 kV 2R X 4C X 300 sqmm XLPE Insulated stranded conductor, PVC outer Sheath Power Cable		Lot	1					
21	LT Power Cable with proper ferruling and tagging along with glands and lugs		Lot	1					
22	Control Cables with proper ferruling and tagging along with glands and lugs		Lot	1					
23	Cable Tray including bends etc with 50% spare capacity in each		Lot	1					
24	Cable Sealing System		Lot	1					
25	Fire Resistant Coating		Lot	1					
26	Cable Support Structure along with Clamping Arrangement		Lot	1					
27	Auto Switched Capacitor Bank		Nos	2					
	Auxiliary Equipment								
28	DC Distribution Board		Nos	1		,			
29	220 V Li Ion Battery Bank		Nos	1					
30	Insulated Floor Coating		Lot	1					
31	Earthing		Lot	1					
32	Angle and Channel		Lot	1					
33	Fire protection system		Lot	1					
34	Conduits		Lot	1					
35	SCADA Works		Lot	1					
36	Licensed programming software for Numerical Relays		Nos	1					
37	Communication Cord		Lot	1					
38	Emergency Exit Marking		Lot	1					
39	Recommended & Mandatory Spares		Lot	1					
40	Accessories		Lot	1					
41	Trolley type ladder		Nos	1					
	Tools			_					
42	Special Tools		Lot	1					
43	High voltage Test Set (0-80 kV DC)		Nos	1					
44	Insulation Resistance Kit		Nos	1					
45	Earthing Rod for Discharging Purpose		Nos	1					

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NIT NO: CMC/BY/22-23/RS/SV/25		

S. No.	DESCRIPTION OF GOODS	HSN CODE (8 Digit Mand atory)	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	APF () SGST	IT GST & ESS AS PLICABLE CGST & '/UTGST or IGST) (₹) (C) AMT	UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
46	Live Line Detector		Nos	1					
47	Bosch Professional Tool Kit		Nos	1					
48	Bosch Cordless Motorized Torque Wrench		Nos	1					
49	Portable Flash Light		Nos	1					
	·	GRAND ⁻	TOTAL LA	ANDED C	OST (₹)				

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 BID NIT NO: CMC/BY/22-23/RS/SV/25	Page 6 of 9	BIDDERS SEAL & SIGNATURE
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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 Mand atory)	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (₹) (C) % AMT	UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
	Erection, Testing and Commissioning of all items specified in "Scope of Supply"							
1	31.5 MVA, 66 /11 kV Power Transformer		Nos	2				
	11 kV Switchboard							
2	Incoming panel (with Line PT)		Nos	2				
3	Adaptor for Incomer Panel		Nos	2				
4	Bus Coupler Panel		Nos	1				
5	Adaptor for Bus Coupling Through Cables		Nos	1				
6	Bus Riser Cum Bus PT Panel		Nos	1				
7	Bus PT Panel		Nos	1				
8	Capacitor Panel		Nos	2				
9	Outgoing Panel		Nos	16				
10	Station Transformer Panel		Nos	1				
11	Earthing Truck for Bus bar Side Earthing		Nos	2				
12	Earthing Truck for Cable Side Earthing		Nos	2				
	End Termination Kits							
13	End termination kit for 11kV, 1c x 1000sqmm cable		Set	54				
14	End Termination kit for 11kV, 3C x 300 sqmm cable		Nos	8				
15	End termination kit for 11kV, 3C x 300 sqmm cable		Nos	2				
16	End Termination kit for 0.415 kV 4C X 300 sqmm cable		Nos	4				
	Cable and Associated Items							
17	11 kV 1CX1000 sqmm XLPE insulated, stranded Aluminium conductor, PVC outer sheath cable		Lot	1				
18	11 kV 3CX300 sqmm XLPE insulated, stranded		Lot	1				

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S. No.	DESCRIPTION OF SERVICES	SAC CODE (8 Digit Mand atory)	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	APF () SGST	IT GST & ESS AS PLICABLE CGST & '/UTGST or IGST) (₹) (C) AMT	UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
	aluminum conductor, PVC outer sheath Power cable								
19	11 kV 3CX300 sqmm XLPE insulated, stranded aluminum conductor, PVC outer sheath Power cable		Lot	1					
20	0.415 kV 2R X 4C X 300 sqmm XLPE Insulated stranded conductor, PVC outer Sheath Power Cable		Lot	1					
21	LT Power Cable with proper ferruling and tagging along with glands and lugs		Lot	1					
22	Control Cables with proper ferruling and tagging along with glands and lugs		Lot	1					
23	Cable Tray including bends etc with 50% spare capacity in each		Lot	1					
24	Cable Sealing System	<i>y</i>	Lot	1					
25	Fire Resistant Coating		Lot	1					
26	Cable Support Structure along with Clamping Arrangement		Lot	1					
27	Auto Switched Capacitor Bank		Nos	2					
	Auxiliary Equipment								
28	DC Distribution Board		Nos	1					
29	220 V Li Ion Battery Bank		Nos	1					
30	Insulated Floor Coating		Lot	1					
31	Earthing		Lot	1					
32	Angle and Channel		Lot	1					
33	Fire protection system		Lot	1					
34	Conduits		Lot	1					
35	SCADA Works		Lot	1					
36	Licensed programming software for Numerical Relays		Nos	1					
37	Communication Cord		Lot	1					
38	Emergency Exit Marking		Lot	1					
39	Dismantling of Existing 11 kV Switchgear Panels including Control Cables		Lot	1					
40	Dismantling of Existing Power Transformers with its Associated Items		Nos	2					

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NIT NO: CMC/BY/22-23/RS/SV/25		

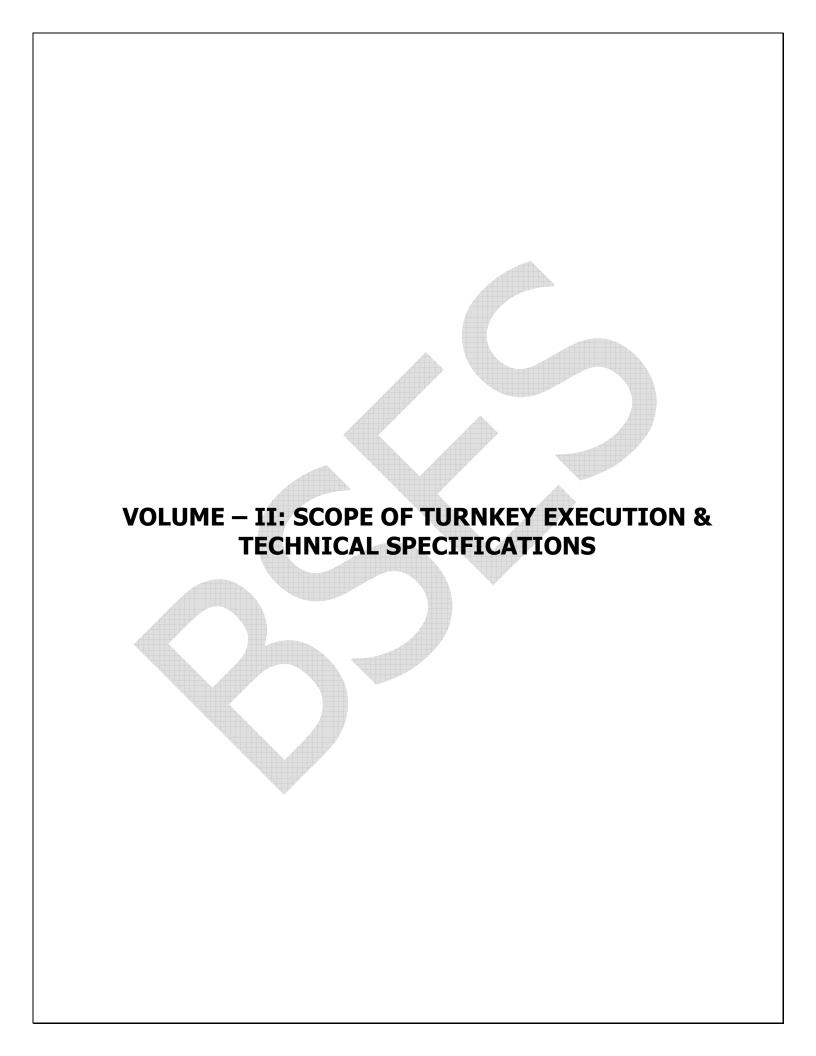
S. No.	DESCRIPTION OF SERVICES	SAC CODE (8 Digit Mand atory)	UoM	QTY (A)	UNIT BASIC PRICE (₹) (B)	API (1 SGST	IT GST & CESS AS PLICABLE CGST & T/UTGST or IGST) (₹) (C) AMT	UNIT LANDED COST (₹) (D = B+C)	TOTAL LANDED COST (₹) (E = DXA)
41	Dismantling of Cables Associated with Power Transformer, Capacitor Banks and Station Transformer		Lot	1					
42	Dismantling of DCDB , Battery, Capacitor Banks with its Associated Items		Lot	1					
43	Disconnection and Connection of 11 kV Switchgear Power Cables		Lot	1					
44	Training on application, programming, testing and commissioning of Numerical Relays		Days	2					
45	Training on commissioning, operations and maintenance of 11KV Switchgear		Days	2					
46	Training on commissioning, operations and maintenance of NIFPS		Days	2		4			
47	Training on IEC 61850		Days	2					
48	Painting of Feeder names (SCADA code, Asset Code, etc)		Lot	1					
49	SLD of Grid		Nos	1					
GRAN	ID TOTAL LANDED COST (₹)		-						

In words			
iii wolus	 	 	

Note: All quantities mentioned above are estimated quantities. Actual quantities may vary as per actual site requirement.

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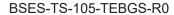


SCOPE OF TURNKEY EXECUTION

FOR

BHAGIRATHI GRID SUBSTATION

Revision			0
Date			20.05.2022
Pages			Page 1 of 14
Prepared by	Abhishek Harsh	CES	326707:3-82b5-46ct-b5s6-867ee7820a34
Reviewed by	Srinivas Gopu	CES	\$612525e-ed3a-4441-6127-683627761519
	Manoj Vidhyarthi	P&E	Manoj Vidyarthi
Approved by	Gaurav Sharma	CES	236/2002 9/se 4472 9977 46877 34726
	Pramod Kumar	P&E	Pramod J Kumar 8bbc4b3-y943-4fce-s14e-527ef4e0034f





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2	SITE DETAILS	3
3	BIDDER'S SCOPE	3
4	APPROVED MAKE LIST	13



1 INTENT

- a. This document defines the scope for turnkey execution of Bhagirathi Grid 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. Bhagirathi Grid S/S is situated near Bhagirathi Water treatment plant, Delhi 110094.
- b. Longitude and Latitude of Bhagirathi Grid S/S is 28°42'10.0"N 77°16'46.1"E

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



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	66	11
3.1.3.2	Rated voltage kV	72.5	12
3.1.3.3	Power Frequency (kV rms) with stand voltage	140	28
3.1.3.4	Basic Insulation Level KVp	325	75
3.1.3.5	Rated Frequency Hz	50±5%	50±5%
3.1.3.6	System Neutral Earthing	Solidly Grounded	Solidly Grounded

3.2 SCOPE OF SUPPLY

S No.	Items	UOM	Qty	Remarks
3.2.1	Transformer, 31.5MVA, 66/11KV	Nos	2	
3.2.2	11 kV Switchboard			
3.2.2.1	Incoming panel (with Line PT)	Nos	2	
3.2.2.2	Adaptor for Incomer Panel	Nos	2	
3.2.2.3	Bus Coupler Panel	Nos	1	
3.2.2.4	Adaptor for Bus Coupling through Cables	Nos	1	
3.2.2.5	Bus Riser Panel with Bus PT	Nos	1	
3.2.2.6	Bus PT Panel	Nos	1	
3.2.2.7	Capacitor Panel	Nos	2	
3.2.2.8	Outgoing Panel	Nos	16	
3.2.2.9	Station Transformer Panel	Nos	1	

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3.2.2.10	Earthing Truck for Bus bar Side Earthing	Nos	2	
3.2.2.11	Forthing Truck for Coble Side	Nos	2	
3.2.3	End Termination Kits			
3.2.3.1	End termination kit for 11kV, 1C x 1000 sqmm cable	Set	54	 a. For Terminating 11 kV Cables at 11 kV incomer end b. For Terminating 11 kV Cables at Transformer end c. For Coupling Existing and New Switchboard through Cables
3.2.3.2	End Termination kit for 11kV, 3C x 300 sqmm cable	Nos	8	For Terminating 11 kV Cables at 11 kV Capacitor Bank end and 11 kV Capacitor Panel end
3.2.3.3	End termination kit for 11kV, 3C x 300 sqmm cable	Nos	2	For Terminating 11 kV Cables at 11 kV Station Transformer Panel and Station Transformer
3.2.3.4	End Termination kit for 0.415 kV 4C X 300 sqmm cable	Nos	4	For Terminating 0.415 kV Cables at ACDB and Station Transformer
3.2.4	Cable and Associated Items			
3.2.4.1	11 kV 1CX1000 sqmm XLPE insulated, stranded Aluminium conductor, PVC outer sheath cable	Lot	1	Power transformers to 11 kV incoming Panel
3.2.4.2	11 kV 3CX300 sqmm XLPE insulated, stranded aluminum conductor, PVC outer sheath Power cable	Lot	1	For 11 kV Capacitor Banks
3.2.4.3	11 kV 3CX300 sqmm XLPE insulated, stranded aluminium conductor, PVC outer sheath Power cable	Lot	1	For Station transformer
3.2.4.4	0.415 kV 2R X 4C X 300 sqmm XLPE Insulated stranded conductor, PVC outer Sheath Power Cable	Lot	1	For Station Transformer
3.2.5	LT Power Cable with proper ferruling and tagging along with glands and lugs	Lot	1	For items specified in "Scope of Supply"
3.2.6	Control Cables with proper ferruling and tagging along with glands and lugs	Lot	1	For items specified in "Scope of Supply"
3.2.7	Cable Tray including bends etc with 50% spare capacity in each	Lot	1	a. For items specified in "Scope of Supply"b. 50% spare capacity in each is tray is required
3.2.8	Cable Sealing System	Lot	1	For all cables entering and exiting the Proposed Substation Building



3.2.9	Fire Resistant Coating	Lot	1	a. On all cable specified in "Scope of Supply"b. Fire rating-2 hours
3.2.10	Cable Support Structure along with Clamping Arrangement	Lot	1	a. For all Power Cable Terminations b. For Control Cable Termination wherever Required
3.2.11	Auto Switched Capacitor Bank	Nos	2	
3.2.12	Auxiliary Equipment			
3.2.12.1	DC Distribution Board	Nos	1	It shall be of Type-1
3.2.12.2	220 V Li Ion Battery Bank	Nos	1	It shall be of Type-1
3.2.13	Insulated Floor Coating	Lot	1	For Switchgear Room, Battery Bank Room, DCDB Room
3.2.14	Earthing	Lot	1	Earthing of items specified in "Scope of Supply"
3.2.15	Angle and Channel	Lot	1	For Erection and Commission of items included in "Scope of Supply"
3.2.16	Fire protection system	Lot	1	
3.2.17	Conduits	Lot	1	
3.2.18	SCADA Works	Lot	1	As per Specification
3.2.19	Licensed programming software for Numerical Relays	No	1	
3.2.20	Communication Cord	Lot	1	
3.2.21	Emergency Exit Marking	Lot	1	For Complete 11 kV Switchgear Room
3.2.22	Recommended & Mandatory Spares	Lot	1	As per Specification of Supplied items
3.2.23	Accessories	Lot	1	As per specification of Supplied Items
3.2.24	Trolley type ladder	No	1	For Relay Programming
3.2.25	Tools			
3.2.25.1	Special Tools	Lot	1	Corresponding to Items specified in "Scope of Supply" for ease of Operation and Maintenance
3.2.25.2	High voltage Test Set (0-80 kV DC)	No	1	
3.2.25.3	Insulation Resistance Kit	No	1	
3.2.25.4	Earthing Rod for Discharging Purpose	No	1	
3.2.25.5	Live Line Detector	No	1	
3.2.25.6	Bosch Professional Tool Kit	No	1	
3.2.25.7	Bosch Cordless Motorized Torque Wrench	No	1	 a. Including all accessories suitable for Tightening and opening of bolts of 11 kV Switchgear b. Cordless tool shall have facility of working on 240 VAC also
3.2.25.8	Portable Flash Light	No	1	



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	Dismantling of Existing 11 kV Switchgear Panels including Control Cables	Lot	1	
3.3.3	Dismantling of Existing Power Transformers with its Associated Items	No	2	It Includes Dismantling of Marshalling Box, Control Cable, NIFPS, Transformer Oil
3.3.4	Dismantling of Cables Associated with Power Transformer, Capacitor Banks and Station Transformer	Lot	1	
3.3.5	Dismantling of DCDB , Battery, Capacitor Banks with its Associated Items	Lot	1	
3.3.6	Disconnection and Connection of 11 kV Switchgear Power Cables	Lot	1	a. Disconnection of All Power Cables b. Connection of Incomer, Station Transformer and Capacitor Bank Cable
3.3.7	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
3.3.8	Training on commissioning, operations and maintenance of 11KV Switchgear	Days	2	One-day classroom training at BYPL Training Centre and one-day onsite training. Training shall be provided by Domain experts only
3.3.9	Training on commissioning, operations and maintenance of NIFPS	Days	2	One-day classroom training at BYPL Training Centre and one-day onsite training. Training shall be provided by Domain experts only
3.3.10	Training on IEC 61850	Days	2	Two - Day Classroom Training
3.3.11	Painting of Feeder names (SCADA code, Asset Code, etc)	Lot	1	It Includes Supply Part

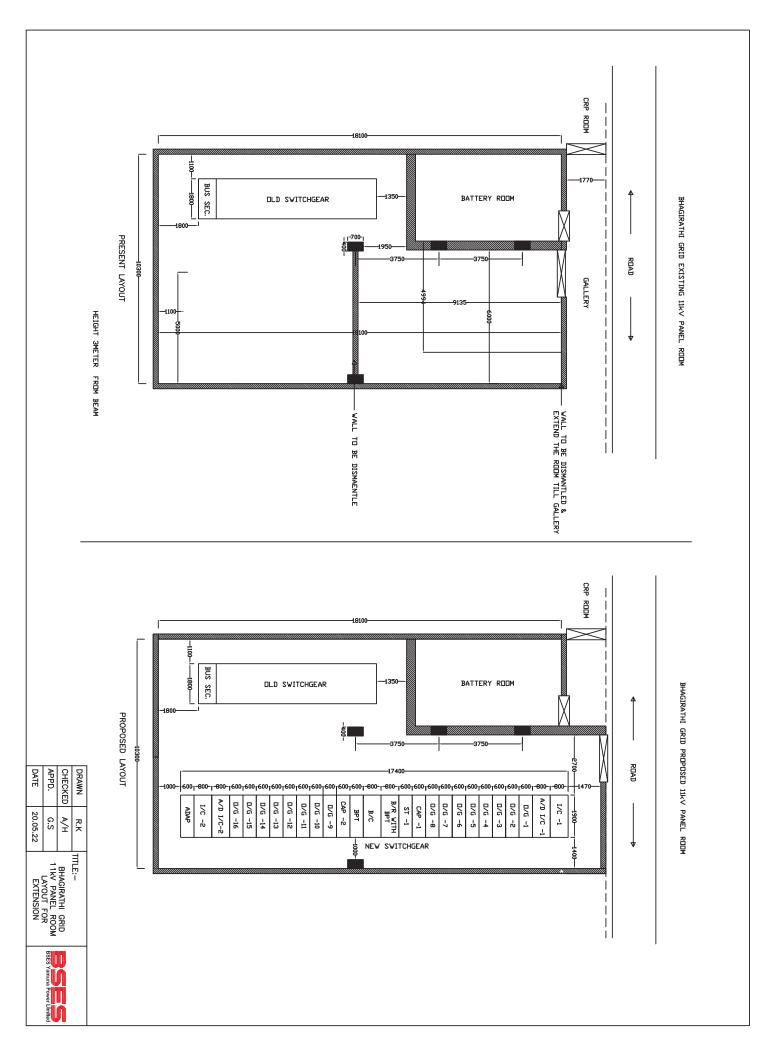
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SCOPE OF TURNKEY EXECUTION FOR BHAGIRATHI GRID SUBSTATION

			a.	Covered in	Acrylic
3.3.12 SLD of Grid	No	1	b.	Sheet It Includes Part	Supply

3.4 REFERENCE LAYOUT FOR 11 kV SWITCHGEAR





3.5 SCOPE DEMARCATION

S. No	Head	BYPL	Bidder's Scope	Remarks
3.5.1	Dismantling of Foundations	✓	×	It Includes Foundation of a. Power Transformer b. Marshalling Box c. NIFPS d. Capacitor Banks
3.5.2	Fire Wall Construction	✓	×	
3.5.3	Dismantling and Extension of Wall in 11 kV Switchgear Room	✓	×	
3.5.4	Chequered Plate Work	\checkmark	×	
3.5.5	Cable Work Related to 11 kV Outgoing Feeders	✓	*	
3.5.6	Permissions from Various External and Internal Agencies	*	✓	Statutory fees will be borne by BYPL if applicable
3.5.7	Permit to work request to BYPL authority	*	✓	Permit Should be applied to Engineer Incharge prior to work through proper procedure
3.5.8	Permit to work issuance from BYPL authority	✓	*	
3.5.9	Testing Equipment	×	✓	
3.5.10	Lighting Arrangement	*	✓	
3.5.11	Construction Power	*	✓	Bidder may take temporary connection from BYPL on chargeable basis.
3.5.12	Construction Water	×	\checkmark	
3.5.13	Safety and Security of Manpower(Labor, Engineers, Supervisors etc)	*	√	
3.5.14	Various Tools and Tackles related to Job	*	✓	
3.5.15	Loading, Unloading and Transportation of Material	*	√	It includes transportation of dismantled equipment to BYPL store in stacked manner.
3.5.16	Cleanliness around work premises	×	✓	
3.5.17	Document/Drawing Submission	×	✓	
3.5.18	Document/Drawing Approval	√	*	



	1			
3.5.19	Security and Safety of material until handover	*	✓	
3.5.20	Various Machines e.g. Crane, Hydra, JCB etc to complete the Job	×	√	
3.5.21	Maintenance of Equipment Until Handover to Engineer Incharge and EHV O&M	*	✓	
3.5.22	Electrical Inspector Clearance	*	✓	Only statutory fees will be borne by BYPL if applicable
3.5.23	Permit issuing agency for Works inside BYPL Premises	√	×	
3.5.24	Permit requesting Agency	×	✓	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.
3.5.25	Temporary office near work premises	*	✓	After handing over the equipment, contractor has to evacuate the premises within one week otherwise deemed fit action will be taken
3.5.26	Temporary store at work premises	*	✓	
3.5.27	Yard aesthetics at work place should be maintained at the time and after the completion of Work	×	✓	Disposal of Scrap/Debris etc from site and complete cleaning of working area till handover
3.5.28	Any damages done to the existing system, shall be repaired/ rectified/ replaced	*	✓	
3.5.29	Clearance certificate	×	✓	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.
3.5.30	Various compliances pertaining to Job	×	✓	IE rules, CEA Regulation 2010



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			

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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
		ABB/Schneider/Siemens/Transformer &
4.1.1	Power Transformer	Rectifiers/ EMCO/ Bharat Bijlee/
		BHEL/Toshiba/Voltamp/CGL
4.1.2	11 kV Power Cable	Universal/KEI/GEMSCAB/Polycab/Torrent/Ste rlite/Gupta Power/KEC
4.1.3	Auto Switched Capacitor Bank	Epcos/Shreem/ABB
4.1.4	11 kV End Termination kit	Raychem/3M/Yamuna Power Infrastructure
4.1.5	Control cable	Universal/KEI/GEMSCAB/Polycab/ Cords Cable
4.1.6	11 kV AIS	ABB/Siemens/Schneider/CGL

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SCOPE OF TURNKEY EXECUTION FOR BHAGIRATHI GRID SUBSTATION

4.1.7	Numerical relays	Siemens (Siprotec series) /Schneider , GE(Micom Series)
4.1.8	Ethernet Switch	Ruggedcom/Hirschman
4.1.9	Cable sealing system	Roxtec/MCT Brattberg
4.1.10	Fire retardant coating for cables	3M/Demech/Stanvac
4.1.11	Floor coating	3M/Demech/Stanvac



Technical Specification

Of

HT Indoor Switchgear (33 & 11 kV)

Specification no – BSES-TS-66-HTSWG-R0

Rev:		0		
Pages:		1 of 60		
Date:		29 Apr 2022		
Prepared by	Abhishek Harsh	26767-3825-46cb 55:6-6782034		
Reviewed by	Srinivas Gopu	5.023255-6-63-441-01.7-80.567/01519		
Approved by	Gaurav Sharma	Masura		

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TECHNICAL SPECIFICATION OF HT INDOOR SWITCHGEAR (33 & 11kV)

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TECHNICAL SPECIFICATION OF HT INDOOR SWITCHGEAR (33 & 11kV)

1 SCOPE OF SUPPLY

- a. This specification covers the design, manufacture, testing, supply, erection & commissioning of 33kV and 11kV, Air Insulated, metal-enclosed and factory assembled switchgear.
- b. This specification shall be used in conjunction with all specifications, switchgear data sheets, single line diagrams, and other drawings attached to the specification / purchase requisition.

2 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
		IEC: 60694, IEC: 60298, IEC: 62271-200, IEC:
2.3	Switchgear and control gear	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
0.44	Control switches and push	IS 6875
2.11	buttons	16 667 6
2.12	HV fuses	IS 9385
	Arrangement of Switchgear bus	
2.13	bars, main connections and	IS:375
	auxiliary wiring	
2.14	Code of practice for phosphating	IS 6005
2.14	iron & steel	
2.15	Colours for ready mixed paints	IS 5
2.46	Code of practice for installation	IS 3072
2.16	and maintenance of switchgear	10 0012



TECHNICAL SPECIFICATION OF HT INDOOR SWITCHGEAR (33 & 11kV)

3 SERVICE CONDITION

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 PANEL CONSTRUCTION

	Engloquiro Typo	Free standing, Indoor, Fully compartmentalised,
4.1	Enclosure Type	Metal clad, Vermin proof
	Enclosure degree of protection	IP 4X for high voltage compartment
4.2		IP 5X for low voltage compartment
4.3	Enclosure material	Pre-Galvanized CRCA steel
4.3.1	Load bearing members	2.5 mm thick
4.3.2	Doors and covers	2.0 mm thick
		3.0 mm MS for multicore and 5. 0 mm Aluminium for
4.3.3	Gland plate	single core cables. All gland plates should be
		detachable type with gasket
	Dimension of Panel	Maximum 2700mm, Operating height maximum
		1600mm. In case of Extension of Existing make
4.4		panels, vendor shall match the dimension of existing
		panel.
4.5	Extensibility	On either side
	Separate Compartments for	Bus bar, Circuit Breaker, HV incoming cable, HV
4.6		outgoing cable, PT, LV instruments & relays
4.7	Transparent inspection window	For cable compartment at height of cable termination.
4.8	Bus end cable box	For direct cable feeder from bus
4.0	Rear Doors	Rear doors shall not be interlocked i.e. all door
4.9		opening shall be independent to each other.

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TECHNICAL SPECIFICATION OF HT INDOOR SWITCHGEAR (33 & 11kV)

		Separate, with lockable handle (Design with breaker
	Breaker compartment door	trolley as the front cover is not acceptable). Door of
4.10		one panel should not cause hindrance for opening of
		adjacent panel.
4.11	Inter compartmental connections	
	Breaker to bus bar	Through and off hughings
4.11.1	compartment	Through seal-off bushings
4.11.2	Breaker to cable compartment	Through seal-off bushings
4.40	Nut Bolt	Shall be as less as possible for ease of opening of
4.12	Nut Boil	compartments
4.13	Pressure relief devices	To be provided for each HV compartment
	Bus support insulator	Non-hygroscopic, track-resistant, high strength,
		Epoxy insulators (Calculation for validating dynamic
4.14		force withstand capability to be submitted during
		detailed engineering)
	Fixing arrangement	Doors - Concealed hinged, door greater than 500mm
		shall have minimum three sets of hinges
4.15		Covers - SS bolts
		Gasket - Neoprene
	Required HV cable termination	650 mm for 11 KV.
4.16	height in the cable compartment	1000mm for 33 KV
4.17	Panel Base Frame	Steel Base frame as per manufacturer's standard.
	Handle	Removable bolted covers with handle for cable
4.40		chamber and busbar chamber. Panel
4.18		no./identification to be provided on cable box cover
		also.
	L	



TECHNICAL SPECIFICATION OF HT INDOOR SWITCHGEAR (33 & 11kV)

		a. Controlling of Capacitor Banks' switching shall be
	APFC	done by APFC. Although APFC shall not be in
		bidder's scope, Space for cut out shall be
		provided in the Capacitor panel. Space
4.19		requirement-150X150 mm ²
		b. Wiring of Bus PT , Incomer CT and Capacitor CT
		upto spare terminal for APFC shall also be
		provided in Capacitor Panel
4.20	Technical particulars	As per Annexure –C

5 CIRCUIT BREAKER

5.1	Туре	Truck or cassette type
. .		On withdrawable truck or carriage, with locking
5.2	Mounting	facility in service position.
		c. Transformer (oil filled and dry type)
		d. Motor (of small and large ratings – DOL starting
5.3	Switching duty	with starting current 6 to 8 times the full load
		current & with a maximum of 3 starts per hour)
		e. Underground cable with length up to 10 km
5.4	Interrupting medium	Vacuum
	Contact	Tulip contact shall be provided without any gap
5.5		between contacts
5.0	Breaker operation	Three separate identical single pole units operated
5.6		through the common shaft
	Operating Mechanism	Re-strike free, Trip free, with electrical anti-pumping
5.7		feature
	Туре	Motor wound, spring charged, stored energy type
5.7.1		with manual charging facility
	Operation on supply failure	One O-C-O operation possible after failure of power
5.7.2		supply to the spring charging motor
5.8	Breaker indications & push button	s

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TECHNICAL SPECIFICATION OF HT INDOOR SWITCHGEAR (33 & 11kV)

		a. Manual / mechanical.
5.8.1	ON/ OFF / Emergency trip push button	b. Emergency Off push button should be provided with a protective flap.c. Mechanical ON shall have padlocking facility.
5.8.2	Mechanical ON – OFF indication	On breaker trolley front
5.8.3	Operation counter	On breaker trolley front
5.8.4	Test-service position indicator	On breaker trolley front
5.8.5	Mechanism charge / discharge indicator	On breaker trolley front
5.9	Breaker positions	Service, Test and Isolated
5.10	Inter changeability	Possible, only with breaker of same rating
5.11	Breaker Control	On panel front only
5.12	Handle	Breaker shall be provided with handles for easy handling, rack in–out operation and manual spring charging as applicable.
5.13	Pin Sequence and Configuration of Pin of Adaptor Plug	(a) Pin sequence and No of Pins of Adaptor plug shall be same in Outgoing and Capacitor Panel(b) Pin sequence and No of Pins of Adaptor plug shall be same in Incoming and Bus Coupler Panel
5.14	Technical particulars	As per Annexure-C

6 FUNCTIONAL REQUIREMENTS

6.1	Interlocks	
6.1.1	Breaker compartment door opening	Opening of door and rack out to test/isolated position should be possible with breaker in OFF position only.
6.1.2	Breaker compartment door closing	Should be possible even when breaker is in isolated position
6.1.3	Racking mechanism safety interlock	Mechanical type
6.1.4	Racking in or out of breaker inhibited	When the breaker is closed



TECHNICAL SPECIFICATION OF HT INDOOR SWITCHGEAR (33 & 11kV)

6.1.5	Racking in the circuit breaker	Unless the control plug is fully engaged
0.1.5	inhibited	
6.1.6	Disconnection of the control plug	As long as the breaker is in service position
0.1.0	inhibited	, to reflig de the product to in control position
	Opening of cable compartment	
6.1.7	cover of Incomer Panels	As long as cable end is alive
	inhibited	
6.2	Safety Devices	
		In case the breaker panel door is required to be
		opened during a contingency, the personnel should
6.2.1	Exposure to live parts	not be exposed to any live part. Suitable
		shrouds/barriers/insulating sleeves should be
		provided.
	Breaker handing	In case the breaker is mounted on a carriage which
6.2.2		does not naturally roll out on the floor, a trolley for
		handling the breaker is to be provided.
6.3	Operation of breaker	In either service or test position
0.0.4	Closing from local	Only when local/remote selector switch is in local
6.3.1	Closing nom local	position
0.0.0	Closing from remote	Only when local/remote selector switch is in remote
6.3.2		position
0.0.0	Tripping from local	Only when local/remote selector switch is in local
6.3.3		position
6.2.4	Tripping from remote	Only when local/remote selector switch is in remote
6.3.4		position
6.3.5	Tripping from protective relays	Irrespective of position of local/remote switch
0.0.0	Testing of breaker	In test or isolated position keeping control plug
6.3.6	resulty of breaker	connected
6.4	Safety shutters.	



TECHNICAL SPECIFICATION OF HT INDOOR SWITCHGEAR (33 & 11kV)

		T ()
		To fully cover contacts when breaker is withdrawn to
6.4.1	Automatic safety shutter for	test. Independent operating mechanism for bus bar
0.4.1	female primary disconnects	& cable side shutters, separately pad-lockable in
		closed position.
6.4.2	Label for identification	For Bus side and cable side shutters
0.4.0	Warning label on shutters of	Clearly visible label "Isolate elsewhere before
6.4.3	incoming and other connections	earthing" be provided
6.5	Breaker electrical operation featur	es
6.5.1	Trip circuit supervision	To be given for breaker close & open condition
	Trip circuit supervision relay	For indication, clarm 8 to inhibit classing of breaker
6.5.2	contact	For indication, alarm & to inhibit closing of breaker
	Emergency trip push button	Wired directly to trip coil (wired to Master trip relay if
6.5.3	contact	second trip coil provided)
	Emergency trip push button	Wind to inhibit closing of hypothes
6.5.4	contact	Wired to inhibit closing of breaker
	Master trip relay contact (if	Wingel to inhihit aloning of burning
6.5.5	given)	Wired to inhibit closing of breaker
	Tripping or opening of breaker	
	through relay but not routed	Wired to Contact multiplication Bolov and then from
6.5.6	through Lockout (Example-	Wired to Contact multiplication Relay and then from
	SCADA Opening, Undervoltage,	CMR to tripping of breaker
	Overvoltage)	
	Closing of brooker through!	Wired to Contact multiplication Relay and then from
6.5.7	Closing of breaker through relay	CMR to closing of breaker
	DC control supply bus in all	Fed by two DC incoming sources in Bus coupler
6.6	panels	panel with auto changeover facility
	PT supply bus in all panels	Fed normally by bus PT with automatic changeover
6.7		facility to incomer line PT
6.8	Flans for Internal Are Protection	Flaps shall not have any pores/ opening during
	Flaps for Internal Arc Protection	normal operation



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7 SURGE SUPPRESSOR

7.1	Provision	To be provided in all panels except bus coupler and BPT.
7.2	Туре	Gapless, metal oxide type
7.3	Technical particulars	As per Annexure -C

8 CURRENT TRANSFORMER

8.1	Туре	Shall be cast resin type with insulation class of E or better.
8.2	Rating and technical particulars	As per Annexure – C (Technical particulars) and Annexure – F (SLDs)
8.3	СВСТ	If specified, bidder shall clearly mention his proposal for mounting the same.

9 POTENTIAL TRANSFORMER

9.1	Туре	Shall be cast resin type with insulation class of E or better.
9.2	Rating and technical particulars	As per Annexure – C (Technical particulars) and Annexure – F (SLDs)
9.3	Mounting	It shall be mounted on a withdrawable carriage. Mounting of PT on the breaker truck is not acceptable. Mounting of PT on the panel top is also not acceptable. Primary PT fuse shall be easily accessible.
9.4	Neutral	The HV neutral connection to earth shall be easily accessible for disconnection during HV test.

10 FEEDER AND BUS EARTHING

10.1	Earthing arrangement	Through separate earthing truck for bus & feeder
10.2	Short time withstand capacity of	Equal to rating of breaker. Refer technical
	earthing truck	parameters.
10.3	Operation from front	Mechanically operated by separate switch.



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		To prevent inadvertent closing on live circuit, with
10.4	Interlocks and Alarm	padlocking arrangement to lock truck in close or
		open position.

11 EQUIPMENT EARTHING

11.1	Material of earthing bus	Aluminium	
11.2	Earthing Bus Position	It shall run through whole switchgear passing nearer	
		to Power Cable Position	
11.3	Earth bus joints	All bolted joints in the bus should be made by	
11.0		connection of two bolts.	
11.4	Rating	Sized for rated short circuit current for 3 seconds	
	Enclosure & non -current		
11.5	carrying part of the switchboard /	Effectively bonded to the earth bus.	
	components		
11.6	Hinged doors Earthed through flexible copper braid		
	Circuit breaker frame /carriage	Earthed before the main circuit breaker contacts/	
11.7		control circuit contacts are plugged in the associated	
		stationary contacts	
		Connected to the earth bus by independent copper	
	Metallic cases of relays, instruments and other LT panel mounted equipment	wires of size not less than 2.5 sq. mm with green	
		colour insulation. For this purpose LT compartment	
11.8		should have a clear designated earth bus to which	
		earth connections from all components are to be	
		connected.	
44.0	CT and PT neutral	Earthed at one place at the terminal blocks through	
11.9	OT and I Houlai	links.	

12 METERS

12.1	Mounting	Flush mounted
12.2	Multifunction Meter	
12.2.1	SCADA Interfacing	RS485 rear port suitable for integration on Modbus Protocol
12.2.2	Size	96x96 mm ²

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TECHNICAL SPECIFICATION OF HT INDOOR SWITCHGEAR (33 & 11kV)

12.2.3	Panels where to be provided	All panels except Bus PT Panel	
12.2.4	Accuracy Class	1	
12.2.5	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	
12.2.6	Data Type	MFI	
12.2.7	Compatibility with RTU	ABB 560	
12.2.8	Programmability	CT secondary shall be programmable i.e for both 1 A and 5 A	
12.2.9	Auxiliary Supply	 a. 48 – 240VDC and AC i.e universal type. b. Although in Scheme, MFM must be wired up with DC only 	
12.3	Voltmeter	Digital type with programmable ratio	
12.3.1	Size	96x96 mm ²	
12.3.2	Panels where to be provided	Incomer and bus PT panel	
12.3.3	Voltmeter switch	Inbuilt in meter	
12.3.4	Accuracy Class	1.0	
12.4	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 ²	

13 INDICATION, ALARMS & ANNUNCIATION

13.1	Indications	Flush mounted, High intensity, clustered LED type
13.1.1	Breaker ON	Red
13.1.2	Breaker Off	Green
13.1.3	Spring Charged	Blue
13.1.4	DC control supply fail	Amber
13.1.5	AC control supply fail	Amber
13.1.6	Auto trip	Amber
13.1.7	Test Position	White
13.1.8	Service Position	White



	Heater circuit healthy	Yellow (Indication with integrated push button for		
13.1.9		checking)		
13.1.10	Trip circuit healthy	White		
13.1.11	PT supply as applicable	R,Y B		
13.2	Annunciator (For 33kV Panels o	nly)		
		Static type alongwith alarm. Annunciations shall be		
40.04	_	repetitive type and shall be capable of registering the		
13.2.1	Туре	fleeting signal. Fascia test facility should also be		
		provided.		
40.00	NI (LED type indications may not be provided for alarm		
13.2.2	Note	signals provided on annunciator.		
13.2.3	Mounting	Flush mounted		
13.2.4	Fascia	12 window		
	Signals to provided on Fascia	Window 1 – Main Protection Operated (Distance		
		/Differential)		
		Window 2 – Backup O/C & E/F Protection Operated		
		Window 3 – LBB operated		
40.0.5		Window 4 – CB Autotrip		
13.2.5		Window 5 – Trip Circuit Unhealthy		
		Window 6 – DC Fail		
		Window 7 – AC Fail		
		Window 8 – VT Fuse Fail		
		Window 9 – Protection Relay Faulty		
13.2.6	Push Buttons	For test, accept and reset		
13.2.7	Potential Free Contacts	To be provided for event logger		
		a. For DC fail, TC fail and CB auto trip in 11kV		
12.2	Alarm scheme with isolation	panels		
13.3	switch	b. For all signals wired to annunciator in 33kV		
		panels		



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Sequence of operation of the annunciator shall be as follows-

S No.	Alarm Condition	Fault Contact	Visual	Audible
S 140.			Annunciation	Annunciation
a.	Normal	Open	Off	Off
b.	Abnormal	Close	Flashing	On
C.	Accept	Close	Steady on	Off
d.	Return to normal	Open	Steady On	Off
e.	Reset	Open	Off	Off
f	Reset before return to	Close	Flashing	On
I.	normal	Ciose	Flasiling	Oil

14 SELECTOR SWITCHES & PUSH BUTTONS

14.1	Selector switches	Flush mounted on LV compartment door, with shrouded terminals	
14.1.1	TNC switch with pistol grip	Lockable, spring return to normal position	
14.1.2	Local / SCADA selector switch	2 pole Lockable Switch	
14.1.3	Rotary ON/OFF switches	For heater / illumination circuit	
14.1.4	Rating	16 A	
14.2	Push Button	Flush mounted on LV compartment door, with shrouded terminals	
14.2.1	Emergency trip push button	Red color with stay put	
14.2.2	Accept push buttons	Black color – Trip alarm / DC fail alarm	
14.2.3	Reset push buttons	Yellow color – Trip alarm / DC fail alarm	
14.2.4	Rating	10 A	

15 INTERNAL WIRING

15.1	Internal wiring	1100 V grade, PVC insulated (FRLS) stranded flexible copper wire.
15.2	Size	2.5 sq mm for CT circuit, 1.5 sq mm for PT & control circuits
15.3	Colour code	
	CT & PT	R Ph – Red
		Y Ph – Yellow
15.3.1		B Ph – Blue
		Neutral – Black

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15.3.2	Others	DC– grey, AC-black, Earth – green
15.4	Ferrules	At both ends of wire
15.5	Ferrule type	Interlocked type (one additional red colour ferrule for
		all wires in trip circuit)
		Tinned copper, pre-insulated, ring type, fork type and
15.6	Lugs	pin type as applicable. CT circuits should use ring
		type lugs only.
45.7	Spare contacts	Spare contacts of relays and contactors etc. should
15.7		be wired upto the terminal block.
45.0	Wiring enclosure	Plastic channels, Inter panel wiring through PVC
15.8		sleeves
	Interpanel wiring	Wires with ferrule to be terminated in the adjacent
15.9		shipping section should be supplied with one end
		terminated and the other end bunched and coiled.
	Auxiliary supply	Auxiliary bus wiring for AC and DC supplies, voltage
15.10		transformer circuits, annunciation circuits and other
		common services shall be provided on the same set
		of terminals in all the panels with proper segregation.

16 TERMINAL BLOCKS

16.1	Rating and Type	1100 V grade, moulded piece, stud type screw driver operated terminals complete with insulated barriers, washers, nuts and lock nuts.
16.2	Segregation	TBs shall be segregated.
	Suitability	Terminal Block shall be Stud Type Screw Driver
		Operated suitable for 6sqmm control cable.
16.3		Disconnecting facility shall be provided in CT and
		PT terminal. Shorting and Earthing facility shall be
		provided in CT
16.4	Marking and covers	White fibre markings strip with clear plastic, slip-on /
		clip-on terminal covers to be provided.
16.5	Disconnecting Facility	To be provided in CT and PT terminals

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16.6	Shorting & Earthing Facility	To be provided in CT Terminals
16.7	Spare Terminals	20% in each TB row
16.8	Spare Terminal Block in Capacitor Bank Panel	Separate Terminal Block with 50 number terminals required (20 Numbers Disconnecting and 30 Number Non Disconnecting type)
16.9	TB shrouds & separators	Moulded non- inflammable plastic material
16.10	Clearance between 2 sets of TB	100 mm min
16.11	Clearance with cable gland plate	250 mm min
16.12	Clearance between AC / DC set of TB	100 mm min
16.13	Test terminal blocks	Screw driver operated stud type for metering circuit

17 RELAYS

17.1	Protection Relays – General Features	
17.1.1	Technology and Functionality	Numerical , microprocessor based with provision for multifunction protection, control, metering and monitoring
17.1.2	Mounting	Flush Mounting, IP5X
17.1.3	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.
17.1.4	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.
17.1.5	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



		LC type Dual fibre optic port for interfacing with SCADA on IEC 61850 & PRP compatible. Through
17.1.6	SCADA Interface port	this port relays shall be connected to Ethernet
		switches
		SCADA functions for monitoring shall be executed
		on SPI (Single Point Input) and DPI (Double Point
17.1.7	Processing Indications	Input). DPI shall only be used in case of Isolator and
		Circuit breaker "close" and "open" indication.
		Functionality of command processing offered for
		SCADA interface shall include the processing of
		single and double commands i.e SCO (Single
17.1.8	Command Processing	Command Output) and DCO (Double object
		command Output). DCO shall only be used in case
		of Isolator and Circuit Breaker "close" and "open"
		command.
		Front port (preferably serial) for configuration/data
		downloads using PC. Cost of licensed software and
17.1.9	PC Interface port	communication cord, required for programming of
	·	offered protection relays shall be included in the cost
		of switchgear.
		An alphanumeric key pad and graphical LCD display
	User Interface	with backlight indicating measurement values and
17.1.10		operating messages. It should be possible to access
		and change all settings and parameters without the
		use of PC.
		Relay shall communicate all measured & monitored
17.1.11	SCADA Interface	parameters, analog signals, event record, fault
		record, DIs , DOs etc to SCADA
		Polay shall integrate all possessary protections for
		Relay shall integrate all necessary protections for different applications in accordance with IS and IEC.
17.1.12	Relay Characteristics	
		Relay shall provide wide setting ranges and choice
		of all IEC, IEEE and other tripping curves through a

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		minimum of two setting groups.
17.1.13	COOSE Massaging	Relays shall communicate all status signals,
17.1.13	GOOSE Messaging	commands and events on GOOSE messaging.
		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
17.1.14	Event and Fault records	fault time. Relay shall store records for last 10 events
		and 10 faults (minimum). It should be possible to
		download records locally to PC and remotely to
		SCADA.
		Relay shall be able to detect internal failures. A
17.1.15	Self diagnosis	watchdog relay with changeover contact shall
	Con diagnosis	provide information about the failure.
		All relays shall be capable of being synchronized
17.1.16	Time synchronization	with the system clock using SCADA interface and
		PC.
17.1.17	Operation Indicators	LEDs with push button for resetting.
17.1.18	Test Facility	Inbuilt with necessary test plugs.
17.2	Protection Relays for 11kV Inco	·
		3-phase Directional Overcurrent and Earthfault
		protection with IDMT, Definite time and
		instantaneous characteristics
		Undervoltage and overvoltage protection
		Trip Circuit Supervision
17.2.1	Relay 1	Sync Check function
		PT supervision (fuse failure monitoring)
		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 ,



	T	Tag
		DOs etc to SCADA
17.2.2	Relay 2	High Impedance Restricted Earth fault protection.
	User Configurable DIs and	Relay-1 & 2 should have a total of 16 Dis and 10 Dos
17.2.3	Dos	(minimum). Each relay should have atleast 2 Dis and
	D03	4 Dos
47.0.4	Note	Combining functions of Relay-1 and Relay-2 in single
17.2.4	Note	relay is not acceptable.
17.2.5	SLD	Refer annexure – F1
17.3	Protection Relays for 11kV Bus	Section panel
		3-phase Overcurrent and Earthfault protection with
		IDMT, Definite time and instantaneous
		characteristics
		Sync Check function
		Trip Circuit Supervision
	Polov 1	PT supervision (fuse failure monitoring)
17.3.1	Relay 1	User Configurable 16 Dis and 8 Dos (minimum)
		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
17.3.2	SLD	Refer annexure – F2
17.4	Protection Relays for 11kV Outo	poing panel
	Relay 1	3-phase Overcurrent and Earthfault protection with
		IDMT, Definite time and instantaneous
		characteristics
		Trip Circuit Supervision
17.4.1		User Configurable 12 Dis and 6 Dos (minimum)
		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 ,
	1	



		DOs etc to SCADA
17.4.2	SLD	Refer annexure – F3
17.5	Protection Relays for 11kV Sta	tion Transformer panel
		3-phase Overcurrent and Earthfault protection with
		IDMT, Definite time and instantaneous
		characteristics
		Trip Circuit Supervision
47.5.4	Relay 1	User Configurable 12 DIs and 6 DOs (minimum)
17.5.1	Today 1	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
17.5.2	SLD	Refer annexure – F4
17.6	Protection Relays for 11kV Capacitor panel	
	Relay 1	3-phase Overcurrent and Earthfault protection with
		IDMT, Definite time and instantaneous
		characteristics
		Undervoltage and Overvoltage protection(From Bus
		PT)
		Trip Circuit Supervision
		Neutral Unbalance protection(From RVT associated
17.6.1		to Cap Bank)
		Timer for on time delay (minimum 600 seconds)
		User Configurable 12 DIs and 6 DOs (minimum)
		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
17.6.2	SLD	Refer annexure – F5.
17.7	Protection Relays for 33kV Incomer	



		Line differential protection (Dual channel, ST Port Compatible for Single Mode Fibre having wavelength 1310 nm)
		Distance Protection
17.7.1	Relay 1	Software based CT ratio correction
		Dedicated port for communication with remote end
		relay through optical fibre. This port should be in
		addition to PC interface and SCADA interface ports.
		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
		Under Frequency, Over Frequency, Rate of Change
	Relay 2	of Frequency
17.7.2		Circuit Breaker failure protection
		Reverse blocking function
		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
	User Configurable DIs and Dos	Relay-1 & 2 should have a total of 16 DIs and 12
17.7.3		DOs (minimum). Each relay should have atleast 2
		DIs and 6 Dos
	Note	Combining functions of Relay-1 and Relay-2 in single
17.7.4	Note	relay is not acceptable.
17.7.5	SLD	Refer annexure – F6
17.8	Protection Relays for 33kV Transformer Feeder Panel	
	Relay 1	Biased differential protection
17.8.1		REF protection



		Software based ratio and vector correction feature
		(without ICT)
		H2 and H5 harmonic restraint
		Bay control unit having MIMIC with 3-phase
		Overcurrent and Earthfault protection with IDMT,
		Definite time and instantaneous characteristics
		Trip Circuit Supervision
		Under Frequency, Over Frequency, Rate of Change
		of Frequency
17.8.2	Relay 2	Reverse Blocking function
17.0.2		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
		Relay-1 & 2 should have a total of 16 DIs and 12
	User Configurable DIs and DOs	
17.8.3		DOs (minimum). Each relay should have atleast 2 DIs and 6 DOs.
17.8.4	Note	Combining functions of Relay-1 and Relay-2 in single
		relay is not acceptable.
17.8.5	SLD	Refer annexure – F7
17.9	Protection Relays for 33kV Buse	•
	Relay 1	Bay control unit having MIMIC with 3-phase
		Overcurrent and earthfault protection with IDMT,
17.9.1		Definite time and instantaneous characteristics.
		Trip Circuit Supervision
		Sync check function
		Reverse Blocking Function
		Circuit Breaker failure protection
		PT supervision (fuse failure monitoring) for Bus PT-1
		User Configurable 16 DIs and 8 DOs (minimum)
	•	



		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
		Under Frequency, Over Frequency, Rate of Change
17.9.2	Relay 2	of Frequency
		PT supervision (fuse failure monitoring) for Bus PT-2
17.9.3	SLD	Refer annexure – F8
47.40	Protection Relays for 33kV Outg	oing Panel (For Installation at KCC Consumer
17.10	Premises)	
		Bay control unit having MIMIC with 3-phase
		Overcurrent and Earthfault protection with IDMT,
	Relay 1	Definite time and instantaneous characteristics
		Trip Circuit Supervision
		Reverse Blocking Function
		Under Frequency, Over Frequency, Rate of Change
		of Frequency
17.10.1		Circuit Breaker failure protection
		User Configurable 12 DIs and 6 DOs (minimum)
		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
17.10.2	SLD	Refer annexure – F9
17.11	Protection Relays for 33kV Incomer from 66/33kV Autotransformer	
17.11.1	Relay 1	High Impedance Restricted Earth fault protection
		Bay control unit having MIMIC with 3-phase
	Dalay 0	Overcurrent and Earthfault protection with IDMT,
17.11.2	Relay 2	Definite time and instantaneous characteristics
		Trip Circuit Supervision
		·

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		Under Frequency, Over Frequency, Rate of Change
		of Frequency
		Reverse Blocking Function
		Sync check function
		Undervoltage and overvoltage protection
		Circuit Breaker failure protection
		PT supervision (fuse failure monitoring)
		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
	Harri Orofformalda Dia and	Relay-1 & 2 should have a total of 16 DIs and 12
17.11.3	User Configurable DIs and	DOs (minimum). Each relay should have atleast 2
	DOs	DIs and 6 Dos
	Note	Combining functions of Relay-1 and Relay-2 in single
17.11.4		relay is not acceptable
17.11.5	SLD	Refer annexure – F10
17.12	Protection Relays for 33kV Outgoing from 66/33kV Autotransformer	
		Power swing blocking
	Relay 1	Line differential protection(Dual channel, ST Port Compatible for Single Mode Fibre having wavelength 1310 nm)
17.12.1		Distance Protection
17.12.1		Software based CT ratio correction
		Dedicated port for communication with remote end
		relay through optical fibre. This port should be in
		addition to PC interface and SCADA interface ports.
		Bay control unit having MIMIC with 3-phase
17.12.2		Overcurrent and Earthfault protection with IDMT,
	Relay 2	Definite time and instantaneous characteristics.
		PT Supervision
		Under Frequency, Over Frequency, Rate of Change



		,
		of Frequency
		Trip Circuit Supervision
		Reverse Blocking Function
		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
	User Configurable DIs and	Relay-1 & 2 should have a total of 16 DIs and 12
17.12.3	DOs	DOs (minimum). Each relay should have atleast 2
	DOS	DIs and 6 Dos
	Note	Combining functions of Relay-1 and Relay-2 in single
17.12.4	Note	relay is not acceptable.
17.12.5	SLD	Refer annexure – F11
17.13	Protection Relays for 33kV Buscoupler for Switchboard of 66/33kV Autotransformer	
		Bay control unit having MIMIC with 3-phase
	Relay 1	Overcurrent and earthfault protection with IDMT,
		Definite time and instantaneous characteristics.
		Trip Circuit Supervision
		Sync check function
		Circuit Breaker failure protection
17.13.1		PT supervision (fuse failure monitoring) for Bus PT-1
		User Configurable 16 DIs and 8 DOs (minimum)
		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
		Under Frequency, Over Frequency, Rate of Change
17.13.2	Relay 2	of Frequency
		PT supervision (fuse failure monitoring) for Bus PT-2
L	1	



17.13.3	SLD	Refer annexure – F12
17.14	Protection Relays – SCADA Inte	erfacing
		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 – CB in service
	Configuration and wiring of Dis	DI-7 – CB in test
	Configuration and wiring of DIs	DI-8 – Spring Charged
17.14.1	in Protection Relays (All panels) for routing status	DI-9 – L/R switch Remote
	' '	DI-10 – AC fail
	signals to SCADA	DI-11 – Adjacent Panel DC Fail/DC MCB Trip
		DI-12 – Adjacent Panel Protection Relay fail
		DI-13 – PT MCB trip (metering and protection, for
		incomer and capacitor panel only)
		Sequence of DIs should be strictly as mentioned
		above. Change in sequence of DIs will not be
		acceptable.
	Configuration and wiring of	DO-1 – CB Open
	DOs in Protection relays (all	DO-2 – CB close
47 44 0	panels) for execution of	DO-3-Electrical Reset
17.14.2	SCADA commands through	Sequence of DOs should be strictly as mentioned
	SCADA interface port (refer	above. Change in sequence of DOs will not be
	clause 16.1.5).	acceptable.
17.14.3	Looping of numerical relays	All relays in the switchboard have to be looped to
17.14.3	Looping of Humenoal Telays	form a common bus for interfacing with SCADA.
17.14.4	Spare DIs and DOs	Should be wired upto terminal block for future use.
17.15	Transformer Monitoring cum AV	R Relay
17.15.1	Features	As per annexure –B
17.15.2	Requirement	To be provided in 33KV Transformer panel only
17.16	Auxiliary Relays – General Feat	ures

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	Deleve for equilibring	
	Relays for auxiliary,	
17.16.1	supervision, trip and timer	Static or electromechanical type.
	relays	
47.40.0	Reset mechanism for auxiliary	Self reset contacts except for lock-out relays.
17.16.2	relays	Sell reset contacts except for lock-out relays.
17.16.0	Reset mechanism for lockout	Electrical reset type for 11kV outgoing panels only.
17.16.3	relays	Hand reset type for all other panels.
17.10.1	Operation indicators	With hand-reset operation indicators (flags) or LEDs
17.16.4	Operation indicators	with pushbuttons for resetting.
17.17	Auxiliary relays – Requirement	
17.17.1	Anti pumping (94), lockout (86),	a. For each breakerb. Lock Out Relay mounting shall be flush type on front side of Panel
17.17.2	PT selection relays	To be provided in bus coupler panel for selection between Bus PT and Line PT of respective sections.
	Switchgear with two incomer & bus coupler	Lockout relay (86) contact of each incoming breakers
17.17.3		to be wired in series in closing circuit of other
		incoming breakers & bus coupler.
	Contact Multiplication Relay	a. One for Tripping and one for closing with each breaker
17.17.4	for Tripping and closing of	b. Current Rating shall be 30 percent more than
17.17.4	Breaker	closing and tripping coil current rating
	Dicarci	c. Shall be of closed type i.e. direct unauthorised access shall not be provided.
47.47.	Auxiliary Relays, contact	To effect interlocks and to exchange signals of status
17.17.5	multiplication relays etc.	& control
		Auxiliary relays with indicating flags (contactors will
		not be accepted) should be provided for the following
		trip and alarm commands –
	Transferment translate males	a. Buchholz trip
17.17.6	Transformer trouble relays (For 33kV Transformer feeder panel only)	b. OSR trip
		c. PRV trip
		d. SPR trip
		e. WTI Trip
		f. OTI Trip
		g. Buchholz Alarm

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		h. Low oil level alarm
		i. OTI Alarm
		j. WTI Alarm.
17.18	General Requirements for all relays/contactors	Auxiliary supply will be 50/220VDC based on
		requirement. All relays/contactors shall be suitable
		for continuous operation at 15% overvoltage.

18 SYNCH CHECK PHILOSOPHY

18.1	Dead Bus – Live Line	 a. Application - Required for Charging of Bus from Line Supply b. Logic - Sync check relay installed on line panel will check the line and bus voltage and derive that the line is live and bus is in dead condition i.e bus has to be charged by the line breaker. Hence Sync check relay wil allow the line breaker to close in this condition.
18.2	Dead Line – Live Bus	 a. Application - Required for Charging of Line from Bus Supply b. Logic - Sync check relay installed on line panel will check line and bus voltage and derive that the line is dead and bus is in live condition i.e line has to charged from bus. Hence Sync check relay will allow the line breaker to close in this condition.
18.3	Live Bus – Live Line	 a. Application - Required for paralleling of bus and line supply b. Logic - Sync check relay installed on line panel will compare magnitude and phase sequence of line and bus voltages. If the variations are within the range set in the relay, sync check relay will allow the closing of line breaker.
18.4	Live Bus – Dead Bus	 a. Application – Required for charging of dead bus through another live bus. b. Logic – Sync check relay installed on bus coupler/bus section panel will check voltage of both buses and derive that one bus is dead and other bus is live i.e dead bus is being charged from live bus. Hence Sync check relay will allow the bus coupler/bus section breaker to close in this condition.



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		 a. Application – Required for paralleling of two buses/bus sections.
		b. Logic – Sync check relay installed on bus
		coupler/bus section panel will compare the
18.5	Live Bus – Live Bus	magnitude and phase sequence of voltage
		of both buses (or bus sections). If the
		variations are within the range set in the
		relay, sync check relay will allow the bus
		coupler/bus section breaker to close.

19 ETHERNET SWITCHES & FIBRE OPTICS

19.1	Ethernet Switch	
19.1.1	Numbers	Two at each site
19.1.2	FO Port	16 Nos
19.1.3	RJ 45 Port	4 Nos
19.1.4	Communication Protocol	IEC 61850
19.1.5	Network Protocol	PRP
19.1.6	Downlink Rate	100 MBPS
19.1.7	Uplink Rate	1 GBPS
19.1.8	Coating	Conformal
19.1.9	Power Supply Voltage	220 / 50 VDC as per site condition
19.1.10	Grade	Industrial
19.1.11	Certification required	KEMA,CE & FCC for IEC 61850 compliance
19.1.12	Operating Temperature	
19.1.13	Mounting	In Switchgear Panel
19.1.14	Blinking LED Indicators	On each RJ45 ports
19.1.15	Separate Maintenance/console Part	Required
19.1.16	Latency	Less than or equal to 10 ms
19.1.17	Fibre Optic Compatibility	Multimode, 1310 nm
19.1.18	Placement	Din Rail Arrangement Inside Switchgear
19.2	Fibre Optics (Patch Cord) and Ethernet cable	
19.2.1	Connection	From Relays, Meters to Ethernet Switch
19.2.2	Mode of Fibre Optics	Multimode
19.2.3	Wavelength	1310 nm
19.2.4	Ethernet Cable Type	CAT VI
19.2.5	Associated Connectors and Accessories	Required



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20 SPACE HEATERS

20.1	Туре	Thermostat controlled with switch for isolation
		In Breaker & HV cable compartment, mounted on
		an insulator. Heater position in cable compartment
20.2	Location	should be easily accessible after cable termination.
		Heater position in breaker chamber shall be
		accessible with breaker racked-in.

21 SOCKETS, SWITCHES, ILLUMINATION LAMPS & MCBs

21.1	Illumination lamp with switch	For LV & cable chamber
21.2	Universal type (5/15 A) Socket with Switch	In LV chamber
	MCBs	a. MCBs of Proper rating may be provided.
		b. Although Main MCB shall be directly wired up to
		Trip Circuit, No other MCB shall be provided in
21.3		between
		c. Rating of MCB shall be 300% of full load current
		of relevant circuit

22 NAMEPLATES AND MARKING

22.1	Nameplates	To be provided as per the following description
22.1.1	Equipment Nameplates	 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



		panel internal wiring to facilitate easy tracing of the wiring.
		a. Large and bold name plate carrying the feeder identification/ numbers shall be provided on the top of
22.1.2	Feeder Nameplates	each panel on front as well as rear side. On rear side, nameplate should be provided on frame. b. Rear bottom of each panel shall have a nameplate clearly indicating the following: Customer Name – BSES Delhi; PO No. & date; Drawing Reference No. etc.
22.1.3	Rating Plate	Following details are to be provided on Panel rating plate: a. Customer Name – BSES Yamuna Power Limited b. PO No. & Date – c. Complete CT Rating plate details d. Complete PT Rating plate details e. Complete CB Rating Plate details f. Date of Manufacturing- g. Warranty Period- h. Customer care No- i. Control Voltage-
22.1.4	Material	Non-rusting metal or 3 ply lamicoid. Nameplates shall be black with white engraving lettering. Stickers are not allowed.
22.1.5	Fixing	All nameplates/rating plates shall be riveted to the panels at all four corners. Bolting/screwing is not acceptable.
22.2	Markings	Each switch shall bear clear inscription identifying its function. Similar inscription shall also be provided on

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	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 SURFACE TREATMENT & PAINTING

23.1	Surface Treatment Sand blasting or by seven tank process.		
23.2 Paint type		Powder coated. Pure polyester base grade-A structure finish.	
23.3	23.3 Paint shade RAL 7032 for external & internal surface		
23.4	Paint thickness	Minimum 50 microns	

24 APPROVED MAKES OF COMPONENTS

		Siprotec series of Siemens, Micom series of				
24.1	Numerical Relays	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.				
04.0	Transformer monitoring cum AVR	A-eberle				
24.2	relay	A-cuelle				
24.3	Electromechanical Relays	Alstom/Schneider/Siemens/ABB/ER				
24.4	Aux Relays	ABB/Jyoti/Omran				
24.5	Contactors	ABB/Siemens/Telemechanique				
04.0	Instrument transformers	ECS/ Pragati/				
24.6	modulient dansionners	Gemini/Schneider/CGL/Kappa/Narayan power tech				
24.7	MCBs	Siemens/Schneider/Legrand/ABB				
24.8	Control switches	Switron/Kaycee				
24.9	Test terminal blocks	IMP/Schneider/Alstom				
24.10	Terminal blocks	Elmex/Connectwell				
24.11	Indicating lamps	Siemens/ Teknic/ Binay				

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24.12 Surge Suppressors Oblum/Tyco		Oblum/Tyco
24.13	3 Meters Rishabh(Rish delta Energy)/Conzerv	
24.14 Ethernet Switch Ruggedcom/Hirschman		Ruggedcom/Hirschman

25 INSPECTION, TESTING & QUALITY ASSURANCE

25.1	Type Tests	The product must be of type tested as per applicable Indian standards / IEC		
25.1.1	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		
25.1.2	Pressure relief device operation	Test certificate for panel to be submitted		
25.2	Acceptance & Routine tests	As per the specification and relevant standards. Charges for 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 -		
25.2.1	Primary injection test	To be carried out on panels selected for testing		
25.2.2	Temperature rise test	One panel per Purchase order (PO with minimum 10 panels) without any commercial implication to BSES. In-house testing is acceptable.		
25.2.3	Paint Thickness/ Peel off	To be carried out on panels selected for testing		
25.3	Inspection	The purchaser/owner reserves the right to witness all the acceptance/routine tests during inspection.		
25.4	Notice to purchaser for conducting type tests	At least three weeks in advance		
25.5	Quality Assurance			
25.5.1	25.5.1 Vendor quality plan To be submitted for purchaser appr			



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25.5.2 Inspection points

26 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		
26.3	Details of Packing Identification Label on each packing case	 a. Individual serial number b. Purchaser's name c. PO number (along with SAP item code, if any) & date d. Equipment Tag no. (if any) e. Destination f. Project Details g. Manufacturer / Supplier's name h. Address of Manufacturer / Supplier / it's agent i. Description and Quantity j. Country of origin k. Month & year of Manufacturing l. Case measurements m. Gross and net weights in kilograms n. All necessary slinging and stacking instructions 		



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27 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		
27.1	Shipping	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.		

28 HANDLING AND STORAGE

			Manufacturer instruction shall be followed. Detail	
2	28.1	Handling and Storage	handling & storage instruction sheet / manual needs	
			to be furnished before commencement of supply.	

29 DEVIATION

	Deviation	Deviations from this Specification shall be provided
29.1		in excel sheet with 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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30 ACCESSORIES & TOOLS

30.1	Type and Quantity	Bidder to indicate		
30.2	Special tools & tackles required for erection, testing, commissioning and maintenance of the switchboard	The cost of these items shall be indicated separately in the bid as optional.		
30.3	Suitable handling truck / trolley for lifting and moving the circuit breaker	To be supplied. (Two trolleys for each type/rating of breaker)		

31 DRAWINGS & DATA SUBMISSION MATRIX

Drawing submission shall be as per the matrix given below. All documents/ drawing shall be provided on A3/A4 sheet (based on legibility) in box file with separators for each section. PDF shall also be provided of all documents via USB. Deviation sheet and GTP shall be provided in excel sheet .Language of the documents shall be English only. Deficient/ improper document/ drawing submission shall be liable for rejection.

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
31.1	Contact Person Name, Email ID and Mobile Number	Required			
31.2	Consolidated Deviation Sheet	Required	Required		
31.3	GTP	Required	Required		
31.4	Relevant Type Test as per IS/IEC	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	11 kV / 33 kV Switchgear drawing			
31.9.1	General Arrangement	Required	Required	
31.9.2	Sectional Layout		Required	
31.9.3	Door Layout		Required	
31.9.4	LV Box Internal Layout		Required	
31.9.5	SLD	Required	Required	
31.9.6	Schematic Circuit diagram and Scheme of Each type of Panel		Required	
31.9.7	Communication Architecture		Required	
31.9.8	Bus Bar Arrangement		Required	
31.9.9	QAP		Required	
31.9.10	Panel wise BOQ		Required	
31.9.11	Logic Operation Diagram		Required	
31.9.12	Plan		Required	
31.9.13	Synch Logic Diagram		Required	
31.9.14	Foundation Diagram		Required	
31.9.15	DI sheet		Required	
31.9.16	DO Sheet		Required	
31.9.17	TB Details		Required	
31.9.18	Make of all Component as per specification		Required	
31.10	Drawing of CT, PT and Surge Arrestor		Required	
31.11	Drawing of Substation Room		Required	
31.12	Ventilation detail requirement of GIS Room		Required	



31.13	Installation, erection and commissioning manual for switchgear	Required		
31.14	Inspection Reports		Required	
31.15	As manufacturing Drawings		Required	
31.16	Operation and Maintenance Manual		Required	Required
31.17	Trouble shooting manual		Required	Required
31.18	As built Drawings			Required
31.19	Test Report			Required
31.20	Weekly progress report			Required



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ANNEXURE - A - SCOPE OF SUPPLY

Scope of supply should include the following –

- 1.1 Design, manufacture, assembly, testing at manufacturer's works, properly packed for transport, supply and FOR delivery at site of following 11kV / 33kV Switchgears as per enclosed specification and single line diagram.
- 1.2 Base channel frame of the switchgears with hardware.
- 1.3 Two trolleys for breaker of each size are to be provided per switchboard.
- 1.4 Programming software and communication cord for numerical relays.
- 1.5 Unit price of 33kV Incomer with Distance relay as primary protection and 33kV Incomer with Line differential relay as primary protection should be mentioned separately in the bid. Primary protection to be used in Incomer panel will be finalized based on site requirement.
- 1.6 Unit price of Bus PT should be indicated separately in the bid to enable addition/deletion based on site requirement.
- 1.7 Bidder should indicate price of one set of special tools and tackles (if any) required for maintenance of switchgear and its components.
- 1.8 Bidder should indicate price of each spare as per Annexure E.
- 1.9 All relevant drawings, data and instruction manuals.



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ANNEXURE - B - TRANSFORMER MONITORING CUM AVR RELAY

1	General features		
1.1	Technology and	Microprocessor based with provision for multifunction	
Functionality		control and monitoring.	
1.2	Mounting	Flush Mounting	
		Hardware and software architecture shall be modular and	
1.3	Architecture	disconnectable to adapt the control unit to the required level	
		of complexity as per the application.	
	Programming and configuration	AVR shall utilize a user friendly setting and operating	
1.4		multilingual software in windows environment with menus	
	Comgulation	and icons for fast access to the data required.	
		UMI with an alphanumeric key pad and graphical LCD	
1.5	User Machine Interface	display with backlight indicating measurement values and	
1.5		operating messages. Capability to access and change all	
		settings and parameters.	
	PC Interface port	Front port (preferably serial) for configuration using PC.	
1.6		Cost of licensed software and communication cord, required	
1.0		for programming of offered protection relays using PC, shall	
		be mentioned separately in the bid.	
	SCADA Interface port	LC Type Dual fibre optic port for interfacing with SCADA on	
1.7		IEC 61850 & PRP compatible. Through these ports relays	
		shall be connected to Ethernet switches.	
	Self diagnosis	Shall be able to detect internal failures. A watchdog relay	
1.8		with changeover contact shall provide information about the	
		failure.	
1.9	Cable Termination	Termination of cable shall be at rear side.	
1.10	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)	
2.7	Binary Outputs	Ten programmable binary outputs should be provided	
3	Control		
3.1	Control Tasks	Ability to implement control functions through programmable	
3.1	Control rasks	logics	
3.2	Voltage setting	Programmable Voltage set point	
3.3	Voltage Regulation	Raise/Lower tap position to maintain the preset value of	
3.3	Voltage (Vegulation	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 AVRs are	
3.7 Transformer Farallelling		interconnected via a communication network.	
4	SCADA Interfacing		
		DI-1 – Buchholz trip	
	Configuration of DIs for	DI-2 – OSR Trip	
		DI-3 – PRV trip	
		DI-4 – SPR trip	
		DI-5 – OTI trip	
		DI-6 – WTI trip	
		DI-7 – Buchholz alarm	
4.1	routing alarm/trip signals to	DI-8 – Oil Level low alarm (MOG alarm)	
	SCADA.	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	DO-1 – Tap raise	



	executing commands from	DO-2 – Tap lower	
	SCADA through interface DO-3 – Fan group 1 control		
	port/CRP	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	Voltage, Current, Active Power, Reactive Power, Apparent	
3.1	(optional)	Power, Power factor, frequency	
5.2	5.2 Event Recording	Facility for recording parameters during various events such	
5.2		as tap change, change in binary input status etc.	
		Capability to monitor important transformer parameters such	
5.3	Monitoring	as Oil temperature, Winding Temperature etc and give	
		indication/alarm when the value of a particular parameter	
		exceeds the preset value.	



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ANNEXURE - C - TECHNICAL PARTICULARS

1.0	SWITCHGEAR			
1.1	Туре	Metal clad, air insulated with VCB type circuit		
		breaker		
1.2	Service	Indoor		
1.3	Mounting	Free standing, floor moun	ted	
1.4	System Voltage	11 KV	33kV	
1.5	Voltage variation	+/- 10%		
1.6	Frequency	50 Hz +/- 5%		
1.7	Phase	3		
1.8	Rated voltage	12 KV	36 kV	
1.9	Rated current	As per SLDs given in Annexure-F		
1.10	Short time rating for 3 sec.	25kA	25kA	
1.11	Internal arc classification			
	and rating			
1.11.1	Classification	IAC – A - FLR	IAC – A - FLR	
1.11.2	Rating	25kA for 1 second	25kA for 1 second.	
1.12	Insulation level	28 kV / 75 kV	70 kV/ 170 kV	
	(PF rms / Impulse peak)			
1.13	System ground	Effectively earthed	Effectively earthed	
1.14	Enclosure degree of	IP – 4X for high voltage compartment and		
	protection	IP – 5X for metering and protection compartment		
1.15	Bus bar - Main	Rating as per SLDs given in annexure - F, Short		
		time rating as per clause 1	1.10.	
1.15.1	Material	Tinned Electrolytic copper		
1.15.2	Bus bar sleeve	Sleeved with shrouds on joints. 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	

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1.16	Auxiliary bus bar	Electrolytic grade tinned cop	pper
1.17	Auxiliary DC Supply	220 V DC / 48 V DC	
1.18	Auxiliary AC supply	240 V AC 50 Hz	
1.19	Hardware	Stainless steel.	
1.20	Earth bus	Aluminium	
1.21	Bus duct entry	From top (where ever applic	eable)
1.22	Power cable entry	From bottom and rear	
1.23	Control cable entry	From bottom and front (i.e b	reaker compartment)
2.0	CIRCUIT BREAKER		
2.1	Voltage class, insulation	As specified for switchgear	
	level, short time rating		
2.2	Rated current	As per SLDs given in annex	ure - F. Use of two
		breakers in parallel to meet	the required current
		rating shall not be acceptable	e.
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	25kA
2.4.2	Short circuit making current	62.5kA	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	spare aux. Contacts Minimum 6 NO + 6 NC	
	of Breaker, for Owner's		
	use.		
	ı	ı	



2.8	No. of spare contacts of	2 NO	
	Service and Test position		
	limit switch		
3.0	CURRENT TRANSFORMERS		
3.1	Voltage class, insulation	As specified for switchgear	
	level and short time rating		
3.2	Туре	Cast resin, window / bar primary type	
3.3	Class of insulation	Class E or better	
3.4	Ratio	As per SLDs given in annexure - F	
3.5	Number of secondaries	As per SLDs given in annexure - F	
3.6	Accuracy class		
3.6.1	Protection core	5P20	
3.6.2	Protection (Diff. / REF)	PS	
3.6.3	Metering	0.2s	
3.6.4	Core balance CT	PS	
3.7	Burden (VA)	Adequate for the protection & instruments offered	
3.8	Excitation current of PS	30 mA at Vk/4	
	Class CTs		
3.8	Knee Point Voltage of PS	>= 40 (Rct + 4)	
	Class CTs (Vk)		
3.9	Primary operating current	5A	
	sensitivity of CBCTs		
4.0	VOLTAGE TRANSFORMER	FORMERS	
4.1	Туре	Cast resin, draw out type, single phase units	
4.2	Rated Voltage		
4.2.1	Primary	11000/sq.rt.3 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	

Page **45** of **60**



BSES-TS-66-HTSWG-R0

TECHNICAL SPECIFICATION OF HT INDOOR SWITCHGEAR (33 & 11kV)

4.6	Rated voltage factor	1.2 continuous, 1.9 for 30	0 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	
4.9	Primary and secondary	HRC current limiting type	e, Primary fuse
	fuses	replacement shall be pos	ssible with VT in withdrawn
		position	
5.0	HV FUSES		
5.1	Voltage class	12kV	36kV
5.2	Rupturing capacity	50kA	
5.3	Rated current	As per application	
6.0	SURGE ARRESTORS	For 11kV switchgear	For 33kV switchgear
6.1	Rated Voltage	9kV	30kV
6.2	Maximum continuous	7.65kV	25kV
	operating voltage (MCOV)		
6.3	Discharge current	10kA	10kA
6.4	Discharge class	3	3

Note - The auxiliary DC voltage shall be checked on a case to case basis by Purchaser



BSES-TS-66-HTSWG-R0

TECHNICAL SPECIFICATION OF HT INDOOR SWITCHGEAR (33 & 11kV)

ANNEXURE - D - GUARANTEED TECHNICAL PARTICULARS (DATA BY BIDDER)

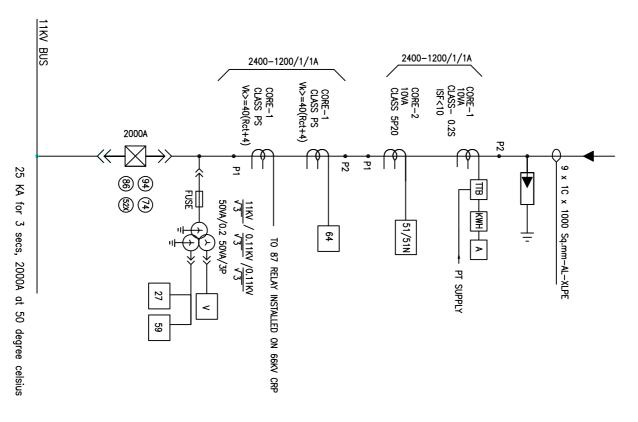
Vendor must submit clause wise compliance in Excel sheet against specification at the time of drawing approval clearly highlighting the deviations from specification against each clause.

ANNEXURE - E - SPARES REQUIREMENT

Unit rate of all below mentioned spares have to be provided in the bid.

S No.	Description	Qty
1	Line voltage transformer	3 (1 set)
2	Bus voltage transformer	3 (1 set)
3	Current transformer of each ratio	3 (1 set)
4	Trip Coil	4
5	Closing Coil	4
6	CB Spring charging motor	2
7	Auxiliary switch	2 sets (2 Nos. each type)
8	Bursting disc / pressure relief plate complete	2
9	Numerical relay of each type	1 nos. (each type)
10	Ethernet Switch	1 No (Each Site)
11	Optical Fibre	20% of Supplied Items
12	CAT VI Ethernet cable for Communication	20% of Supplied Items
13	Vacuum Interrupter Bottle	1 set (3 nos.) of each rating
14	Breaker contacts for busbar	1 set (3 nos.) of each rating
15	Breaker testing cable with plug suitable for breaker on one side and plug suitable for the panel on the other side	3 meter(each type)
16	SCADA Spare	20% of Supplied Items

ANNEXURE - F - SLDs



Þ	<	86	94)	(74)	(52X)	ф	₽	\(\)	m	≪⊠->>	SYMBOL
AMMETER	VOLTMETER	HIGH SPEED TRIP RELAY	ANTI PUMPING RELAY	TRIP CIRCUIT SUPERVISION RELAY	BREAKER AUX CONTACT MULTIPLIER	FUSE	SURGE ARRESTOR	POTENTIAL TRANSFORMER	CURRENT TRANSFORMER	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE	DESCRIPTION

21

DISTANCE RELAY

59

OVER VOLTAGE RELAY

25	46	KWH	SYMBOL	
SYNC CHECK	NEGATIVE PHASE SEQUENCE PROTECTION	ENERGY METER	DESCRIPTION	

4	_	
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_		
Г	η	
٠	٠	
	ı	
	•	

1. KWH METER NOT IN SUPPLIER'S SCOPE

67/67N

DIRECTIONAL O/C & E/F RELAY

64

REF RELAY

B

TEST TERMINAL BLOCK

REFER CLAUSE 16 OF SPECIFICATION
 FOR DETAILED FUNCTIONAL REQUIREMENTS OF
 PROTECTION RELAYS



51/51N

0/C & E/F RELAY

27

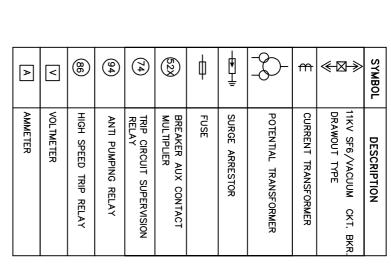
UNDER VOLTAGE RELAY

87

DIFFERENTIAL RELAY

ANNEXURE-F2

LEGEND



11KV BUS

2000 A BUS COUPLER

1200-2400/1A 10VA 5P20 86 (9) (8) (7)

51/51N

25 KA for 3 secs, 2000A at 50 deg. celsius

TEST BETT	67/67N DIREC	64 REF I	59 OVER	21 DISTANCE	87 DIFFE	27 UNDE	51/51N 0/C	25 SYNC	46 NEGATIVE SEQUENCE	KWH ENER	
TERMINAL BLOCK	DIRECTIONAL O/C & E/F RELAY	RELAY	OVER VOLTAGE RELAY	ANCE RELAY	DIFFERENTIAL RELAY	UNDER VOLTAGE RELAY	& E/F RELAY	SYNC CHECK	NEGATIVE PHASE SEQUENCE PROTECTION	ENERGY METER	0000

NOTE:-

1. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS

SCALE	DAILE		APPD.	CHECKED S.G/A.S	DRAWN
NTS	77.40.87	3	G.S/G.N	s.g/A.s	R.K/A.H H.K
SLD-SWG-11KV-02	SPECIFICATION NO. BSES-TS-66-HTSWG-RO	BUS SECTION		STANDARD SID FOR 11KV	INCE:-

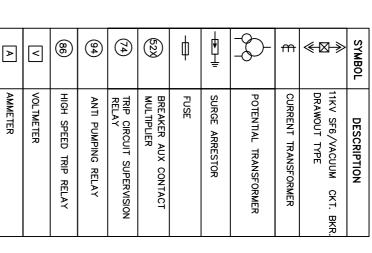


11KV BUS

25 KA for 3 secs, 2000A at 50 degree celsius

800A

(%) (%) (%) (%)



400/1/1A

CORE-2 10VA 5P 20

51/51N

P2

CORE-1 10VA CL. 0.2S ISF<10

ПВ ⊢К₩Н ⊢ А

PT SUPPLY

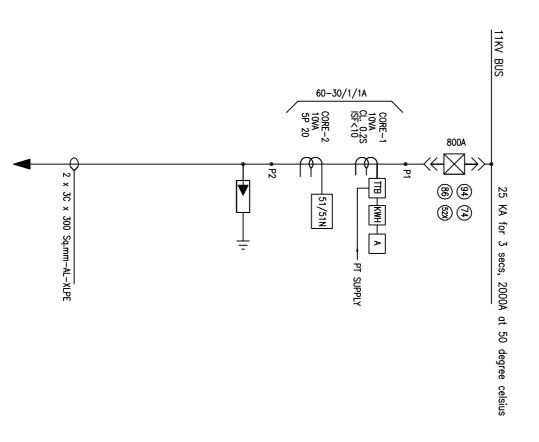
P

ВТТ	67/67N	64	59	21	87	27	51/51N	25	46	KWH	SYMBOL
TEST TERMINAL BLOCK	DIRECTIONAL O/C & E/F RELAY	REF RELAY	OVER VOLTAGE RELAY	DISTANCE RELAY	DIFFERENTIAL RELAY	UNDER VOLTAGE RELAY	O/C & E/F RELAY	SYNC CHECK	NEGATIVE PHASE SEQUENCE PROTECTION	ENERGY METER	DESCRIPTION

 $2 \times 3C \times 300$ Sq.mm-AL-XLPE

- NOTE:
 1. KWH METER NOT IN SUPPLIER'S SCOPE
- 2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS

SCALE	DATE	APPD.	CHECKED S.G/A.S	DRAWN
STN	29.04.22	G.S/G.N	s.g/a.s	R.K/A.H TITLE:-
		OUTGOING FEEDER	STANDARD SID FOR 11KV	ше:-
SLD-SWG-11KV-03	SPECIFICATION NO. BSES-TS-66-HTSW			



VOLTMETER AMMETER
HIGH SPEED TRIP RELAY
ANTI PUMPING RELAY
TRIP CIRCUIT SUPERVISION RELAY
BREAKER AUX CONTACT MULTIPLIER
FUSE
SURGE ARRESTOR
POTENTIAL TRANSFORMER
CURRENT TRANSFORMER
11KV SF6/VACUUM DRAWOUT TYPE
DESCRIPTION

						-		ı			
[21] [59] [64]	59	59	21	87	27	51/51N	25	46	KWH	SYMBOL	
OVER VOLTAGE RELAY REF RELAY DIRECTIONAL O/C & E/F RELAY	OVER VOLTAGE RELAY REF RELAY	DISTANCE RELAY OVER VOLTAGE RELAY	DISTANCE RELAY	DIFFERENTIAL RELAY	UNDER VOLTAGE RELAY	O/C & E/F RELAY	SYNC CHECK	NEGATIVE PHASE SEQUENCE PROTECTION	ENERGY METER	DESCRIPTION	

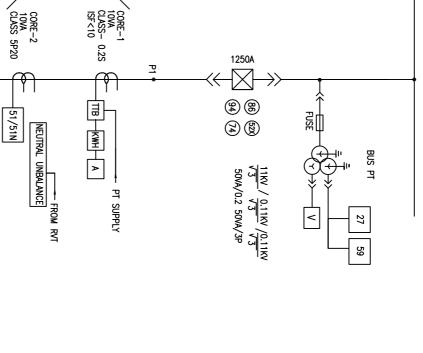
NOTE:-

- 1. KWH METER NOT IN SUPPLIER'S SCOPE
- 2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS

SCALE	DATE	APPD.	CHECKED S.G/A.S	DRAWN
NTS	29.04.22	G.S/G.N	S.G/A.S	R.K/A.H
		STATION TRANSFORMER FEEDER	STANDARD SLD FOR 11KV	TITLE:-
SLD-SWG-11KV-04	SPECIFICATION NO. BSES-TS-66-HT			



11KV BUS



800-400/1/1A

P2

LEGEND

AMMETER	>
VOLTMETER	<
HIGH SPEED TRIP RELAY	(98)
ANTI PUMPING RELAY	94)
TRIP CIRCUIT SUPERVISION RELAY	(74)
BREAKER AUX CONTACT MULTIPLIER	(52X)
FUSE	ф
SURGE ARRESTOR	⊪ .
POTENTIAL TRANSFORMER	ϕ
CURRENT TRANSFORMER	#
11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE	≪⊠ ≫
DESCRIPTION	SYMBOL

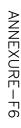
											<u> </u>
H H	0//0/14	67 /67N	64	59	21	87	27	51/51N	25	XWI	SYMBOL
TEST TERMINAL BLOCK	01010101010101010101010101010101010101	DIRECTIONAL O/C & F/F RFLAY	REF RELAY	OVER VOLTAGE RELAY	DISTANCE RELAY	DIFFERENTIAL RELAY	UNDER VOLTAGE RELAY	O/C & E/F RELAY	SYNC CHECK	ENERGY METER	DESCRIPTION

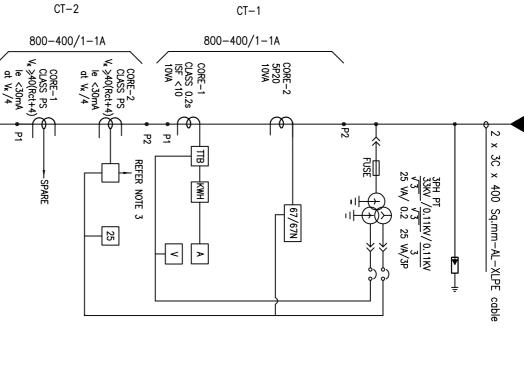
NOTE:-

- 1. KWH METER NOT IN SUPPLIER'S SCOPE
- 2. REFER CLAUSE 16 OF SPECIFICATION PROTECTION RELAYS FOR DETAILED FUNCTIONAL REQUIREMENTS OF
- 3. ONE BPT TO BE CONSIDERED FOR EACH CAPACITOR PANEL

2 x 3C x 300 Sq.mm-AL-XLPE

SCALE	DATE	APPD.	CHECKED S.G/A.S	DRAWN
NTS	29.04.22	G.S/G.N	s.g/a.s	R.K/A.H
		CAPACITOR FEFDER	STANDARD SID FOR 11KV	IIILE:-
SLD-SWG-11KV-05	SPECIFICATION NO. BSES-TS-66-HTSWG-RO			





A	٧	88		3	(2)	ф	- - - -	. 1-	ф	m	₩	⊠- ≫	SYMBOL
AMMETER	VOLTMETER	HIGH SPEED TRIP RELAY	ANTI PUMPING RELAY	TRIP CIRCUIT SUPERVISION RELAY	MULTIPLIER	FUSE	SURGE ARRESTOR	- 1	POTENTIAL TRANSFORMER	CURRENT TRANSFORMER	DRAWOUT TYPE	11KV SF6/VACUUM CKT. BKR.	DESCRIPTION
		67 /67N	2	59	21	87	27	51/51N	25		&	KWH	SYMBOL

REF RELAY

TEST TERMINAL BLOCK

DIRECTIONAL O/C & E/F RELAY

							,		
			_						
59	21	87	27	51/51N	25	8	KWH	SYMBOL	
OVER VOLTAGE RELAY	DISTANCE RELAY	DIFFERENTIAL RELAY	UNDER VOLTAGE RELAY	O/C & E/F RELAY	SYNC CHECK	NEGATIVE PHASE SEQUENCE PROTECTION	ENERGY METER	DESCRIPTION	

		NOTE:
	2	:-
F R	REFE	XWI
FOR DETAILED F	2. REFER CLAUSE 1	METER
E E	ISE 16	NO T
S	0,	Z
ōNAL	16 OF SPECIFICATION	SUPPL
REQU	CIFICA	IER'S
FUNCTIONAL REQUIREMENT	TION	METER NOT IN SUPPLIER'S SCOPE

PROTECTION RELAYS

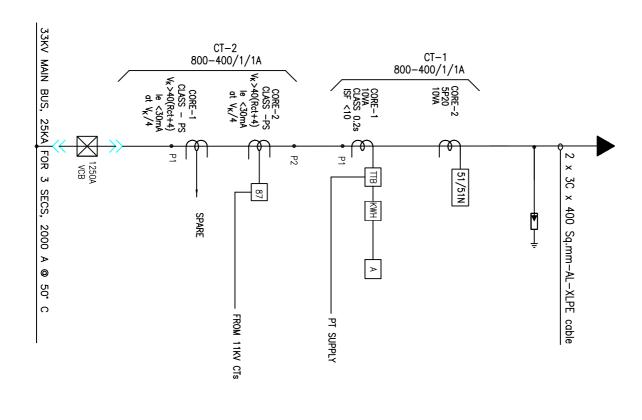
3. LINE DIFFERENTIAL OR DISTANCE RELAY. REFER CLAUSE 16.7.1 OF SPECIFICATION ENTS OF

SCALE	DATE	APPD.	CHECKED S.G/A.S	DRAWN
NTS	29.04.22	G.S/G.N	S.G/A.S	R.K/A.H H.K
	_	33KV INCOMER		
SLD-SWG-33KV-01	SEECIFICATION NO. 53E3-13-66-F13-WG-R0	SDECIEICATION NO DSES TS 66 HTSWC DO		

33KV MAIN BUS, 25KA FOR 3 SECS,

2000 A @ 50° C

VCB 1250A



>	[<u> </u>	@		((74)	(§)	ф	Ā		-6 -6	<u>></u> -	1	m	*	×.	≽	SYMBOL
AMMETER	AOC I WE LEK	STEED ON	HIGH SPEED TRIP RELAY		ANTI PUMPING RELAY	RELAY	MULTIPLIER	BREAKER AUX CONTACT	FUSE	SURGE ARRESTOR			POTENTIAL TRANSFORMER		CURRENT TRANSFORMER		11KV SF6/VACUUM CKT. BKR.		DESCRIPTION
		0//0/14	INCS/ E3	64		59	21	Į.	97	27		51/51N	2]	[46	HWX		SYMBOL
TEST TERMINAL BLOCK		CINECHONAL O/C & E/T NELST	AV 138 5/ 5 % O/O IVNOLLUSBIO	REF RELAY		OVER VOLTAGE RELAY	DISTANCE RELAY	OFFICE NEW TALKS	DIFFERENTIAL BELAY	UNDER VOLTAGE RELAY	0/0 a r/1 mrs	O/C & F/F RFI AY	SYNC CHECK		SEQUENCE PROTECTION	NEGATIVE PHASE	ENERGY METER		DESCRIPTION

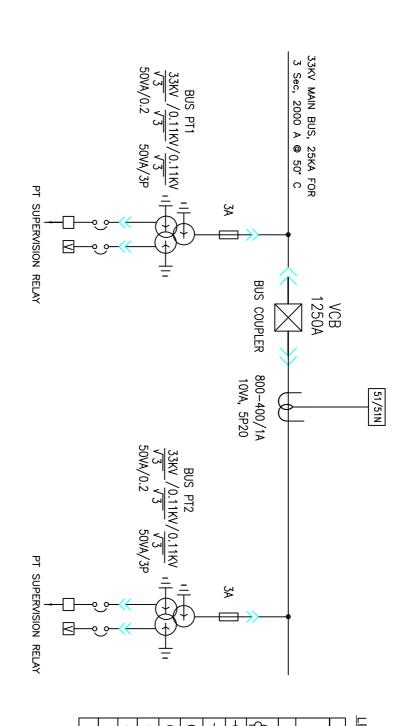
NOTE: 1. KWH METER NOT IN SUPPLIER'S SCOPE

2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS



SCALE

APPD. DATE

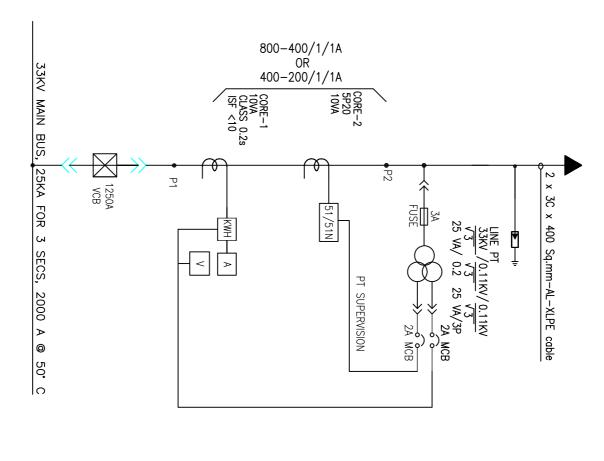


Þ	<	(8)	(4)		3	(E)) (]	 	-	<u>-</u> E)- -C	₩	≪	-⊠-≫	SYMBOL
AMMETER	VOLTMETER	HIGH SPEED TRIP RELAY	ANII POMPING RELAT	RELAY	TRIP CIRCUIT SUPERVISION	MULTIPLIER	BREAKER ALLY CONTACT	EICE	SURGE ARRESTOR			POTENTIAL TRANSFORMER	CURRENT TRANSFORMER		11KV SF6/VACUUM CKT. BKR.	DESCRIPTION
		67 /67N	64	59		21	87	_ [[27	51/51N	- /-	25		46	KWH	SYMBOL
TEST TERMINAL BLOCK	ᆤ	DIRECTIONAL O/C & E/F RELAY	REF RELAY	OVER VOLTAGE RELAY		DISTANCE RELAY	DIFFERENTIAL RELAY		UNDER VOLTAGE RELAY	1N 0/C & E/F RELAY		SYNC CHECK	SEQUENCE PROTECTION	NEGATIVE PHASE	ENERGY METER	BOL DESCRIPTION

NOTE:-

 REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS

SCALE	DATE	APPD. G.S/G.N	CHECKED S.G/A.S	DRAWN
NTS	29.04.22	S.G/A.S	R.K/A.H H.K	
	BUS COUPLER CUM BUS PT	TYPICAL SLD FOR 33KV Spi		HILLI
SLD-SWG-33KV-03	29.04.22 BUS COUPLER CUM BUS PT	ECIFICATION NO RSES_TS_66_HTSWG_R0		ון ח ח



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D

>	<	8	9	(74)	(52)) ¢]	-6 -6	>	₩	≪	⊗→	SYMBOL
AMMETER	VOLTMETER	HIGH SPEED TRIP RELAY	ANTI PUMPING RELAY	RELAY	MULTIPLIER	BREAKER ALLY CONTACT	SURGE ARRESTOR			POTENTIAL TRANSFORMER	CURRENT TRANSFORMER		11KV SF6/VACUUM CKT. BKR.	DESCRIPTION
ā		67/67N	64	59	23	87	27	[7, 6]	51 /51N	25		46	К₩Н	SYMBOL
TEST TERMINAL BLOCK		DIRECTIONAL O/C & E/F RELAY	REF RELAY	OVER VOLTAGE RELAY	DISTANCE RELAY	DIFFERENTIAL RELAY	UNDER VOLTAGE RELAY	טייר מי ביידי	0 /C & E /E BEI AY	SYNC CHECK	SEQUENCE PROTECTION	NEGATIVE PHASE	ENERGY METER	DESCRIPTION

R.K/A.H H.K		
TITLE	3. TTB NOT REQUIRED IN THIS PANEL	PROTECTION RELAYS
	ED IN THIS PANEL	AYS

NOTE:

1. KWH METER NOT IN SUPPLIER'S SCOPE 2. REFER CLAUSE 16 OF SPECIFICATION

FOR DETAILED FUNCTIONAL REQUIREMENTS OF

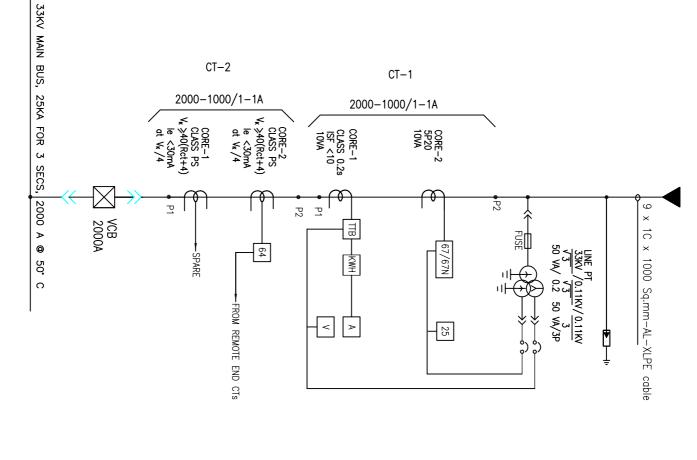
TITLE
TYPICAL SLD FOR 33 KV
OUTGOING FEEDER (FOR INSTALLATION AT KCC CONSUMERS PREMISES)

TYPICAL SLD FOR 33 KV
SPECIFICATION NO. BSES-TS-66-HTSWG-R0
SLD-SWG-33KV-04

APPD.
DATE
SCALE

G.S/G.N 29.04.22 NTS DRAWN

CHECKED S.G/A.S



A	V	8	94)	74)	623)	ф	₩₩	☆	€	≪⊠ ≫	SYMBOL
AMMETER	VOLTMETER	HIGH SPEED TRIP RELAY	ANTI PUMPING RELAY	TRIP CIRCUIT SUPERVISION RELAY	BREAKER AUX CONTACT MULTIPLIER	FUSE	SURGE ARRESTOR	POTENTIAL TRANSFORMER	CURRENT TRANSFORMER	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE	DESCRIPTION
_				_			_		_		

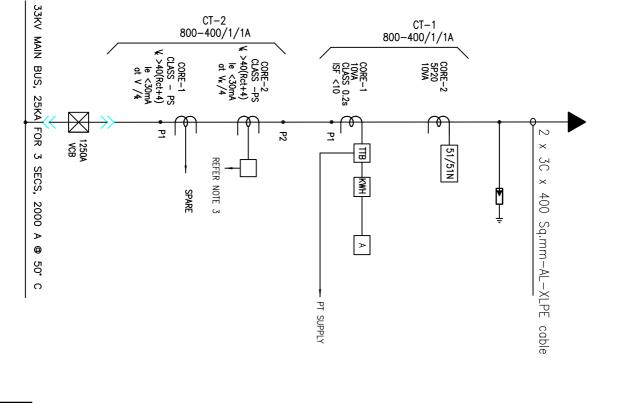
TTB	67/67N	64	59	21	87	27	51/51N	25	46	KWH	SYMBOL
TEST TERMINAL BLOCK	DIRECTIONAL O/C & E/F RELA	REF RELAY	OVER VOLTAGE RELAY	DISTANCE RELAY	DIFFERENTIAL RELAY	UNDER VOLTAGE RELAY	O/C & E/F RELAY	SYNC CHECK	NEGATIVE PHASE SEQUENCE PROTECTION	ENERGY METER	DESCRIPTION

SCALE	DATE	APPD.	CHECKED S.G/A.S	DRAWN
NTS	29.04.22	G.S/G.N	S.G/A.S	R.K/A.H H.K
ALMALINA OLOMANIA	TRANSFORMER	33KV INCOMER	TYPICAL SLD FOR	Timi E

NOTE:

KWH METER NOT IN SUPPLIER'S SCOPE
 REFER CLAUSE 16 OF SPECIFICATION
 FOR DETAILED FUNCTIONAL REQUIREMENTS OF
 PROTECTION RELAYS

SPECIFICATION NO. BSES-TS-66-HTSWG-R0 SLD-SWG-33KV-05



Þ	<	8	(%	(¥)	(29)	ф	Ī	\$	m	≪ ⊠⇒	SYMBOL
AMMETER	VOLTMETER	HIGH SPEED TRIP RELAY	ANTI PUMPING RELAY	TRIP CIRCUIT SUPERVISION RELAY	BREAKER AUX CONTACT MULTIPLIER	FUSE	SURGE ARRESTOR	POTENTIAL TRANSFORMER	CURRENT TRANSFORMER	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE	DESCRIPTION
	_	_	_						1		

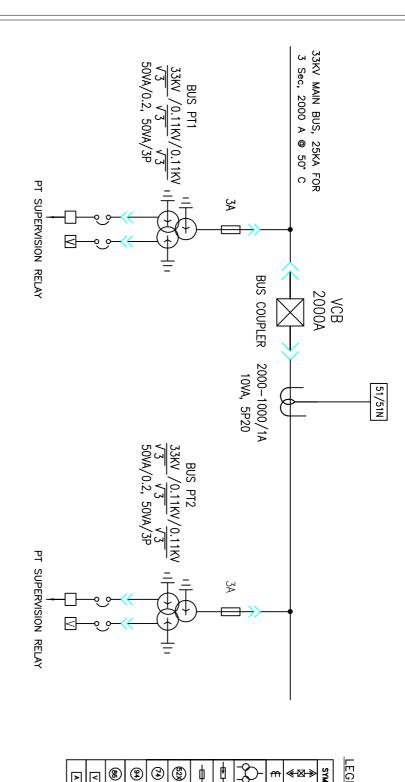
			z							BK P.	
a	67/67N		50	21	87	27	51/51N	25	#	S KW	SYMBOL
TEST TERMINAL BLOCK	DIRECTIONAL O/C & E/F RELAY		OVER VOLTAGE RELAY	DISTANCE RELAY	DIFFERENTIAL RELAY	UNDER VOLTAGE RELAY	O/C & E/F RELAY	SYNC CHECK		ENERGY METER	DESCRIPTION

NOTE: 1. KWH METER NOT IN SUPPLIER'S SCOPE

- 2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS
- LINE DIFFERENTIAL OR DISTANCE RELAY. REFER CLAUSE 16.12.1 OF SPECIFICATION

SCALE	DATE	APPD.	CHECKED S.G/A.S	DRAWN
NTS	29.04.22	G.S/G.N	S.G/A.S	R.K/A.H H.K
	AUTO TRANSFORMER	OUTGOING FROM 66/33KV	TYPICAL SIDEOD 22VV	

SPECIFICATION NO. BSES-TS-66-HTSWG-R0



		1		
MBOL.	DESCRIPTION		SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE		KWH	ENERGY METER
	CIERRENT TRANSFORMER		46	NEGATIVE PHASE SEQUENCE PROTECTION
	CURRENT IRANSFORMER			SERVETACE FIXOTECTION
	POTENTIAL TRANSFORMER		25	SYNC CHECK
-c		_	51/51N	O/C & E/F RELAY
₹	SURGE ARRESTOR	T		
;			27	UNDER VOLTAGE RELAY
4	FUSE		87	DIFFFRENTIAL RELAY
₩/	BREAKER AUX CONTACT MULTIPLIER		3 [DISTANCE RELAY
	TRIP CIRCUIT SUPERVISION	1	[
	RELAY		59	OVER VOLTAGE RELAY
🖑	ANTI PUMPING RELAY		64	REF RELAY
•	HIGH SPEED TRIP RELAY		[45.67	משבכיזומאאו מילי זי בילב שבו אי
	VOI TWETER	_	0//0/19	DIRECTIONAL O/C & E/F RELAT
ا اك	AMMETER		a	TEST TERMINAL BLOCK

NOTE:-

1. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS

E NTS	APPD. G.S/G.N PANEL FOR DATE 29.04.22 BOARD OF	_	DRAWN R.K/A.H TYPICAL ST
AER SLD-SWG-33KV-07	PANEL FOR 33KV SWITCH SPECIFICATION NO. BSES-TS-66-HTSWG-R0	BUS COUPLER CUM BUS PT	



Technical Specification For Heat Shrinkable and GIS Cable Termination Kit (For 11 KV, 33 KV & 66 KV Cables)

Technical Specification For Heat Shrinkable and GIS Cable Termination Kit (For 11 KV, 33 KV & 66 KV Cables)

Specification no - SP-HSGTK-04-R1

Prepa	red by	Revie	ewed by	Appro	oved by		_
Name	Sign	Name	Sign	Name	Sign	Reg	Date
AV	aller	GS	(auto	MAA	Holie	RO	02/06/2017



Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)

Index

Recor	d of Revision	3
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2.0.0	Codes & standards	4
3.0.0	Cable Construction	4
4.0.0	Cable Termination Kits	6
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6.0.0	Deviations	10
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Annex	cure – D: Technical Deviation Sheet	15
Annex	cure – E: Service Conditions	15
Annex	cure – F: Bimetallic Aluminium / Copper Lug	16
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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, 66KV 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 : 1985	Cross-linked Polyethylene (XLPE) Insulated PVC sheathed cables: Part 2: For working voltages from 3.3 kV upto 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	

2.1.1 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 (Um=36 KV) up to 150 KV (Um=170 KV) - test methods and requirements.

3.0.0 Cable Construction

Normal sizes of XLPE cables used in BSES system and the construction features of these cables are indicated below:

XLPE type Cables: 3-core x 150, 300 & 400 sq. mm. Al

1-core x 630 or 1000 sq. mm. Al

PILC type Cables: 3-core 240 or 300 sq. mm. Al



3.1.0	Conductor	For XLPE: a) Electrolytic Grade stranded Aluminium b) Grade: H2/ H4 as per IS: 8130/84 (For AI) 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 XLPE Insulation For PILC: Layers of impregnated papers
3.4.0	Insulation Screen	For XLPE: a) Freely strippable Semi Conducting (without application of heat) for 66KV firmly bonded b) Copper Tape For PILC: a) 11 kV: absent (Belted) b) 33kV: metallised paper tape
3.5.0	Water Swellable Tape	For XLPE: Semi-conducting Water Swellable Tape shall be provided under the copper tape on each core. For PILC: not applicable
3.6.0	Filler	For XLPE: All interstices, including centre interstices filled by PP filler. For PILC: a) 11 kV: Crushed paper filler b) 33kV: Jute twine
3.7.0	Over all three cores	XLPE: Binder tape PILCA: 11 kV: belt paper 33kV: Copper Woven Fabric tape
3.8.0	Inner Sheath For XLPE: Extruded Inner Sheath of Black PVC type ST-2. For PILC: Lead alloy sheath	
3.9.0	Bedding Tape	For XLPE: not applicable For PILC: two layers of paper, followed by compounded (bituminized) cotton tape.
3.10.0	Copper Woven Fabric Tape (CWF tape)	For XLPE : not applicable For PILC : a) 11 kV : absent (Belted cable) b) 33 kV : applicable for screened cable



Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)

3.11.0	Armour	For XLPE: a) Galvanised steel flat strip armour (For 3 core cables) b) Hard drawn Aluminium Wire (For 1 core cables) c) Aluminium or lead sheathed for 66KV cable For PILC: a) 11 kV double steel tape armour	
3.12.0	Binder Tape	For XLPE: Rubberised cotton tape	
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 PILC: compounded (bituminised) Jute/PVC	

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					
		Voltage Grade	Cable Size	Application	Material of Lug	Connection Method
			3Cx 150 & 3Cx	Indoor	Bi-Metal	Mechanical connector
		11 KV	300 sq mm	Outdoor	Aluminium	Mechanical connector
			1Cx1000	Indoor	Aluminium	Crimping
	Conductor Connection 66 a) For lug su b) For shall I cone		sq mm	Outdoor	Aluminium	Crimping
			3Cx400 sq mm	Indoor	Bi-Metal	Mechanical
		33 KV				connector
4.2.1.				Outdoor	Aluminium	Mechanical connector
		66 KV	1Cx630 &	Indoor	Aluminium	Crimping
			1Cx1000 sq mm	Outdoor	Aluminium	Crimping
		lug suitable b) For GIS shall be do	e for 300 sq. i cable termina ne by standa	C cable and 30 mm. XLPE cab ation kits: Cond rd method of sontact assemble	le shall be us ductor connec plit, silver-pla	ed. ction assembly ted copper



4.2.2	Stress Control System	a) The earthed insulation screen of an XLPE cable is terminated at a suitable distance from the conductor. b) The tube is in electrical contact with insulation screen. c) Impedance of the tube shall be constant upto an operating temperature and shall be within the range 1x10 ⁰⁸ ohm-cm to 8x10 ohm-cm. d) Minimum length of stress control tube for 11 kV and 33 kV shall be 130 mm and 260 mm respectively. e) The physical and electrical properties shall conform to ESI 09: 13. f) For GIS cable termination kits Stress control shall be done 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.
4.2.3	Insulation Protection	a) XLPE insulation shall be protected by means of an outer tube, resistant to tracking and weathering. b) One end of the tube shall be coated internally with red sealant mastic for a length of 50 mm. c) Physical and Electrical properties shall conform to ESI 09: 13.
4.2.3.1	Outer Anti-tracking Tube	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:

Cable System		Minimum Length of tube (mm)		Creepage Extension Shed (No.) (min)	
Voltage	Cores	Indoor Outdoor		Indoor	Outdoor
11 kV	3 - core	650	650	Nil	2
	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)	 a) Transparent tube is used for restoring the insulation provided by belt paper, which is terminated at the crotch. 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.
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4.2.4	Environmental Sealing System	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. 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. 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. 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.
4.2.5	Earth Bond System	a) Earth Bond Assembly shall comprise of copper braided conductors as earthing conductors, GI armour support ring (split type) and two stainless steel hose clips. b) For GIS termination kit The earthing arrangement for 3-core cables shall be the same as stated under 'a' above. c) Two nos. copper braided conductors shall be of size: 25 sq. mm. for 11 kV cables, 35 sq. mm. for 33 kV cables and 50 sq mm for 66KV. d) Length of the copper braided conductor shall be 750 mm. e) Each copper braided conductor shall be supplied with copper lug, crimped at one end. Size of lug: 70 sq. mm. for 11 kV and 120 sq. mm. for 33 kV.
4.2.6	Suppression of electrical discharges	Following materials are required for use during cable termination: a) Silicone-based compound Required for filling-in minute services/ surface cracks over XLPE insulation. b) Polymeric mastic Required for application over semiconducting 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.
4.2.7	Installation. Instruction Sheet	It shall be in English and Hindi language and shall be provided inside every kit.
4.2.8	Identification Tag (for traceability)	 a) An aluminum pouch with paper tag & sealing arrangement at one end shall be provided. b) This tag is required to be tied over the cable at one side of the joint. c) The paper tag shall give following information 1) Vendor kit designation 2) Division 3) Breakdown ID/Shutdown ID/Scheme No. 4) Cable section 5) Type of joint 6) Size of Joint 7) Make of joint



	Paper Measuring	8) Voltage class 9) Serial no. of kit 10) Vendor lot & batch no 11) Month & year of manufacturing 12) Date of installation 13) Name of jointer 14) Name of vendor supervisor 15) Name of BSES supervisor 16) Remarks
4.2.9	Тар	Required for use during cable preparation / terminations.
4.3.0	Technical Particulars	Vendor shall submit Guaranteed Technical Particulars (GTP) as per Annexure A.
4.4.0	Type Tests	Termination Kit shall be of type-tested quality.
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	1) Buyer reserves the right to witness all tests specified on individual H. S. components, Moulded components or completed Cable Termination Kit. 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. 3) In-process and final inspection call intimation shall be given in advance to purchaser.
	c) Test Certificates	Three sets of complete Test Certificates (Routine & Acceptance tests) shall be submitted along with the delivery of Cable Termination Kits.
	d) Type Test	a) End termination kit shall be of type-tested quality. b) In addition to this, vendor will be required to conduct type-testing on heat shrinkable and moulded components, stress grading mastic, etc., in line with EA TS 09-13 standard, at third party test laboratory once in every six months on randomly selected sample of each voltage rating without any commercial implication.
4.6.0	Documents	"Documents" refer to Documents, Data, Manuals, etc. (Scanned copy of signed documents also shall be part of entire soft file (efile) or CD.)
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.



Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)

4.6.3	"As-Built" documents	Final signed "As-built" documents for the equipment in 3 sets (hard copy), 1 no. soft copy. 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/ pack protection against damage.	
a)	Identification Label	Markings / Labels shall be on both sides of every packed box. 1) Identification number/type designation (as per manufacturer's standard) 2) Voltage grade, size, description of the Kit (including the voltage grade, size, type of the cables, for which it is to be used) 3) Batch no., lot no., etc. 4) Quantity 5) a) Purchase Order no. & date
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.

6.0.0 Deviations

6.1.0.	Deviations	A) Deviations from this specification can- be acceptable, only where the Seller has listed in his quotation the requirements he cannot, or does not, wish to comply with and which deviations the Buyer has agreed to in writing, before any order is placed. B) In the absence of any list of deviations from the Seller, it will be assumed by the Buyer that the Seller complies with the Specification fully.
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Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)

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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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	Test report submitted	
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		
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 I 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.)	



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	Type Test Reports (TTR) (Relevant test report no. & date, With type, size, other details of each type of Kit.)		
	a) Prepared Joint:	Yes/No	
17	CPRI TTR as per BIS / IEC enclosed?		
	b) Loose Components:	Yes/No	
	CPRI TTR as per EA TS 09-13 enclosed?		
18	Printing details on each of the Heat- shrinkable and Moulded components	(Mention the text, presently printed on each of the component)	

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



Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)

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, it 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)



Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 KV, 33 KV, 66 KV Cables)

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

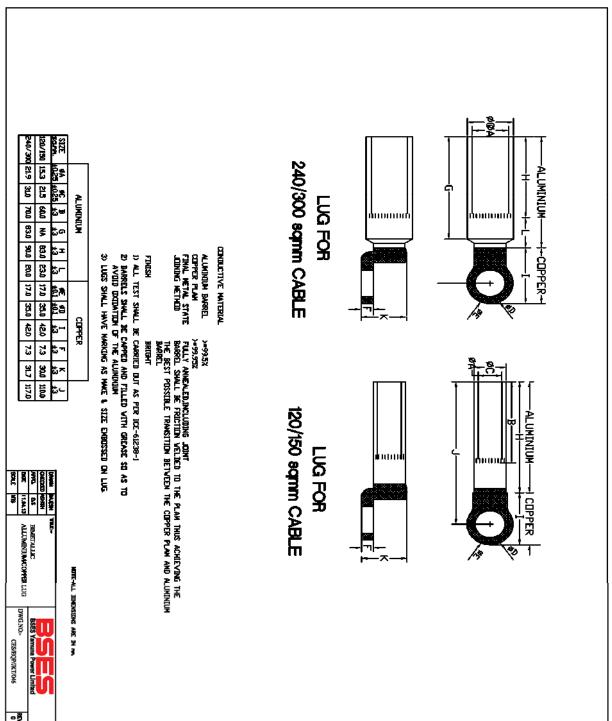
Annexure - E: Service Conditions

(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



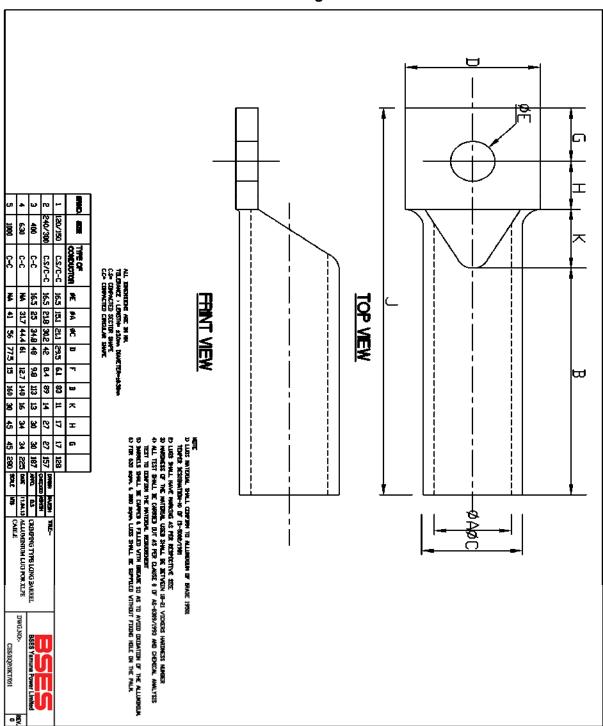
Annexure - F: Bimetallic Aluminium / Copper Lug







Annexure - G: Aluminum Lug For XLPE Cable





Technical Specification For LT Cable Joints and Terminations

Specification no - SP-LTJKT-06-R1

Prepa	Prepared by		Reviewed by		Approved by		
Name	Sign	Name	Sign	Name	Sign	Rev	Date
AV	Marx	GS	Jeans a	AA	- shr	R1	02/06/2017





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Record of Revision

CI No	Change in Specification	Approved by	Rev
1	Polyurethane type joint has been deleted	GS	R1
2	Requirement of LT outdoor termination kit has been added	GS	R1



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 ± 6% (415V Phase to phase)
3.3	Frequency	50 Hz ± 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



5.0.0 Cable Construction:

5.1	Size of the cables	 2C X 10 Sqmm – circular 2C X 25 Sqmm - filler 4C X 25 Sqmm 4C X 50 Sqmm 4C X 95 Sqmm 4C X 150 Sqmm 4C X 300 Sqmm
5.2	Conductor	 a. Electrolytic Grade stranded Aluminum Conductor b. Grade: H2/ H4 as per IS: 8130/84 (For AI) c. Shape: compacted sector shaped stranded d. Class 2
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	Туре	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	 a. By long barrel AL Ferrule (Please refer drawing mentioned in annexure 'x'. b. Corrosive inhibition paste (M/s Jainson or equivalent) inside the ferrule with plastic end caps. c. Ferrule shall be marked for size of the cable for which it is suitable. d. Crimping mark shall be provided on ferrule. e. Inner edge of ferrules should be chamfered for easy insertion of cable core. 	
6.4	Insulation	 a. Heat shrinkable Insulating tubing for providing insulation over ferrule. 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. 	
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	





		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 sleve 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	 a. By long barrel AL Lug (Please refer drawing mentioned in annexure 'x'. b. Corrosive inhibition paste (M/s Jainson or equivalent) inside the ferrule with plastic end caps. c. Lug shall be marked for size of the cable for which it is suitable. d. Crimping mark shall be provided on ferrule. e. Inner edge of Lug should be chamfered for easy insertion of cable core. 		
7.4	Insulation	 a. The minimum length of outer sleeve shall be shall be 1000mm. b. It shall also have UV rating to protect from direct sun light exposure. c. 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. 		





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		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	>= 8 kV/mm
8.3	Heat shock 250 °C for 15 Min.	No splitting, dripping or flowing.
8.4	Tensile Strength	>= 12 Mpa (120 kg/sq.mm)
8.5	Elongation	>= 200%
8.6	After Thermal Ageing at 120°C for 500Hrs.	
8.7	Tensile Strength	>= 10 Mpa (100 kg/sq.mm)
8.8	Elongation	>= 100%





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	 a. Joints and terminations shall be type tested from CPRI / ERDA as per IS 13573 -Part1. b. Randomly selected sample shall also be type tested without any commercial implication from the offered lot in the event of order. c. Loose components shall be tested as per EA TS -09-13. 	
9.5	Routine tests	As per relevant IS and EA TS -09-13	
9.6	Acceptance test	 a. Visual Inspection- The offered kits shall be free from any visible defects, b. Physical verification of contents - all the contents shall be checked as per kit contents list enclosed by the bidder, c. Electric Strength test for Insulation tubing. d. Elongation tests for all types of tubing. e. Wall thickness ratio f. Longitudinal change after full recovery. g. Tracking and corrosion resistance test. h. Tensile strength. 	
9.7	Inspection	 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. b. 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. c. In-process and / or final inspection call intimation shall be given in advance to purchaser. 	
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.	



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	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	1	of this specification along with company seal & signature on each page.

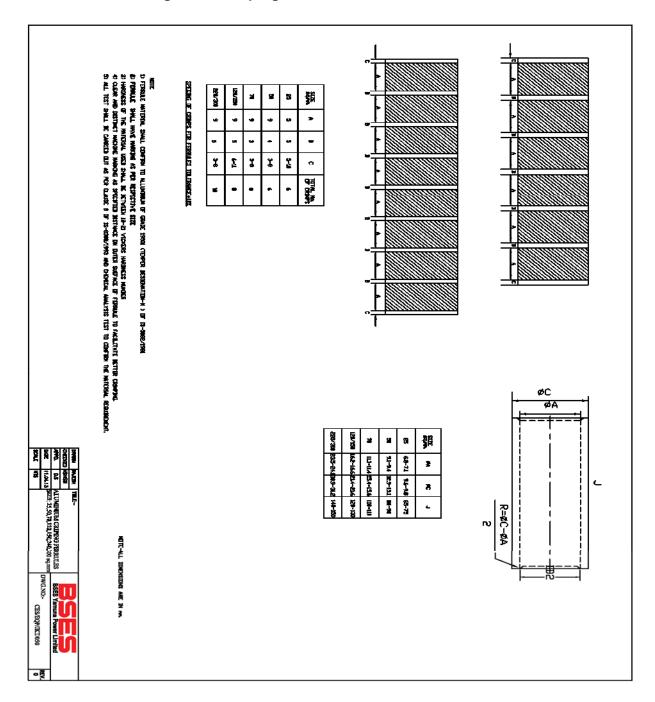
12.0.0 Drawing Submission:

40.4				
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			
12.1.3	components.			
12.1.4	01 no's sample of each type of kit.			
40.4.5	Detailed reference list of customers using the offered product during the last 5 years			
12.1.5	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.			
40.4.0				
12.1.9	Recommended accessories or any other hardware for five years of operation.			
40.0	Seller has to submit following drawings for buyer's Approval (A) / Reference (R) After			
12.2	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			
	Duly signed & stamped copies of the drawings / documentation are required to be			
12.3.6	submitted to BSES for approval.			
	Submitted to DOLO for approval.			



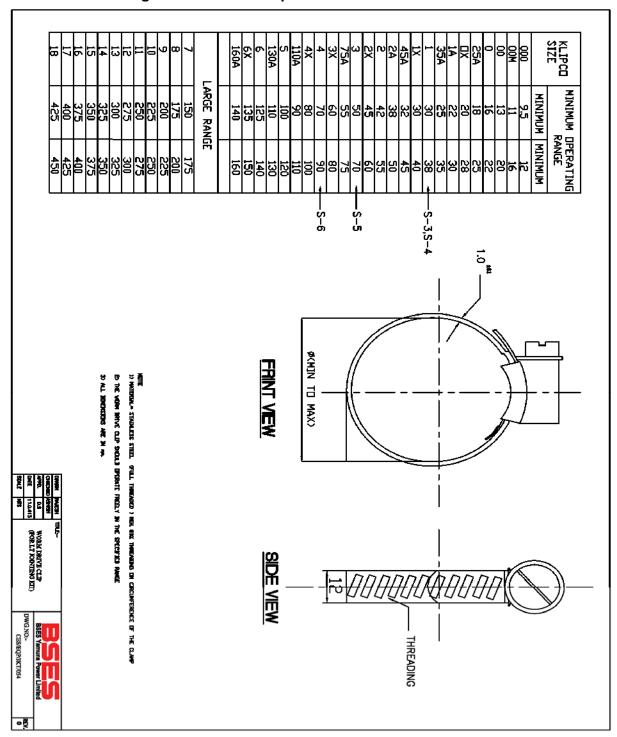


Annexure A: Drawing of AI Crimping Ferrule



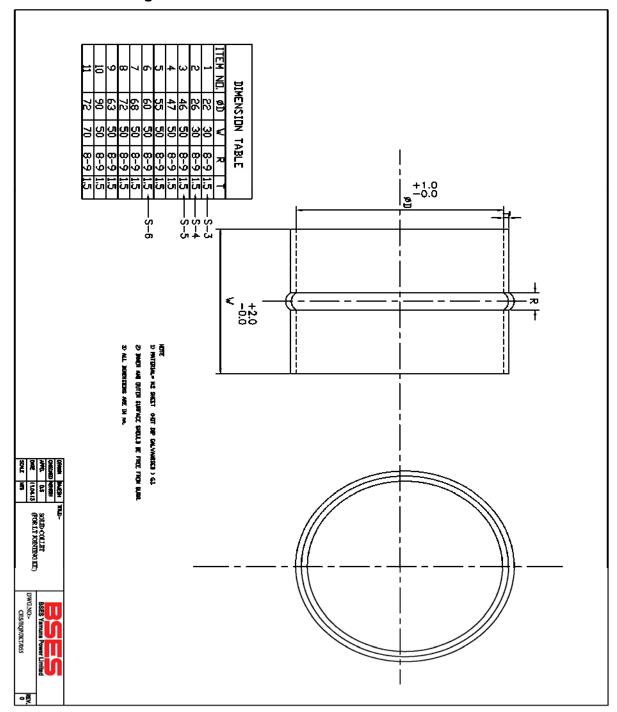


Annexure B: Drawing of Worm Drive Clip



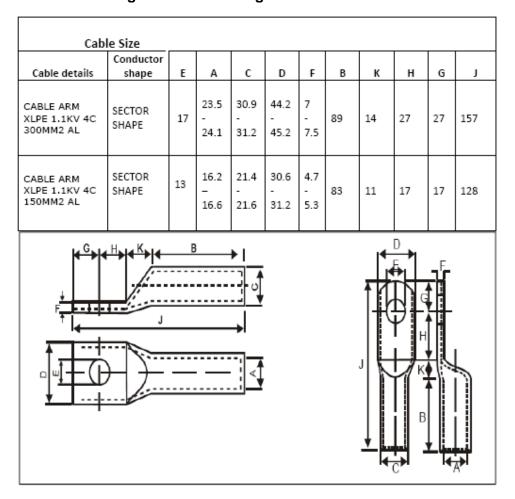


Annexure C: Drawing of Solid Collet





Annexure D: Drawing of Aluminum Lug



NOTE: ALL DIMENSIONS ARE IN MM

Technical Specification for

11 kV Cables

Conventional - 1CX1000, 3Cx400, 3CX300 and 3CX150 sqmm

Cable in Co-Extruded Duct - 3Cx400 & 3Cx300 sq mm

Rev:		0
Date:		6 Apr 2022
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Approved by	Gaurav Sharma	Cecureur
Approved by	K. Sheshadri	Leve 110



Technical Specification for 11 kV Cables (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)

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Technical Specification for 11 kV Cables (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)

General Specification

1.0.0 Codes & Standards

The cables shall be designed, manufactured and tested in accordance with the following National Standards and IEC Standards.

National Standards

IS 7098 Part-2	Cross linked polyethylene (XLPE) insulated PVC sheathed cables for working voltages from 3.3 kV up to and including 33 kV.
IS 5831 : 1984	PVC insulation & sheath of electric cables.
IS 10810 : 1984	Methods of test for cables.
IS 8130 : 1984	Conductors for insulated electric cables and flexible cords.
IS 3975 : 1999	Mild steel wires, formed wires and tapes for armouring of cables.
IS 0462 (Part 1) / 1983	Fictitious Calculation Method for determination of dimensions of protective covering of cables

International Standards

IEC 60183	Guide to the selection of high voltage cables
IEC 60228	Conductors of insulated cables. Guide to the dimensional limits of
	circular conductors.
IEC 60332 – 3	Tests on electric cables under fire conditions.
	Part 3: Tests on bunched wires or cables.
IEC 60502 – 2	Power cables for rated voltages from 6 kV (Um = 7.2 kV) up to 30
	kV (Um = 36 kV)
IEC 60811	Common test methods for insulating and sheathing materials of
Pts 1 through 5	electric cables.
IEC 885	Electric test methods for electric cables.
Pts 1 through 3	
IEC 28	International Standard of Resistance for Copper
IEC 332	Test on Electric Cables under fire conditions

2.0.0 Cable Construction Features

This Specification generally covers following types / sizes of TR-XLPE H. T. Cables used in BSES network in Delhi area, mostly under-ground (buried, with chances of flooding by water) or for laying on racks, in ducts, trenches, conduits, and so on.



Technical Specification for 11 kV Cables (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)

Note: (Ref.: Table stating Cable sizes given below.)

Cable Code:

As per IS, cable designations comprise of following codes / options, as applicable for this Specification:

(N.A. - Not applicable for Specification)

-	(with Copper conductor)	(N.A.)
---	-------------------------	--------

A Aluminium conductor

2X XLPE insulation

W	Steel round Wire armour	(N.A.)

Wa Non-magnetic round Wire armour

F Steel formed wire (strip) armour

FF Double steel formed wire (strip) armour (N.A.)

Fa Non-magnetic formed wire (strip) armour (N.A.)

- ("un-armoured" or without armour) (N.A.)

Y PVC outer sheath

Sr. No.	Description	Conductor Material	Cable Code
1.	11 kV, 3c x 150 sq. mm.	Al	A 2X F Y
2.	11 kV, 3c x 300 sq. mm. (conventional)	Al	A 2X F Y
3	11 kV, 3c x 300 sq. mm. cable in co-extruded Duct	Al	A 2X F 2Y 2Y
4	11 kV, 3c x 400 sq. mm. (conventional)	Al	A 2X F Y
5	11 kV, 3c x 400 sq. mm. cable in co-extruded Duct	Al	A 2X F 2Y 2Y
6.	11 kV, 1c x 1000 sq. mm.	Al	A 2X Wa Y





Technical Specification for 11 kV Cables (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm) Description of each item mentioned in the Specification (the text, BOQ, GTP or any site specific requirement) shall be followed, along with IS: 7098 – Part 2.

	T	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
		a) Electrolytic Grade Stranded Aluminium
		Conductor
		b) Grade: H2 as per IS: 8130 / 1984 (For Al)
		c) Stranded, compacted and circular in shape
		d) Class 2
		e) "Longitudinal Water-Blocking Arrangement" (or
		water-tight construction or water barrier
2.1.1	Conductor	protection) shall be provided within the
		Conductor.
		i) As per manufacturer's procedures, 100 %
		water-tight conductor shall be achieved.
		iii) Make & Type of materials to be used (i.e.
		Water-swellable tapes / yarn / powder,
		etc.) shall also be stated in the List of Sub-
		Vendors for pre-order approval.
		f) All detailed constructional features shall be shown
		in the cross-sectional drawing.
		Extruded semi-conducting material.
2.1.2	Conductor Screen	(Also refer Cl. 2.1.3.)
		(Tapes are not acceptable)
		, ,
		a) Extruded XLPE (Cross-Linked Poly-Ethylene)
		Insulation, with water-tree retardant (WTR)
		property
2.1.3	Insulation	b) The required compound used shall be from
		BSES-approved sub-vendors and not from any
		other (refer Annexure – C).
		c) Uniform thickness of insulation shall be within
		of Chilothi unokiless of Hisulation shall be Within



Technica	Technical Specification for 11 kV Cables (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)		
		the permissible values as per IEC Standards;	
		eccentricity check shall be carried out to ensure	
		this.	
		d) Insulation Color:natural	
		a) Freely-strippable semi-conducting screen, which	
		should not require application of heat for its	
		removal.	
		(Refer Cl. 2.1.3.)	
		b) Text "Do not Heat - Freely Strippable" to be	
		printed on insulation screen (at every 600 mm	
0.4.4	1	interval).	
2.1.4	Insulation Screen	c) Round shape over the outer semi-con shall be	
		within the permissible limits as per IEC	
		standards; Ovality (2% max) check shall be	
		carried out to ensure this.	
		d) Compound used shall be suitable for the	
		operating temperature of the Cable and shall be	
		compatible with the insulation used.	
2.1.4A	XLPE Process		
2.1.4A-1	11 kV	Dry Cure and Dry Cool process only.	
2.1.4A-2	Not in use		
		It is mandatory that Conductor Screen, Insulation	
	Extrusion	and Insulation Screen shall be extruded	
2.1.4A-3		simultaneously, in a Single One-Time Process (i.e.	
		as a triple-head extrusion) to ensure homogeneity of	
		layers over the conductor, and absence of voids.	
		Any deviation from Approved Makes mentioned in	
	Make of Compounds for	Annexure-C shall not be acceptable, unless the	
2.1.4A-4	Insulation and Semi-	deviation has been specifically approved by BSES	
	conducting	during tendering stage	
		J J J	
		a) Semi-Conducting Water-Sellable Tape shall be	
2.1.5	Water-Swell able Tape	provided, under the copper tape, on each core.	
		, , , , , , , , , , , , , , , , , , , ,	



Technica	Technical Specification for 11 kV Cables (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)		
		b) Nominal thickness : 0.3 mm	
		c) Weight: 118 gm / sq. m approx.	
		d) Swell height: ≥ 12 mm in 1 min.	
		e) Compatible to strippable / non-strippable semi-	
		con, over which it is applied.	
2.1.6	Core Identification	 a) For 3-core cables, cores shall be identified by coloured strips (Red, Yellow, Blue), applied helically / longitudinally below the copper tape. The coloured strips shall carry the name of cable manufacturer permanently printed at 1 meter intervals; this is to provide additional identification of manufacturer of the cable. 	
2.1.6A	Copper Tape	Copper Tape shall be applied helically over the layer formed after application of insulation screen, waterswell able tape and identification strip. Zero negative tolerance in thickness of copper tape	
2.1.7	Filler	 a) All interstices, including center interstices shall be filled by PP filler. b) PP Filler shall be non-hygroscopic, not having any effect on other compounds used, stable at cable temperatures, etc. c) PVC filler is not acceptable. d) Filler is not applicable for single-core cables. 	
2.1.8	Binder Tape	As per manufacturer's standard	
2.1.9	Inner Sheath	Extruded Inner Sheath of Black PVC type ST-2 (IS 5831)	
2.1.10	Armour	a) For 3-core Cables :Galvanised Steel flat strip armourb) For 1-core Cables :	



Technica	al Specification for 11 kV Ca	bles	(1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)
			Non-magnetic round wire armour
			(hard-drawn aluminium wire)
		c)	Minimum area of coverage of armouring shall be
			90 % (min.). At any time, the gap between any
			two adjacent armour strips / wires shall not be
			more than the width of strip / diameter of wire.
		d)	Zero negative tolerance is for :
			Thickness of armour strip
			Diameter of armour wire
2.1.11	Binder Tape	Ru	bberised cotton tape
0.4.40	Outen Charth		
2.1.12	Outer Sheath	- >	Extended outen the of DVO (OT 0
		a)	,
			5831) with termite-repellant and anti-rodent
2.1.12.1	For Conventional cable		properties. Color - Blue
			(Outer Sheath shall be FRLS-type, if chosen by
			purchaser.)
	For 3Cx300 & 3Cx400	a)	Inner Layer- Extruded PE compound Type
	sq mm CCD cable (Cable in Co-extruded duct)		HDPE ST7 (Black)- Thickness 3.00 mm
2.1.12.2		b)	Outer Layer- Extruded PE compound Type
			HDPE ST7 ; Thickness 2 mm, color Orange (IS
	,		557) or other color as per Tender requirement
		b)	Shape of the cable over the outer sheath shall
			be circular, when manufactured / completed.
			Regular Ovality check shall be carried out at
			factory, to detect any abnormality.
			Manufacturing quality shall be such that cable
			will retain its circular shape, even after it is laid
			will retain its circular shape, even after it is laid at site.
		c)	·
		c)	at site.
		c)	at site. The Outer Sheath shall be embossed as well as
		c)	at site. The Outer Sheath shall be embossed as well as laser printed with following minimum text at a



Technica	al Specification for 11 kV Ca	bles (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)
		(e.g. A2XFY)
		Manufacturer's Name and Trade-mark
		4. Number of cores and nominal cross-
		sectional area of conductor
		5. Name of buyer / purchaser,
		6. Month & Year of manufacturing
		7. IS reference, i.e. IS: 7098
		8. Batch No. / Lot No.
		(For traceability purpose, in case of any, in
		case of any manufacturing defect or
		otherwise arising in the cable in future.)
		9. Purchase Order Number & date
		10. Word 'FRLSH', in case the cable is of
		FRLSH type.
		Note:
		a) Drum No. & Progressive (sequential) length
		marking shall be provided by Laser Printing at
		every meter with proper contrast in coloring
		b) Progressive length marking for every drum
		shall be starting from zero for every drum.
	Sealing-end Cap at	Cable both ends (inner and outer end) shall be
	both ends	sealed as per drawing MISC/E/4-1131/1698. One
2.1.13	(for Cables)	PVC cap with Polyurethane compound shall be
		provided as primary sealing and heat-shrink end-cap
		shall form a secondary sealing over the PVC cap.
		A cable pulling-eye assembly as per Drg. No.
	Pulling-eye Assembly	MISC/E/4-1131/1698 shall be provided at the loose
	at one end, Sealing-end	end (outer end) of the cable on each drum. Sealing
2.1.14	cap at other end	material shall be filled in inside the spaces / gaps
	(if required as per tender	between the pulling-eye assembly and cable outer
	requirement)	sheath. Further, a heat-shrinkable sleeve shall be
		provided over the pulling-eye assembly and outer
	l	I .



Technic	al Specification for 11 kV Ca	bles (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)
		sheath of cable.
		If pulling eye is required as per tender requirement,
		sealing end cap shall be required for only one end of
		cable.
3.0.0	(This number not used.)	
4.0.0	Testing & Inspection	Tests shall be carried out in accordance with IS 7098
	recuiring or interpretation	(Part-2).
		1) To Qualify in Tender:
		Cables must be of type tested quality. Type Test
		Reports shall be submitted for the type, size and
		rating of cable offered in the bid.
		For participation in the tender Type Test report
		shall be submitted from CPRI/ERDA only and
		shall not be more than 5 years old from the date of
		tender. If the report is more than 5 years and but
	a) Type Tests (IS 7098,	less than 10 years old than bidder to submit
	IEC)	undertaking that there is no design changes from
		the Type test conducted.
		2) Type Test Required After Award of PO:
		Type test on one cable drum of each type/rating
		from any lot shall be conducted at CPRI/ERDA on
		sample basis as per relevant IS/IEC. Sample shall
		be sealed by BSES during inspection of cable.
		This type test is applicable subject to BSES
		requirement and cost shall be borne by BSES.
	b) BSES QAP	In general, all tests mentioned in the BSES QAP
	(Typical)	(Characteristics – Typical) mentioned in Annexure-F
	(ι γρισαι)	shall be included in the Routine Tests, Type Tests
		and Acceptance Tests stated above.
		Measurement of Electrical Resistance
		2. HV Test with power frequency AC voltage
	c) Routine Tests	3. Partial Discharge test
		4. "Strippability Test" at both the ends of cable for
		each drum, to check the freely-strippable



Technica	al Specification for 11 kV Ca	bles (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)
		property of the Insulation Screen (outer semi-
		con).
		5. Impulse voltage test of one drum
		6. Armour coverage measurement
		7. Physical test-Dimensions of each and every layer
		and components.
		Test results from the above tests must appear in the
		documents forwarded by the vendor for Inspection
		call / waiver.
		The Buyer reserves the right to witness all tests
		specified on completed cables.
		2. The Buyer reserves the right to inspect cables at
		Sellers works at any time prior to dispatch, to
		verify compliance with the specifications.
		3. In-process (stage inspection) and final
		inspection call intimation shall be given at 10
	d) Inspection	days advance to the purchaser along with
		complete manufacturing scheduled.
		4. Minimum lot size of Cables to be offered for
		inspection shall be mutually agreed between
		Purchaser and Vendor, before placing the order.
		Vendor shall raise inspection call only after a
		minimum lot size is ready and with due factory
		routine tests already carried out.
		Acceptance Tests shall be conducted as per Cl. 18.2
		of IS 7098 (Part-2) and the approved Quality
		Assurance Plan (QAP) for each lot of cables.
		Following tests shall also be carried out during the
		Acceptance Tests :
	e) Acceptance Tests	a) "Wafer Boil Test" for checking integrity of semi-
		conducting layers-in each lot.
		b) "Void-and-contamination Test" for the Insulation-
		in each lot
		c) "Strippability Test" at both the ends of cable for
		each drum, to check freely-strippable property of



Technica	ical Specification for 11 kV Cables (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)				
		the Insulation Screen (outer semi-con) - in each			
		lot.			
		d) "Water Penetration Test (WPT)", as per			
		applicable IEC standards, to check adequacy of			
		water-blocking arrangement provided inside the			
		conductor -in each lot.			
		e) Impulse voltage test – in each lot sample basis.			
		f) Heating Cycle along with potential once per PO			
		on sample basis.			
		Three sets of complete Test Certificates (Routine			
		tests and Acceptance tests) shall be submitted along			
		with the delivery of cables.			
		Soft copy of the TCs shall be separately e-mailed to			
		the Purchaser.			
	f) T+ O+: (TO)	Note:			
	f) Test Certificates (TC)	Make/grades of critical materials (such as, for			
		conductor screen, insulation, insulation screen, etc.),			
		actually used during manufacturing of cables for			
		order-on-hand, shall be clearly stated in the TCs			
		forwarded by the Manufacturer, enabling references			
		in future.			
		a) Refer Annexure-A regarding Document			
		Submission.			
		b) Cross-Sectional Drawing shall show every			
		feature of construction, including the thickness /			
		diameter over every layer. This drawing shall			
		also state the text to be embossed over the			
5.0.0	Drawing, Data and	outer sheath - i.e. type/size, etc. of the cable,			
	Manuals	drum no./lot no., sequential marking over every			
		meter, printing text on outer semi-con ("Do Not			
		Heat-Freely Strippable"), font sizes to be used,			
		additional text, if any, etc. Also, drum details,			
		markings to be made on both sides of the drum,			
		and so on.			



Technical Specification for 11 kV Cables (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)

5.0.1	Documents to be submitted along with bid	The vendor shall submit: a) Cross-sectional drawing b) GTP (all data to appear) c) Type Test certificates d) Fault Level Calculation for armour and copper tape screen e) Complete Cable Catalogue and Manual f) Armour Coverage Calculation g) Raw materials make list		
5.0.2	Documents after award of contract	Within 15 days, the seller has to submit four sets of above-mentioned drawings, along with one soft copy for buyer's approval.		
5.0.3	Final As-Built Drawings	One soft copy of all documents, including type & routine test certificates.		
6.0.0	Drum length & tolerance	Cable length per drum		
6.0.1	 a) 11 kV, 3Cx150 sqmm b) 11kV, 3Cx300 sqmm c) 11 kV, 1Cx1000 sqmm d) 11kV, 3Cx400 sqmm 	300 mtr +/- 5% or 500 mtr +/- 5% (100% of the ordered quantity) as per tender requirement		
6.0.2	Overall tolerance	- 2 % for the total cable length for the entire order.		
6.0.3	Short length of cables	Manufacturer shall take prior approval for Purchaser for any supply of short length cables. For 11 kV cables, minimum acceptable short length cables can be 250 meter. In any case, manufacturer shall not put two capieces of different short lengths in same cable dru		



Technica	nnical Specification for 11 kV Cables (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)			
		Only one short length drum shall be accepted and in		
		last lot only.		
	Packing, Shipping,			
7.0.0	Handling			
	& Storage			
		a) Both the ends of the cables shall be properly		
		sealed to prevent any deterioration of the cable,		
		due to ingress of water, etc.		
		b) Cable inner end (starting end) shall project,		
		outside the completely wound cable, by		
		sufficient length enabling verify cable details,		
		including the initial length marking.		
		c) Similarly, outer end of the cable shall be saddled		
		/ secured to the drum properly to prevent any		
		external damage to the end at any time.		
	a) Packing	d) Before putting on wooden planks, protective		
		covers (thick plastic sheets, etc.) shall be		
		secured over the wound cable, to avoid any		
		abrasion by wooden planks, over the outer		
		sheath of the cable.		
		e) After providing the protective covers, the cable		
		drums shall be finally closed by wooden planks		
		(with saddles), without leaving any gaps		
		between the planks; i.e. 100 % covering shall be		
		ensured.		
		Direct marking (i.e. text painting through stencils,		
		etc.) shall be done on the drums, instead of attaching		
		labels, which may be misplaced/lost over a period of		
		time.		
	b) Drum Identification	a) Drum identification number		
	Markings:	b) Cable voltage grade		
		c) Cable code (e.g. A2XFY, etc.)		
		d) Number of cores and cross sectional area		
		,		
		e) Cable quantity, i.e. cable length (meter)		



Technica	Technical Specification for 11 kV Cables (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)			
		f) Purchase order number & date		
		g) SAP item code		
		h) Total weight of cable and drum (kg)		
		i) Manufacturer's Name		
		j) Buyer's name		
		k) Month & Year of Manufacturing		
		I) Direction of rotation of drum		
		m) Cable length final end-markings		
		(i.e., reading at the inner end and reading at		
		the outer end, just before packing, shall be		
		marked on the drum.)		
	c) Shipping information	The seller shall give complete shipping information		
	o, omponing information	concerning the weight, size of each package		
	d) Transit damage	The seller shall be responsible for any transit		
	d) Transit damage	damage due to improper packing.		
		Wooden or Steel drums as per tender requirement		
	e) Type of Drum	(all the drums shall be non returnable except		
	c) Type of Bruin	otherwise mentioned in the tender), as per relevant		
		IS / IEC.		
		The drums shall be with M.S. spindle plate (with nut-		
	f) Cable Drum handling	bolts) of adequate size to suit the spindle rods,		
	1) Cable Brain Harlaning	normally required for handling the drums, according		
		to expected weight of the cable drums.		
8.0.0	Quality Assurance Plan			
	(QAP)			
		Manufacturer shall submit QAP in line with		
8.0.1	Vendor's QAP	BSESQAP (Annexure-F) for purchaser's approval		
		before starting of manufacturing which is mandatory		
		As per BSES approved QAP and special BSES		
8.0.2	Inspection Points	requirement if any to cross check the product quality.		
	,	Seller must have to meet the special requirement of		
		BSES during inspection.		
9.0.0	Progress Reporting			



Technica	al Specification for 11 kV Cables (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)				
0.01	Outline Decument	To be submitted for purchaser's approval for outline of programmes for production, stage-inspection,			
9.0.1	Outline Document	testing, final inspection, packing, dispatch and			
		documentation.			
		To be submitted to Purchaser once a month			
		containing:			
		i) Progress on material procurement			
		ii) Progress on fabrication (as applicable)			
0.00	Detailed Dragges Depart	iii) Progress on assembly (as applicable)			
9.0.2	Detailed Progress Report	iv) Progress on internal stage-inspectionv) Reason for any delay in total programme			
		vi) Details of test failures, if any, during			
		manufacturing stages.			
		vii) Progress on final box-up Constraints / Forward			
		Path			
		a) Deviations from this specification shall be			
		listed separately by bidder clause wise (format			
		given in Annexure- H) 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			
10.0.0	Deviation	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.			



Technical Specification for 11 kV Cables (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)

Annexure - A

Scope, Documentation and Delivery schedule

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

- a. All documents/drawings shall be provided in soft copy only in returnable Pen drives
- 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 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	For Tender	For Approval/Review	Final Submission
1	Guaranteed Technical Particulars (GTP)	Required	Required	Required
2	Deviation Sheet, if any	Required	Required	Required
3	Detailed cross sectional drawing of cable and drum	Required	Required	Required
4	Installation Instructions		Required	Required
5	Manual/Catalogue	Required	Required	Required
6	Cable de-rating factors		Required	Required
7	Type test reports of offered type and rating of cable	Required	Required	Required
8	BIS certificate	Required		
9	Make of Raw Materials	Required	Required	Required
10	Inspection and test reports, carried out in manufacturer's works			Required
11	Routine Test Certificates			Required
12	Test certificates of all the raw materials			Required



Technical Specification for 11 kV Cables (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)

Annexure - B

GUARANTEED TECHNICAL PARTICULARS (GTP)

Note:

- 1) For every type / size of cable, every data shall be mentioned.
- 2) Seller may submit separate GTP for every type / size of cable, as suitable.
- 3) GTP requirements are generally as per IS: 7098 (Part-II).
- 4) GTP shall be read in line with purchaser's Project Site Specific Requirement.

Sr. No.	Description	Buyer's requirement	Unit	Seller's Data
1.0	Purchase Req. No.	-		
2.0	Guarantee Period (Min.)	60 Months (from date of commissioning) / 66 Months (from date of receipt at purchaser's store) whichever is earlier		
3.0	Applicable IS / IEC Standard followed by vendor	IS 7098 Part-2 / IEC 60502-2		
4.0	Make	-		
5.0	Type (as required by purchaser)			
	a) 11 kV, 3c x 150 sq. mm.	A2XFY		
	b) 11 kV, 3c x 300 sq. mm.	A2XFY		
	c) 11 kV, 3c x 300 sq. mm.	A2XF2Y2Y		
	d) 11 kV, 3c x 400 sq. mm.	A2XFY		
	e) 11 kV, 3c x 400 sq. mm. CCD	A2XF2Y2Y		
	f) 11 kV, 1c x 1000 sq. mm.	A2XWaY		
6.0	Voltage Grade			
	a) 11 kV, 3c or 1c	6.35 / 11	kV	
7.0	Maximum Conductor temperature			
Α	Continuous	90	deg. C	
В	Short time	250	deg. C	
8.0	Conductor	Compacted, Circular, Water tight construction is mandatory		



Techr	nica	al Specification for 11 kV Cables	(1CX1000,3Cx400, 3C	X300 and 3CX150 sqmm)
	Α	Material and Grade	As per Cl. 2.1.1	
	В	Size	As shown under 5.0	
			above	
	С	Wires in each conductor	As per Table 2 of IS 8130	Nos.
	D	Conductor Shape	As per Cl. 2.1.1 c	
	F	Dia. of wires in each	Manufacturer	Mm
	_	conductor before compaction	Standard	
	F	Diameter over conductor		Mm
	G	Maximum Conductor		
		resistance at 20 ° C		
		a) 11 kV, 3c x 150 sq. mm.	0.2060	ohm/km
		b) 11 kV, 3c x 300 sq. mm.	0.1000	ohm/km
		c) 11 kV, 3c x 400 sq. mm.	0.0778	ohm/km
		d) 11 kV, 1c x 1000 sq. mm.	0.0291	ohm/km
	Н	Longitudinal Water Blocking	Is it provided and	
		Arrangement within	shown in the cross-	
		conductor	sectional drawing?	
			(Yes / No)	
	ı	Short circuit current-carrying		kA
		capacity of conductor		for 1 sec.
9.0		Conductor Screen		
		(inner semi-con)		
		Material & type	As per Cl. 2.1.2	
	В	Thickness (min)	0.50	Mm
	С	Diameter over conductor screen		Mm
	D	Make and grade of semi-		
		conducting compound		
10.0		Insulation		
10.0	Α	Insulation Material	As per Cl. 2.1.3	
	В	Nominal thickness	710 por 01. 2.1.0	
	_	a) 11 kV, 3c or 1c	3.6	Mm
	С	Minimum thickness	3.3	
	_	a) 11 kV, 3c or 1c	3.14	Mm
	D	Diameter over Insulation	-	Mm
	E	Make and grade of Insulation		
		compound		
	F	Eccentricity	As per IEC standards	%
	G	Water-tree retardant property	Required	
11A.		Insulation Screen		
		(outer semi-con)		
	a.	i) Thickness of freely	0.50	Mm
		strippable Semi conducting	0.50	
		screen		
		ii) Make and grade of semi-		
		conducting compound		
		iii) Printing	As per Cl. No. 2.1.4 (Yes / No)	



Technical Specification for 11 kV Cables (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)				
	iv) Ovality of the core (max)	2	%	
b.	Diameter over Insulation Screen (approx.)		Mm	
11B.	Water-Swellable Tape			
TID.	(if required by Purchaser)			
	a) Thickness	a) 0.3 mm		
	b) Weight	b) 118 gm / sq. m		
	c) Swell height	c) ≥ 12 mm in 1 min.		
	d) Compatible to strippable /	d) Yes / No		
	non-strippable semi-con,			
	over which it is applied.	e) Pl. state		
	e) Make & Grade f) Pre-slitted packed tapes	f) Yes/No		
	from sub-vendors	1) 100 / 110		
	approved by BSES			
11C.	Cable Core identification			
	a) By coloured strips over			
	cores applied helically /			
	longitudinally			
	b) Manufacturer's name shall be permanently			
	printed on the strips, at			
	close intervals.			
11D.	Copper Tape			
TID.	Copper rape			
	i) Dimensions	a) Thickness :	Mm	
		0.06 + 5 %		
		b) Width: 50 mm		
		C) Overlap: 10%		
		d) no negative		
		tolerance in thickness		
		of copper tape		
	ii) Fault current-carrying	Manufacturer's	kA	
	capacity of copper tape	Standard	for	
		(Calculation sheet	sec.	
		shall be attached)		
11E.	Diameter over laid up core		Mm	
	(approx.)			



Technica	al Specification for 11 kV Cables	(1CX1000 3Cx400 3C	X300 and 3	CX150 samm)
12.0	Filler	As per Cl. 2.1.7		
12.0	(Material and type)	(Specify no. & size of		
	(Waterial and type)	filler at center & core		
		interstices)		
	a) 11 kV, 3c x 150 sq. mm.	microtices)		
	b) 11 kV, 3c x 300 sq. mm.			
	c) 11 kV, 3c x 400 sq. mm.			
	d) 11 kV 1core	Not applicable		
12A.0	Binder Tape	over laid-up cores		
13.0	Inner Sheath	over laid up cores		
Α	Material and type	As per Cl. 2.1.9		
	• •	7.to por 01. 2. 1.0		
В	Minimum thickness			
	a) 11 kV, 3c x 150 sq. mm.	0.6	Mm	
	b) 11 kV, 3c x 300 sq. mm.	0.7	Mm	
	(conventional & CCD)			
	c) 11 kV, 3c x 400 sq. mm.	0.7	Mm	
	(conventional & CCD)			
	d) 11 kV, 1c x 1000 sq. mm.	0.7	Mm	
С	Approx. dia. over inner		Mm	
44.0	sheath			
14.0	Armour	as per purchaser's		
_	NA-t	requirements		
A	Material	0.1.00	NI.	
	a) 11 kV, 3c	G. I. Strip	No.	
	b) 11 kV 1c	non-magnetic	No.	
		wire armour		
		(Aluminium wire)		
В	Armour – Wires	As per Table 6 of IS		
		7098 Part-2	mm	
	a) Diameter of wire	(zero negative	mm.	
		tolerance for diameter)		
	b) Number of wires		no.	
	(min.)			
С	Armour – GI strips a) Width of strip &	a) 6 1 v 1 4	mm	
	Thickness of strip	a) 6.1 x 1.4 (zero negative	111111	
	THICKHESS OF SUIP	tolerance for thickness)		
	b) Number of strips	1515141155 101 (1110111003)		
	(min.)	b) Vendor to specify	no.	
D	Approx. Equivalent Area		sq. mm.	
E	Area covered by armour	Min. 90 %	%	
	, and dovoice by aimour	Calculation shall be	"	
		attached.		
F	Dia. over armour - approx.	5.115.311041	Mm	
G	Fault current carrying	Calculation sheet	kA	
	capacity of armour	shall be attached.	for	
			sec.	
15.0	Outer Sheath			
Α	Material and type	As per Cl. 2.1.12		



Technica	al Specification for 11 kV Cables	s (1CX1000,3Cx400, 3C)	X300 and 30	CX150 sqmm)
В	Thickness (min.)	** As per Table-5 of IS 7098 Part-2		
	a) 11 kV, 3c x 150 sq. mm.	**	mm	
	b) 11 kV, 3c x 300 sq. mm. Conventional cable	**	mm	
	c) 11 kV, 3c x 400 sq. mm. Conventional cable			
	d) 11 kV, 1c x 1000 sq. mm.	**	mm	
	e) 11 kV, 3c x 300 sq. mm. CCD cable	Ac nor Cl 2 1 12		
	f) 11 kV, 3c x 400 sq. mm. CCD cable	As per Cl. 2.1.12		
С	Color	As per Cl. 2.1.12		
D	Embossing (details as per Cl. 2.1.12)	Yes		
E	FRLS Properties	As per customer's requirement		
16.0	Approx. overall diameter		mm	
	pproxi oronan anamora.			
17.0	Standard drum length with tolerance			
	a) 11 kV, 3Cx150 sqmm		meters	
	b) 11kV , 3Cx300 sqmm			
	conventional or CCD	500 mtr +/- 5% or		
	c) 11kV , 3Cx400 sqmm	300 mtr +/- 5%		
	conventional or CCD			
	d) 11kV , 1Cx1000 sqmm			
17A	Overall order telerance (P4)	- 2 % for the total		
ITA	Overall order tolerance-{R1}	cable length for the entire order.		
10.0	Coble Drum			
18.0 a.	Cable Drum Type of drum	Wooden/ Steel non		
a.	Type of didiff	returnable (Specify the relevant IS / IEC followed for drum design)		
b.	Markings on the drum (as per Cl. 7.0.0)	On both faces		
18A.0	Cross-Sectional Drawing (ref. Cl. 5.0.0)	Is drawing submitted, showing every feature of constructions?		



Technic	al Specification for 11 kV Cables	(1CX1000,3Cx400, 3C	X300 and 3	CX150 sqmm)
		(Yes / No)		
19.0	a. Sealing-end Cap (provided at the both Ends)	Yes/No Is manufacturer's / Sub-Vendor's drawing submitted? (Yes / No)		
	b. Pulling Eye at one end and Sealing-end Cap provided at other end	Yes/No Is manufacturer's / Sub-Vendor's drawing submitted? (Yes / No)		
20.0	Weights			
	a) Net weight of cable (approx.)		kg / km	
	b) Weight of empty drum	500 mtr/300 mtr	Kg	
	c) Weight of Cable with drum	500 mtr/300 mtr	Kg	
	d) Size of Drum	500 mtr/300 mtr	mm	
	e) Drawing of Drum	Required	EA	
21.0	Continuous current rating for standard I. S. condition laid Direct			
	a) In ground 30° C		Amp	
	b) In duct 30° C		Amp	
	c) In air 40° C		Amp	
22.0	(not used)			
23.0	Electrical Parameters at Maximum Operating temperature:			
Α	AC Resistance		ohm / km	
В	Reactance at 50 c/s		ohm / km	
С	Impedance		ohm / km	
D			ohm / km	
Е	Positive sequence impedance		ohm / km	
F	Negative sequence impedance		ohm / km	
G	Capacitance		micro- farad / km	
Н	Conductance		Amperes per volts	
	Inductive susceptance		mho	_
J			ohms	
24.0	Recommended minimum bending radius	12 x O. D.	mm	



Technic	cal Specification for 11 kV Cables	s (1CX1000,3Cx400, 3C	X300 and 3	CX150 sqmm)
25.0	De-rating factor for following Ambient Temperatures :	Ground / Air		
	a) At 30° C			
	b) At 35° C			
	c) At 40° C			
	d) At 45° C			
	e) At 50° C			
26.0	Group factor for following	Touching Trefoil		
20.0	numbers of cables laid :	rodening rreion		
	a) 3 Nos.			
	b) 4 Nos.			
	c) 5 Nos.			
	d) 6 Nos.			
27.0	Recommended pressure for laying cable using power winch	30 N / mm2	N / sq. mm.	
28.0	Process of Cross-linking of Polyethylene			
	a) 11 kV, 3c or 1c	Dry Cure process and Dry Cooling only		
29.0	Type test (TTR - Type Test Report)	Is copy of latest valid TTR for respective sizes enclosed? (Yes / No)		
30.0	Quality Assurance Plan (QAP)	Is QAP Format (Annexure-F), duly filled in and enclosed? (Yes / No)		
24.0	List of Out Variations	la Maia liatl		
31.0	List of Sub-Vendors for construction items (Annexure-C)	Is this list enclosed for BSES approval? (Yes / No)		



Technical Specification for 11 kV Cables (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)

Annexure - C

List of Sub-Vendors for critical items

Vendor/Bidder to state sub-vendors' names for other items, wherever approved names are not mentioned, for purchaser's approval during tendering stage else purchaser shall impose as per their requirement and bidder to follow the same in post-order stages.

Ser.	Raw Materials		Name of the Make
No.	Raw Materials		Name of the make
1.	XLPE Compound	1	Dow Chemicals , U.S.A.
		2	Borealis , Sweden
		3	Hanwha , South Korea
2.	Semi-Conducting Compound	1	Dow Chemicals, U.S.A.
		2	Borealis , Sweden
		3	Hanwha , South Korea
	Conductor Water-Blocking tapes / yarn	1	Lantor
3.		2	Geca
		3	Miracle
		4	Scapa
		5	Sneham International
	Water-Swellable Tapes (Pre-slitted)	1	Lantor
		2	Geca
4.		3	Miracle
		4	Scapa
		5	Sneham International
		1	Bharat Aluminium Co. Ltd. (BALCO)
5.	Aluminium Rod	2	Hindustan Aluminium Co. Ltd. (HINDALCO)
		3	National Aluminium Co. Ltd. (NALCO)
		4	Vedanta (Sesa Sterlite)



Technical Specification for 11 kV Cables (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)

Ser.	Raw Materials	`	Name of the Make
No.	Raw materials		Name of the make
6.	Copper Tape	1	Aggarwal Metal
		2	Indian Smelting
		3	Luvata Swedan
		4	Outokumpu Copper Strip AB, Swedan
		,	
		1	Tata
7	Galvanised Steel Wires /	2	Balaji
	Strips	3	Systematic
		4	Mica Wires Pvt. Ltd.
		5	Bansal Industries
	PVC Compound	1	Kalpana
		2	Universal
8		3	SCJ Plastic
		4	Sriram Polytech
		5	Shri Ram Vinyl, Kota
		1	Vijoy Polymers
9	P. P. Fillers	2	Yash Polymers
		3	AVSL Industries
		1	AVSL Industries
10	Core Identification Tape	2	Yash Polymer
		3	Vijoy Polymers
11	PE Compound	1	Borealis
		3	Shakun
		4	Kalpana



Technical Specification for 11 kV Cables (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)

Annexure - D

Service Conditions

(Atmospheric / Soil conditions at Site)

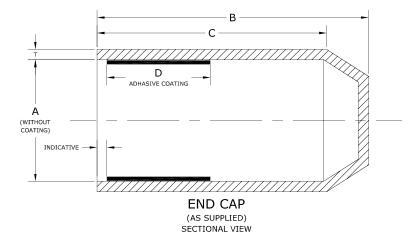
B.	Delhi	
a)	Average grade atmospheric	Heavily polluted, dry
	condition	
b)	Maximum altitude above sea	1000 M
	level	
c)	Air temperature Ambient	i) Highest : 50 deg C
		ii) Average : 40 deg C
		iii) Minimum : 0 deg C
d)	Relative Humidity	100 % max
e)	Thermal Resistivity of Soil	150 deg. C. cm / W max.
f)	Seismic Zone	4
g)	Rainfall	750 mm concentrated in four months

ANNEXURE E

DIMENSIONS

SIZE	Α	Α	В	С	D	LC %	Т
SIZL	EXP.(Min.)	REC (Max)	EXP.(Min.)	EXP (Min.)	EXP (Min.)		(WALL REC. ± 20 %)
EC 120/150	75	34	120	105	50	± 10	4.2
EC 240/300	100	62	130	110	70	± 10	3.5
EC 400	145	75	155	120	70	± 10	4.6

EXP - Expanded (as supplied), REC - Recovered freely, LC - Longitudinal Change, T - Wall Thickness, EC - End Cap



MATERIAL SPECIFICATIONS

	Characteristics	Test Class	Value	Test Method
Α	Physical Properties			
1	Specific Gravity	Туре	1.05 ± 0.2	ASTM D = 1505
2	Water Absorption	Type	1 % (max)	ASTM D-570 / ISO 62
3	Tensile Strength	Routine	10 N /sqmm (min)	ASTM D-412 / ISO 37
4	Ultimate Elongation	Routine	300% (min)	ASTM D-412 / ISO 37
5	Hardness	Type	45 shore D ± 3	ASTM D-2240
6	Thermal Test			
В	Thermal Ageing (120°C for 500 hrs)			
1	Tensile Strength	Type	8 N/sqmm (min)	ASTM D-412 / ISO 37
2	Ultimate Elongation	Type	200% (min)	ASTM D-412 / ISO 37
С	Electrical Properties		10	
1	Volume Resistivity	Type	10 ¹² ohm-cm. (min)	ASTM D-257 / IEC 93
2	Dielectrical Strength	Type	10 kV/mm. (min)	ASTM D149 / IEC 243
3	Dielectric Constant	Туре	5 (max)	ASTM D150 / IEC 250

HOLE FOR POURING
P.U.COMPOUND

(BEFORE FIXING END CAP)

PVC CAP

HOLE FOR LETTING
AIR OUT
(BEFORE FIXING END CAP)

END CAP
(AFTER HEAT SHRINKING OVER THE CABLE END)

Note: 1) All dimension in mm

2) Colour Black

3) Size as mentioned in the table shall be stencilled on respective item

PVC OUTER SHEATH
OF XLPE CABLE

HEAT SHRINK CAP OF
RAYCHEM/REPL.(XICON)
MAKE

SOFT POLYURETHANE
(P.U).COMPOUND
(M-SEAL EPOXY)

BSES	-	V-
	The same of	
	-	
	-	

 DRAWING No.
 MISC/E/4-1131/1698

 SCALE :NOT TO SCALE
 DATE: 09-05-2011

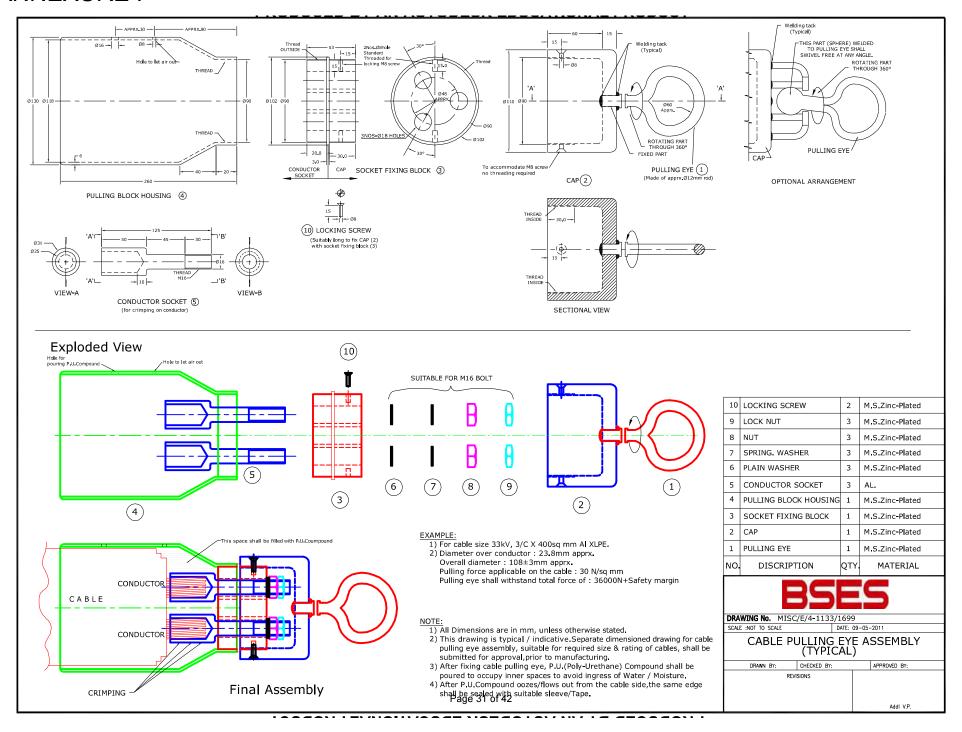
END SEALING CAP (FOR XLPE CABLE)

DRAWN BY: CHECKED BY: APPROVED BY:

REVISIONS

Addl V.P.

ANNEXURE F



ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

S.	COMPONENT &	CHARACTERISTICS	CLASS	TYPE OF	QUANTUM OF CHECK	REFERENCE	ACCEPTANCE	FORMAT OF		AGENCY	1	Remark
NO.	OPERATION			CHECK		DOCUMENT	NORMS	RECORD	sv	MFR	BSES	
1	2	3	4	5	6	7	8	9	10	11	12	13
		endor of Cable Manufacturer, MFR : Cabl	e Manufacturer,	MPS : Material	Purchase Specification,							
		tness, V : Verification										
	W MATERIAL											
1	Aluminium/Copper	a) Tensile strength	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
	Rod	b) Resistivity	Major	Electrical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
		c) Diameter	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
		d) Chemical composition	Major	Chemical	Sample	MPS	MPS	Test certificate		V	V	
		e) Surface finish	Major	Visual	Sample			-	Р	Р	_	
2	PVC Compound	a) Tensile Strength	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
		b) Elongation at break	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
		c) Thermal stability	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
3	TR-XLPE	a) Packing	Minor	Visual	100%	MPS	MPS	-	Р	V	-	
	Compound	b) Tensile Strength	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
	(Borealis/Dow	c) Elongation at break	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
	chemical/ Hanwa)	d) Hot set test	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
		e) Volume Resistivity	Major	Electrical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
		f) Cure Curve (Max. Torque)	Major	Physical	Sample	MPS	MPS	Reg./Sheet	-	Р	V	
		g) Density	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
4	Semi-conducting	a) Packing	Minor	Visual	100%	MPS	MPS	-	Р	V	-	
	Compound	b) Volume Resistivity	Major	Electrical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
	(Borealis/Dow chemical/ Hanwa)	c) Tensile Strength	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
	Chemical/ Hanwa)	d) Elongation at break	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
		e) Cure Curve (Max. Torque)	Major	Physical	Sample	MPS	MPS	Reg./Sheet	-	Р	V	
		f) Density	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
5	Copper tape	a) Thickness & width	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
		b) Tensile Strength	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
		c) Elongation at break	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
		d) Resistivity	Major	Electrical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
6.	Armour wires/strips	a) Dimensions	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
	(Galvanised steel)	b) Surface condition/finish	Major	Visual	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
		c) Tensile Strength	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
		d) Elongation at break	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
		e) Torsion test for round wire	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
		f) Wrapping test	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
		g) Mass of zinc coating	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
		h) Uniformity of zinc coating	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
		i) Adhesion test	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
		j) Resistivity test	Major	Electrical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
7	Water Swellable	a) Dimensions	Minor	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	

BSES-

ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

S.	COMPONENT &	CHARACTERISTICS	CLASS	TYPE OF	QUANTUM OF CHECK	REFERENCE	ACCEPTANCE	FORMAT OF		AGENC	Υ	Remark
NO.	OPERATION			CHECK		DOCUMENT	NORMS	RECORD	sv	MFR	BSES	
1	2	3	4	5	6	7	8	9	10	11	12	13
		endor of Cable Manufacturer, MFR : Cable	Manufacturer,	MPS : Material	Purchase Specification,							
		tness, V : Verification										
	tape	b) Swelling height	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
		c) Resistivity	Major	Electrical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
		d) Weight	Major	Physical	Sample	MPS	MPS	Reg./Sheet	Р	P/V	V	
8	Steel Drum	a) Dimension	Major	Meas.	1 sample per size	IS 10418 /	Purchase order	-	Р	Р	-	
		b) Finish & workman ship	Minor	Visual	1 sample per size	Compliance to sta norms & free from		-	Р	Р	-	
9	Binder tape	a) Dimensions & material	Minor	Physical	Sample	MPS	MPS	-	P	P	-	
10	Polypropylene filler	a) Size	Minor	Physical	Sample	Purchase order	Purchase order	-	P	P	-	
11	Heat shrinkable end	a) Bore diameter	Major	Physical	1 sample per size			-	-	P	-	
	сар	b) Length of end cap	Minor	Physical	1 sample per size			-	-	Р	-	
B PR	OCESS INSPECTION											
1	Wire Drawing	a) Diameter	Major	Physical	Sample			Reg./Sheet	-	Р	V	
		b) Surface finish	Major	Visual	100 %	Smooth & fre	e from defects		-	Р	-	
		c) Tensile test (for AI)	Major	Physical	Sample	IS: 8130/84	IS: 8130/84	Reg./Sheet	-	Р	V	
		d) Elongation test (for Cu)	Major	Physical	Sample	IS: 8130/84	IS: 8130/84	Reg./Sheet	-	-	V	
		e) Wrapping test (for AI)	Major	Physical	Sample	IS: 8130/84	IS: 8130/84	Reg./Sheet	-	Р	V	
2	Stranding	a) No. of wires/strands	Major	Physical	At the time of m/c setting			Reg./Sheet	-	Р	V	
		b) Lay length & Lay direction	Major	Physical	-do-			-	-	Р	V	
		c) Dia of conductor	Major	Physical	During setting & once in each shift			Reg./Sheet	-	Р	V	
		d) Surface finish	Major	Visual	100 %	No surface defects edges, scratches,	s and free from sharp grease, oil etc.	-	-	Р	-	
3	Core extrusion	a) Compound Make/Grade	Major	Visual	During m/c setting			-	-	Р	-	Insulation screen
-	(Conductor screen, Insulation & insulation screen)	b) Thickness of insulation & extruded S.C. layers	Major	Physical	0	Tech. Data Sheet / IS 7098/II/2011	Tech. Data Sheet / IS 7098/II/2011	Reg./Sheet	-	P	V	shall be freely strippable, without application of heat.
		c) Surface finish	Minor	Visual	100 %	Smooth & fre	e from defects	-	-	Р	-	1
		d) Printing on outer semi- conducting layer	Major	Visual	100 %		EELY STRIPPABLE"	-	-	Р	-	1
		e) Tensile Strength	Major	Physical	Sample	IS 7098/II/2011	IS 7098/II/2011	Reg./Sheet		Р	V	
		f) Elongation at break	Major	Physical	Sample	IS 7098/II/2011	IS 7098/II/2011	Reg./Sheet		Р	V]
		g) Hot set test	Major	Physical	Sample	IS 7098/II/2011	IS 7098/II/2011	Reg./Sheet	-	Р	V	
		g1) Ovality of core	Minor	Physical	Sample	Tech. Data Sheet	Tech. Data Sheet	Reg./Sheet	-	Р	V	

ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

S.		& CHARACTERISTICS CLA	CLASS	TYPE OF	QUANTUM OF CHECK		l l	FORMAT OF		AGENC	1	Remark
NO.	OPERATION			CHECK		DOCUMENT	NORMS	RECORD	sv	MFR	BSES	
1	2	3	4	5	6	7	8	9	10	11	12	13
		Vendor of Cable Manufacturer, MFR : Cabl	e Manufacturer,	MPS : Material	Purchase Specification,							
	P : Perform, W : W	itness, V : Verification										
		h) Eccentricity of insulation	Minor	Physical	Sample	Tech. Data Sheet	Tech. Data Sheet	Reg./Sheet	-	Р	V	
		i) Core diameter	Minor	Physical	Sample	Tech. Data Sheet	Tech. Data Sheet	Reg./Sheet	-	Р	V	
		j) Void & contamination test for insulation (Silicon Oil test)	Major	Physical	Sample			-	-	Р	V	
		k) Wafer boil test for extruded semi- conducting layers	Major	Physical	1 sample/lot	BIS draft Specn	BIS draft Specn	Reg./Sheet	-	Р	V	
4	Taping - water	a) Dimensions	Minor	Physical	Sample	Tech. Data Sheet	Tech. Data Sheet	-	-	Р	-	
	Swellable semi- conducting	b) Tape Application (Overlap)	Minor	Visual	During m/c setting	Suitable overlap	Suitable overlap	-	-	Р	-	
5	Taping - Copper	a) Width & Thickness of tape	Major	Physical	During m/c setting	Tech. Data Sheet	Tech. Data Sheet	Reg./Sheet	-	Р	V	
	tape	b) Number of tapes	Major	Visual	During m/c setting	Tech. Data Sheet	Tech. Data Sheet	Reg./Sheet	-	Р	V	
		c) Tape application (Overlap)	Minor	Visual	During m/c setting	Tech. Data Sheet	Tech. Data Sheet	-	-	Р	-	
6	Laying up	a) Identification of cores	Major	Visual	During m/c setting	Tech. Data Sheet	Tech. Data Sheet	-	-	Р	-	Cores shall be
		b) Direction of lay, core Sequence & Lay length	Major	Visual	During m/c setting	IS 7098/II/2011, PIL- W-02	IS 7098/II/2011, PIL- W-02	-	-	Р	-	laidup with PP fillers & suitable tape
		c) Application of binder tape	Minor	Visual	During m/c setting	Tech. Data Sh	neet	_	-	Р	-	binder shall be provided over laid
		d) Shape of laid up assembly	Minor	Visual	100%	Reasonably circular	Reasonably circular	-	-	Р	-	up assembly
7	Inner sheath	a) Material & type	Major	Visual	During m/c setting	Tech. Data Sheet	Tech. Data Sheet	-	-	Р	-	
		b) Thickness	Major	Physical	During m/c setting & drum change	Tech. Data Sheet & IS 7098/II/2011	ech. Data Sheet & IS 7098/II/2011	Reg./Sheet	-	Р	V	
		c) Surface finish	Minor	Visual	100 %	Surface shall be sr defects	mooth & free from	-	-	Р	-	
		d) Colour of inner sheath	Major	Visual	100 %	Tech. Data Sheet	Tech. Data Sheet	-	-	Р	-	
8	Armouring	a) Dimension of armour wires/strips	Major	Physical	During m/c setting	Tech. Data Sheet	Tech. Data Sheet	Reg./Sheet	-	Р	V	No negative tol. on strip thickness/wire diameter
		b) No. of armour strip/wire	Major	Counting	During m/c setting	Tech. Data Sheet	Tech. Data Sheet	Reg./Sheet	+ -	Р	V	
		c) Armour coverage	Minor	Visual	During m/c setting	IS 7098/II/2011	IS 7098/II/2011	-	+-	P	-	
		d) Direction of lay	Major	Visual	During m/c setting	IS 7098/II/2011	IS 7098/II/2011	_	+ -	P	-	
		e) Lay length/Gear setting	Minor	Visual	During m/c setting			_	+ -	P	_	
		f) Surface finish	Major	Visual	100 %	No cross over/over	r riding of wire/strip	-	+ -	P		
9	Outer	a) Material & type	Major	Visual	During m/c setting	Tech. Data Sheet			+	Р	_	
Э	sheath/Rewinding	b) Anti rodent & termite additives	Major	Visual	Each loading	Techi. Data offeet	Techi. Data Sileet	Reg./Sheet	+	P	V	
	Jones and The Williams	D) And Todent & termine additives	Iviajui	ViSuai	Each loading	1	l	Reg./Sileet	1 -	「	V	

ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

S.	COMPONENT &	CHARACTERISTICS	CLASS	TYPE OF	QUANTUM OF CHECK		ACCEPTANCE	FORMAT OF		AGENC		Remark
NO.	OPERATION			CHECK		DOCUMENT	NORMS	RECORD	sv	MFR	BSES	
1	2	3	4	5	6	7	8	9	10	11	12	13
		/endor of Cable Manufacturer, MFR : Cable	e Manufacturer,	MPS : Material	Purchase Specification,							
	P : Perform, W : Wi	itness, V : Verification		<u> </u>		T 1 D 1 01 1	T 1 D 1 01 1	D (0)			.,	
		b) Thickness	Major	Physical	Each length	Tech. Data Sheet	Tech. Data Sheet	Reg./Sheet	-	Р	V	
		c) Overall diameter	Major	Physical	Each length	Tech. Data Sheet	Tech. Data Sheet	Reg./Sheet	-	Р	V	
		d) Surface finish & colour of sheath	Major	Visual	100 %	Surface smooth & Colour as per Tech		-	-	P	-	
		e) Cable length verification	Major	Visual	Each length	Manufacturing Plan	Manufacturing Plan	-	-	Р	-	
		f) Marking	Major	Visual	Each length	As per approved GTF drawing	P/cross sectiona	Reg./Sheet	-	Р	V	
C FII	NAL INSPECTION											
1	Routine tests	a) High Voltage	Critical	Electrical	100 %	IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	V	
		b) Conductor Resistance	Critical	Electrical	100 %	IS 8130/84	IS 8130/84	Test Report	-	Р	V	
		c) Partial Discharge	Critical	Electrical	100 %	IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	V	
		d) Impulse	Critical	Electrical	One sample per lot			Test Report		Р	V	
		e) Armour Coverage	Critical	Physical	One sample per lot			Test Report		Р	V	
		f) Physiacal Dimensions	Critical	Physical	One sample per lot			Test Report		Р	V	
		g) Freely Strippable insulation screen (Strippability Test)	Major	Physical	One sample per lot	Factory Standard	Factory Standard	Test Report	-	Р	V	
2	Stage Inspection	Wire Drawing	Major	Visual	100 %	Tech. Data Sheet	IS/IEC	Test Report	-	Р	W	
		Extrusion process	Major	Visual	100 %	Tech. Data Sheet	IS/IEC	Test Report	-	Р	W	Stage Inspection
		Raw maerial inspection at factory	Major	Physical	100 %	Tech. Data Sheet	IS/IEC	Test Report	-	Р	W	shall be conducted
		Wrapping of Aluminium	Major	Physical	100 %	Tech. Data Sheet	IS/IEC	Test Report	-	Р	W	subject to BSES requirement
		Tensile test for Aluminium	Major	Physical	100 %	Tech. Data Sheet	IS/IEC	Test Report	-	Р	W	† .
		a) Annealing test for copper	Major	Physical	Appendix A to IS	IS 8130/84	IS 8130/84	-	-	P	V	Verification of
		b) Tensile test for aluminium	Major	Physical	7098/II/2011, each lot sample basis	IS 8130/84	IS 8130/84	-	-	Р	V	process records.
		c) Wrapping test for aluminium	Major	Physical		IS 8130/84	IS 8130/84	-	-	Р	V	Tests N/A on finished conductor.
		d) Conductor resistance test	Major	Electrical	Appendix A to IS 7098/II/2011, each lot sample basis	IS 8130/84	IS 8130/84	Test Report	-	Р	W	
		e) Test for thickness of insulation & sheath	Major	Physical	_ sample pasis	IS 7098/II/2011 & Tech. Data sheet	IS 7098/II/2011 & Tech. Data sheet	Test Report	-	Р	W	
		f) Hot set test for insulation	Major	Physical	1	IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	

ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

	COMPONENT &	CHARACTERISTICS	CLASS	TYPE OF	QUANTUM OF CHECK	REFERENCE	ACCEPTANCE	FORMAT OF		AGENCY	′	Remark
NO.	OPERATION			CHECK		DOCUMENT	NORMS	RECORD	sv	MFR	BSES	
1	2	3	4	5	6	7	8	9	10	11	12	13
		endor of Cable Manufacturer, MFR: Cable	Manufacturer,	MPS : Material F	Purchase Specification,							
	P : Perform, W : Wi	tness, V : Verification										
		g) Tensile strength & Elongation at break of insulation & outer sheath	Major	Physical		IS 7098/II/2011 & IS 5831/84	IS 7098/II/2011 & IS 5831/84	Test Report	-	P	W	
		h) Partial discharge test	Critical	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	
		i) High voltage test	Critical	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	
		j) Insulation resistance (Volume resistivity) test	Major	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	
		k) Tests for dimension of armour wires/strips	Major	Physical		1	0810 Pt. 36 & ata sheet	Test Report	-	Р	W	
		I) Test for anti termite & anti rodent property of outer sheath	Major	Physical		Tech. Data Sheet	Tech. Data Sheet	Reg./Sheet	-	Р	W	
		m) Rewinding of cable on drum	Major	Visual		appearance, cable	appearance, drum e winding, packing, /sequential marking	Reg./Sheet	-	P	W	
		n) Void & contamination test for insulation (Silicon Oil test)	Major	Physical				Reg./Sheet	-	Р	W	
		o) Wafer boil test for extruded semi- conducting layers	Major	Physical				Reg./Sheet	-	Р	W	
3	Acceptance tests	p) Freely Strippable insulation screen	Major	Physical		Factory Standard	Factory Standard	Test Report	-	Р	W	
		q) Water Penetration test (WPT) on core (i.e.Logitudinal Water Blocking Test)	Major	Physical	Each Lot Sample Basis	IEC:60502	IEC:60502	Test Report	-	P	W	Test shall be conducted for leakage of water through conductor.
		r) Armour coverage	Major	Physical		As per data sheet & FS	As per data sheet & FS	Test Report	-	Р	W	
		s) Ovality	Major	Physical	1		As per data sheet	Test Report	<u> </u>	P	w	
		t) Eccentricity	Major	Physical	1	As per data sheet	As per data sheet	Test Report	! -	P	W	
		u) Mass & uniformity & zinc coating on armour	Major	Physical		As per data sheet & FS	As per data sheet & FS	Test Report	-	Р	W	
		v) Resistivity of Strip armour	Major	Electrical		As per data sheet & FS	As per data sheet & FS	Test Report	-	Р	W	
		w) Swelling height of water swellable tape	Major	Physical		As per data sheet & FS	As per data sheet & FS	Test Report	-	Р	W	
		x) Flammability test	Major	Physical		As per IS- 78098/II/2011	As per IS- 78098/II/2011	Test Report	-	Р	W	
		y)Impulse withstand test	Critical	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	

ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

	COMPONENT &	CHARACTERISTICS	CLASS	TYPE OF	QUANTUM OF CHECK		ACCEPTANCE	FORMAT OF		AGENC		Remark
0.	OPERATION			CHECK		DOCUMENT	NORMS	RECORD	sv	MFR	BSES	
1	2	3	4	5	6	7	8	9	10	11	12	13
		Vendor of Cable Manufacturer, MFR : Cable	Manufacturer	, MPS : Material	Purchase Specification,					-		
	P : Perform, W : W	itness, V : Verification										
		z) Ageing & Water absorption test(Gravimetric) on Insulation & Outer sheath	Major	Physical		IS 5831/84	IS 5831/84	Test Report	-	Р	W	
		z1) Heating Cycle with Potential	Critical	Electrical	sample basis, once per PO			Test Report	-	Р	W	
		z2) Raw Material Verification in all aspects	Major	Physical	Each Lot					Р	W	
		Z3) OFC Continuty Test and verification of outer sheath marking with continuous 15mm red strip for OFC embedded identification	Major	Physical	Each Lot					Р	W	
4	Type tests at	a) Tests on conductor										
	vendor's works	i) Annealing test for copper	Major	Physical	1	IS 8130/84	IS 8130/84	-	-	Р	V	Verification
		ii) Tensile test for aluminium	Major	Physical	1	IS 8130/84	IS 8130/84	-	-	Р	V	process recor
		iii) Wrapping test for aluminium	Major	Physical	_	IS 8130/84	IS 8130/84	-	-	Р	V	Tests N/A on finish conductor.
		iv) Conductor resistance test	Major	Electrical	_	IS 8130/84	IS 8130/84	Test Report	-	Р	V	
		b) Tests for armouring wires/strips										
		i) Dimensions of wire/strip	Major	Physical]		0810 Pt. 36 & ata sheet	Test Report	-	Р	W	
		ii) Tensile strength & Elongation at break	Major	Physical	1	IS 3975	IS 3975	Test Report	-	Р	W	Only for Ste wires/strips
		iii) Torsion test for wire	Major	Physical	1	IS 3975	IS 3975	Test Report	-	Р	W	1
		iv) Winding test for strip	Major	Physical	1	IS 3975	IS 3975	Test Report	-	Р	W	
		v) Uniformity of zinc coating	Major	Chemical	1	IS 3975	IS 3975	Test Report	-	Р	W	
		vi) Mass of zinc coating	Major	Chemical	1	IS 3975	IS 3975	Test Report	-	Р	W	
		vii) Resistivity of wire/strip	Major	Electrical		IS 3975	IS 3975	Test Report	-	Р	W	1
		c) Test for thickness of insulation & sheath	Major	Physical		IS 7098/II/2011 & Tech. Data sheet	IS 7098/II/2011 & Tech. Data sheet	Test Report	-	Р	W	
		d) Physical tests for insulation			1					<u> </u>	W	
		i) Tensile strength & Elongation test	Major	Physical	1	IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	
		ii) Ageing in air oven	Major	Physical	_	IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	
		iii) Hot set test	Major	Physical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	
		iv) Shrinkage test	Major	Physical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	
		v) Water absorption (gravimetric)	Major	Physical	One sample per Tender	IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	
		e) Physical tests for outer sheath			7						W	

ANNEXURE G: QUALITY ASSURANCE PLAN (QAP)

S.		CHARACTERISTICS	CLASS	TYPE OF	QUANTUM OF CHECK		ACCEPTANCE	FORMAT OF		AGENC	Υ	Remark
NO.	OPERATION			CHECK		DOCUMENT	NORMS	RECORD	sv	MFR	BSES	
1	2	3	4	5	6	7	8	9	10	11	12	13
		endor of Cable Manufacturer, MFR: Cable	Manufacturer	MPS : Material	Purchase Specification,							
		tness, V : Verification										
		i) Tensile strength & Elongation test at break	Major	Physical		IS 5831/84	IS 5831/84	Test Report	-	P	W	
		ii) Ageing in air oven	Major	Physical		IS 5831/84	IS 5831/84	Test Report	-	Р	W	
		iii) Shrinkage test	Major	Physical		IS 5831/84	IS 5831/84	Test Report	-	Р	W	
		iv) Hot deformation test	Major	Physical		IS 5831/84	IS 5831/84	Test Report	-	Р	W	
		v) Loss of mass in air oven	Major	Physical		IS 5831/84	IS 5831/84	Test Report	-	Р	W	
		v) Heat shock test	Major	Physical		IS 5831/84	IS 5831/84	Test Report	-	Р	W	
		vi) Thermal stability test	Major	Physical		IS 5831/84	IS 5831/84	Test Report	-	Р	W	
		f) Electrical tests in sequence									W	
		i) Partial discharge test	Critical	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	
		ii) Bending test	Major	Physical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	
		iii) Partial discharge test	Critical	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	
		iv) Dielectric power factor as a function of voltage	Major	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	
		v) Dielectric power factor as a function of temperature	Major	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	
		vi) Heating cycle test	Major	Electrical	1	IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	
		vii) Dielectric power factor as a function of voltage	Major	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	
		viii) Partial discharge test	Critical	Electrical	1	IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	
		ix) Impulse withstand test	Critical	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	
		x) High voltage test	Critical	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	
		g) Insulation resistance (Volume resistivity test)	Major	Electrical		IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	
		h) Flammability test	Major	Physical	1	IS 7098/II/2011	IS 7098/II/2011	Test Report	-	Р	W	
D PA	CKING & MARKING											
1	Packing & Marking	a) Cable end sealing	Major	Visual	100 %	IS 7098/II/2011/ Agreement	IS 7098/II/2011/ Agreement	-	-	Р	W/V	BSES representative may
		b) Pulling eye at leading end- removed from vendor scope, end cap shall be provided at both the end of cable	Major	Visual	100 %	As per agreement	As per agreement	-	-	Р	W/V	verify these characteristics on randomly selected drums.
		b) Stencilling/Marking on drum	Minor	Visual	100 %	IS 7098(Part 2):2011/ Agreement	IS 7098(Part 2):2011/ Agreement	-	-	Р	V	ui uiio.

			ANNE	EXURE G :	QUALITY ASSURAI	NCE PLAN (QA	AP)					
FOR 11 kV H. T. CABLES												
S.	COMPONENT &	CHARACTERISTICS	CLASS	TYPE OF	QUANTUM OF CHECK	REFERENCE	ACCEPTANCE	FORMAT OF		AGENCY	1	Remark
NO.	OPERATION			CHECK		DOCUMENT	NORMS	RECORD	sv	MFR	BSES	
1	2	3	4	5	6	7	8	9	10	11	12	13
	Legend : SV : Sub-	Vendor of Cable Manufacturer, MFR: Cab	le Manufacturer	MPS : Material	Purchase Specification,							
	P : Perform, W : W	/itness, V : Verification										
	<u>Note</u>	Checks specified above for Raw Mater Number of samples shall be selected a Plant standards shall be followed in ca BSES may witness Raw material and BSES's Inspector may randomly select For each of the offered lot for inspection All factory Type Tests shall be Witnes	s per Factory Sta se Technical Data I in process inspe t a cable drum for on, BSES may rar	ndard/Agreemen a Sheet does not ction in addition t r type testing at v	t wherever 'sample' is indica include requirements for cha to Routine/Acceptance tests endor's works.	ted for extent of chec aracteristics to be ch at any time/stage of	ck. ecked. manufacturing.	ion of sealing ca	p to cabl	e outer sł	neath	

Specification No: BSES-TS-15-HTC-R0

Technical Specification for 11 kV Cables (1CX1000,3Cx400, 3CX300 and 3CX150 sqmm)

Annexure- H

Testing and manufacturing process requirements w. r. t. TR- XLPE insulation

All cables made with TR-XLPE Insulation should be tested and/or certified to meet the following performance parameters as per ANSI /ICEA S-94-649 after one year AWTT.

Property	Units	Requirements Values
Min. Avg. Electrical	kV/mm	<u>></u> 25
Breakdown Strength(qual. test)		
Impulse Strength	kV/mm	<u>≥</u> 83
Water Tree Length	Mm	0.25
Max. Bowtie Tree Density	(Number per	Maximum 15
	16.4 cu. cm)	(0.12-0.25 mm range)

Manufacturing processes to produce high-quality cables with the following characteristics:

- Cure consistency with hot set/creep less than 100%
- No voids larger than 75 microns per 16.4 cubic cm
- No ambers larger than 250 microns per 16.4 cubic cm
- No contaminants larger than 125 microns and less than 5 between 50-125 microns per cubic 16.4 cubic cm tested.
- Neutral indent on cable is less than 375 microns
- Cable insulation concentricity greater than 90% tested
- No protrusions greater than 75 microns at the conductor shield and 125 microns at the insulation shield

Annexure-I: Deviation Format

SI. No.	Document Name	Clause No.	Deviation	Reason	Merit to BSES



Technical Specification of LT Power Cable(Single & Multi-Core)

Specification no - BSES-TS-01-LTPC-R0

Rev		0
Date:		31 Mar 2022
	Abhishek Vashistha	Mr.X
Prepared by	Rohit Patil	Palati
	Puneet Duggal	B
Reviewed by	Amit Tomar	[hal 33/103/2022
	Gaurav Sharma	Cearran
Approved by	K. Sheshadri	Jugger



TECHNICAL SPECIFICATION OF LT POWER CABLE

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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)
2.7	IS-5484	EC Grade aluminium rod produced by continuous casting and rolling
2.0	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) Elec	trolytic Grade :	Stranded Aluminium C	onductor
		b) Gra	de: H2 as per IS	5: 8130/1984	
		c) Clas	ss 2		
		d) Che	mical Composi	tion as per IS 4026	
		e) Sha	pe& Size:		
		S. no.	Shape	Single core (sq.mm)	Multi core (sq.mm)
				• 1cx25	
			C	• 1cx95	
		1	Compacted Circular	• 1cx300	• 2cx10
			Circular	• 1cx630	
				• 1cx1000	
					• 2cx25
					• 4cx25
		2	Sector		• 4cx50
		~	Sector		• 4Cx150
					• 4Cx300
					• 4Cx400
3.2	Insulation	Extrude	d XLPE insulati	on as per IS : 7098 part	t-1
3.3	Core Identification	a) Sing	le Core Cable –	- Natural	
		b) Two	Core Cable – F	Red & Black	
		c) Fou	r Core Cable – I	Red, Yellow, Blue and E	Black
3.4	Inner Sheath	a) For	Single Core Cal	ole – Inner Sheath Not	Required
		b) For	2 Core cable- P	ressurized Extruded, B	lack PVC type ST-2 (IS
		583	1-1984)		
		-		xtruded Black PVC typ	
3.5	Armour	- ,		Galvanized Steel round	
		-		10 mm²-Galvanized Sto	-
			•	ed for single core cable	
		d) Min	imum area of o	overage of armouring	shall be 90%



	Ī	
		e) The breaking load of armour joint shall not be less than 95% of that of armour wire / strip
		f) Zero negative tolerance for thickness of armour strip shall be as
		per IS:3975
		g) Zinc rich paint shall be applied on strip/wire and its joint
		surface.
3.6	Outer Sheath	a) Extruded FRLS outer sheath of PVC (ST-2) shall be as per
		IS:5831
		b) Colour:
		 For multi core cables-Orange/Yellow as per tender
		requirement
		For single core cables – Orange/Black as per tender
		requirement
		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. d) Shape of the cable over the outer sheath shall be circular, when
		manufactured/completed.
		e) The FRLS outer Sheath shall be embossed with following
		minimum text:
		i) The voltage designation
		ii) Type of construction /cable code (For e.g.
		A2XWY/A2XFY)
		iii) FRLS
		iv) Manufacture name/Trade mark
		v) Number of Cores and nominal cross section area of
		conductor
		vi) Name of buyer i.e BSES
		vii) Month & year of manufacturing
		viii) IS reference , i.e. IS:7098
		ix) P.O No. and Date
		x) Font size shall be 5/5mm xi) ISI mark
		The embossing shall be progressive, automatic, in line and marking
		shall be legible and indelible.
		Following points shall be printed on every meter of cable
		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.
		ii. Drum number marking on every meter of the cable
		length
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 ASTMD
		2843 (Smoke Density rating shall be max 60%)
		Flammability Test – IEC 60332 part -1

4.0 CABLE DRUM

CABLE DRUM	
Reference Standard	Cable drum shall comply with IS: 10418.
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)
Drum Length &	• For 2C X 10 mm ² Cable - 1000+/-5% Mtr
Tolerance	• For all Other cable sizes - 500 +/-5% Mtr
Overall Tolerance	-2 % for the total cable length for the entire order.
Short Length of Cable	a) Minimum acceptable length (Max. is 525 mtr) shall be 1 % of the total ordered qty. & 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.
	b) Manufacture shall not be allowed to put two cable pieces of
	different short length in same cable drum
Preventive Measure	a) The surface of the drum and outer most cable layer shall be
for cable Drum	covered with water proof layer
	b) Ferrous part of wooden drum shall be treated with suitable
	rust preventive paint/coating to minimize rusting during
	storage.
	a) Drum identification number
Labels	b) Cable voltage grade
	c) Cable code (eg. A2XFY/A2XWY)
	d) Number of cores and cross sectional area
	e) Cable quantity i.e cable length (Meters)f) Purchase order number, date & SAP item code
	g) Total weight of cable and drum (kg)
	h) Manufacture's and Buyer's name
	i) Month & year of manufacturing
	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.
	k) Cable length final end-marking (i.e reading at the inner end
	Reference Standard Type of Drum Drum Length & Tolerance Overall Tolerance Short Length of Cable Preventive Measure



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and reading at the outer end, just before packing shall be
marked on the drum.

5.0 PACKING, SHIPPING, HANDLING & STORAGE

5.1	Shipping	The seller shall be give complete shipping information concerning
	information Plan	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
		The drum shall be with M.S spindle plate(with nut -bolts) of
5.3	Cable Drum	adequate size to suit the spindle rod , normally required for
	Handling	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	In event of order manufacturer has to submit the signed conver
6.1	Quality Assurance	In event of order manufacturer has to submit the signed copy of
	Plan	QAP.
6.2	Inspection hold	AS per approved QAP (QAP shall be approved at the time of GTP
	points	approval)
6.3	Routine Test	a) Measurement of Electrical Resistance
		b) HV test with power frequency AC voltage
6.4	Type Test	For bid participation—
		(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.
		After award of P.O
		(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
		7, 1
		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



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		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) (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).
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)	 a) For cable sizes up to 25 mm² – one sample for chemical composition and purity test of aluminium shall be conducted per300km of ordered quantity and multiple thereof. b) For cable sizes 50mm² – one sample for chemical composition and purity test of aluminium shall be conducted per 100km of ordered quantity and multiple thereof. c) For cable sizes above 50 mm² – one sample for chemical composition and purity test of aluminium shall be conducted upto 50km of ordered quantity and multiple thereof. 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. e) The sample will be selected either during acceptance test or after receipt of cable in BSES Stores.
6.6	Inspection	 a) The buyer reserves the right to witness all tests specified on completed cables 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. c) In-process and final inspection call intimation shall be given in 10 days advance to purchaser/CES.
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

		To be submitted for purchaser approval for outline of				
8.1	Outline Document	Production-inspection, testing-inspection, packing, dispatch,				
0.1	Outilile Document					
		documentation programme.				
		To be submitted to purchaser once a month containing				
		a) Progress on material procurement				
		b) Progress on fabrication (As applicable)				
8.2	Detailed Progress	c) Progress on assembly (As applicable)				
0.2	Report	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.				



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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

Sr. No.	Description	Buyer's Requirement	Seller's data
	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)		
Α	For 2CX10Sqmm	A2XWY	
В	For Sizes above 10 mm ²	A2XFY	
3	Voltage Grade (kV)	1.1	
4	Maximum Conductor temperature		
Α	Continuous	90°C	
В	Short time	250°C	
5	Conductor		
Α	Material and Grade	As per Cl.3.1	
В	Make of Al	Ref Annexure D	
С	Size (mm²)	mm²	
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	



Sr. No.	Description	Buyer's Requirement	Seller's data
F	Shape of Conductor	As per Cl.3.1 (e)	
G	Diameter over conductor (mm)		
Н	Maximum Conductor resistance at 20 ° C(Ohm/Km)	As per Table 2 of IS 8130	
6	Insulation		
Α	Insulation Material	As per Cl. 3.2	
В	Nominal thickness (mm)	As per Table 3 of IS 7098 Part-1	
С	Diameter over Insulation (mm) Approx.		
D	Make of insulation compound	Ref: Annexure D	
7	Inner Sheath		
Α	Material and Type	As per Cl. 3.4	
В	Minimum thickness	As per Table 5 of IS 7098 Part-1	
С	Approx. dia. Over sheath (mm)		
8	Galvanized Steel Armour	as per purchaser's site - specific condition	
Α	Material		
a)	For 2CX10 mm ²	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 ²	G.I. Strip	
(i)	Strip size (Width and Thickness)	4x0.8 (Zero negative tolerance for thickness)	
(ii)	No. of Strips	As per Manufacturer Standard	
В	Area covered by Armour	Min 90% and calculations shall be strictly as per Annexure-D	
С	Dia. over Armour – Approx.(mm)		



Sr. No.	Description	Buyer's Requirement	Seller's data
9	Outer Sheath (FRLS)		
Α	Material and Type	As per Cl. 3.6	
В	Minimum Thickness	As per Table 8 of IS 7098 Part-1	
С	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		
Α	Type of Drum	Wooden	
В	Drum Length & tolerance	As per Spec. Cl. 4.3 & 4.4	
С	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:		
Α	AC Resistance	Ohm/Km	



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Sr. No.	Description	Buyer's Requirement	Seller's data
В	Reactance at 50 C/s	Ohm/Km	
С	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 mm² cables)



S.No.	Description	Buyer's Requirement	Seller's data
	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	Туре	A2XY (Un-armoured)	
3	Voltage Grade (kV)	1.1kV	
4	Maximum Conductor temperature		
Α	Continuous	90°C	
В	Short time	250°C	
5	Conductor		
Α	Material and Grade	As per Cl. 3.1	
В	Size (mm²)	mm²	
С	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	
Н	Make of Al	Ref Annexure D	
6	Insulation	As per Table 3 of IS7098 Part-1	
Α	Insulation Material	As per Cl. 3.2	



S.No.	Description	Buyer's Requirement	Seller's data
В	Nominal thickness (mm)		
(i)	For 1Cx300 mm ²	1.8 mm	
(ii)	For 1Cx500 mm ²	2.2 mm	
(iii)	For 1Cx630 mm ²	2.4 mm	
iv)	For 1Cx1000 mm ²	2.8 mm	
С	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		
Α	Material and Type	As per Cl. 3.6	
В	Minimum Thickness	As per Table 8 of IS 7098 Part-1	
С	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		
Α	Type of Drum	Wooden	
В	Drum Length & tolerance	As per Spec. Cl. 4.3 & 4.4	
С	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	



S.No.	Description	Buyer's Requirement	Seller's data
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:		
Α	AC Resistance	Ohm/Km	
В	Reactance at 50 C/s	Ohm/Km	
С	Impedance	Ohm/Km	
D	Capacitance	Micro farad / Km	
18	Recommended minimum bending	x O/D	
	radius		
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?	

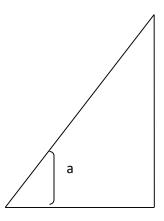


TECHNICAL SPECIFICATION OF LT POWER CABLE

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



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%.



TECHNICAL SPECIFICATION OF LT POWER CABLE

13.0 ANNEXTURE - D

LIST OF SUB-VENDORS

Sr. No.	Description of Material	Sub-Vendors
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



TECHNICAL SPECIFICATION

FOR

FRLS CONTROL CABLE

SPECIFICATION NO. - BSES-TS-57-CCAB-RO.

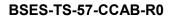
Rev:		0
Pages:		11
Date:	scell	20 April 2022
	Abhishek Vashistha	dit
Prepared by	Rohit Patil	PAP.
	Puneet Duggal	Mo- o
Reviewed by	Amit Tomar	Jestod
	Gaurav Sharma	Convini
Approved by	Gopal Nariya	5/1





INDEX

1.0	SCOPE	3
2.0	STANDARDS & CODES	3
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5.0	QUALITY ASSURANCE PLAN, INSPECTION AND TESTING	6
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7.0	DEVIATIONS	7
8.0	DOCUMENT SUBMISSION MATRIX	8
∆ nne	xure – A: Guaranteed Technical Particulars (Data by Supplier)	Ç





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:

S No.	STANDARD	DESCRIPTION
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



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")

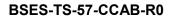
S No.	Parameters	Technical Requirements
4.1		Size & dimensions of each item mentioned under this clause shall be followed as detailed out in GTP, refer Annexure A
4.2	Conductor	 Stranded, plain copper, circular Shall be made from high conductivity copper rods
4.3	Insulation	Extruded PVC Insulation Type 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	 As per Clause 13.2 of IS 1554 Part-1: Galvanized steel round wire armour. Minimum area of coverage of armouring shall be not less than 90 %. (refer Annex C of IS 1554-part 1 for % calculation)



BSES-TS-57-CCAB-R0

TECHNICAL SPECIFICATION FOR FRLS CONTROL CABLE

S No.	Parameters	Technical Requirements
4.7	Outer Sheath	 a) Extruded outer sheath of PVC type ST-2 as per IS 5831 having FRLS properties b) Color: Black c) The Outer Sheath shall be embossed with: i. The voltage designation ii. Type of construction / cable code (for e.g. AYWY) iii. Manufacturers Name or Trade mark iv. Number of Cores and nominal cross sectional area of conductors v. The drum progressive length of cable and individual drum number at every meter. (By Printing) vi. Name of buyer i.e. BSES vii. Month & Year of Manufacturing viii. P.O. No. and P.O. Date
4.8	FRLS Properties	 a) Oxygen Index: Not less than 29% as per ASTM 2863 b) Temperature Index: 250°C at Oxygen Index 21 (when tested as per ASTM D 2863) c) Max Acid Gas Generation – Not more than 20% as per IEC -60754-1 d) Light Transmission - Minimum 40% when tested as per ASTMD 2843 (Smoke Density rating shall be max 60%) e) Flammability Test – As per IEC 60332-III, Cat – B, IEC 60332- I, IS- 10810 – Part 53, IS:10810 – Part 61 & 62 (Category A)
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	 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. b) Manufacturer shall not be allowed to put two cable pieces of different short lengths in same cable drum. c) Only 1% of the total ordered quantity.





5.0 QUALITY ASSURANCE PLAN, INSPECTION AND TESTING

S No.	Parameters	Technical Requirements
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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BSES-TS-57-CCAB-R0

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.

S No.	Description	Bid	Approval	Pre Dispatch
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 mm²)

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

Sr.	Description	Buyer's requirement	Vendor's Data
	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 (mm²)	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	
b)	Minimum thickness (mm)	specification & Table 2 of IS 1554(Part-1)	
c)	Core Identification	As per IS 1554 Part 1	
d)	Approx. dia. over Insulation (mm)	To be specified by	



BSES-TS-57-CCAB-R0

TECHNICAL SPECIFICATION FOR FRLS CONTROL CABLE

Sr.	Description	Buyer's requirement	Vendor's Data
		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	



BSES-TS-57-CCAB-R0

TECHNICAL SPECIFICATION FOR FRLS CONTROL CABLE

Sr.	Description	Buyer's requirement	Vendor's Data
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

Of

Cable Sealing System

Specification no - BSES-TS-69-CSS-R0

Rev:		0
Page:		1 of 8
Date:		29 Apr 2022
Prepared by	Abhishek Harsh	26/10/10/10/10/10/10/10/10/10/10/10/10/10/
Reviewed by	Srinivas Gopu	5d32525e-ed3a-4f41-b1c7-b8a5e77d1519
Approved by	Gaurav Sharma	224c24c2 954c 4472 9957 dox 9724572b4



TECHNICAL SPECIFICATION OF CABLE SEALING SYSTEM

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TECHNICAL SPECIFICATION OF CABLE SEALING SYSTEM

1.0 SCOPE

- This specification covers the design, manufacture, testing, supply, erection & commissioning of Cable Sealing System and its accessories.
- Scope also includes
 - Supply of Modular Cable Sealing System including its transportation to BYPL Sites.
 - ➤ Installation testing commissioning of Modular Cable Sealing Solution with all the accessories including civil work if any.

2.0 CODES & STANDARDS

 Material, equipment and methods used in the manufacturing of Cable Sealing System shall confirm to the latest edition of following standard

Standard Name / No	Standard's Description
Indian Electricity Act	Latest Edition
CBIP manual	Latest Edition
BS476 Part 20	Fire tests on building materials and structures. Method for determination of the fire resistance of elements of construction (general principles)

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



TECHNICAL SPECIFICATION OF CABLE SEALING SYSTEM

3.10	Seismic Zone	IV
------	--------------	----

4.0 GENERAL FEATURES

4.1 <u> </u>	Multi-cable transit system	Consisting of transit frames
4.1.1	Material	Stainless Steel of Grade 304
4.2 _	Multi-layered Insert blocks with Accessories	
4.2.1	Characteristic	Peelable,Tearable and adjustable
4.2.2	Material	Lycron or EPDM based halogen free rubber low-smoke index rubber
4.2.3	Filling of usable insert blocks for the future use	For Uncovered space left
4.2.4	Spare Capacity	30%
4.3	Retainer Plate	Required
4.4	End Packing	Required
4.5	Lubricant	Required
4.6	Stay Plates	For separating Flexible multi-layered Insert blocks
4.6.1	Material	Stainless Steel of Grade 304
4.7	Press Wedge	
4.7.1	Material	EPDM based halogen free low-smoke index rubber
4.8	Special Tool	For opening the cable sealing system
4.9	Fire insulation	3 Hours
4.10	Tests	
4.10.1	Type test as per BS476 Part 20 or UL-1479 or NBC-2016.	Required
4.10.2	Water Tightness (3 Bar) Type Test	Required
4.10.3	Smoke Tighness (2.5 Bar)	Required
4.10.4	Protection against Vermin	Required
4.11	IP Protection	IP67
4.12	Shelf Life	25 Years
4.13	Solubility in Water	Insoluble
4.14	Make	Roxtec, MCT brattberg



TECHNICAL SPECIFICATION OF CABLE SEALING SYSTEM

 Note- Any other make other than specified in above table 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		



TECHNICAL SPECIFICATION OF CABLE SEALING SYSTEM

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
8.4	Relevant Type Test as per IS/IEC/UL	Required	Required		
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

		Against corrosion, dampness, heavy rains,
		breakage and vibration. During transportation/
9.1	Packing Protection	transit and storage, module may be subjected
		to outdoor conditions. Hence, packing of each
		panel shall be weatherproof.
		Robust wooden non returnable packing case
9.2	Packing for accessories and spares	with all the above protection & identification
		Label



TECHNICAL SPECIFICATION OF CABLE SEALING SYSTEM

	Packing Identification Label to be provided on each packing case with the following
9.3	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

		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
	Shipping	project site. Bidder shall furnish the confirmation that
10.1		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.



TECHNICAL SPECIFICATION OF CABLE SEALING SYSTEM

11.0 HANDLING AND STORAGE

		Manufacturer instruction shall be followed. Detail
11.1	Handling and Storage handling & storage instruction sheet / manual nee	
		to be furnished before commencement of supply.



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-447/2-99a/-dea8/314/2b6	

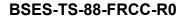




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1.0 SCOPE

 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

Standard Name / No	Standard's Description	
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 mar from cables		
ASTM D2843 Standard Test Method for Density of Smoke from 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



4.0 GENERAL FEATURES

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/m² @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 Required 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	4.1	Base Type	Water based Intumescent coating
4.4 Mix ratio by weight 4.5 Solids by weight 4.6 ph 4.7 Toxicity 4.8 DFT 4.9 Coverage 4.10 Drying time 4.11 Functional Cure Time 4.12 Application temperature 4.13 Temperature endurance 4.14 Application method 4.15 Fire Rating 4.16 Features 4.16.1 Solvent free 4.16.2 Eco friendly 4.16.3 Free of any fibers including asbestos 4.16 Required 4.16.4 Single component, ready to apply/use 4.16.5 Easy to apply using a paint brush/spray 4.16.6 No de-rating effect on cables 4.16.7 Added fire protection for existing cables 4.17.3 Fiammability 4.17.4 HCL 4.17.5 Smoke density 4.18 Solvent Required 4.19 Solvent free 4.19 Required 4.10 Required 4.11 Required 4.12 Required 4.13 Required 4.14 Required 4.15 Required 4.16 Required 4.17 Required 4.17 Required 4.18 Required 4.19 Required 4.10 Required 4.10 Required 4.10 Required 4.10 Required 4.11 Required 4.12 Required 4.13 Required 4.14 Required 4.15 Required 4.16 Required 4.17 Required 4.17 Required 4.18 Required 4.19 Required 4.10 Requi	4.2	Color	Off white
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/m² @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 Required 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 ca	4.3	Density	1.3 ± 0.05 g/cc
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/m² @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 >100.00°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 4.17.1 Fire Resistance/Circuit Integrity As per IEC 60331-11 4.17.2 Flame Retardance As per IEC 60754-1 4.17.5 Smoke density As per ASTM D2843 4.17.6 Limiting oxygen index	4.4	Mix ratio by weight	Single component
4.7 Toxicity 4.8 DFT 4.9 Coverage 4.10 Drying time 4.11 Functional Cure Time 4.12 Application temperature 4.13 Temperature endurance 4.14 Application method 4.15 Fire Rating 4.16 Features 4.16.1 Solvent free 4.16.2 Eco friendly 4.16.3 Free of any fibers including asbestos 4.16.4 Single component, ready to apply/use 4.16.5 Easy to apply using a paint brush/spray 4.16.6 No de-rating effect on cables 4.16.7 Added fire protection for existing cables 4.17 Test 4.17.1 Fire Resistance/Circuit Integrity 4.18.2 End Fire Restme 4.19.3 Province of the set o	4.5	Solids by weight	64 ± 2 %
4.8 DFT 4.9 Coverage 3.2kg±0.10 kg/m² @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 4.16.1 Solvent free 4.16.2 Eco friendly 4.16.3 Free of any fibers including asbestos 4.16.4 Single component, ready to apply/use 4.16.5 Easy to apply using a paint brush/spray 4.16.6 No de-rating effect on cables 4.16.7 Added fire protection for existing cables 4.16.8 Compatible with different sheathing chemistries of electrical cables 4.17 Test 4.17.1 Fire Resistance/Circuit Integrity 4.18.2 Flame Retardance 4.19.3 Flammability 4.19.4 As per IEC 60331-11 4.17.2 Flame Retardance 4.17.3 Flammability 4.18.4 Sper IS 10810 (P-53) 4.17.4 HCL 4.17.5 Smoke density 4.18.6 Limiting oxygen index 4.19.9 Coverage 3.2kg±0.10 kg/m² @1.6mm DFT 3.2kg±0.10 kg/m²	4.6	ph	8
4.9 Coverage 3.2kg±0.10 kg/m² @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 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 ASTM D2843 4.17.6 Limiting oxygen index	4.7	Toxicity	Non-toxic, asbestos and lead free
4.10Drying timeSurface dry in 30 mins4.11Functional Cure Time48 hours4.12Application temperature10-30°C4.13Temperature endurance>1100°C4.14Application methodBrushing, Airless spraying4.15Fire Rating2 Hours4.16Features4.16.1Solvent freeRequired4.16.2Eco friendlyRequired4.16.3Free of any fibers including asbestosRequired4.16.4Single component, ready to apply/useRequired4.16.5Easy to apply using a paint brush/sprayRequired4.16.6No de-rating effect on cablesRequired4.16.7Added fire protection for existing cablesRequired4.16.8Compatible with different sheathing chemistries of electrical cablesRequired4.17TestAs per IEC 60331-114.17.2Flame RetardanceAs per IEEE 3834.17.3FlammabilityAs per IS 10810 (P-53)4.17.4HCLAs per IEC 60754-14.17.5Smoke densityAs per ASTM D28434.17.6Limiting oxygen indexAs per ASTM D2843	4.8	DFT	1.6 mm
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 ASTM D2843 4.17.5 Smoke density As per ASTM D2843 4.17.6 Limiting oxygen index	4.9	Coverage	3.2kg±0.10 kg/m² @1.6mm DFT
4.12Application temperature10-30°C4.13Temperature endurance>1100°C4.14Application methodBrushing, Airless spraying4.15Fire Rating2 Hours4.16FeaturesRequired4.16.1Solvent freeRequired4.16.2Eco friendlyRequired4.16.3Free of any fibers including asbestosRequired4.16.4Single component, ready to apply/useRequired4.16.5Easy to apply using a paint brush/sprayRequired4.16.6No de-rating effect on cablesRequired4.16.7Added fire protection for existing cablesRequired4.16.8Compatible with different sheathing chemistries of electrical cablesRequired4.17TestAs per IEC 60331-114.17.1Fire Resistance/Circuit IntegrityAs per IEC 60331-114.17.2Flame RetardanceAs per IEE 3834.17.3FlammabilityAs per IEC 60754-14.17.4HCLAs per IEC 60754-14.17.5Smoke densityAs per ASTM D28434.17.6Limiting oxygen indexAs per ASTM D2863	4.10	Drying time	Surface dry in 30 mins
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 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 ASTM D2843 4.17.5 Smoke density As per ASTM D2843 4.17.6 Limiting oxygen index	4.11	Functional Cure Time	48 hours
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 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 ASTM D2843 4.17.5 Smoke density As per ASTM D2863	4.12	Application temperature	10-30°C
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 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 IEC 60754-1 4.17.5 Smoke density As per ASTM D2843 4.17.6 Limiting oxygen index As per ASTM D2863	4.13	Temperature endurance	>1100°C
4.15 Fire Rating 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 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	4.14	Application method	_
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4.16.7 Added fire protection for existing cables 4.16.8 Compatible with different sheathing chemistries of electrical cables 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	4.16.5	Easy to apply using a paint brush/spray	Required
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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	4.17.1	Fire Resistance/Circuit Integrity	As per IEC 60331-11
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	4.17.2	Flame Retardance	As per IEEE 383
4.17.5Smoke densityAs per ASTM D28434.17.6Limiting oxygen indexAs per ASTM D2863	4.17.3	Flammability	As per IS 10810 (P-53)
4.17.6 Limiting oxygen index As per ASTM D2863	4.17.4	HCL	As per IEC 60754-1
	4.17.5	Smoke density	As per ASTM D2843
4.18 Make Stanvac/3M/Demech	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		



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TECHNICAL SPECIFICATION FOR FIRE RETARDANT COATING ON CABLES

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
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

		Against corrosion, dampness, heavy rains,
		breakage and vibration. During transportation/
9.1	Packing Protection	transit and storage, module may be subjected
		to outdoor conditions. Hence, packing of each
		panel shall be weatherproof.
		Robust wooden non returnable packing case
9.2	Packing for accessories and spares	with all the above protection & identification
		Label
1		



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TECHNICAL SPECIFICATION FOR FIRE RETARDANT COATING ON CABLES

	Packing Identification Label to be provided on each packing case with the following	
9.3	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

		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
	Shipping	project site. Bidder shall furnish the confirmation that
10.1		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.



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TECHNICAL SPECIFICATION FOR FIRE RETARDANT COATING ON CABLES

11.0 HANDLING AND STORAGE

		Manufacturer instruction shall be followed. Detail
11.1	Handling and Storage	handling & storage instruction sheet / manual needs
		to be furnished before commencement of supply.



TECHNICAL SPECIFICATION

FOR

11KV INDOOR TYPE

AUTO SWITCHED CAPACITOR BANK

Revision		0
Date		24.03.2021
Pages		Page 1 of 21
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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20.	GUARANTEED TECHNICAL PARTICULARS	



1. SCOPE OF SUPPLY

- a. This specification covers the design, manufacturing, testing, supply, erection & commissioning of 7.2 MVAR (One fixed step of 1.8 MVAR and three steps of 1.8 MVAR), 12.65 KV three phase Indoor Type Auto Switched Capacitor Bank with bus bar arrangement at site in an enclosure including but not limited to 0.2% series reactors, capacitor switch/contactor, Isolator cum earth switch, HT fuses, RVT, APFC Panel and all necessary equipment for auto switching. No Equipment should lie outside the enclosure apart from APFC panel which shall be the part of VCB panel. Necessary space will be provided for APFC panel in switchboard. Fitting and wiring of this panel shall be in vendor's scope. Isolator, Earth Switch etc should be incorporated in enclosure only. NDR will not be the part of vendor's scope but wiring for NDR shall be in vendor's scope.
- b. This specification shall be used in conjunction with all specifications, data sheets, single line diagrams, and other drawings attached to the tender.

2. CODES & STANDARDS

2.1	Indian Electricity Rules	
2.2	Indian electricity act	
2.3	CBIP manual	
2.4	IS 13925 part 1,2 & 3	Shunt capacitors above rated voltage 1000v
2.5	IS 11298 part 3	Plastic films for capacitors
2.6	IS 9921-1985	Isolator
2.7	IS 5553	Series reactor
2.8	IS 2099	Bushings for voltages above 1000v
2.9	IS 12672	Internal fuses & disconnector for shunt capacitors
2.10	IS 2705	Current transformers
2.11	IS 13067	Imp regnant for power capacitors
2.12	IS5	Color of mixed paints
2.13	IS 3156	RVT
2.14	IS 15086	Surge arrestor
2.15	IS 3070 (Pt 3)	Surge arrestor
2.16	IS 2629	Recommended practice for Hot dip galvanizing of
	10 2020	steel
2.17	IS 4759	Hot dip Zinc coating on Steel structures and other
	10 47 00	allied products
2.18	IEC 60871	Shunt capacitors for AC power Systems
2.19	IEC 61000	Automatic Power Factor Controller
2.20	IS 9920-2002	Vacuum Contactors/Capacitor Switch



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. 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. GENERAL

4.1	Capacitor Scheme	3 Phase, 7.2 MVAR @ 12.65KV,Single Star with RVT protection.
4.2	Switching	Auto switched in three steps of 1.8 MVAR with one fixed step of 1.8 MVAR. Auto switching will be controlled by APFC.
4.3	Service location	Suitable for Indoor use
4.4	Connection	Single star for individual steps
4.5	HT capacitor bank assembly	 a. Individual single phase capacitor units mounted on steel stand / rack & connected externally by sleeved flexible copper connectors b. Sleeves to be Red, Yellow, Blue, & Black in colour.
4.6	Interchangeability	Between various single phase capacitor units without disturbing other units
4.7	Capacitor bank enclosure	 a. Wire Mesh Enclosure with door for enclosing complete capacitor bank including capacitor units, Reactors, flexible copper connectors, RVT & terminal bus bar. b. Powder Coated GI wire mesh with opening of size 12mm X 12mm c. Side wall wire mesh frame shall be bolted to main frame structure with Allen head type screws / bolts d. 1500 mm wide enclosure's door shall be provided with limit switch having interlock with Isolator and Circuit breaker.

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	1	
		e. Enclosure door shall be hinged, center
		opening, double leaf type
		f. Enclosure top cover shall be 2.5 mm thick.
		g. Door shall have pad locking facility.
		h. All wire mesh side walls, doors & top cover
		shall be connected to each other by metallic jumper links, two earth studs with hole size for
		M10 bolt to be provided on enclosure frame
		bottom
		i. Any Hardware for wire mesh shall be in
		bidder's scope.
		j. Galvanization quantity shall be minimum 610
		g/mm²
		k. Powder coating thickness shall be minimum 70
	<u> </u>	micron.
4.8	Equipment mounting	Plinth mounted
	De an Interde de	Doors shall be provided with solenoid type lock to
4.9	Door Interlock	avoid door opening (after tripping of breaker) for a
	5	minimum of 10 minutes.
4.10	Bus bar for HV cable	One for each phase mounted on porcelain or
4.10	termination	epoxy insulators
	Bus bar material	Tinned copper, sized for 150% of rated current
4.11	Bus bai material	and rated fault duty
		a. Suitable for termination of HT cable size up to
4.12	Power Cable Termination	2 x 3C x 300 sqmm for each phase.
7.12	Tower dable remination	b. Power Cable termination shall be from
		bottom/top as per space availability
4.13	GA drawing	Manufacturer shall submit the G.A. Drawings for
		Capacitor Bank with mounting of series reactor inside the bank.
	Power Frequency	mode the bank.
4.14	1	28kVrms
	Withstand Voltage	
4.15	Impulse Withstand Voltage	75kVp
		•

5. SINGLE PHASE CAPACITOR UNIT

		a. Totally enclosed, leak proof, dust proof suitable for indoor application, comprising individual capacitor elements connected in series & parallel groups.
5.1	Single phase capacitor unit	b. As per IS 13925 Part 1 :2012, Clause No. 20 Overloads – maximum permissible current "Capacitor units shall be suitable for continuous operation at an R.M.S current that occurs at rated sinusoidal voltage and rated frequency, excluding transients. Depending on the actual capacitance value, which may be a maximum of 1,10 CN, the maximum current can reach 1,43 I _N



5.2	Capacitor unit size	Preferred size is 200kVAR, however higher unit sizes may be considered if the space availability at site is scarce
5.3	Capacitor element	Developed from alternate layers of conducting metal foil & dielectric film
5.4	Conducting layer material	Aluminum foil
5.5	Dielectric material	Hazy Poly Propylene (APP), Double layer minimum
5.6	Cooling	Natural air
5.7	Impregnating liquid	Non PCB(Poly chlorinated Biphenyl), less toxic, with low bio-accumulation and bio-degradable liquid filled under vacuum
5.8	Capacitor unit enclosure	Fabricated from sheet metal CRCA steel of thickness 2mm minimum, hermetically sealed & hydraulically tested
5.9	Discharge device	For each single phase capacitor unit
5.10	Fuse	External HRC Fuse
5.11	Surge arrestor	Gap less metal oxide type
5.12	Rated voltage	9kV
5.13	Maximum continuous operating voltage	7.65kV
5.14	Discharge current	10 kA
5.15	Spare capacitor unit	One capacitor unit for each bank

6. VACUUM CONTACTOR FOR AUTO SWITCHING

6.1	Rated Voltages	12 KV
6.2	Rated Continuous Current	200% of full load current (minimum) of unit being switched
6.3	Rated Capacitor Switching Current	150% of full load current (minimum) of unit being switched
6.4	Frequency	50 Hz
6.5	Control supply	230 V Single phase AC supply
6.6	Type	Vacuum
6.7	Installation	Inside Enclosure
6.8	Mechanical Endurance	10000 operations (minimum)
6.9	Electrical Endurance	10000 electrical operations at rated capacitive switching current (minimum)
6.10	Indicator	To show number of operations
6.11	Trip lever	For emergency tripping operation
6.12	Closing lever	For capacitor bank discharging



7. SERIES REACTOR

7.1	Series Reactor	 Shall be provided fulfilling following requirement, a. Parallel switching of one bank with another two bank in service b. Suitable design calculation shall be submitted at the time of drawing approval c. Reactors shall be suitably designed to limit inrush current with proper calculation to be submitted to BYPL. d. The series reactor shall be designed to suit the final capacity of Capacitor Bank e. The manufacturer shall submit the G.A. Drawings for Capacitor Bank with mounting of series reactor inside the bank
7.2	Series reactor continuous rating	0.2% of capacitor bank rating
7.3	Series reactor rated voltage	Same as capacitor bank rated voltage
7.4	Series reactor rated frequency	50Hz
7.5	Series reactor single phase unit connections	Connected between single phase capacitor units and neutral star point
7.6	Series reactor type	Dry type with air natural cooling
7.7	Series reactor power frequency withstand voltage	28 KV
7.8	Series reactor lightening impulse withstand voltage	75 KV
7.9	Series reactor short time withstand current rating for 3 seconds	16 times capacitor rated current at 130% rated voltage
7.10	Class of Insulation	F

8. RVT

8.1	Туре	Resin cast
8.2	Application	Indoor inside the wire mesh
8.3	Connection	Star/Star-Open delta winding(11KV/Sqrt 3:110 V/Sqrt 3: 190 V)
8.4	Winding	Three winding Star/Star –Open Delta. Secondary winding in Star shall be for Metering and secondary winding for open delta shall be for Residual/ Unbalance voltage Protection.
8.5	Protection	One RVT for All banks' protection. NDR (Neutral Displacement Relay) will not be in vendor's scope. Although its wiring shall be in vendor's scope.
8.6	Accuracy Class	0.5/ 3 PR



8.7	Nominal System Voltage	11 KV
8.8	Highest System Voltage	12 KV
8.9	Power frequency withstand voltage	28 kVrms(As per IS 13925 Part 1 Table 3A)
8.10	Lightning impulse withstand voltage	75 kV Peak(As per IS 13925 Part 1 Table 3A)

9. APFC

9.1	Installation	Indoor Type. To be fitted in VCB panel.
9.2	Power Factor Setting Range	0.7 Inductive to 0.7 Capacitive
9.3	DIs and DOs	 a. DIs and DOs shall be as per control scheme suitable for auto switching of 3 phase, 7.2MVAR capacitor bank in three stages i.e steps of 1.8MVAR (0.6MVAR per phase). b. Automatic control shall be achieved by switching of vacuum contactors/switches provided in the capacitor bank to achieve the set power factor. c. Atleast 4 Dis and 4 Dos shall be spare for future use
9.4	Interface	 a. SCADA Compatible with RS-485 communication protocol on MODBUS. b. Integration of APFC with RTU and Capacitor bank shall be in bidder's scope. c. Shielded RS485 Twisted copper shield wire shall be laid from APFC to RTU for SCADA communication
9.5	Configuration of DIs for SCADA Integration	DI-1-Vacuum Contactor 1 ON DI-2-Vacuum Contactor 1 OFF DI-3-Vacuum Contactor 2 ON DI-4- Vacuum Contactor 2 OFF DI-5-Vacuum Contactor 3 ON DI-6- Vacuum Contactor 3 OFF DI-7-Manual /Auto Switch in Manual DI-8- Manual/Auto Switch in Auto
9.6	Configuration of DOs for SCADA Integration	DO-1-Vacuum Contactor 1 Close DO-2-Vacuum Contactor 1 Open DO-3-Vacuum Contactor 2 Close DO-4- Vacuum Contactor 2 Open DO-5-Vacuum Contactor 3 Close DO-6- Vacuum Contactor 3 Open



9.7	Operation	 a. Both Automatic and Manual Mode. b. Switching ON and OFF the bank through vacuum contactor/switch as per the desired power factor value c. Overriding provision shall also be made for electrical switching ON and OFF of the capacitor contactor/switch by operator from APFC panel. d. The switching ON operation should take place after period of 10 minutes. e. The switching OFF operation of relevant step shall be instantaneous.
9.8	Ingress Protection(Except for Terminals)	IP 42
9.9	Auxiliary Supply	50 / 220 VDC
9.10	Current Measuring	0 - 5A, suitable for CT x/1A and x/5A
9.11	Display	Power, Energy, Voltage, Current, Average PF, Missing Reactive Power, Supplied Reactive Power, Total no of switching of each vaccum contactor/isolator, ON and OFF indication of Vaccum contactor/switch, THD measurement with odd harmonics coefficient
9.12	Size	Maximum 150x150 mm ²
9.13	Logging	Recording of Electrical Data upto last 2 months in the form of Hourly Records, Fault Records and Daily Records
9.14	Protection	Over/Under Load, Over/Under Frequency, Load Unbalance, Over Current, Over Temperature
9.15	LED Required on APFC For ON and OFF Status of Each step	8

10. ISOLATOR

10.1	Installation	Indoor
10.2	Rated Voltage	11 KV
10.3	Туре	Single throw double break off, off load type, triple pole horizontal gang operated with earth switch. Mechanical interlock should be provided between isolator and Earth Switch.
10.4	Operation Type	Manual

11. LIGHTNING ARRESTOR

11.1	Voltage Rating	9 kV
11.2	Туре	Gapless ZnO type



11.3	Discharge Class	III
11.4	Nominal Discharge Current	10 kA

12. PERFORMANCE

12.1	Over voltage operation	as per IS 13925 part1
12.2	Over current operation	as per IS 13925 part1
12.3	Operating temperature category	+5/C as per IS 13925 part1
12.4	Discharge characteristic as per IS 13925 part1	 a. Each capacitor single phase unit residual voltage after disconnection from mains supply shall be 50V (maximum) within 10 minutes b. Capacitor bank residual voltage after disconnection from mains supply shall be 50V (maximum) within 10 minutes
12.5	Power loss and tangent of Loss angle (tan δ)	To be specified by manufacturer as per IS 13925 part1

13. LABELS & FINISH

13.1	Rating plate for HT Capacitor	
13.2	bank Material	Anodized aluminum 16SWG
13.3	Background	Satin silver
13.4	Letters, diagram & border	Black
13.5	Process	Etching
13.6	Bank Name plate details	Mfg name, Mfg Sr. No., Month & year of Mfg, equipment type, total output rating, Bank Capacitance in μF, Bank watt losses, Owner name & order number, Temp. category, connection diagram, Warranty period, Customer care Number
13.7	Rating plate for each single phase capacitor unit	Anodized aluminum with white character on black background and details as per clause no 10.1 of IS 13925
13.8	Unit Name plate details	Mfg name, Mfg Sr. No., Month & year of Mfg, equipment type, total output rating, unit Capacitance in μF, unit watt losses, Temp. category, Discharge device rating, connection diagram, Owner name & order number, Guarantee period, unit wt. in kG,
13.9	Danger plate on front & rear side of wired mesh enclosure	Anodized aluminum with white letters on red background
13.10	Painting - Capacitor single phase unit	
13.11	Surface preparation	Shot blasting or chemical 7 tank process
13.12	External finish	Powder coated pure-polyester base Mat finish,

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		shade- Siemens Gray RAL 7032, uniform
		thickness 70 microns minimum
		a. Chemical 7 tank process for surface
13.13	Painting–frame enclosure	b. Galvanization with uniform thickness
	_	610g/m ² minimum as per IS 2629 and 4759.
13 14	SLD	SLD of Approved drawing must be engraved
13.14	SLD	in inside the enclosure door

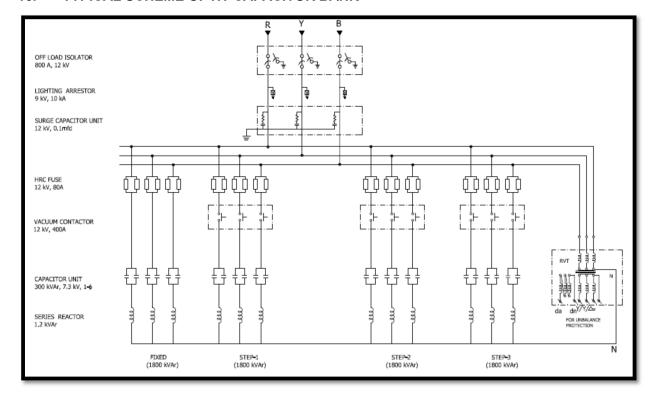
14. APPROVED MAKES OF COMPONENTS

14.1	APFC	Beluk/ABB/EPCOS/Shreem
14.2	Vacuum Contactor	ABB/ EPCOS/Shreem
14.3	RVT	Pragati/Kappa
14.4	Electromechanical Relays	Alstom/Schneider/Siemens/ABB/ER
14.5	Miniature Relays	ABB/Jyoti/Omran
14.6	Contactors	ABB/Siemens/Telemechanique
14.7	Instrument transformers	ECS/ Pragati/ Gemini/Schneider/CGL/Kappa/Narayan power tech
14.8	MCBs	Siemens/Schneider/Legrand/ABB
14.9	Control switches	Switron/Kaycee
14.10	Test terminal blocks	IMP/Schneider/Alstom
14.11	Terminal blocks	Elmex/Connectwell
14.12	Indicating lamps	Siemens/ Teknic/ Binay
14.13	Surge Suppressors	Oblum/Tyco/Nexan/NKT/Rachem
14.14	Meters	Rishabh/Conzerv

15. INSPECTION & TESTING

15.1	Type test	Equipment of type tested quality only, type test certificate to be submitted along with offer.		
15.2	Routine test	As per relevant Indian standard		
15.3	Acceptance test as per IS	To be performed in presence of Owner at manufacturer works, as per relevant Indian standard along with BOM.		

16. TYPICAL SCHEME OF HT CAPACITOR BANK



17. MANDATORY SPARES

Following spares have to be provided for each capacitor bank set of 7.2 MVAR

S. No	Item	UOM	Qty
17.1	Capacitor Unit	Nos	2
17.2	Series Reactors	Nos	2
17.3	Vacuum Contactor	Nos	2

18. DRAWING AND 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
18.1	Contact Person Name, Email ID and Mobile Number	Required			
18.2	Consolidated Deviation Sheet	Required	Required		
18.3	GTP	Required	Required		
18.4	Relevant Type Test as per IS/IEC	Required			
18.5	Power Cable and control cable Philosophy and Schedule		Required		
18.6	Manufacturer's quality assurance plan and certification for quality standards		Required		
18.7	Sizing Calculation of Associated Equipment		Required		
18.8	Recommended Spares Apart from spares stated in Spec(for five years of operation)		Required		
18.9	11 kV Auto Switched Capacitor Bank				
18.9.1	General Arrangement	Required	Required		
18.9.2	Sectional Layout		Required		
18.9.3	Door Layout		Required		
18.9.4	SLD	Required	Required		
18.9.5	Schematic Circuit diagram and Scheme		Required		
18.9.6	Bus Bar Arrangement		Required		
18.9.7	QAP		Required		
18.9.8	BOQ		Required		
18.9.9	Logic Operation Diagram		Required		
18.9.10	Plan		Required		
18.9.11	Interlock Diagram		Required		
18.9.12	Foundation Diagram		Required		



18.9.13	DI sheet	Required		
18.9.14	DO Sheet	Required		
18.9.15	TB Details	Required		
18.9.16	Make of all Component as per specification	Required		
18.9.17	Drawing of Position of Capacitor Bank	Required		
18.10	Installation, erection and commissioning manual for Bank	Required		
18.11	Inspection Reports		Required	
18.12	As manufacturing Drawings		Required	
18.13	Operation and Maintenance Manual		Required	Required
18.14	Trouble shooting manual		Required	Required
18.15	As built Drawings			Required
18.16	Test Report			Required
18.17	Weekly progress report			Required

19. DEVIATION

	Deviation Sheet	Deviations from this Specification shall be provided
19.1		in excel sheet with 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.

20. 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

S. No	o Description Specification Requirement		Bidder's Data
20.1	General		
20.1.1	Reference Standard	IS-13925,Part 1,2012	

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20.1.2	Capacitor Scheme	3 Phase, 7.2 MVAR @ 12.65KV,Single Star with RVT protection.	
20.1.3	Switching	Auto switched in three steps of 1.8 MVAR with one fixed step of 1.8 MVAR	
20.1.4	Service location	Indoor	
20.1.5	Connection	Single star for individual steps	
20.1.6	HT capacitor bank assembly	 a. Individual single phase capacitor units mounted on steel stand / rack & connected externally by sleeved flexible copper connectors b. Sleeves to be Red, Yellow, Blue, & Black in colour. 	
20.1.7	Capacitor bank enclosure	No component shall be outside the enclosure	
20.1.8	Enclosure size	Max 6m X 1.5m	
20.1.9	Enclosure mounting	Panel mounted	
20.1.10	Degree of Ingress Protection for Bank Enclosure	IP55	
20.1.11	Enclosure side walls	CRCA metal with thickness of loaded parts-2mm and unloaded parts-1.5mm	
20.1.12	Enclosure doors	Hinged, center opening, double leaf type, two doors provided on adjacent side walls with bolting as well as padlocking and interlocking facility.	
20.1.13	Inspection Window	Inspection window shall be provided in each door to see the status of fuse of Capacitor Bank	
20.1.14	Exhaust Fan with Air filter And Canopy	Exhaust fan must ON when that particular bank is in ON condition	
20.1.15	Enclosure top cover	CRCA sheet metal 2mm thick with stiffeners	
20.1.16	Door Interlock	Solenoid type lock to avoid door opening (after tripping of breaker) for a minimum of 10 minutes.	
20.1.17	Earth Connection	All wire CRCA Sheet metal side walls/, doors & top cover shall be connected to each other by metallic jumper links, two earth studs with hole size for M10 bolt to be provided on enclosure frame bottom	
20.1.18	Bus bar for HV cable termination	One for each phase mounted on porcelain or epoxy insulators	
20.1.19	Bus bar material	Tinned copper, sized for 425 A rated current and Fault Current 26.3 kA for 3 Sec	
20.1.20	Bus bar arrangement	Suitable for termination of HT cable size up to 2 x 3C x 300sqmm for each	

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		phase	
20.1.21	Cutout space for Power Cable Entry	400x400 mm ²	
20.1.22	(nuts/bolts/handles)	Stainless steel	
20.1.23	Power Frequency Withstand Voltage	28kVrms	
20.1.24	Impulse Withstand Voltage	75kVp	
20.2	Capacitor Unit		
20.2.1	Make		
20.2.2	Continuous operating current	Continuous operating current shall be minimum 1.43 times to max. 1.65 times as per clause 6.2 of IS 13925.	
20.2.3	Capacitor unit size	Preferred size is 200kVAR, however higher unit sizes may be considered if the space availability at site is scarce	
20.2.4	Capacitor element	Developed from alternate layers of conducting metal foil & dielectric film	
20.2.5	Conducting layer material	Aluminum foil	
20.2.6	Dielectric material	Hazy Poly Propylene (APP), Double layer minimum	
20.2.7	Cooling	Natural air	
20.2.8	Impregnating liquid	Non PCB(Poly chlorinated Biphenyl), less toxic, with low bio-accumulation and bio-degradable liquid filled under vacuum	
20.2.9	Capacitor unit enclosure	CRCA steel of thickness 2mm minimum, hermetically sealed & hydraulically tested	
20.2.10	Discharge device	For each single phase capacitor unit	
		External HRC Fuse	
20.2.12	Surge arrestor	Gap less metal oxide type	
20.2.13	Rated voltage	9kV	
20.2.14	Maximum continuous operating voltage	7.65kV	
20.2.15	Discharge current	10 kA	
20.2.16	Losses	≤0.2 Watts/kVAR	
20.2.17	Power Frequency Withstand Voltage	28 kVrms(As per IS 13925 Part 1 Table 3A)	
20.2.18	Impulse Withstand Voltage	75 kV Peak(As per IS 13925 Part 1 Table 3A)	
20.2.19	Discharging Values	Less than 50 V in 10 Minutes	
20.3	VACUUM CONTACTOR		
20.3.1	Make	ABB/EPCOS/SHREEM	
20.3.2	Reference Standard	IEC 62271-103/IS 9920 (Part IV)	



20.3.3	Rated Voltages	12 KV	
20.3.4	Rated Continuous Current	≥164 A	
20.3.5	Rated Capacitor Switching Current	≥124 A	
20.3.6	Short Time withstand current for 1 sec		
20.3.7	Power Frequency Withstand Voltage	28 kVrms(As per IS 13925 Part 1 Table 3A)	
20.3.8	Impulse Withstand Voltage	75 kV Peak(As per IS 13925 Part 1 Table 3A)	
20.3.9	Opening Time(lower and Upper limit)	35/60 ms	
20.3.10	Closing Time(lower and Upper limit)	60/90 ms	
20.3.11	Frequency	50 Hz	
20.3.12	Control supply	230 V Single phase AC supply	
20.3.13	Type	Vacuum	
20.3.14	Installation	Inside Enclosure	
20.3.15	Mechanical Endurance	10000 operations (minimum)	
20.3.16	Electrical Endurance	10000 electrical operations at rated capacitive switching current (minimum)	
20.3.17	Indicator	To show number of operations	
20.3.18	Trip lever	For emergency tripping operation	
20.3.19	Closing lever	For capacitor bank discharging	
20.4	Series Reactor		
20.4.1	Make		
20.4.2	Reference Standard	IS:5553 (Part 3)	
20.4.3	Series Reactor	Submission of Suitable design Calculation	
20.4.4	Series reactor continuous rating	1.2 kVAR	
20.4.5	Series reactor rated voltage	Same as capacitor bank rated voltage	
20.4.6	Series reactor rated frequency	50Hz	
20.4.7	Series reactor single phase unit connections	Connected between single phase capacitor units and neutral star point	
20.4.8	Series reactor type	Dry type with air natural cooling	
20.4.9	Series reactor power frequency withstand voltage	28 kVrms(As per IS 13925 Part 1 Table 3A)	
20.4.10	Series reactor lightening impulse withstand voltage	75 kV Peak(As per IS 13925 Part 1 Table 3A)	
20.4.11	Rated Current	82.15A	
20.4.12	Series reactor short time withstand current rating for 3 seconds	16 times capacitor rated current at 130% rated voltage	



20.4.13	Class of Insulation	F	
20.5	RVT		
20.5.1	Make		
20.5.2	Reference Standard	IS 3156	
20.5.3	Application	Indoor inside the panel	
20.5.4	Туре	Resin cast suitable for Panel Mounting	
20.5.5	Connection	Star/Star-Open delta winding(11KV/Sqrt 3:110 V/Sqrt 3: 190 V)	
20.5.6	Accuracy Class	0.5/ 3 PR	
20.5.7	Nominal System Voltage	11 kV	
20.5.8	Highest System Voltage	12 kV	
20.5.9	Power frequency withstand voltage	28 kVrms(As per IS 13925 Part 1 Table 3A)	
20.5.10	Lightning impulse withstand voltage	75 kV Peak(As per IS 13925 Part 1 Table 3A)	
20.5.11	Winding	Three winding Star/Star –Open Delta. Secondary winding in Star shall be for Metering and secondary winding for open delta shall be for Residual/ Unbalance voltage Protection.	
20.5.12	Protection	One RVT for All banks' protection	
20.6	APFC		
20.6.1	Make	Beluk/ABB/EPCOS/Shreem	
20.6.2	Reference Standard		
20.6.3	Installation	Indoor Type and To be fitted on VCB Panel	
20.6.4	Power Factor Setting Range	0.7 Inductive to 0.7 Capacitive	
20.6.5	DIs and Dos	4 Dis and 4 Dos shall be spare for future use	
		Scada Compatible with RS-485	
20.6.6	Interface	communication port and Modbus protocol. In case of any other port, suitable convertor shall be provided by the vendor). Integration of APFC with RTU and Capacitor bank shall be in bidder's scope.	
20.6.6	Interface Operation	communication port and Modbus protocol. In case of any other port, suitable convertor shall be provided by the vendor) . Integration of APFC with RTU and Capacitor bank shall be	
		communication port and Modbus protocol. In case of any other port, suitable convertor shall be provided by the vendor). Integration of APFC with RTU and Capacitor bank shall be in bidder's scope.	
20.6.7	Operation	communication port and Modbus protocol. In case of any other port, suitable convertor shall be provided by the vendor). Integration of APFC with RTU and Capacitor bank shall be in bidder's scope. Both Automatic and Manual Mode	



20.6.11	Display	Power, Energy, Voltage, Current, Average PF, Missing Reactive Power, Supplied Reactive Power, Total no of switching of each vaccum contactor/isolator, ON and OFF indication of Vaccum contactor/switch, THD measurement with odd harmonics coefficient	
20.6.12	Size	Maximum 150x150X100 mm ³	
20.6.13	Logging	Recording of Electrical Data upto last 2 months in the form of Hourly Records, Fault Records anmd Daily Records	
20.6.14	Protection	Over/Under Load, Over/Under Frequency, Load Unbalance, Over Current, Over Temperature	
20.6.15	APFC		
20.6.16	Number of LED required on APFC for Cap bank ON and OFF status of each stage	8	
20.7	ISOLATOR		
20.7.1	Make		
20.7.2	Reference Standard		
20.7.3	Installation	Indoor	
20.7.4	Rated Voltage	11 KV	
20.7.5	Туре	Single throw double break off, off load type ,triple pole horizontal gang operated with earth switch. Mechanical Interlock should be provided between isolator and Earth Switch	
20.7.6	Operation Type	Manual	
20.8	Lightning Arrestor		
20.8.1	Reference Standard	IS 3070-1993(Part-3)	
20.8.2	Voltage Rating	9 kV	
20.8.3	Туре	Gapless ZnO type	
20.8.4	Discharge Class	III	
20.8.5	Nominal Discharge Current	10 kA	
20.8.6	Power frequency withstand voltage	28 kVrms(As per IS 13925 Part 1 Table 3A)	
20.8.7	Lightning impulse withstand voltage	75 kV Peak(As per IS 13925 Part 1 Table 3A)	
20.9	Labels and Finish		
20.9.1	Rating plate for HT Capacitor bank		

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20.9.2	Material	Anodized aluminum 16SWG	
20.9.3	Background	Satin silver	
20.9.4	Letters, diagram & border	Black	
20.9.5	Process	etching	
20.9.6	Bank Name plate details	Mfg name, Mfg Sr. No., Month & year of Mfg, equipment type, total output rating, Bank Capacitance in μF, Bank watt losses, Owner name & order number, Temp. category, connection diagram, Warranty period, Customer care Number	
20.9.7	Rating plate for each single phase capacitor unit	Anodized aluminum with white character on black background and details as per clause no 10.1 of IS 13925	
20.9.8	Unit Name plate details	Mfg name, Mfg Sr. No., Month & year of Mfg, equipment type, total output rating, unit Capacitance in µF, unit watt losses, Temp. category, Discharge device rating, connection diagram, Owner name & order number, Guarantee period, unit wt. in kG,	
20.9.9	Danger plate on front & rear side of wired mesh enclosure	Anodized aluminum with white letters on red background	
20.9.10	Painting - Capacitor single phase unit		
20.9.11	Surface preparation	Shot blasting or chemical 7 tank process	
20.9.12	External finish	Powder coated pure-polyester base Mat finish, shade— Siemens Gray RAL 7032, uniform thickness 50 microns minimum	
20.9.13	Painting–frame enclosure	 a. Chemical 7 tank process for surface b. Hot dipped Galvanized with uniform thickness 65 microns minimum as per IS 2629 and 4759. 	
20.9.14	SLD	SLD of Approved drawing must be engraved in inside the enclosure door	



Technical Specification

Of

Direct Current Distribution Board

Specification no - BSES-TS-71-DCDB-R0

Rev:		0
Pages:		1 of 16
Date:		02 May 2022
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TECHNICAL SPECIFICATION FOR DCDB

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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 ³

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				
			Type-1		Type-2	
Application		No of Poles	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	3 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-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 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	Туре	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°
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

Page 7 of 16



TECHNICAL SPECIFICATION FOR DCDB

		panel internal wiring to facilitate easy tracing of the wiring.
9.4	Material	Non-rusting metal or 3 ply lamicoid. 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	МСВ	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.

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.

S. No.	Description	Specification requirement	Bidder's Data
16.1	GENERAL FEATURES		
16.1.1	Make		
16.1.2	Туре		
16.1.3	Reference Standard		
16.1.4	Rated Operational voltage	220 VDC/50 VDC	



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		
а	Load Bearing Member	>=2.5mm	
b	Doors and Covers	>=2 mm	
С	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))		
16.1.18	Incomer	Required	
16.1.19	Outgoings		
16.1.20	Dimensions of the DCDB Panel	500(L)X500(D)X1800(H) mm3	
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	



16.1.26	Ventilating louvers	Required	
16.1.27	Base Frame	100mm channel	
16.2	мсв		
16.2.1	Make	Datar/Legrand/Hager/Schneider/ABB	
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	BUS AND BUS TAPS		
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	



w/m/ph	Losses-middle phase Minimum clearance of	16.3.9
	Minimum clearance of	
		16.3.10
Required	Phase to phase (mm)	16.3.11
	Phase to earth (mm)	16.3.12
 Heat shrinkable sleeves rated for maximum operating voltage ii. Cast resin shrouds for joint	Bus bar insulation	16.3.13
Silver	Bus joints	16.3.14
	Bus bar support insulator	16.3.15
	Spacing (mm)	16.3.16
	Make	16.3.17
 Required	Туре	16.3.18
 rtoquilou	Reference standard	16.3.19
	Voltage class (kV)	16.3.20
	Minimum creepage distance (mm)	16.3.21
	Cantilever strength (Kg/sq.cm.)	16.3.22
	Wiring and Terminals	16.4
	Wiring	16.4.1
1100 V grade, PVC insulated, FRLS type stranded flexible copper wire.	Grade and type	а
Each wire shall bear an identifying ferrule or tag at each end or connecting point.	Ferruling	b
 20% Spare Wiring	Spare	С
	Terminals	16.4.2
		а
1100 V grade, moulded piece terminals complete with insulated barriers, washers, nuts and lock nuts.	Grade	
	Power Terminals type	b
complete with insulated barriers, washers, nuts and lock nuts.		b c
 type stranded flexible copper wire. Each wire shall bear an identifying ferrule or tag at each end or connecting point. 20% Spare Wiring	Reference standard Voltage class (kV) Minimum creepage distance (mm) Cantilever strength (Kg/sq.cm.) Wiring and Terminals Wiring Grade and type Ferruling Spare Terminals	16.3.19 16.3.20 16.3.21 16.3.22 16.4 16.4.1 a b c 16.4.2



е	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	METERS, INDICATIONS, PUSH BUTTONS & HEATERS		
16.5.1	Ammeter	DC Moving coil ammeter of size 96 sq.mm. with external shunt. Rating of Ammeter shall be 0-100A DC.	
а	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	
а	Model No Voltmeter		
b	Make of Voltmeter	Rishabh/Schneider/AE	
С	Туре	Digital type	
16.5.3	Indicating lamps	Cluster LED type.	
а	Make of Indicating lamps	Vaishno/Binay/Teknic/Siemens/Mimic/C &S	
b	Incomer/ Outgoing On	Red	
С	Incomer/ Outgoing Off	Green	
d	Incomer/ Outgoing Trip	Amber	
е	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 0-900	
16.5.5	CFL	Cubicle lamp shall be provided in DCDB having rating of 11 W.	
16.6	NAME PLATES & MARKINGS		



а		Panel Serial No
b		Customer Name - BSES Yamuna/Rajdhani Power Ltd
С	Panel nameplate	PO No. & date -
d		Type of Panel -
е		Current rating -
f		Guarantee period -
16.6.1	Feeder nameplate	As per Spec
а	Equipment nameplate	As per Spec
b	Material	As per Spec
С	Fixing	As per Spec
d	Markings	As per Spec
16.7	FINISH	
а	Primer	Two coats
b	Paint	Two finishing coats of epoxy based paint of Shade RAL 7032 with glossy finish.
С	Paint thickness	50 microns (minimum)



Technical Specification

Of

50 V and 220 V Lithium Ion Battery Bank

Specification no - BSES-TS-72-LIBB-R0

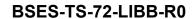
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TECHNICAL SPECIFICATION FOR LI ION BATTERY BANK

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TECHNICAL SPECIFICATION FOR LI ION BATTERY BANK

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



TECHNICAL SPECIFICATION FOR LI ION BATTERY BANK

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 Manganes /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.

		a. Battery shall comprise of two strings of equal rating.				
	Arrangement	b. In Type-1 Battery Bank, for 220 VDC, two strings of 150 Ah capacity shall be provided				
		c. In Type-1 Battery Bank, for 50 VDC, two strings of 300 Ah capacity shall be provided				
6.1		d. In Type-2 Battery Bank, for 220 VDC, two strings of 50 Ah capacity shall be provided				
		e. In Type-2 Battery Bank, for 50 VDC, two				
		strings of 100 Ah capacity shall be provided				
		f. Each battery string should have its own dedicated BMS.				
		g. Refer Annexure –A for architecture				
6.2	Display	BMS shall have a display showing all measured				
0.2		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 m³ 				
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	a. BSES Logo			
		b. Property of BSES			
		c. Name of manufacturer			
		d. Name of customer			
		e. Battery Rating			
		f. PO no. & Date			
		g. Serial Number			
		h. Month & year of manufacturing			
		i. Guarantee period			
		j. Manufacturer Call center no. & email id			
		k. Weight of Panel			
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:			
		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.			



TECHNICAL SPECIFICATION FOR LI ION BATTERY BANK

b. Font: Recommended type face for the signage is
True type or Post script.
c. Font Size: All painting should be in UPPERCASE.
Recommended height of 50 mm with spacing
between alphabets of 3 mm.
d. Total No's of Character: 18
e. Height of Font: 50 mm
f. Height of Base: 100 mm
g. Spacing between alphabets: : 3 mm
h. Paint: Base coat – Dense Yellow. Letters – Black
Quick Drying paint 2 coats.

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
		accreted 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



TECHNICAL SPECIFICATION FOR LI ION BATTERY BANK

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 Sparesfor five years of operation)		Required		
13.8	Li lon drawing				
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

	I			
		Against corrosion, dampness, heavy rains,		
		breakage and vibration. During		
	Packing Protection	transportation/ transit and storage, module		
14.1	Packing Protection	may be subjected to outdoor conditions.		
		Hence, packing of each panel shall be		
		weatherproof.		
		Robust wooden non returnable packing case		
14.2	Packing for accessories and spares	with all the above protection & identification		
		Label		
	Packing Identification Label to be provided on each packing case with the following			
14.3	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

		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
15.1	Shipping	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.



TECHNICAL SPECIFICATION FOR LI ION BATTERY BANK

16 HANDLING AND STORAGE

		Manufacturer instruction shall be followed. Detail
16.1	Handling and Storage	handling & storage instruction sheet / manual needs
		to be furnished before commencement of supply.

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-lon	Li-ion		
18.3	Type/Model No.				
18.4	Cell Chemistry				
18.5	Battery nominal voltage with variation upto ±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		



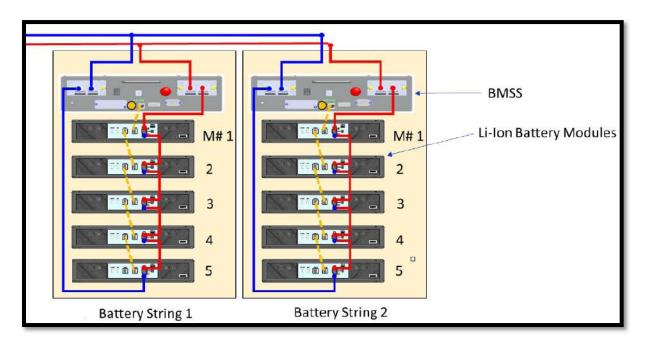
TECHNICAL SPECIFICATION FOR LI ION BATTERY BANK

	Self-discharge rate			
18.17	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	



TECHNICAL SPECIFICATION FOR LI ION BATTERY BANK

19 ANNEXURE B-BATTERY ARRANGEMENT



Battery System

BSES

Technical Specification of Power Transformer

Specification no - BSES-TS-24-TRPU-R0

Rev:		0
Date:		08 Apr 2022
Pages		90
Description of the	Abhishek Harsh	to the territory
Prepared by	Javed Ahmed	dans
	Srinivas Gopu	159. 1
Reviewed by	Abhinav Srivastava	Jamm'
Approved by	Gaurav Sharma	Ceaveau
Approved by	K. Sheshadri	Jee 00/04/22



TECHNICAL SPECIFICATION OF POWER TRANSFORMER

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	JRE – C – TECHNICAL PARTICULARS (DATA BY OWNER)	
	JRE – D – TECHNICAL SPECIFICATION FOR TRANSFORMER OIL	
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	JRE – F – SPECIFICATION FOR SILICAL GEL BREATHER	
	JRE – G – MANUFACTURING QUALITY ASSURANCE PLAN	
	JRE – H – TECHNICAL SPECIFICATION OF MATERIAL TRACKING -GPS DEVICE	
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TECHNICAL SPECIFICATION OF POWER TRANSFORMER

RECORD OF REVISION

Revision No	Item / clause no.	Nature of Change	Approved By



TECHNICAL SPECIFICATION OF POWER TRANSFORMER

1.0 SCOPE OF SUPPLY

For scope of supply, refer Annexure A

2.0 CODES & STANDARDS

Material, equipment and methods used in the manufacture of power transformer shall conform to the latest edition of following:

IS 2026	Power Transformers
IS 2026-4	Terminal Marking, tappings and Connections for Power
10 2020 4	Transformers.
IS:3347	Dimensions for Porcelain Transformer bushing
IS:3637	Gas operated relays
IS:3639	Fitting & Accessories for power transformers
IS:4201	Application guide for CT's
IS:8478	Application guide for On-load tap changer
IS:10028	Code of practice for selection, installation & maintenance of
13.10020	transformers
IS 5561	Electrical Power Connectors
IS 5	Colors for ready mix paints
IS:335	Insulating oil
IS 6272	Industrial cooling fans
IS 12615	Three phase induction motors
IS/IEC 60034	Rotating Electrical Machines. (e.g. For Cooler Fan Motors.)
IS/IEC 60071	Co-ordination of Insulation.
IS 16227/IEC 61869	Current Transformers.
IS 8468/ IEC 60214	On Load Tap Changers
IS2026-7/IEC 60076-7	Loading Guide for Oil-Immersed Power Transformers.
IS 2026-8 /IEC 60076-8	Application Guide for Power Transformers.
IS 2026-10/IEC 60076-10	Determination of Transformer Sound Levels.
IS/IEC 60529	Degrees of Protection Provided by Enclosures (IP Code).
IS/IEC 60947	Low-Voltage Switchgear and Control gear.
IS/IEC 60137	Bushing for alternating voltage above 1000V
IS:1271/IEC 60085	Thermal evaluation and classification of electrical insulation
IEC 60076	Power transformers.
IEC 60156	Method for Determination of the Electric Strength for Insulating
	Oils.
IEC 60296	Specification for Unused Mineral Insulating Oils for
	Transformers and Switchgear.
IEC 60445	Basic& Safety principles for man-machine interface, marking
	and identification, Identification of Equipment Terminals and
	conductor terminals
BS 148	Determination of Transformer and Reactor Sound Levels.



TECHNICAL SPECIFICATION OF POWER TRANSFORMER

BS 223	Application Guide for Power Transformers.
BS 2562	Terminal and Tapping Markings for Power Transformers.
	Indian Electricity Rules
	Indian Electricity Act
	CBIP manual

In the event of direct conflict between various order documents, the precedence of authority of documents shall be as follows:

- a. Guaranteed Technical Particulars (GTP)
- b. This Specification
- c. Referenced Standards
- d. Approved Vendor Drawings
- e. Other documents

3.0 MAJOR DESIGN CRITERIA & PARAMETERS OF THE TRANSFORMER

3.1	Major design criteria	
3.1.1.	Voltage variation on supply side	+ / - 10%
3.1.2	Frequency variation on supply side	+ / - 5%
3.1.2	Transient condition	- 20% or + 10% combined variation of voltage and frequency
3.1.4	Service condition	Refer Annexure C
3.1.5	Insulation level	Refer Annexure C
3.1.6	Short circuit withstand level	Refer Annexure C
3.1.7	Overload capability	Refer Annexure C
3.1.8	Noise level	Refer Annexure C
3.1.9	Radio influence voltage	Refer Annexure C
3.1.10	Harmonic currents	Refer Annexure C
3.1.11	Partial discharge	Refer Annexure C
3.1.12	Parallel operation	Shall be designed to operate in parallel with
		transformer.
	Major parameters	
	Rating	Refer Annexure C
	Voltage ratio	Refer Annexure C
3.2.3	Vector group	Refer Annexure C
3.2.4	Impedance	Refer Annexure C
3.2.5	Losses	Refer Annexure C
32.5.1	No load loss	Refer Annexure C
.32.5.2	Load losses at principal tap	Refer Annexure C
3.2.6	Temperature rise top oil	Refer Annexure C
3.2.7	Temperature rise winding	Refer Annexure C
3.2.8	Flux density	Refer Annexure C
3.2.9	Current density	Refer Annexure C
3.2.10	Tappings on HV winding	Refer Annexure C
3.2.11	Design clearances	Refer Annexure C



TECHNICAL SPECIFICATION OF POWER TRANSFORMER

4.0 CONSTRUCTION & DESIGN

4.1	Туре	ONAN/ONAF, Copper wound, three phase, oil
		immersed with on load tap changer
4.1.1	Essential provision for ONAF cooling	See note 1 of Annexure C
4.1.2	Provision of mounting cooling fan at site in future at service condition.	Required
4.1.3	Provision of replacement of cooling fan at site in future at service condition	Required
4.1.4	Fan guard if fans mounted in future.	Required
4.2	Major parts	
4.2.1	Tank	
4.2.1.1	Material of construction	Robust mild steel plate without pitting and low carbon content
4.2.1.2	Plate thickness	Adequate for meeting the requirements of pressure and vacuum type tests as per CBIP. Test will be conducted on each transformer tank for design validation.
4.2.1.3	Welding features	i) All seams and joints shall be double welded ii) All welding shall be stress relieved for sheet thickness greater than 35 mm iii) All pipes, radiators, stiffeners, welded to the tank shall be welded externally
4.2.1.4	Tank feature	 i) Adequate space at bottom for collection of sediments ii) Stiffeners provided for rigidity and Designed to prevent accumulation of water iii) No internal pockets in which gas / air can accumulate iv) No external pockets in which water can lodge v) Tank bottom with welded skid base vi) Tank cover sloped to prevent retention of rain water vii) Minimum disconnection of pipe work and accessories for cover lifting viii) Tanks shall be of a strength to prevent permanent deformation during lifting, jacking, transportation with oil filled ix) Tank to be designed for oil filling under vacuum x) Fitted with lifting lug to lift the tank cover only xi) Manhole of sufficient size required for inspection of core and winding



		vii) Oil level indicator for transportation
4.2.1.5	Flanged type adequately sized	xii) Oil level indicator for transportation
4.2.1.5	Flanged type adequately sized	i) HV line bushing
	inspection cover rectangular in	ii) LV line bushing
	shape required for	iii) LV neutral bushing and NCT connection
		iv) OLTC to winding connection from both
		sides
		v) Core assembly ear thing Inspection covers
		should be provided with jacking screws &
		handle and shall not weigh more than 25
		KG . Overall design shall be in such a way
		that there shall not be any
		hindrance/overlapping of some other
		component, in front of any of the inspection
4040	Fig. 1	covers.
4.2.1.6	Fittings and accessories on	See under fittings and accessories
400	main tank	
4.2.2	Conservator for the main tank	
4.2.2.1	Capacity	Adequate between highest and lowest visible
		levels to meet the requirement of expansion of
		oil volume in the transformer and cooling
		equipment from minimum ambient temperature
		to 100 °C
4.2.2.2	Conservator oil preservation	By flexible rubber bag (air cell) placed inside
	system	conservator
4.2.2.3	Air cell material	Special type of fabric coated with special grade
		nitrile rubber, outer surface oil resistant and
		inner surface ozone resistant
4.2.2.4	Conservator features	i) Conservator shall be bolted into position so
		that it can be removed for cleaning / other
		maintenance purposes
		ii) Main pipe from tank shall project about 20
		mm above conservator bottom for creating
		a sump for collection of impurities
		iii) Conservator minimum oil level
		corresponding to minimum temperature
		shall be well above the sump level
		iv) It shall be possible to remove and Replace
		the air cell if required
		v) Conservator to main tank piping shall be
4.2.2.5	Fittings and accessories on	supported at minimum two points.
4.2.2.3	Fittings and accessories on main tank conservator	Prismatic oil gauge with NORMAL, MINIMUM and MAXIMUM marking.
	main tank conservator	ii) End cover.
		iii) Oil filling hole with cap
		iv) Magnetic oil gauge with LOW LEVEL Alarm
		contact.
		v) Silica Gel dehydrating breather with Oil seal
		and dust filter with clear acrylic single piece
		clearly transparent cover resistant to UV
		rays.



		 vi) Drain cum filling valve (gate valve) with locking rod and position Indicator made of Brass, 25 mm with Cover plate. vii) Shut off valve (gate valve) with position indicator made of Brass Located before and after Buccholz relay, 80 mm. viii) Flange for breather connection. ix) Air release valve on conservator (gate valve) made of Brass, 25 mm with cover plate x) Air release plug as required
4.2.2.6	Essential provision for	Conservator to be mounted in such a manner
	mounting of conservator	that the top cover of the transformer can be lifted without disturbing the conservator
4.2.2.7	Essential provision for breather	 i) Breather body should be Aluminum pressure die casted, shot blasted and power coated. ii) Container and oil cup should be 143R grade UV resistant polycarbonate. iii) All gaskets should be of nitrile cork rubber. iv) Breather should be flanged type not threaded type v) Breather piping shall not have any valve placed in between vi) Breather piping from conservator shall be supported in such a manner that the maximum unsupported length of the of the breather piping shall not be more than 3 meters vii) Breather shall be removable type mounted at a height of 1400 mm from ground level. viii) Silica Gel used in breather should be of ix) ROUND BALL type & 2.5 mm dia. Breather shall be tested for 0.35 kg/cm for all joints
4.2.3	Conservator for OLTC	
4.2.3.1	Capacity	i) Adequate between highest and lowest visible levels to meet the requirement of expansion of oil volume in the OLTC from minimum ambient temperature to 100 deg cent. ii) Separate conservator to be provided for OLTC and Main tank
4.2.3.2	Conservator oil preservation system	Conventional
4.2.3.3	OLTC conservator features	Same as 4.2.2.4 except air cell features
4.2.3.4	Fittings and accessories on OLTC conservator	i) Prismatic oil gauge with NORMAL and MINIMUM marking ii) End cover



4.2.3.5	Essential provision for mounting of OLTC	 iii) Oil filling hole with cap iv) Magnetic oil gauge with LOW LEVEL Alarm contact v) Silica gel dehydrating breather with oil seal and dust filter with clear acrylic single piece clearly transparent cover resistant to UV rays vi) Drain valve (gate valve)With locking rod and position Indicator made of Brass, 25 mm with cover plate vii) Shut off valve (gate valve) with Position indicator made of Brass ocated before oil surge relay, 25 mm viii) Flange for breather connection ix) Air release plug as required OLTC conservator to be mounted in such a way that the OLTC can be inspected / maintained
	conservator	without disturbing the OLTC conservator
4.2.3.6	Essential provision for OLTC breather	 i) Breather piping shall not have any valve placed in between ii) Breather piping from conservator shall be supported in such a manner that the maximum unsupported length of the of the breather piping shall not be more than 3 meters iii) Breathers shall be removable type mounted at suitable height from ground so that it can be attended to easily for inspection / maintenance
4.2.4	Radiators	
4.2.4.1	Material	Pressed Steel
4.2.4.2	Thickness	Minimum 1.2 mm
4.2.4.3	Features	Detachable type with lifting lugs, air release plug, drain plug, isolating valve top and bottom in each radiator, Radiator support from ground if required
4.2.4.4	Essential provision if radiators mounted separately	Expansion bellow to be provided in the pipes between main tank and radiator headers
4.2.4.5	Essential provision for all type of radiators provided	Radiator header pipes shall not originate from tank top cover to make the tank top cover removable at site with minimum manpower.
4.2.5	Core	
4.2.5.1	Material	High grade, non ageing, low loss, high permeability, grain oriented, cold rolled silicon steel lamination
4.2.5.2	Grade	Premium grade minimum M3 or better
4.2.5.3	Lamination thickness	Max. 0.23 mm with insulating coating on both sides
4.2.5.4	Design flux density at rated conditions at principal tap	As per manufacturers design.



4.2.5.5	Maximum flux density at 10%	As per Annexure C , Cl. 35.0
4.2.5.6	over excitation / over fluxing Core design features	 i) Magnetic circuit designed to avoid short circuit paths within core or to the earthed clamping structure ii) Magnetic circuit shall not produce flux components at right angles to the plane of lamination to avoid local heating iii) Least possible air gap and rigid clamping for minimum core loss and noise generation iv) Adequately braced to withstand bolted faults on secondary terminals without mechanical damage and damage / displacement during transportation and positioning v) Percentage harmonic potential with the maximum flux density under any condition limited to avoid capacitor overloading in the system vi) All steel sections used for supporting the core shall be thoroughly sand blasted after cutting, drilling, welding vii) Provision of lifting lugs for core coil assembly viii) Supporting framework designed not to obstruct complete drainage of oil from transformer ix) The insulation of core to bolts and core to clamps plates shall be able to withstand a voltage of 2 kV rms for one minute, however boltless construction shall be preferred to avoid generation of hot spots and decomposition of oil as well as to reduce noise level.
4.2.6	Winding	
4.2.6.1	Material	Electrolytic Copper
4.2.6.2	Maximum current density allowed	3 A/mm ²
4.2.6.3	Winding Insulating material	Class A, non catalytic, inert to transformer oil, free from compounds liable to ooze out, shrink or collapse
4.2.6.4	Winding Insulation	Uniform
4.2.6.5	Design features	 i) Stacks of winding to receive adequate shrinkage treatment before final assembly ii) Connection braced to withstand shock during transport, switching, short circuit, or other transients. iii) Minimum out of balance force in the transformer winding at all voltage ratios. iv) Conductor width on edge exceeding six



		T
4.2.6.6	Essential provision for core	times its thickness v) Transposed at sufficient intervals. vi) Threaded connection with locking facility vii) Winding leads rigidly supported, using guide tubes if practicable viii) Winding structure and major insulation not to obstruct free flow of oil through ducts ix) Provision of taps as indicated in the technical particulars i) Core coil assembly shall be mounted on
	coil assembly	bottom of the tank. ii) Earthing of core clamping structure and earthing of magnetic circuit shall be in line with CBIP reference manuals.
4.2.7	Transformer Oil	Should be in accordance with specification as per Annex D of this document.
4.2.8	Bushings and terminations	
4.2.8.1	Type below 52 kV	Oil communicating , outdoor, removable
4.2.8.2	Type 52kv and above	Oil filled porcelin condenser & non oil communicating type with oil level gauge, oil filling plug and drain valve if not hermetically sealed, tap for capacitance and loss factor measurement, removable without disturbing bushing CT'S.
4.2.8.3	Arcing horns.	Not required.
4.2.8.4	Termination on HV side bushing	By bimetallic connectors suitable for ACSR/AAAC conductor, cable connection through cable box with disconnecting link as per annexure A Scope of Supply.
4.2.8.5	Termination on LV side bushing	Cable connection through cable box with disconnecting link as per annexure A, scope supply.
4.2.8.6	Minimum creepage distance of bushing	As per annexure C cl 38.0
4.2.8.7	Protected creepage distance	At least 50 % of total creepage distance
4.2.8.8	Continuous current rating	Minimum 20 % higher than the current corresponding to the minimum tap of the transformer.
4.2.8.9	Rated thermal short time current	As per annexure C Cl 38.0
4.2.8.10	Atmospheric protection for clamp and fitting of iron and steel.	Hot dip galvanizing as per IS 2633
4.2.8.11	Bushing terminal lugs in oil and air.	Tinner copper.
4.2.8.12	Sealing washers /gasket ring.	Nitrile rubber/ Expanded TEFLON(PTFE) as applicable
4.2.9	HV, LV, LV Neutral cable box	Required.
4.2.9.1.1	Material of construction	Sheet steel min 4.0 mm thick. Inspection covers



		shall be min 3mm thick.
4.2.9.1.2	Cable box doors (33kV and 11kV Cable boxes)	The doors should be internal anti theft hinge with minimum opening angle of 120°, minimum 3 nos. with lockable handle & with padlocking facility
4.2.9.2	Cable entry	At bottom through detachable gland plate with cable clamps of non magnetic material
4.2.93	Cable size for HV	As pe annexure C Cl 15.1
4.2.9.4	Cable size for LV	As per Annexure C CI 15.2
4.2.9.5	LV Neutral connection	As per Annexure C CI 15.3
4.2.9.6	Detachable gland plate material for HV, LV, LV Neutral box	As per GTP
4.2.9.7	Gland plate thickness for HV, LV, LV Neutral box	As per GTP
4.2.9.8	Cable gland for HV, LV, LV Neutral cables	As per GTP
4.2.9.9	Cable lug for HV& LV cables	As per CL 4.9 of this spec and suitable for cable size as per GTP
4.2.9.10	Essential parts	 ii) Disconnecting chamber ii) Flexible disconnecting link of tinned copper iii) Tinned copper busbar for Owner's cable termination with busbar supports iv) Detachable gland plate as per Schedule A GTP CI. 24.4, 24.5, 25.4, 25.5, 26.4, 26.5 v) Earthing boss for the cable box vi) Earthing link for the gasketted joints at two points for each joint vii) Earthing provision for cable armour / screen viii) Flange type Inspection cover with handle for Inspecting bushing and busbars on top as well as on front cover ix) Anti theft hinged type door with lockable handle & with padlocking facility for cable box. x) Drain plug xi) Rainhood on gasketted vertical joint xii) Danger plate made of Anodized aluminum with white letters on red background on HV and LV side fixed by rivets. xiii) Phase marking plate inside cable box near termination as well as on front cover of cable box made of anodized aluminum with black letters on satin silver background on HV and LV side fixed by rivets xiv) Support insulators for the busbars shall be epoxy resin cast type. xv) Space heaters for HV and LV cable box controlled by thermostat



4.2.9.11	Terminal Clearances	As per Annexure C technical particulars
4.2.9.12	Termination height required	Minimum 1000 mm
	for cable termination	
4.2.9.13	Essential provision for LV neutral cable box	 i) Neutral shall be outdoor type bushing OR with cable box. Box shall have adequately sized inspection cover suitable for inspection of bushings / replacement / maintenance of neutral CT. For Outdoor Bushing the NCT shall be mounted in IP55 box. ii) Knife switch with locking arrangement to be provided to disconnect the neutral from grounding. Connection from Neutral bushing to the knife switch shall be with 100x12mm Tinned copper bus bar. Bus Bar shall brought down to the bottom of the transformer supported by suitable support insulator made of epoxy resin cast (insulator shall be suitable for outdoor application suitable for connecting. iii) Knife switch shall be suitable for connecting 2 runs of 75 x 10 mm size GS strip. iv) Height of knife switch shall be at maximum 1500 mm. Housing of Knife switch shall be suitable for easy & quick operations.
4.2.10	Current Transformers	
4.2.10.1	WTI CT	As per GTP
4.2.10.1.1	Rating	As per GTP
4.2.10.1.2	Mounting	In the turret of the bushing
4.2.10.1.3	Essential provision	 i) CT mounting shall be such that CT can be replaced without removing tank cover ii) CT secondaries shall be wired upto TB with TB spec. as per Cl. 4.7of this specification
4.2.10.2	Neutral CT	
4.2.10.2.1	Туре	Cast resin
4.2.10.2.2	Rating	As per GTP
4.2.10.2.3	Location of NCT	Separate box with TB arrangement for secondary Bushing type not acceptable.
4.2.10.2.4	Essential provision	 i) CT mounting shall be such that CT can be replaced without removing the neutral cable box. ii) CT secondary shall be wired upto TB
4.2.10.2.5	Size of NCT Box	Overall size of NCT box shall not exceed 1200x600x1000 mm including canopy on top.
4.2.11	Marshalling Box Cubicle	
4.2.11.1	Material of construction	Construction of Marshalling Box should be stainless steel 304 grade (Min) with powder coating of specified color shed
4.2.11.2	Door hinges of marshalling	Required



	box should be from inner side		
	and should not be exposed to		
	rain.		
4.2.11.3	Major equipments in Marshalling box	 i) Mechanical gauge for HV and LV WTI ii) Mechanical gauge for OTI iii) Power supply unit (PSU) for remote monitoring of OTI and WTI temperatures. PSU suitable for 48V-265V AC/DC supply. iv) Make of OTI and WTI is Precimeasure 1005AH/1007H model with PSU v) Electronic OTI/WTI Scanner vi) Capillaries for WTI and OTI min 15M length vii) Control & Protection Equipment for Fan Control viii) DC contactors to be provided for all trouble free signals. Same to be wired up to the TB ix) Other panel accessories listed elsewhere 	
4.2.11.4	Gland plate	i) Min. 3 mm thick detachable with knockout 6	
4.2.11.4	Glariu piate	x 1 inch ii) Gland plate mounting should be from inside only	
4.2.11.5	Contacts wired to terminal block	i) WTI alarm and trip ii) OTI alarm and trip iii) Buchholz relay alarm and trip iv) OSR trip contacts v) MOG low level alarm vi) MOG on OLTC low level alarm vii) PRV main tank trip viii) PRV OLTC trip ix) Sudden pressure relay trip x) WTI and OTI PSU/ relay contacts of the temperature scanner. xi) Note: 2NO +2NC auxiliary contacts for all the above to be provided for customer use (By using auxiliary relay)	
4.2.11.6	Signals to be wired to terminal block	ii) WTI CT ii) NCT iii) Capillaries for WTI and OTI iv) 4 to 20 mA signals for WTI and OTI repeater located elsewhere	
4.2.11.7	Ingress protection	IP 55 plus additional rain canopy to be provided	
4.2.11.8	Welding	Continuous welding on joints, welding at regular intervals on joints and filling of gaps with use of M seal not accepted	
4.2.11.9	Cable entry	Bottom for all cables	
4.2.11.10	Panel internal Access	Front only through front door double leaf with antitheft hinges	
4.2.11.11	Pane back access	None	
4.2.11.12	Mounting of marshalling box	Separately mounted as per GTP	
4.2.11.13	Panel supply	415 V AC, Three phase, 50 Hz	



4.2.11.14	Panel accessories	i) Cubicle lamp with door switch and
7.4.11.14	i alici accessories	separate fuse / MCB
		ii) Approved space heaters controlled by
		thermostat and separate fuse / MCB
		iii) Incoming fuse switch / MCB for the
		incoming supply
		iv) Panel wiring diagram fixed on back of panel
		door on Aluminum plate engraved fixed by
		rivet
		v) Stainless steel door handle with lock &
		additional facility for padlock
		vi) Earthing boss for the marshaling box
		vii) Single phase power plug industrial type
		15/5 Amp. With MCB
		viii) Single phase preventer
4.2.11.15	Painting of marshalling box	As per Cl. 4.10 of the specification
4.2.11.16	Hardware, Gasket, Cables	As per Cl. 4.3, 4.4, 4.6, 4.7, 4.8, 4.9 of the
	and Wires, Terminal blocks,	specification respectively.
	Cable gland, Cable lugs of	
404447	marshalling box	;) 0 · · F00/ f
4.2.11.17	Fan motors control installed in	i) 2 x 50% fans
	marshalling box or separate	ii) Complete fan control with fuse switch,
	fan control cubicle	contactor, Bimetallic relay, in starter circuit
		with type 2 coordinated rating as per IS
		iii) Automatic control from WTI contact
		iv) Provision for manual control both from local/ remote.
		v) Fan Control Cubicle should be separately
		mounted.
		vi) 2RC/2RS type bearings shall be used
		instead of ball bearings.
		vii) Fan enclosure shall be perforated sheet
		with holes at motor side with ground
		support.
4.2.11.18	Control Cable Length	All the control Cable shall have minimum 15
		Meters of length for all control cable, OTI, WTI
		Capillaries and NIPFPS control cables also.
4.3	Hardware	Mo i a de la companya
4.3.1	External	M12 size & below Stainless Steel & above M12
422	Internal	Hot Dip galvanized steel.
4.3.2	Internal	Cadmium plated except special hardware for frame parts and core assembly as per
		manufacturer's design
4.3.3	Provision of fully enclosed	All Oil Surge Relays, Buchholz Relay, Pressure
7.0.0	Aluminium hoods/Canopy for	release Valve.
	following accessories of power	TOTOGOG VAIVO.
	transformer for protection	
	against water ingress.	
4.4	Gasket	
4.4.1		Nitrile rubber based
4.4.1	Gasket For transformer, OLTC	Nitrile rubber based



	chamber, PT chamber, surfaces interfacing with oil like inspection cover etc.	
4.4.2	For cable boxes, marshalling box, OLTC drive mechanism etc.	Neoprene rubber based
4.4.3	Tank top cover gasket	It shall be double O ring type sealing arrangement seating over a double groove made in transformer tank & top cover.
4.5	Valves	
4.5.1	Material of construction	Gun metal/Brass
4.5.2	Туре	Both end flanged gate valve / butterfly valve depending on application
4.5.3	Size	As per manufacture's standard
4.5.4	Essential provision	Position indicator, locking rod, padlocking facility, valve guard, cover plate.
4.6	Cable routing on Transformer	Control cable for accessories on transformer tank to marshalling box and WTI, OTI Capillaries shall be routed through perforated Covered GI trays
4.6.1	Control cable specification	 i) PVC insulated, extruded PVC inner sheathed, armoured, extruded PVC outer sheathed 1100V grade control cable as per latest edition of IS 1554 Part 1 ii) Minimum 2.5 sqmm for signals and 4 sqmm for CT with multistrand copper conductor
4.6.2	Specification of wires to be used inside marshalling box, OLTC drive mechanism.	PVC insulated multistrand flexible copper wires of minimum 2.5 sqmm size, 1100 V grade as per latest edition of relevant IS
4.6.3	Essential provision for Capillary routing from transformer to marshalling box	Routing shall be done in such a way that adequate protection is available from mechanical and fire damage.
4.7	Terminal Blocks to be used by the vendor	Nylon 66 material, minimum 6 sqmm stud type screw driver operated for control wiring and potential circuit. Terminal blocks to be located in such a way to achieve the termination height as min 250 mm from grand plate.
4.7.1	Essential provision for CT terminals	Sliding link type disconnecting terminal block screwdriver operated stud type with facility for CT terminal shorting material of housing melamine/Nylon66
4.8	Cable glands to used by the vendor	Nickel plated brass double compression weatherproof cable gland
4.9	Cable lugs to be used by the vendor	
4.9.1	For power cables	Long barrel medium duty bi-mettalic lug with knurling on inside surface
4.9.2	For control cable	Tinned copper pre insulated Pin Ring, Fork type as applicable. For CT connection ring type lug shall be used.



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4.10	Painting of transformer, conservator, OLTC, Radiator, cable boxes marshalling box.	
4.10.1	Surface preparation	By 7 tank pretreatment process or shot blasting method
4.10.2	Finish on internal surfaces of the transformer interfacing with oil	Bright Yellow heat resistance and oil resistant paint two coats. Paint shall neither react nor dissolve in hot transformer insulating oil.
4.10.3	Frame parts	Bright Yellow heat resistance and oil resistant paint two coats. Paint shall neither react nor dissolve in hot transformer insulating oil.
4.10.4	Finish on inner surface of the marshalling box	White Polyurethane paint anti condensation type two costs, minimum dry film thickness 80 microns
4.10.5	Finish on outer surface of the transformer, conservator, radiator, cable boxes, marshalling box	Smoke Grey (IS shade 692) polyurethane paint two coats, minimum dry film thickness 80 micros

5.0 MINIMUM PROTECTIVE DEVICES ON TRANSFORMER

5.1	Spring loaded with detachable diaphragm type pressure relief valve with two trip contacts for the main tank of LSM model with limit switch design IP 65 with additional rain hood. PRV Oil discharge pipe arrangement	Required
5.2	Spring loaded with detachable diaphragm type pressure relief valve with two trip contacts for OLTC of LSM model with limit switch design IP 65 with additional rain hood. Oil discharge pipe arrangement	Required
5.3	Double float bucchholz relay with alarm and trip contacts, service and test position, with test cock for the main tank, terminal box shall be IP 65 with drain plug for rainwater draining. Additional rain hood shall be provided.	Reed Switch Type shall be required
5.4	Oil surge relay with two contacts, services and test position, with test cock for OLTC tank, terminal box shall be IP 65 with drain plug for rainwater draining. Additional rain hood shall be provided.	Required
5.5	Sudden pressure relay with trip contact for the main tank	Required



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5.6	Oil temperature indicator metallic bulb type 150 mm diameter with maximum reading pointer, potential free independent adjustable alarm and trip contacts, resetting device with temperature sensing element	Required
5.7	Winding temperature indicator 150 mm diameter with maximum reading pointer, two sets of potential free independent adjustable alarm and trip contacts, resetting device with temperature sensing element, thermal image coil	Required
5.8	2 No's PT 100 sensors/RTDs for winding emperature indication wired upto TB's in marshalling box for external connection.	Required
5.9	Magnetic switching for all the protective devices including Buchholz (alarm and Trip) OSR,SPR,WTI and OTI. Mercury switching is not acceptable	Required

6.0 FITTINGS AND ACCESSORIES ON TRANSFORMER

6.1	Rating and diagram plate	Required
6.1.1	Material	Anodized aluminum 16SWG
6.1.2	Background	SATIN SILVER
6.1.3	Letters, diagram & boder	Black
6.1.4	Process	Etching
6.1.5	Name plate details	Following details shall be provided on rating and diagram plate as a minimum i) Type / kind of transformer with winding material ii) Standard to which it is manufactured iii) Manufacture's name iv) Transformer serial number v) Month and year manufacture vi) Rated frequency in Hz vii) Rated voltages in kV viii) Number of phases ix) Rated power in kVA x) Type of cooling (ONAN) xi) Rated currents in A xii) Vector group symbol xiii) 1.2/50µs wave impulse voltage withstand level in kV xiv) Power frequency withstand voltage in kV



		xv) Impedance voltage at rated current and frequency in percentage at principal, minimum and maximum tap xvi) Load loss at rated current xvii) No load loss at rated voltage and frequency xviii) Auxiliary loss xix) Continuous ambient temperature at which ratings apply in C xx) Top oil and winding temperature rise at rated load in deg C xxi) Temperature gradient of HV and LV winding xxii) Winding connection diagram xxiii) Weight of radiator xxiv) Volume and weight of oil in radiator xxv) Transport weight of transformer xxvi) Weight of core and frame xxvii) Weight of winding xxviii) Weight of core and winding xxix) Weight of tank and fittings xxx) Total weight xxxi) Volume of oil xxxii) Weight of oil xxxiii) NCT, WCT, details xxxiv) Type of OLTC xxxv) Tapping details xxxvi) Name of the purchaser xxxviii) PO no and date
6.2	Instruction plate for OLTC anodized aluminum black lettering on satin silver background fixed by rivet	xxxviii) Guarantee period Required
6.3	Oil filling instruction plate anodized aluminum black lettering on satin silver background fixed by rivet	Required
6.4	Valve schedule plate anodized aluminum black lettering on satin silver background fixed by rivet	Required
6.5	Instruction plate anodized aluminum black lettering on satin silver background for flexible air cell for oil conservator	Required
6.6	Terminal marking plate for bushing WTI, OTI & RTD anodized aluminum black lettering on satin silver background fixed by rivet	Required
6.7	Company monogram plate	Required



6.8	Lifting lugs / bollards with antiskid head to lift complete transformer with oil	Required
6.9	Lashing lug	Required
6.10	Jacking pad with Haulage hole to raise or lower complete transformer with oil	Required
6.10.1	Essential provision for jacking pads. Designed in such a way that jacking of complete transformer with oil shall be possible with 3 nos jacking pads out of 4 nos jacking pads provided as minimum	Required
6.11	Detachable bi-directional roller assembly with corrosion resistant bearing, fitting / nipple for lubrication or with permanently lubricated bearing, anti earthquake locking device. The wheels shall be capable of swiveling when transformer is lifted with provision for locking the swivel movement. Roller shall be suitable for 90 lb rail. Suitable antirolling clamp for 90 lb rail minimum 4 nos. shall be provided	Required
6.12	Pockets for OTI, WTI, & RTD on tank	Required (with one spare pocket for future use)
6.13	Pockets for ordinary thermometer on tank cover, top and bottom header of radiator, top of each radiator	Required
6.14	Ordinary thermometer 4 nos.	Required
615	Drain valve (gate valve) for the main tank, 80 mm	Required
6.16	Drain valve (gate valve) for OLTC, 50 mm	Required
6.17	Drain valve (gate valve) for all headers, 50 mm	Required
6.18	Filter valve (gate valve) at top and bottom of the main tank, 50 mm	Required
6.19	Sampling valve (gate valve) at top and bottom of the main tank, 15 mm	Required
6.20	Vacuum breaking valve (gate valve), 25 mm	Required
6.21	Drain plug on tank base	Required
6.22	Air release plug on various fitting and accessories	Required
6.23	Earthing pad on tank for transformer earthing complete with non ferrous nut, bolt, washers, spring washers	Required



	etc.	
6.24	Vacuum pulling pipe with blanking plate on main conservator pipe work	Required
6.25	Rainhood (canopy) for Buccholz relay, PRV on main transformer and OLTC, OSR relay of OLTC	Required
6.26	Rainhood for vertical gasketted joints, in cable boxes	Required
6.27	Oil level gauge on tank for transformer shipment	Required
6.28	Earthing bridge by copper strip jumpers on all gasketted joints at least two points for electrical continuity	Required
6.29	Aluminium ladder with anticlimbing device and safety flap, with lockable hinged plate for at least 1.5 m from ground level. Ladder shall be located in such a way that it avoids any hindrance to operation of nearby electrical/mechanical accessories etc.	Required
6.30	OLTC panel as specified	Required
6.31	Skid base welded type	Required
6.32	Core, frame to tank earthing	Required
6.33	Danger plate made of anodized aluminium white lettering on red background fixed by rivet	Required
6.34	Identification plate for all accessories, protective devices, instruments, thermometer / RTD pockets, earthing terminals, all inspection covers, cable boxes, marshalling boxes etc.made of anodized aluminium black lettering on silver background fixed by rivet	Required
6.35	Provision for Valves and NRV for mounting of Nitrogen fire protection System	Required
6.36	Separate structure for mounting of cooling fans	Required
6.37	Terminal box of contacts from, Core and Yoke with shorting link at top cover of Transformer	Required. The IR test will be performed on these terminals on trailer prior to unloading at site.
6.38	Aluminum ladder on transformer top cover to conservator top	Required
6.39	Space heaters with thermostat control in HV and LV cable box	Required



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7.0 OLTC

7.1	Requirement	i) For 33kV – CTR make EQ16 or equivalent.ii) For 66kV – CTR make FQ 16 or equivalent
		No in-tank OLTC acceptable.
7.2	OLTC gear location	Side mounted on conservator side not in front
		of HV bushing
7.3	Type of OLTC gear	i) The tapings shall be controlled by a high
		speed resistor transition type gear in which tap change is carried out virtually under 'no
		volt' 'no ampere' condition and the selector
		switches do not make and break any
		current, main current is never interrupted
		and a resistor is provided to limit the
		arching at diverter contacts to a minimum
		suitable for outdoor mounting and
		continuously rated for operating at all
		position including positions in the middle of tap change. In particulars, the tap change
		gear shall be suitable when delivering the
		full output plus permissible overload and
		operating the lowest voltage tap on the HV
		side.
		ii) The value of the transition resistor shall be
		indicated on the rating plate of the OLTC
		with continuous current rating with reference to design ambient temperature
		specified.
7.4	Tappings	As per Cl. 34 of Annexure C
7.5	Operation of OLTC gear	Selection of local / remote operation by selector
		switch on OLTC drive mechanism
7.5.1	local operation	From OLTC drive mechanism through pistol
		grip rotary switch as well as emergency
7.5.2	Remote operation	mechanical hand operation.
7.5.2	Remote operation	From digital RTCC provided by customer /SCADA depending on the selection of control
		on digital RTCC panel.
7.6	Safety interlocks in OLTC	Following safety interlock to be provided in
		OLTC as minimum
		i) Positive completion of tap changing step
		once initiated
		ii) Blocking of reverse tap change command during a forward tap change already in
		progress until the mechanism resets and
		vice – versa
		iii) Cutting of electrical circuits during
		mechanical operation
		iv) Mechanical stops to prevent overrunning of
		the mechanism at the end taps
		v) Interlock to avoid continuous tap change



		which will cut off motor supply in such
		events
		vi) Raise / lower command in OLTC and Digital
		relay shall be positively interlocked
7.7	Feature of OLTC	i) OLTC mechanism and associated controls
		shall be housed in an outdoor, IP 55,
		weatherproof, vermin proof and dust proof
		cabinet
		ii) It shall be ensured that oil in compartments
		containing contacts making and breaking
		current compartments containing contacts
		not making and breaking current and main
		transformer tank does not mix
		iii) The hand cranking arrangement shall be
		such that it can be operated at standing
		height from ground level
		iv) Mechanical indicator to indicate completion
		of tap change operation shall be provided
		with suitable (Green & Red) colour code to
		confirm correct method of completion of tap
		change operation
		v) Contractors shall be placed in the OLTC
		driving mechanism in such a way that the
		name-plate shall be visible on opening of
		door.
		vi) Protective cover shall be provided for raise
		and lower push buttons, external ON-OFF
		switch, which are mounted on OLTC driving
		mechanism door. This is required to
		prevent unauthorized person operating these buttons.
		vii) It shall be possible to remove the top cover of the OLTC tank without difficulty. The
		OLTC conservator, piping & oil surge relay
		shall be placed accordingly.
		viii) The tap change equipment shall be so
		designed that if the mechanism is struck in
		an intermediate position, the transformer
		shall be capable of delivering full load
		without any damage.
		ix) Limit switches may be connected in the
		control circuit of the operating motor
		provided that a mechanical de-clutching
		mechanism is incorporated. Otherwise it
		shall be directly connected to the operating
		motor circuit and mechanical stop.
		x) Thermal devices or other means shall be
		provided to protect the motor and control
		circuits
		xi) The tap changer shall be capable of
		permitting parallel operation with other
	ı	Dogo 22 of 00



		transformer for which necessary wiring and accessories, if any, shall be provided xii) The control scheme for the tap changer shall be provided for independent control of the tap changers when the transformers are in Independent service. In addition provision shall be made to enable parallel operation control also at times so that the tap changer will be operated simultaneously when oneunit is in parallel with another it will not become out of step and this will eliminate circulating current. Additional features like master /follower and visual indication during the operation of motor shall also be incorporated. xiii) OLTC shall be suitable for bi- directional power flow in transformer xiv) Mechanical indicator and operation counter shall be visible through glass window OLTC drive mechanism door xv) External ON /OFF switch in addition to door switch xvii) All mcb shall be located in such a way that they are easily replaceable. xviii) Motor protection relay shall be provided
7.8	Essential BOM for OLTC drive mechanism (indicative only,	
	bidder to provide all necessary components to complete the function of the OLTC)	ii) Local remote selector switch 1 pole, 2 way, 6A, pistol grip iii) Retaining switch raise / lower iv) Handle interlock switch v) Raise / lower switch 1 pole, 2way, 6A, pistol grip vi) Lower limit switch vii) Raise limit switch viii) Tap changer motor, 415 V AC, 3 phase, adequate rating ix) Motor protection relay with single phasing preventor x) Motor control contactors raise / lower xi) Stepping relay xii) Out of step switch xiii) Tap position indicator xiv) Operation counter xv) Emergency stop push button xvi) Tap change incomplete scheme with timer



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		xvii) Required indication lamp
7.9	Essential provision of accessories on OLTC	i) Pressure relief valve ii) Oil surge relay
7.10	Drive mechanism accessories	 i) Cubical lamp with door switch and separate fuse / MCB with external ON /OFF switch on front cover of OLTC drive mechanism ii) Approved space heaters controlled by thermostat and separate fuse / MCB iii) Incoming fuse switch / MCB for the incoming supply iv) Panel wiring diagram fixed on back of panel door aluminium engraved fixed by rivet v) Nylon 66 terminal block min 4 sqmm screw type, with 10% spare terminals vi) Stainless steel door handle with lock & additional facility for padlock vii) Earthing boss
7.11	Hardware, Gasket, Cables and Wires, Terminal blocks, Cable gland, Cable lugs of OLTC drive mechanism	As per Cl. 4.3, 4.4, 4.6, 4.7, 4.8, 4.9 of the specification respectively.
7.12	OLTC and drive mechanism painting	As per Cl. 4.10 of the specification
7.13	RTCC panel	Not in the scope of supply.

8.0 APPROVED MAKE OF COMPONENTS

8.1	CRGO	Nippon/JFE/Posco
8.2	Copper	Birla copper/Sterlite
8.3	Pre compressed Pressboard	Raman Board, Mysore/ Senapathy Whiteley
8.4	Laminated Wood	Permalli Wallance / Rochling Engineers
8.5	Oil	Apar/Savita/Raj
8.6	Condensor Bushings (OIP)	CGL/BHEL/ABB/ALSTOM
8.7	Porcelain Bushing	CJI/Jayshree Insulators/BHEL
8.8	Steel	TATA/Jindal/SAIL
8.9	Lugs/Glands	Jainson/Dowells/Comet
8.10	Radiators	CTR/Hi-Tech Radiators/Tarang Engineers
8.11	Fans	Marathon / Khaitan
8.12	Magnetic Oil Level Indicator	Sukrut /Yogna
8.13	Pressure relief valve	Sukrut / Qualitrol
8.14	Bucchholz Relay	Proyog / ATVUS
8.15	Oil surge Relay	Proyog / ATVUS



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8.16	Winding Temperature Indicator	Precimeasure / Perfect Controls /
		Pradeep sales
8.17	Oil Temperature Indicator	Precimeasure / / Perfect Controls/ Pradeep
		Sales
8.18	Sudden Pressure Relay	Sukrut / Qualitrol/ATVUS
8.19	Aircell	Sukrut(Unirub)/Pronol / Rubber Product
8.20	Neutral CT	Pragati /ECS / KAPPA/ Reputed equivalent
821	WCT	Pragati / ECS / KAPPA/ Reputed equivalent
8.22	Switch	L&T (Salzer) / Siemens
8.23	HRC Fuse Links	Siemens / L&T/GE
8.24	Fuse base	Siemens / L&T/GE
8.25	AC Contactors & O/L Relay	L&T / Siemens / Schneider
8.26	Terminals	Connectwell / Elmex
8.27	Push buttons / Actuator	L&T / Siemens
8.28	Thermostat	Velco/Girish
8.29	Heater	Velco/Girish
8.30	Voltmeter Selector Switch	Siemens/ equivalent
8.31	Control selector switch	Siemens/ equivalent
8.32	Auxiliary Relays	Jyoti / Easun Rayrole
8.33	Timers	L&T /Siemens
8.34	Tap Position Indicator	Accord
8.35	Annunciator	Accord
8.36	Digital tap change counter	Selectron
8.37	LED cluster type indication lamp	MIMIC/ Siemens/ Binay

Note – Any other make of component to be approved by Owner

9.0 QUALITY ASSURANCE

9.1	Quality assurance	To be submitted before contract award. Program shall
		contain following
		i) The structure of the organization.
		ii) The duties and responsibilities assigned to staff ensuring quality of work.
		iii) The system for purchasing, taking delivery and verification of materials.
		iv) The system for ensuring quality of workmanship
		v) The system for control of documentation



vi) The arrangements for the suppliers internal auditing vii) The system for retention of records. viii) A list of the administration and work procedures required to achieve and verify contracts quality requirements. These procedures shall be made readily available to the purchaser for inspection on request. 9.2 Quality plan To be submitted by the successful bidder for approval. Plan shall contain following as a minimum i) An outline of the proposed work and programme sequence ii) The structure of the suppliers organization for the contract. iii) The duties and responsibilities assigned to staff ensuring quality of work for the contract. iv) Hold and notification points. v) Submission of engineering documents required by the specification. vi) The inspection of materials and components on receipt vii) Reference to the suppliers work procedures appropriate to each activity viii) Inspection during fabrication /construction. ix) Final inspection and test.
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x) Successful bidders shall include submittal of Mills
invoice, Bill of lading, Mills test certificate for grade,
physical tests, dimension, specific watt loss per KG
for the core material to the purchaser for
verification in the quality plan suitably.
9.3 Manufacturing Bidder to ensure the following manufacturing areas
environment should be maintain positive atmospheric pressure,
clean, dust free (Clean room class ISO 9 or better as
per ISO 14644-1) and humid controlled environment.
i) Insulation storage
ii) Core storage
iii) Glue stacking area
iv) core cutting line
v) Winding manufacturing bay
vi) Core building area
vii) Core coil assembly area
viii) Testing lab
ix) Packing & dispatch area
9.4 Accessories environment Bidder to ensure the following accessories to be kept
in clean and coved location
i) Piping
ii) Radiators
iii) Tank
iv) Bushing (as per manufacturer's guideline)
v) Marshalling box



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		vii) Conservator viii) Insulating oil
9.5	Manufacturing Quality Assurance Plan	Refer Annexure G

10.0 PROGRESS REPORTING

10.1	Online document	To be submitted for purchaser approval for outline of production, inspection,testing,packing dispatch,documentation programme
10.2	Detailed progress report	To be submitted to the purchaser once a month containing i) Progress on material procurement ii) Progress on fabrication iii) Progress on assembly iv) Progress on internal stage inspection v) Reason for any delay in total programme. vi) Details of test failures if any in manufacturing stages. vii) Progress on final box up. viii) Constraints/ Forward path.

11.0 INSPECTION & TESTING

11.1	Inspection and Testing	
11.1.1	during manufacture Tank and conservator	 i) Check correct dimension between wheels demonstrate turning of wheels through 90 deg and further dimensional check. ii) Check for physical properties of material for lifting lugs, jacking pads etc. all load bearing welds, including lifting lug welds shall be subjected to required load tests iii) Leakage test of the conservator as per CBIP iv) Certification of all test results v) Oil leakage test on all tanks at normal head of oil plus 35 kN / sqm at the base of the tank for 24 hrs vi) Vacuum and pressure test on tank as type test as per CBIP vii) Leakage test of radiators as per CBIP.
11.1.2	Core	The below mentioned core critical points should complied by the bidder
11.1.2.1	Mother Core coil	 i) Core material shall be directly procured either from the BSES approved manufacturer or through their authorized service centre/distributor and not through any contractor. ii) Verification & inspection of the mother coil at port & putting stamp & seal may be inspected by BSES.



44 4 0 0	0	Didden should have in house a second time facility for
11.1.2.2	Core cutting	Bidder should have in house core cutting facility for
		proper monitoring & control on quality. In case it is done outside cutting shall be done in presence of BSES.
11.1.2.3	Hydraulic core lifting	Bidder should have hydraulic core lifting facility to
11.1.2.0	Trydradiio coro inting	avoid any jerk at the time of core building
11.1.2.4	Core sample type	Reconciliation of mother coil by checking stamp & seal
		at factory before slitting. One sample of CRGO to be
	testing	sealed for testing at ERDA/CPRI. Following Tests shall
		be conducted on the sample per P.O.
		i) Specific core loss measurement
		ii) Magnetic polarization
		iii) Magnetic permeability
		iv) Specific core loss measurement after accelerated
		ageing test
		v) Surface insulation resistivity
		vi) Electrical resistivity measurement
		vii) Stacking factor
		viii) Ductility(Bend test)
		ix) Lamination thickness
		x) Magnetization characteristics (B-H curve)
11.1.2.5	Core physical	i) Check on the quality of varnish if used on the
111112.0		stampings.
	verification	a) Measurement of thickness and hardness of
		varnish on stampings.
		b) Solvent resistance test to check that varnish does
		not react in hot oil.
		c) Check over all quality of varnish by sampling to
		ensure uniform hipping colour, no bare spots. No
		ever burnt varnish layer and no bubbles on
		varnished surface.
		ii) Check on the amount of burns.
		iii) Bow check on stampings.
		iv) Check for the overlapping of stampings. Corners of
		the sheet are to be apart.
		v) Visual and dimensional check during assembly
		stage.
		vi) Check on complete core for measurements of iron-
		loss and check for any hot spot by exciting the core
		so as to induce the designed value of flux density in
		the core.
		vii) Check for inter laminar insulation between core
		sectors before and after pressing.
		viii) Visual and dimensional checks for straightness and
		roundness of core, thickness of limbs and suitability



		of olompo
		of clamps.
		ix) High voltage test (2 KV for one minute) between
		core and clamps.
		x) Certification of all test results.
11.1.2.6	Documents verification	Following documents to be submitted during the stage
11.1.2.0	Boodinonie vormodion	inspection
		i) Invoice of supplier
		ļ , ·
		, ,
		iii) Packing list
		iv) Bill of lading
		v) Bill of entry certificates by customs
11.1.3	Insulating material	i) Sample check for physical properties of material
		ii) Check for dielectric strength
		iii) Visual and dimensional checks
		iv) Check for the reaction of hot oil on insulating
		materials
		v) Certification of all test results
11.1.4	Windings	i) Sample check on winding conductor for mechanical
		properties and electrical conductivity
		ii) Visual and dimensional check on conductor for
		scratches, dept. mark etc.
		iii) Sample check on insulating paper for PE value,
		bursting strength, electric strength
		iv) Check for the reaction of hot oil on insulating paper
		v) Check for the binding of the insulating paper on
		conductor
		vi) Check and ensure that physical condition of all
		materials taken for winding is satisfactory and free of
		dust
		vii) Check for absence of short circuit between parallel
		strands
		viii) Check for Brazed joints wherever applicable
		ix) Measurement of voltage ratio to be carried out when
		core / yoke is completely restocked and all
		connections are ready
		x) Certification of all test results
11.1.4.1	Checks before drying	i) Check conditions of insulation on the conductor and
	process	between the windings
		ii) Check insulation distance between high voltage
		connection cables and earthed and other live parts
		iii) Check insulation distance between low voltage
		connection cables and earthed and other parts
		iv) Insulation test of core earthing
		v) Check for proper cleanliness
		vi) Check tightness of coils i.e. no free movements
44 4 4 0	Observation desired	vii) Certification of all test results
11.1.4.2	Checks during drying	i) Measurement and recording of temperature and
	process	drying time during vacuum treatment.
		ii) Check for completeness of drying



		iii) Certification of all test result.
11.1.5	Oil	i) As per IS 335 and annexure-D ii) One sample of oil drawn from every lot of transformer offered for inspection should be tested at CPRI/ERDA for tests as listed under table 1 of IS 1866(2000). The cost of this testing should be included within the cost of transformer. Test result shall be confirming to Annexure D of this specification
11.1.6	Test on fittings and accessories	As per manufacturer's standard
11.2	Routine tests/Acceptance tests	The sequence of routine testing shall be as follows i) Visual and dimension check for completely assembled transformer ii) Measurements of voltage ratio iii) Measurements of winding resistance at principal tap and two extreme taps. iv) Vector group and polarity test v) Measurements of insulation resistance and polarization index. vi) Separate source voltage withstand test. vii) Measurements of iron losses and exciting current at rated frequency and 90%, 100% and 110% rated voltage. viii) Induced voltage withstand test. ix) Load losses measurement. x) Impedance measurement at principal tap (HV and LV) of the transformer. xi) Routine test of tanks xii) Induced voltage withstand test (to be Repeated if type tests are conducted). xiii) Measurement of iron loss (to be repeated if type tests are conducted). xiv) Measurement of capacitance and Tan Delta for for transformer winding and HV bushing (including bushing C1 and C2 Values) and Tan Delta for transformer oil (for all transformers). xv) Phase relation test, polarity, angular displacement and phase sequence. xvi) Ratio of HV WTI CT, LV WTI CT and neutral CT xvii) Excitation and knee point voltage test on class PS core of neutral CT. xviii) Routine test on on–load tap changer. xix) IR test from terminals mentioned in Clause no 6.37 xx) Oil leakage test on assembled transformer xxi) Magnetic balance test xxii) Power frequency voltage withstand test on all auxiliary circuits xxiii) Temperature rise test.



	1	
		xxv) SFRA
		xxvi) Aircell charging and discharging test
		a) Insulation resistance measurement shall be carried out at 5 kV. Value of IR should not be less than 2000M ohms. Polarization index (PI = IR10min/IR1min) should not be less than 1.5 (if one minute IR value is above 5000Mohms and it is not be possible to obtain an accurate 10 minutes reading, in such cases polarization index can be disregarded as a measure of winding condition.)
		b) Temperature rise test may be necessary to be carried out on 100% of the order quantity at the manufacturer's works or third party lab.
		c) BSES may appoint recognized testing authority like CPRI /ERDA with their instruments & engineer's team and measure no load loss, load loss and percentage impedance of the transformer at supplier's works at Vendor cost . Bidder shall agree and give them full co-operation during their stay & testing at shop floor. The losses & impedance values so obtained will be considered as final.
11.3	Type tests	On one transformer of each rating and type (In Govt. recognized independent test laboratory / Internationally accredited test lab or at manufacturer's facility if it is approved by component authority. i) Impulse withstand test on all three HV and LV limbs
		of the transformers for chopped wave as per standard ii) Temperature rise test as per IS iii) Dissolved gas analysis before and after Temperature
		Rise test to be carried out from CPRI/ERDA iv) Pressure relief device test
		v) Pressure and Vacuum test on tank(stage inspection)
11.4	Special tests	On one transformer of each rating and type i) Dynamic & Thermal short circuit test short circuit test as per IS
		ii) Measure of zero seq. impedance (CI.16.10 IS 2026 part-1)
		iii) 3) measurement of acoustic noise level (CI.16.12 IS 2026 part-1)
		 iv) Measurement of harmonic level on no load current v) High voltage withstand test shall be performed on the auxiliary equipment and wiring after complete assembly.
		vi) CRGO testing for specific core loss, accelerated ageing test, surface insulation resistivity, AC permeability and magnetization, stacking factor, ductility etc



	T	I II) OIL (I
		vii) Oil testing to be tested at CPRI/ERDA labs, whose
		samples shall be selected & sealed by customer.
		Cost of such tests, if extra, shall be quoted separately by the bidder.
11.5	In house NABL	i) Bidder should have in-house NABL accredited
	accreditation	testing facility.
		ii) NABL accreditation certificate to be submitted.
11.6	Note for special tests	Cost of the above tests, if extra, shall be quoted
	and type test	separately by the bidder which shall be considered in the
11.7	Notification to bidders	price evaluation.
11.7	Notification to bidders	The product offered must be of type tested design with valid type test report of not more than 5 years.
		In case the product offered is never type tested for tests as per above list, type tests to be conducted by bidder at his own cost at Govt. recognized independent test laboratory / Internationally accredited test lab or at manufacturer's facility if it is approved by component authority.
		Valid type test reports for dynamic short circuit test as per IS may be forwarded for customer's review and approval.
		In case the product offered is never tested for dynamic short circuit the same to be conducted by bidder at his own cost at Govt. recognized independent test laboratory/internationally accredited test lab.
11.7	Site Acceptance test	Following tests shall be conducted at BYPL site/store in presence of BYPL official. i) Insulation Resistance from terminal box mentioned in clause no 6.37. The test shall be conducted on following basis: a) The IR test will be performed on the terminals mentioned in clause no 6.37 on trailer prior to unloading at site. b) The results shall be compared with the results obtained during inspection. c) The IR value in any of the tests (Factory as well as site) should not be less than 2000M Ohm d) To access internal physical damage during transportation, Transformer will not be received if the site results are less than 2000MOhm. ii) SFRA with same kit done at factory (Instrument shall be in Vendors scope iii) Magnetic Balance test iv) Measurement of Voltage ratio
		v) Measurement of capacitance and Tan Delta for transformer winding and HV bushing (for all



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vi) transformers). vii) Vector Group and Polarity viii) Physical checks ix) Oil BDV
Note: Testing instruments shall be in scope of Vendor.

12.0 PACKING, SHIPPING, HANDLING AND STORAGE

12.1	Packing	
12.1.1	Packing protection	Against corrosion, dampness, heavy rains, breakage and vibration.
12.1.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection
12.1.3	Packing details	On each packing case details required as follows i) Individual serial number: ii) Purchaser's name: iii) PO Number: iv) Destination: v) Suppliers name: vi) Name and address of suppliers agent vii) Description and numbers of contents: viii) Manufacturers name: ix) Country of origin;: x) Case measurements: xi) Gross and net weights in kilograms xii) All necessary slinging and stacking instructions.
12.2	Shipping	The bidder shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weights, dimensions, roads culverts, overhead lines, free access etc. from the manufacturing plant to project site :and furnish to the purchaser confirmation that the proposed packages can be safely transported, as normal or oversize packages up to the plant site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the purchaser.
12.3	Handling and storage	As per manufacturers instruction.

13.0 COMMISIONING SUPPORT



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13.1	Commissioning support	Supervision of Erection and Commissioning inclusive of all testing equipments/instruments shall be included for minimum 3 days for each Transformer. It includes following:
		 i) BSES will give vendor 7 days advance notice prior to erection testing and commissioning of Transformer. ii) After successful erection testing and commissioning of Transformer Vendor shall issue erection quality check certificate to BSES.

14.0 TRAINING

14.1	Training at factory	Training on installation, commissioning, operation and
	and at site after	maintenance shall be included in the proposal.
	installation	

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. No deviation will be
		acceptable post order.

16.0 DRAWINGS AND DOCUMENTS

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. PDF shall also be provided of all documents via USB. Deviation sheet and GTP shall be provided in excel sheet. Language of the documents shall be English only. Deficient/ improper document/ drawing submission may liable for rejection.

			Afte	r Award
S.no	Documents to be submitted	With the bid	For Approval	Prior to dispatch
1	Copy of specification along with company seal & signature on each page.	✓	✓	
2	Guaranteed technical particulars	✓	✓	
3	Outine dimension drawing for each major component, general arrangement drawing showing component layout an general schematic diagrams.	✓	✓	
4	Type test certificates, where	✓	✓	



S.no			After Award	
	Documents to be submitted	With the bid	For Approval	Prior to dispatch
	available, and sample routine test reports		1.1.	
5	Detailed reference list of customers already using equipment offered during the last 5 years with particular emphasis on units of similar design and rating	✓		
6	Details of manufacturers quality assurance standard and programme and ISO 9000 series or equivalent national certification.	✓		
7	Deviations from this specification. Only deviations approved in writing before award of contract shall be accepted.	✓		
8	Recommended spare parts and consumable items for the five years of operation with prices and spare parts catalogue with price list for future requirements.	√		
9	Transport / shipping dimension and weights, space required for handling parts for maintenance	✓		
10	Write up on oil preservation system.	✓	✓	
11	Write up on OLTC.	✓	✓	
12	Quality assurance program.	✓	✓	
13	Programme for production and testing		✓	
14	General description of the equipment and all components, including brochures		✓	
15	Detailed dimension drawing for all components ,general arrangement drawing showing detailed component layout and detailed schematic and wiring drawings for all components like marshalling box and OLTC drive mechanism box.		✓	
16	Calculations to substantiate choice of electrical, structural, mechanical component size, ratings		✓	
17	Detailed loading drawing to enable the purchaser to design and construct foundations for the transformer.		✓	



	Documents to be submitted	With the bid	After Award	
S.no			For Approval	Prior to dispatch
18	Transport /shipping dimension with weights ,wheel base details, untanking height etc.		✓	
19	Terminal arrangements and cable box details		✓	
20	Flow diagram of cooling system showing no. of cooling banks		✓	
21	Drawings of major components like bushing,CT etc		✓	
22	Valve schedule diagram plate		\checkmark	
23	Instruction plate for flexible separator		✓	
24	Rating and diagram plate with OLTC connection details		✓	
25	Lists of makes of all fittings and accessories		✓	
26	Statement drawing attention to all exposed points in the equipment at which contact with or in close proximity to other metals and stating clearly what protection is employed to prevent corrosion at each point		✓	
27	Detailed installation and commissioning instructions		✓	
28	Inspection and test reports carried out in manufacturers works			✓
29	Test certificates of all bought out items.			✓
30	Operation and maintenance instructions as well as trouble shooting charts.			✓



TECHNICAL SPECIFICATION OF POWER TRANSFORMER

ANNEXURE - A - SCOPE OF SUPPLY

Design, manufacture, assembly, testing at stages of manufacture as per Cl. 11 of this specification, final testing at manufacturer works on completely assembled transformer before dispatch, packing, transportation, delivery and submission of all documentation for the Power transformer with all accessories as below and ratings & requirements as specified in Annex C.

Sr No	Description	Scope of Supply
1.0	Fully assembled transformer with all major parts like	YES
	conservator, Radiators, Marshalling box, Protective devices	
	as per Clause 5.0 of this specification, Fittings and	
	accessories as per Clause 6.0 of this specification	
1.1	OLTC as per this specification	YES
1.2	RTCC panel as per this specification	No
1.3	HV, LV ,LV NEUTRAL cable boxes	YES
1.4	Support steel material for support of cable boxes from ground	YES
1.5	Foundation Bolts for complete transformer	YES
1.6	Nickel Plated brass double compression weather proof	YES
	glands for 33kV cables	
1.7	Long barrel medium duty Aluminum lugs for power cables	YES
1.8	Nickel Plated brass double compression weatherproof glands YES	
	and tinned copper lugs for control cable termination in	
	Marshalling box for vendor's cables	
1.9	Cables and wires for transformer accessories and internal YES	
	wiring of marshalling box.	
1.10	Touch up paint, minimum 5 liters.	YES
1.11	Extra Transformer oil 10 % in non returnable drums	YES
1.12	One spare complete set of gaskets.	YES
1.13	One set (4 Nos in a set) of anti rolling clamp for 90 lb rail.	YES
1.14	Ordinary thermometers 4 Nos'	YES
1.15	Recommended spares as per manufacturer	YES
2.0	Routine testing as per Clause 11 of this specification	YES
3.0	Type testing as per Clause 11 of this specification	YES
4.0	Special testing as per Clause 11 of this specification	YES
5.0	Submission of Documentation as per clause 16 of this YES	
	specification	



TECHNICAL SPECIFICATION OF POWER TRANSFORMER

ANNEXURE - B - SERVICE CONDITIONS

1.0	Delhi Atmospheric condition	
1.1	Average grade atmosphere	Heavily polluted, dry
1.2	Maximum altitude above sea level	1000M
1.3	Ambient air temperature	50 deg C
1.4	Relative humidity	90% Max
1.5	Seismic zone	4
1.6	Rainfall	750 mm concentrated in four
		months



TECHNICAL SPECIFICATION OF POWER TRANSFORMER

ANNEXURE - C - TECHNICAL PARTICULARS (DATA BY OWNER)

Sr No	Description	Data by Owner	
1.0	Location of	OUTDOOR	
	equipment		
2.0	Reference design	40 deg C	
	ambient temperature		
3.0	Туре	Oil immersed, core type,	step down
4.0	Type of cooling	ONAN / ONAF	
5.0	Reference standard	IS: 2026	
6.0	No. of phases	3	
7.0	No. of winding per	2	
	phase		
8.0	Rated frequency (Hz)	50 Hz	
9.0	Rated voltage (kV)		
9.1	HV winding	33	66
9.2	LV winding	11	11
10.0	Vector group	Dyn11	Dyn11
	reference		
11.0	Nominal continuous		
	rating, KVA		
11.1	For 20/25 MVA		
	ONAN	20	20
	ONAF	25	25
11.2	For 25/31.5 MVA		
	ONAN	25	25
	ONAF	31.5	31.5
12.0	Impedance at		
	principal tap at rated		
	frequency with IS		
40.4	tolerance	450/ (5 0514)/4)	450/ (5. 0510)(4)
12.1	For 20/25 MVA	15% (for 25MVA)	15% (for 25MVA)
12.2	For 25/31.5 MVA	15% (for 31.5MVA)	15% (for 31.5MVA)
12.2	1 01 23/31.3 WVA	13% (101 31.3WVA)	13% (IOI 31.3WVA)
13.0	Maximum no load		
10.0	loss at rated		
	condition allowed		
	without any positive		
	tolerance kW		
13.1	For 20/25 MVA	12kW (for 25 MVA),	12kW (for 25 MVA),
13.2	For 25/31.5 MVA	14 kW (for 31.5 MVA)	14 kW (for 31.5 MVA)
14.0	Maximum load loss	, ,	
	at rated condition @		
	75 deg C and		
	principal tap allowed		
	without any positive		
	tolerance, kW		
14.1	For 20/25 MVA	85 kW (for 25MVA),	85 kW (for 25MVA),
14.2	For 25/31.5 MVA	115 kW (for 31.5 MVA	115 kW (for 31.5 MVA



15.0	Terminal connection / cable / conductor size		
15.1	HV side	33kV	66 kV
		By 2 runs of 3C X400sq mm A2XFY ,33kV(E) grade cable for 20/25 MVA.	By single /Double ACSR "ZEBRA" conductor per phase
15.2	LV side	 By 3 runs of 1C x 1000 sqmm per phase A2XY unarmoured cable 11 kV (E) grade cable (For 25MVA) By 4 runs of 1C x 1000 sqmm per phase A2XY unarmoured cable 11 kV (E) grade cable (For 31.5MVA) 	
15.3	LV neutral	By G .S. strip mim 2x75x10 mm size	By G.S. strip min 2x75x10 mm size
16.0	Highest system voltage HV side, kV	36	72.5
17.0	Highest system voltage LV side, kV	12	12
18.0	Lightning impulse withstand voltage, kV peak		
18.1	For nominal system voltage of 11 kV	75	
18.2	For nominal system voltage of 33 kV	170	
18.3	For nominal system voltage of 66 kV	325	
19.0	Power frequency withstand voltage kV rms		
19.1	For nominal system voltage of 11 kV	28	
19.2	For nominal system voltage of 33 kV	70	
19.3	For nominal system voltage of 66 kV	140	
20.0	Clearances phase to phase, mm		
20.1	For nominal system voltage of 11 kV	280	
20.2	For nominal system voltage of 33 kV	350	
20.3	For nominal system voltage of 66 kV	700	
21.0	Clearances phase to earth, mm		
21.1	For nominal system voltage of 11 kV	140	
21.2	For nominal system	320	



	voltage of 33 kV	
21.3	For nominal system	660
	voltage of 66 kV	
21.4	Ground clearance –	4000
	Live part to ground	
	for 66kV – mm	
22.0	System fault level,	1500 MVA for 33 kV
	HV side	3600 MVA for 66 kV
23.0	System fault level,	500 MVA for 11 kV
	LV side	
24.0	Short circuit	
	withstand capacity of	
	the transformer	
24.1	Three phases dead	For 3 secs.
	short circuit at	
	secondary terminal	
	with rated voltage	
	maintained on the	
24.2	other side Single phase short	For 3 secs.
24.2	circuit at secondary	FOI 3 Secs.
	terminal with rated	
	voltage maintained	
	on the other side	
25.0	System earthing	
25.1	HV	Solidly earthed
25.2	LV	Solidly earthed
26.0	Overload capability	As per IS 2026 part 7
27.0	Noise level	Shall not exceed limit as per NEMA TR- 1 with all
		accessories running measured as per IEC 551 / NEMA
		standard
28.0	Radio influence	Maximum 250 microvolt
	voltage	
29.0	Harmonic	Transformer to be designed for suppression of 3 rd , 5 th , 7 th
	suppression	harmonic voltage and high frequency disturbances
30.0	Partial discharge	10 Pico C
31.0	Temperature rise of	40 deg C
	top oil by	
20.0	thermometer	45 dog C
32.0	Temperature rise of	45 deg C
	winding by resistance	
33.0	Note for the bidders	(left blank)
34.0	Tapping to be	For 33/11 kV & 66/11kVTransformer
J -1 .0	provided on HV	+10% to -10% @step of 1.25 % 16 taps, 17 tap positions
	winding for OLTC	10 /0 to -10 /0 @3top of 1.20 /0 10 taps, 17 tap positions
35.0	Maximum flux	1.9 Tesla
00.0	density allowed in	1.0 1.00.0
	the core extreme	
	over excitation /over	
·		1



	fluxing, Tesla	
36.0	Maximum current	3.0 Amperes per sqmm @ lowest tap.
	density allowed	
37.0	AVR input voltage/	Not applicable
	Auxiliary supply	
38.0	Bushing parameters	
38.1	Rated Current for	1000 A for 33 kV bushing
	20/25 MVA Xmer	2000 A for 11kV bushing
38.2	Creepage factor for	31 mm / kV minimum
	all bushing mm /KV	
38.3	Rated thermal short	25 times rated current for 2 secs
	time current for all	
	bushing	
38.4	Angle of mounting	0 to 90 degree
38.5	Cantilever withstand	for 33 kV bushing- as per std. vendor
	load	2000N for 11kV bushing
38.6	Overall Length	for 33 kV bushing- as per std. vendor
	(Approx)	503 mm for 11 kV bushing
38.7	Diameter of base	100 mm



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ANNEXURE - D - TECHNICAL SPECIFICATION FOR TRANSFORMER OIL

Codes and standards

Latest revision of following codes and standards with all amendments-

Cl no.	Standard no	Title
1.1	IS 335	New insulating oils
1.2	IS1783	Drums for oils

2.0 Properties

Sr No	Item description	Specification requirement
2.1	Function	
2.1.1	Viscosity	
2.1.1.1	Viscosity at 40°C	15 mm ² /s, Max
2.1.1.2	Viscosity at 0°C	1800 mm ² /s, Max
2.1.2	Pour Point	- 10°C, Max
2.1.3	Water content	30 mg/Kg, Max
2.1.4	Breakdown voltage	
2.1.4.1	New unfiltered oil	30 kV, Min
2.1.4.2	After filtration	70 kV, Min
2.1.5	Density at 20°C	0.895 g/ml, Max
2.1.6	Dielectric dissipation factor at 90°C	0.005, Max
2.1.7	Particle Content	Manufacturer to specify the data
2.2	Refining/Stability	
2.2.1	Appearance of oil	Clear, free from sediment and
		suspended matter
2.2.2	Acidity	0.01 mg KOH/g, Max
2.2.3	Interfacial tension at 27°C	0.04 N/m, Min
2.2.4	Total sulphur content	Manufacturer to specify the data
2.2.5	Corrosive sulfur	Not-corrosive
2.2.6	Potentially Corrosive sulfur	Not-corrosive
2.2.7	DBDS	Not detectable (<5 mg/kg)
2.2.8	Inhibitor	Not detectable (<0.01%)
2.2.9	Metal Passivator	Not detectable (<5 mg/kg)
2.2.10	Other additives	Manufacturer to specify the data
2.2.11	2-furfural and related Compounds content	Not detectable (<0.05 mg/kg) for each individual compound
2.3	Performance	
2.3.1	Oxidation stability, test duration 164 h	
2.3.1.1	Total acidity	1.2 mg KOH/g, Max
2.3.1.2	Sludge	0.8%, Max
2.3.1.3	DDF at 90°C	0.5, Max
2.3.2	Gassing Tendency	Manufacturer to specify the data
2.3.3	ECT	Manufacturer to specify the data



2.4	Health,safety and Environment	
2.4.1	Flash point	135°C, Min
2.4.2	PCA content Max	3%, Max
2.4.3	PCB content	Not detectable (<2 mg/Kg)





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ANNEXURE - E - SPECIFICATION FOR NITROGEN INJECTION FIRE PROTECTION SYSTEM

1.0.0 SUPPLY AND SCOPE WORK

Design, manufacture, testing of the assembled system at manufacturer's works before dispatch, packing and supply at site, erection and commissioning of the Nitrogen Injection Fire Protection system

Installation testing and commissioning of Nitrogen Injection Fire Protection system shall be in scope of bidder. All material including Pipes, ducts control cables, tools, tackles, hardware, testing equipments and manpower required for the work shall be in scope of bidder except for any type of civil work like fire wall, soak pit etc. Bidder if feels shall conduct physical survey of the power transformer to check feasibility and quantum of work involved.

2.0.0 INTRODUCTION

Nitrogen Injection Fire Protection System (NIFPS) shall use nitrogen as fire quenching medium. The protective system shall prevent transformer / Reactor oil tank explosion and possible fire in case of internal faults. In the event of fire by external causes such as bushing fire, OLTC fires, fire from surrounding equipment etc, it shall act as a fast and effective fire fighter without any manual intervention. It shall accomplish its role as fire preventer and extinguisher without employing water and / or carbon dioxide.

Fire shall be extinguished within 3 minutes (Maximum) of system activation and within 30 seconds (maximum) of commencement of nitrogen injection.

3.0.0 APPLICABLE CODES AND STANDARDS

The design and installation of the complete fire protection system shall comply with the latest applicable Indian standards

- a) IS 10028 (Part II): Code of practice for selection, installation, and maintenance of transformer
- b) Tariff Advisory Committee: Regulations for the electrical equipment of buildings
- c) National fire Codes 1993 of National Fire Protection Association (NFPA) USA
- d) Central Electricity Authority, The Gazette of India, Extraordinary 2010 : Safety provisions for electrical installations and apparatus of voltage exceeding 650V

4.0.0 ACTIVATION OF THE FIRE PROTECTIVE SYSTEM

Mal-functioning of fire prevention / extinguishing system could lead to interruption in power supply. The supplier shall ensure that the probability of chances of malfunctioning of the fire protective system is practically zero. To achieve this objective, the supplier shall plan out his scheme of activating signals which should not be too



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complicated to make the fire protective system inoperative in case of actual need and should not be dependent on auxiliary power source. The system shall be provided with automatic control for fire prevention and fire extinction without any manual intervention. Besides automatic control, remote electrical push button control at Control box and local manual control in the fire extinguishing cubicle shall also be provided. The following electrical-signals shall be required for activating the fire protective system under prevention mode / fire extinguishing mode.

4.1.0 Auto Mode

4.1.1 For prevention of fire:

Differential relay operation + Buchholz relay paralleled with pressure relief valve or RPRR (Rapid Pressure Rise Relay) + Tripping of all or one circuit breakers (on HV & LV/IV side) associated with transformer / reactor is the pre-requisite for activation of system. The system shall have sufficient Input modules.

4.1.2 For extinguishing fire:

Fire detector + Buchholz relay paralleled with pressure relief valve (PRV) or sudden pressure relay (SPR) + tripping of all circuit breakers (on HV & LV/IV side) associated with transformer / reactor is the pre-requisite for activation of system.

4.2.0 Manual Mode (Local / Remote electrical)

Tripping of all circuit breakers (on HV & LV/IV side) associated with transformer/reactor is the pre-requisite for activation of system.

4.3.0 Manual Mode (Mechanical)

Tripping of all circuit breakers (on HV & LV/IV side) associated with transformer / Reactor is the pre-requisite for activation of system.

The system shall be designed to be operated manually in case of failure of power supply to fire protection system.

5.0.0 GENERAL DESCRIPTION

Nitrogen injection fire protection system should be a dedicated system for each oil filled transformer / reactor. It should have a Fire Extinguishing Cubicle (FEC) placed on a plinth at 5-7m away (as per statutory requirement) from transformer / reactor or placed next to the fire wall if fire wall exists. The FEC shall be connected to the top of transformer / reactor oil tank for depressurization of tank and to the oil pit as per Indian standard and CBIP from its bottom through oil pipes. The fire extinguishing cubicle should house a pressurized nitrogen cylinder(s) which is connected to the oil tank of transformer/reactor oil tank at bottom. The Transformer Conservator Isolation Valve (TCIV) is fitted between the conservator tank and Buchholz relay.

Cable connections are to be provided from signal box to the control box in the control room, control box to fire extinguishing cubicle, TCIV to signal box and any other wiring to ensure proper functioning of the fire protection system. Fire detectors placed on the top of transformer/reactor tank are to be connected in parallel to the signal box by Fire survival cables. Control box is also to be connected to relay panel in control room for



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receiving system activation signals. All panel or control equipments shall be fire proof so as to ensure that they do not fail themselves in event of fire.

6.0.0 OPERATION

On receipt of all activating signals, the system shall drain pre-determined volume of hot oil from the top of tank (i.e top oil layer), through outlet valve, to reduce tank pressure by removing top oil and simultaneously injecting nitrogen gas at high pressure for stirring the oil at pre-fixed rate and thus bringing the temperature of top oil layer down. Transformer conservator isolation valve blocks the flow of oil from conservator tank in case of tank rupture / explosion or bushing bursting. Nitrogen occupies the space created by oil drained out and acts as an insulating layer over oil in the tank and thus preventing aggravation of fire.

7.0.0 SYSTEM COMPONENTS

Nitrogen injection fire protection system shall broadly consist of the following components. However, all other components which are necessary for fast reliable and effective working of the fire protective system shall be deemed to be included in the scope of supply.

7.1.0 Fire Extinguishing Cubicle (FEC)

The FEC shall be made of CRCA sheet of 3 mm (minimum) thick complete with the base frame, painted inside and outside with post office red colour (shade 538 of IS-5). It shall have hinged split doors fitted with high quality tamper proof lock. The degree of protection shall be IP55. The following items shall be provided in the FEC.

- Nitrogen gas cylinder with regulator and falling pressure electrical contact manometer
- b. Oil drain pipe with mechanical quick drain valve.
- c. Control equipment for draining of oil of pre-determined volume and injecting regulated volume of nitrogen gas
- d. Pressure monitoring switch for back-up protection for nitrogen release
- e. Limit switches for monitoring of the system
- f. Butterfly valve with flanges on the top of panel for connecting oil drain pipe and nitrogen injection pipes for transformer/reactors
- g. Panel lighting (CFL Type)
- h. Oil drain pipe extension of suitable sizes for connecting pipes to oil pit.

7.2.0 Control box

Control box is to be placed in the control room for monitoring system operation, automatic control and remote operation. Control supply will be 50/220VDC (15% tolerance) based on site requirement. The following alarms, indications, switches, push buttons, audio signal etc. shall be provided.

- a. System on
- b. TCIV open
- c. Oil drain valve closed
- Gas inlet valve closed
- e. TCIV closed*



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- f. Fire detector trip *
- g. Buchholz relay trip
- h. Oil drain valve open*
- i. Extinction in progress *
- j. Cylinder pressure low *
- k. Differential relay trip
- I. PRV / SPR trip
- m . Master relay of Transformer/reactor trip
- n. System out of service *
- o. Fault in cable connecting fault fire detector
- p. Fault in cable connecting differential relay
- q. Fault in cable connecting Buchholz relay
- r. Fault in cable connecting PRV / SPR
- s. Fault in cable connecting transformer /reactor trip
- t. Fault in cable connecting TCIV
- u. Auto/ Manual / Off
- v. Extinction release on / off
- w. Lamp test
- x. Visual/ Audio alarm*
- y. Visual/ Audio alarm for DC supply fail *

Suitable provision shall be made in the control box, for monitoring of the system from remote substation using the substation automation system.

7.3.0 Transformer Conservator Isolation Valve

Transformer conservator isolation valve (TCIV) to be fitted in the conservator pipe line, between conservator and buchholz relay which shall operate for isolating the conservator during abnormal flow of oil due to rupture / explosion of tank or bursting of bushing. The valve shall not isolate conservator during normal flow of oil during filtration or filling or refilling, locking plates to be provided with handle for pad locking. It shall have proximity switch for remote alarm and indication glass window for visual inspection for physical checking of the status of valve.

The TCIV should be of the best quality as malfunctioning of TCIV could lead to serious consequence. The closing of TCIV means stoppage of breathing of transformer/reactor. Fire survival cable connecting TCIV shall be terminated in transformer marshalling box.

7.4.0 Fire detectors

The system shall be complete with adequate number of fire detectors (quartz bulb) fitted on the top cover of the transformer / reactor oil tank. The system generates signal after sensing higher temperature. The placing of fire detectors and numbers shall be designed and finalized by bidder as per requirement.

7.5.0 Signal box

It shall be mounted away from transformer / reactor main tank, preferably near the transformer marshalling box, for terminating cable connections from TCIV & firedetectors and for further connection to the control box. The degree of protection shall be IP55.



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7.6.0 Cables

Fire survival cables (capable to withstand 750° C.) of 4 core x 1.5 sq. mm size for connection of fire detectors in parallel shall be used. The fire survival cable shall conform to BS 7629-1, BS 8434-1, BS 7629-1 and BS 5839-1,BS EN 50267-2-1 or relevant Indian standards.

Fire Retardant Low Smoke (FRLS) cable of 12 core x 1.5 sq. mm size shall be used for connection of signal box / marshalling box near transformer/reactor and FEC mounted near transformer/reactor with control box mounted in control room.

Fire Retardant Low Smoke (FRLS) cable of 4 core x 1.5 sq. mm size shall be used for connection between control box to DC and AC supply source, fire extinguishing cubicle to AC supply source, signal box/ marshalling box to transformer conservator isolation valve connection on transformer/reactor.

7.7.0 **Pipes**

Heavy duty pipe connecting the transformer/reactor tank for oil rain, and for nitrogen injection shall be provided. Pipes connecting oil tank laid underground, shall be preferably be used for interconnection. Pipes, complete with connections, flanges, bends and tees etc. shall be supplied along with the system.

7.8.0 Other items

- 7.8.1 Oil drain and nitrogen injection openings with gate valves on transformer / reactor tank at suitable locations.
- 7.8.2 Flanges with dummy piece in conservator pipe between Buchholz relay and conservator Tank for fixing TCIV.
- 7.8.3 Fire detector brackets on transformer / reactor tank top cover.
- 7.8.4 Spare potential free contacts for activating the system i.e. in differential relay, Buchholz relay, Pressure Relief Device / RPRR, Circuit Breaker of transformer/reactor
- 7.8.5 Pipe connections between transformer / reactor and FEC and between FEC and oil pit required for collecting top oil.
- 7.8.6 Cabling for fire detectors mounted on transformer /reactor top cover
- 7.8.7 Inter cabling between signal box, control box and Fire Extinguishing Cubicle (FEC). All external cables from / to the system i.e. signal box to control box and control box to FEC shall be provided by the purchaser. All internal cables within the system i.e. between detectors / signal box / marshalling box / FEC / TCIV shall be in the scope of NIFPS supplier.
- 7.8.8 Butterfly valves /Gate valves on oil drain pipe and nitrogen injection pipe which should be able to withstand full vacuum.
- 7.8.9 Supports, signal box etc. which are to be painted with enamelled paint.
- 7.8.9 The doors, removable covers and panels shall be gasketted all round with neoprene gaskets.



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8.0.0 MANDATORY SPARES

Cylinder filled with Nitrogen of required capacity per substation	1 No.
Fire Detectors per transformer	3 No's.
Regulator assembly per sub-station	1 No.

9.0.0 TESTS

Reports of all type test conducted as per relevant IS/IEC standards in respect of various bought out items including test reports for degree of protection for FEC /control box / signal box shall be submitted by the supplier.

The supplier shall demonstrate the functional test associated with the following:

- Fire Extinguishing Cubicle, Control Box.
- Fire Detector.
- Transformer Conservator Isolation Valve

The performance test of the complete system shall be carried out after erection of the system with transformer at site.

10.0.0 DOCUMENTS TO BE SUBMITTED

10.1.0 To be submitted along with offer

- 10.1.1 General outline of the system.
- 10.1.2 Detailed write-up on operation of the offered protection system including maintenance and testing aspects / schedules.
- 10.1.3 Technical Data particulars (GTP), the format of which is attached in Annexure A of the specification
- 10.1.4 Data regarding previous supplies, date of commissioning, performance feedback etc.
- 10.1.5 Document related to Type test / proof of design as required by statutory body / electrical inspector

10.2.0 To be submitted after award of contract:

Detailed dimensional layout drawing of the system with complete bill of materials, clearances from ground and other live points, details of detectors, equipment layout drawings, detailed drawings pertaining to signal box, control box, FEC equipment, wiring and schemes, 4 sets of testing, commissioning, Operation and Maintenance manual along with soft copies (in CDs) shall be submitted by the supplier.

11.0.0 PACKING, SHIPPING, HANDLING & SITE SUPPORT

11.1.0	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.



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11.2.0	Packing for accessories and spares	Robust non-returnable packing case with all the above protection & identification Label. Thebidder should get the packing list approved before dispatching the material.
11.3.0	Packing Identification Label	On each packing case, following details are required:
11.3.1	Individual serial number	
11.3.2	Purchaser's name	
11.3.3	PO number (along with SAP item co	ode, if any) & date
11.3.4	Equipment Tag no. (if any)	
11.3.5	Destination	
11.3.6	Manufacturer / Supplier's name	
11.3.7	Address of Manufacturer / Supplier / it's agent	
11.3.8	Description	
11.3.9	Country of origin	
11.3.10	Month & year of Manufacturing	
11.3.11	Case measurements	
11.3.12	Gross and net weight	
11.3.13	All necessary slinging and stacking instructions	
		The seller shall be responsible for all
11.4.0	Shipping	transit damage due to improper packing.
11.5.0	Handling and Storage	Manufacturer instruction shall be followed.
11.6.0	Detail handling & storage instruction commencement of supply.	sheet / manual to be furnished before

12.0.0 DEVIATIONS

List of deviations shall be stated in writing with the tender by reference to the Specification clause / GTP/ Drawing. In absence of such a statement, requirements of the Specification shall be assumed to be met without exception by the bidder.



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ANNEXURE - F - SPECIFICATION FOR SILICAL GEL BREATHER

This specification is intended to cover the manufacturing, testing at manufacturer's works, supply and delivery of "Silica Gel Breather" to the purchaser.

1.0 Scope of Supply

Silica Gel Breather shall be as per REL specification suitable for use in Power Transformer (Main

Tank conservator & OLTC conservator) & for Distribution Transformer (Tank Conservator)

2.0 General

Silica Gel Breather offered by seller shall be suitable for continuous operation of prevailing climatic conditions as mentioned in Annexure –B

3.0 Specific Requirement

3.1 Breather

1.	Body	Aluminium pressure die caste Short Blasted &
		Powder Coated
2.	Container	Polycarbonate : 143R grade
3.	Oil Cup	Polycarbonate : 143R grade
4.	Gasket	Nitrile cork rubber for main body & oil cup
		gasket
5.	Silica Gel	Round ball type of size 2-5 mm (deep Blue)
6.	Paint	Powder Coated
7.	Mounting	Threaded for existing Transformers.
		Flanged type for New Transformers
8.	Hardware	Stainless Steel
9.	Flange Type, Size &	Flange should be of circular shape with diameter of
	hardware	& with hardware of M10 bolts.

- 3.2 The indicating grade of Silica Gel, which shall be filled in the breather, is hard Blue Round Ball with considerable absorption power of moisture & hence signaling the saturation degree by changing colour (from Blue to Pink).
- 3.3 The breather shall have clear visibility of Gel colour & of oil level with dust particles in the oil cup from distance.
- 3.4 Breather should breathe only from the inlet holes provided for breathing. Air should not enter anywhere from the body of breather.
- 3.5 Silica Seal shall be applied on gasket for better air tightening.
- 3.6 Gel removing & refilling method is specially designed to avoid skilled labour requirement at site & consequent air leakages.
- 3.7 Oil filling indicator on oil cup.

3.8 Application



TECHNICAL SPECIFICATION OF POWER TRANSFORMER

Transformer Size	Rating	Silica Gel Quantity in	KG
		Main Tank Conservator	OLTC Conservator
Power	20 & 31.5	5.0 Kg	1.0 Kg
Transformer	MVA	G C	ŭ

3.9 Silica Gel

SI. No	Properties	Requirement
1	Particle Size	Round ball type of size 2.5 mm (deep
		Blue)
2	Bulk Density	570-700 g/l
3	Moisture Adsorption Capacity 1. R.H. = 100% 2. R.H. = 50%	25 % (min)
	3. R.H. = 40%	
	4. R.H. = 20%	
4	Appearance	99.5% (min)
5	Friability	99.5% (min)
6	Chlorides percent by mass (max)	0.04%
7	Sulphates percent by mass (max)	0.5%
8	Cobalt percent by mass (max)	0.5%
9	Ammonium Compounds by mass (max)	0.001%
10	Loss on drying	4% (max)
11	pH of Aqueous extract	5-6.5%
12	Loss on Attrition	< 2.5 %

4.0 Marking

A Sticker label Indicating manufacturer's Name, Sr. No. Gel capacity etc. shall be provided at suitable place. Container may also marked with the Standard mark.

5.0 Testing

Breather container shall be suitably blanked & pressure tested with air at 0.35 Kg/cm for 30 minutes. There shall not be any leakages from gasketted joints. Test certificates from accredited laboratory shall be submitted.

6.0 Prototype

Before starting manufacture of the quantity ordered, the successful bidder shall submit a prototype for approval. Unless the prototype is inspected and approved, manufacturing shall not be started. The necessity of submitting prototype shall be ascertained before starting of manufacturing.



TECHNICAL SPECIFICATION OF POWER TRANSFORMER

7.0 Packing & Keeping Quality

The material shall be packed in clean, dry & air tight container. The material stored in original air tight containers shall continue to satisfy all the properties of Silica Gel for not less than 6 months from date of packing.

8.0 Compliance Status / Deviation

Bidder shall indicate compliance status for every requirement & feature, on the right hand side margin of the specification.

9.0 Documents Comprising The Bid

The bidder shall complete the bid proposal sheets inclusive of copy of the specification duly filled in with compliance status, quality & operational manuals, Test certificates etc.

Indicating the material to be supplied, a brief description of the goods, their quantity and prices. In absence of these documents, the offer shall be considered incomplete & may be rejected.



TECHNICAL SPECIFICATION OF POWER TRANSFORMER

ANNEXURE - G - MANUFACTURING QUALITY ASSURANCE PLAN

SL NO	COMPONENT &	CLASS	TYPE OF	QUALITY OF	REFERENCE	ACCEPTANC	FORMAT OF	A	GEN	СҮ	REMARKS
	CHARACTRISTICS		CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	М	0	
1	2	3	4	5	6	7	8		9		10
Α	RAW Material										
1	Winding Conductor (PICC)										
1.1	Bare Dimensions & Finish of Conductor	Major	Measurement	1 sample per size per lot	MFR. STD / IS 13730 Part 27	MFR. STD / IS 13730 Part 27	Supplier's TC	Р	V	R	
1.2	Increase in dimensions due to Paper covering	Major	Measurement	-DO-	-DO-	-DO-	-DO-	Р	V	R	
1.3	Resistivity @ 20°C	Major	Electrical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
1.4	No of Layers	Critical	Measurement	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
1.5	Conductor Tensile strength	Critical	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	V	R	
1.6	Conductor Elongation	Critical	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
1.7	% Overlap of Paper	Critical	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
1.8	Corner Radius	Critical	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	V	R	
1.9	Kraft Paper Insulation										
1.9.1	Thickness	Major	Measurement	1 sample per size per lot	MFR. STD/ IEC 60554	MFR. STD/ IEC 60554	Supplier's TC	Р	V	R	
1.9.2	Apparent Density	Major	Chemical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	



SL NO	COMPONENT &	CLASS	TYPE OF	QUALITY OF	REFERENCE	ACCEPTANC	FORMAT OF	A	GEN	CY	REMARKS
	CHARACTRISTICS		CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	М	0	
1	2	3	4	5	6	7	8		9		10
1.9.3	Air Permeability	Major	Chemical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
1.9.4	Tensile Index (Longitudinal and Transverse)	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	V	R	
1.9.5	Electrical Strength in Air	Major	Electrical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
1.9.6	Ash Content	Major	Chemical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
1.9.7	pH of 5% Aqueous Extract	Major	Chemical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
1.9.8	Conductivity of 5% Aqueous Extract	Critical	Chemical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
1.9.9	Moisture Content	Major	Chemical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
1.9.10	Heat Stability	Major	Chemical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
1.9.11	Degree of Polymerization	Major	Chemical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
1.9.12	Elongation (MD & CMD)	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
1.9.13	Tear index	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
2.0	CRGO Laminations (Watt absorption)										
2.1	Specific Core Loss	Major	Electrical	Random	MFR. STD/IS 3024	MFR. STD/IS 3024	Supplier's TC	Р	V	R	
2.2	Surface Insulation resistance	Major	Electrical	-DO-	-DO-	-DO-	-DO-	Р	V	R	



SL NO	COMPONENT &	CLASS	TYPE OF	QUALITY OF	REFERENCE	ACCEPTANC	FORMAT OF	A	GEN	CY	REMARKS
	CHARACTRISTICS		CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	М	0	
1	2	3	4	5	6	7	8		9		10
2.3	Ageing Test	Major	Measurement	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
2.4	Stacking Factor	Major	Measurement	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
2.5	Waviness	Major	Measurement	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
2.6	Edge Burr	Major	Visual	-DO-	-DO-	-DO-	-DO-	Р	V	R	
2.7	Sample testing for Checking Specific Core loss, accelerated ageing test, Surface insulation resistivity, AC permeability and magnetization, stacking factor, Ductility	Major	Electrical	100%	MFR. STD/IS 3024	MFR. STD/IS 3024			Р	w	Sample will be randomly selected by BSES & will be send for testing at CPRI/ERDA lab.
3.0	Un-impregnated Laminated Wood										
3.1	Thickness	Major	Visual	1 sample size / LOT	MFR.D STD/ IEC 61061	MFR.D STD/IEC 61061	Supplier's TC	Р	V	R	
3.2	Density	Major	Chemical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
3.3	Moisture Content	Major	Chemical	-DO-	-DO-	-DO-	-DO-	Р	V	R	
3.4	Oil Absorption	Major	Chemical	-DO-	-DO-	-DO-	-DO-	Р	V	R	
3.5	Cross breaking strength	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	V	R	
3.6	Compressive Strength	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	



SL NO	COMPONENT &	CLASS	TYPE OF	QUALITY OF	REFERENCE	ACCEPTANC	FORMAT OF	A	GEN	CY	REMARKS
	CHARACTRISTICS		CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	М	0	
1	2	3	4	5	6	7	8		9		10
3.7	Electric Strength in Oil	Major	Electrical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
3.8	Shrinkage in oil	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
3.9	Tensile Strength	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
4.0	Press Boards (Pre- compressed)										
4.1	Thickness	Major	Measurement	1 sample/Size/LO T	MFR. STD/ IEC 60641	MFR. STD/ IEC 60641	Supplier's TC	Р	V	R	
4.2	Tensile Strength (MD & CMD)	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	V	R	
4.3	Shrinkage in Air (MD & CMD)	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	V	R	
4.4	Moisture Content	Major	Chemical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
4.5	Oil Absorption	Major	Chemical	-DO-	-DO-	-DO-	-DO-	Р	V	R	
4.6	Electrical Strength in Oil and air	Major	Electrical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
4.7	pH of 5% aqueous extract	Major	Chemical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
4.8	Conductivity of 5% aqueous extract	Major	Chemical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
4.9	Compressibility	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
4.10	Ash Content	Major	Chemical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	



SL NO	COMPONENT &	CLASS	TYPE OF	QUALITY OF	REFERENCE	ACCEPTANC	FORMAT OF	A	3EN	CY	REMARKS
	CHARACTRISTICS		CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	М	0	
1	2	3	4	5	6	7	8		9		10
4.11	Apparent density	Major	Chemical	-DO-	-DO-	-DO-	-DO-	Р	V	R	
4.12	Elongation (MD & CMD)	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	V	R	
5.0	Tank and its accessories										
5.1	Structural steel										
5.1.1	Thickness	Major	Measurement	Random	MFR. STD / IS 2062	MFR. STD / IS 2062	Suppliers TC	Р	٧	R	
5.1.2	Yield Strength	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	V	R	
5.1.3	Tensile Strength	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	V	R	
5.1.4	Elongation	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	V	R	
5.1.5	Bend test	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	V	R	
5.2	Manufacturing of Tank and acc.										
5.2.1	Dimension check	Major	Measurement	100%	MFR. Spec/ DRG	MFR. Spec/ DRG	MFR. Fabrication report	Р	W	R	
5.2.2	Joint preparation	Major	Measurement	100%	-DO-	-DO-	-DO-	Р	V	R	
5.2.3	Assembly and alignment	Major	Visual and measurement	100%	MFR. Spec/ DRG	MFR. Spec/ DRG	MFR. Fabrication report	Р	V	R	
5.2.4	DP Test on Welds on	Major	DP Test	100%	-DO-	-DO-	-DO-	Р	W	R	



SL NO	COMPONENT &	CLASS	TYPE OF	QUALITY OF	REFERENCE	ACCEPTANC	FORMAT OF	A	GEN	CY	REMARKS
	CHARACTRISTICS		CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	М	0	
1	2	3	4	5	6	7	8		9		10
	Load bearing members eg. Jack Pads										
5.2.5	Pressure test	Major	Mechanical	On One unit	CBIP	CBIP	Test Report		Р	W	STAGE INSPECTION
5.2.6	Vacuum test	Major	Mechanical	On One unit	CBIP	CBIP	Test Report		Р	W	STAGE INSPECTION
5.2.7	Leakage test										
5.2.7.1	Main Unit	Major	Mechanical	100%	MFR. STD	MFR. STD	Test report	Р	W	R	
5.2.7.2	Conservator	Major	Mechanical	100%	MFR. STD	MFR. STD	Test report	Р	W	R	
5.2.7.3	Pipes	Major	Mechanical	100%	MFR. STD	MFR. STD	Test report	Р	W	R	
5.2.8	Surface preparation	Major	Visual	100%	MFR. STD	MFR. STD	MFR. Fabrication report	Р	V	R	
5.2.9	Final Paint Coat (including Primer), Thickness & Shade	Major	Measurement	100%	MFR. STD	MFR. STD	Test report	Р	V	R	
5.2.10	Paint Peel off test	Major	Visual	100%	MFR. STD	MFR. STD	Test report		Р	R	
6.0	Porcelain insulators										
6.1	Make and rating	Critical	Visual	100%	IS 8603/IS 2099/App.Drg.	IS 8603/IS 2099/App.Drg.	Supplier's TC	Р	V	R	
6.2	Visual inspection for surface smoothness, any	Critical	Visual	100%	-DO-	-DO-	-DO-	Р	V	R	



SL NO	COMPONENT &	CLASS	TYPE OF	QUALITY OF	REFERENCE	ACCEPTANC	FORMAT OF	A	GEN	CY	REMARKS
	CHARACTRISTICS		CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	М	0	
1	2	3	4	5	6	7	8		9		10
	damage, etc.										
6.3	Important dimension including Creepage distance	Major	Measurement	One sample /size / lot	-DO-	-DO-	-DO-	Р	V	R	
6.4	All Routine electrical tests	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	٧	R	
7.0	Magnetic Oil Gauge										
7.1	Make and dimensions	Major	Physical	100%	App.Drg./ Supplier Catalogue	App.Drg./ Supplier Catalogue	Supplier's TC	Р	V	R	
7.2	Test for level (eg at 30° Max)	Major	Mechanical	100%	-DO-	-DO-	-DO-	Р	V	R	
7.3	Switch contact test	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	٧	R	
7.4	Leakage test	Major	Mechanical	100%	-DO-	-DO-	-DO-	Р	٧	R	
7.5	Switch operating and setting	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	V	R	
7.6	Di-electric test at 2 KV AC between live terminal and body	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	V	R	
8.	Buchholz relay										
8.1	Make and type	Critical	Visual	100%	App.Drg./ Supplier Catalogue /IS 3637	App.Drg./ Supplier Catalogue /IS 3637	Supplier's TC	Р	V	R	



SL NO	COMPONENT &	CLASS	TYPE OF	QUALITY OF CHECK	REFERENCE	ACCEPTANC	FORMAT OF	A	AGENCY		REMARKS
	CHARACTRISTICS		CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	M	0	
1	2	3	4	5	6	7	8		9		10
8.2	Bore size	Major	Measurement	One/size	-DO-	-DO-	-DO-	Р	٧	R	
8.3	Porosity and element test	Major	Critical	100%	-DO-	-DO-	-DO-	Р	٧	R	
8.4	Gas volume and surge test	Major	Mechanical	One/Size	-DO-	-DO-	-DO-	Р	٧	R	
8.5	HV test at 2 KV AC & IR test	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	٧	R	
8.6	Continuity for alarm/Trip	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	V	R	
9.0	Marshalling cum cooler control box										
9.1	Dimensions	Critical	Measurement	100%	MFR. STD / App. DRG.	MFR. STD / App. DRG.	Supplier's TC	Р	W	R	
9.2	Make and rating of Components	Major	Visual	100%	-DO-	App Make	Supplier's TC	Р	W	R	
9.3	Functional test	Major	Electrical	100%	-DO-	MFR. STD / DRG	Supplier's TC	Р	W	R	
9.4	HV test at 2 KV AC for 1 min	Major	Electrical	100%	-DO-	MFR. STD / DRG	Supplier's TC	Р	W	R	
9.5	IP 55 test on marshalling cum cooler control box	Major	Environment				Test report			R	Supplier's Test certificate shall be submitted for review
10.0	Radiator										



SL NO	COMPONENT &	CLASS	TYPE OF	QUALITY OF	REFERENCE	ACCEPTANC	FORMAT OF	A	GEN	CY	REMARKS
	CHARACTRISTICS		CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	М	0	
1	2	3	4	5	6	7	8		9		10
10.1	Dimension, number of sections	Major	Measurement	100%	MFR. DRG	VTD DRG	Supplier's TC	Р	V	R	
10.2	Leakage Test with Air	Major	Visual	100%	As per CBIP	As per CBIP	Supplier's TC	Р	V	R	
10.3	Paint shade	Major	Visual & Measurement	Random	MFR. Specs /Drg	MFR. Specs /Drg	Supplier's TC	Р	V	R	
10.4	Surface Preparation	Major	Measurement	100%	SA 2.5 of ISO 8503/2	SA 2.5 of ISO 8503/2	Supplier's TC	Р	٧	R	
11	OLTC and drive mechanism										
11.1	Make, Rating and model	Major	Visual	100%	MFR. Spec/ IS 8468 /IEC 214- 1989	MFR. Spec/ IS 8468 /IEC 214-1989	Supplier's TC	Р	V	R	
11.2	Copper Contact surface finish	Major	Visual	100%	IS 8468	IS 8468	Supplier's TC	Р	V	R	
11.3	Contact Resistance test	Major	Visual	100%	Supplier's STD	Supplier's STD	Supplier's TC	Р	V	R	
11.4	Electrical Routine test	Major	Electrical	100%	IS 8468/ IEC 214	IS 8468/ IEC 214	Supplier's TC	Р	٧	R	
11.5	Mechanical test on diverter switch including pressure test	Major	Mechanical	100%	-DO-	-DO-	-DO-	Р	V	R	
11.6	HV test for Auxiliary	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	٧	R	



SL NO	COMPONENT &	CLASS	TYPE OF	QUALITY OF	REFERENCE	ACCEPTANC	FORMAT OF	A	GEN	CY	REMARKS
	CHARACTRISTICS		CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	М	0	
1	2	3	4	5	6	7	8		9		10
	circuit										
11.7	Mechanical test on Tap selector switch with motor drive	Major	Mechanical	100%	-DO-	-DO-	-DO-	Р	V	R	
11.8	Pressure test for Oil Compartment	Major	Mechanical test	100%	-DO-	-DO-	-DO-	Р	V	R	
12.0	Transformer Oil	Major	Testing	One Sample from each lot	Annexure D of BSES spec.	Annexure D of BSES spec.	STC	Р	V	R	One sample of oil shall be drawn from each lot of Transformer offered for final inspection by BSES representative and same shall be tested at CPRI/ERDA lab as per relevant std.
13.0	OTI / WTI										
13.1	Make and Model	Critical	Visual	100%	MFR. STD/App. Drg.	MFR. STD/App. Drg.	Suppliers TC	Р	Р	R	
13.2	Calibration	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	Р	R	
13.3	Check for alarm & trip	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	Р	R	



SL NO	COMPONENT &	CLASS	TYPE OF	QUALITY OF	REFERENCE	ACCEPTANC	FORMAT	A	GEN	CY	REMARKS
0_110	CHARACTRISTICS		CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	М	0	
1	2	3	4	5	6	7	8		9		10
	signal operation against set value										
13.4	HV test	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	V	R	
13.5	Switch Setting	Major	Mechanical	100%	-DO-	-DO-	-DO-	Р	Р	R	
14.0	Bushing Metal parts										
14.1	Dimension Checks	Major	Mechanical	100%	MFR. STD /IS 3347	MFR. STD /IS 3347	Supplier's TC	Р	V	R	
14.2	Surface Finish	Major	Visual	100%	-DO-	-DO-	-DO-	Р	٧	R	
15.0	Current Transformers										
15.1	Dimensions, make	Major	Measurement	100%	MFR. STD /App. DRG. / IS 2705	MFR. STD /App. DRG. / IS 2705	Supplier's TC	Р	Р	R	
15.2	Rating and terminal marking	Major	Physical	100%	MFR. APPD. DRG	MFR. APPD. DRG	Supplier's TC	Р	Р	R	
15.3	Measurement of ratio and phase angle error	Major	Electrical	100%	IS 2705	IS 2705	Supplier's TC	Р	٧	R	
15.4	High Voltage test	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	V	R	
15.5	Inter-Turn insulation test	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	V	R	
15.6	Knee Point Voltage	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	V	R	Only for CI-PS CT
15.7	Excitation Current	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	V	R	Only for CI-PS



SL NO	COMPONENT &	CLASS	TYPE OF	QUALITY OF	REFERENCE	ACCEPTANC	FORMAT OF	A	GEN	CY	REMARKS
	CHARACTRISTICS		CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	М	0	
1	2	3	4	5	6	7	8		9		10
											СТ
15.8	Secondary winding resistance	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	٧	R	Only for CI-PS CT
15.9	Polarity	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	V	R	
16.0	Valves/ Butterfly valves										
16.1	Make & operation	Critical	Visual	100%	APP.drg./MFR. STD	APP.drg./MFR . STD	Supplier's TC	Р	Р	R	
16.2	Leakage test for body	Major	Mechanical	100%	-DO-	-DO-	-DO-	Р	Р	R	
16.3	Leakage test for top spindle	Major	Mechanical	100%	-DO-	-DO-	-DO-	Р	Р	R	
16.4	Mounting dimensions	Major	Measurement	100%	-DO-	-DO-	-DO-	Р	Р	R	
16.5	Material of Body & Seat	Major	Chemical & measurement	1 sample per lot	-DO-	-DO-	-DO-	Р	٧	R	
17.0	Air Cell										
17.1	Make	Critical	Visual	100%	MFR. STD/App. drg.	MFR. STD/App. drg.	Supplier's TC	Р	V	R	
17.2	Dimensional check	Major	Measurement	100%	-DO-	-DO-	-DO-	Р	V	R	
17.3	Pressure test for 24 hrs. for leakage	Major	Mechanical	100%	-DO-	No Visible Damage	-DO-	Р	V	R	
17.4	Inflation and deflation test (10 times)	Critical	Mechanical	100%	-DO-	-DO-	-DO-	Р	V	R	



SL NO	COMPONENT &	CLASS	TYPE OF	QUALITY OF	REFERENCE	ACCEPTANC	FORMAT OF	A	GEN	CY	REMARKS
	CHARACTRISTICS		CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	М	0	_
1	2	3	4	5	6	7	8		9		10
18.0	Pressure relief Valve										
18.1	Make	Critical	Visual	100%	MFR. STD/ App. Drg.	MFR. STD/ App. Drg.	-DO-	Р	Р	R	
18.2	Operating pressure	Major	Mechanical	100%	-DO-	-DO-	-DO-	Р	Р	R	
18.3	Switch Contact test	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	Р	R	
18.4	Mounting dimensions	Major	Measurement	100%	-DO-	-DO-	-DO-	Р	٧	R	
18.5	HV test between body & terminal	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	٧	R	
19.0	Fan Motor & Cooler Fan										
19.1	Verification of Make & rating	Major	Physical	100%	MFR. STD/App. DRG.	MFR. STD/App. DRG.	Supplier's TC	Р	V	R	
19.2	Input current power speed	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	٧	R	
19.3	HV test at 2.0 KV	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	٧	R	
19.4	Insulation resistance test	Major	Electrical	100%	-DO-	-DO-	-DO-	Р	٧	R	
20.0	Gasket										
20.1	Appearance & Finish	Major	Mechanical	1 sample per size per lot	IS 4253-II, 1980	IS 4253-II, 1980	Supplier's TC	Р	V	R	
20.2	Hardness, IRHD	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	V	R	
20.3	Tensile Strength	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	V	R	



SL NO	COMPONENT &	CLASS	TYPE OF	QUALITY OF	REFERENCE	ACCEPTANC	FORMAT OF	A	GEN	CY	REMARKS
	CHARACTRISTICS		CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	М	0	
1	2	3	4	5	6	7	8		9		10
20.4	Compressibility	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
20.5	Compression set	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
20.6	Flexibility	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	Р	٧	R	
21.0	Silica gel Breather										
21.1	Type / model	Major	Visual	100%	MFR. STD /DRG	MFR. STD /DRG	Supplier's TC	Р	٧	R	
21.2	Color of Gel	Major	Visual	100%	-DO-	-DO-	-DO-	Р	V	R	
В	In Process										
1	Winding										
1.1	Check for Visual, physical and dimensional Parameters and no. of parallel conductors.										
1.1.1	Measurement of axial height, OD & ID& current density calculation.	Major	Measurement	100%	MFR. Data/Drg	MFR. Data/Drg	QC report		Р	w	
1.1.2	Copper Conductor size (Bare & covered)	Major	Measurement	100%	-DO-	-DO-	-DO-		Р	W	
1.1.3	No. of Turns / Disc	Major	Measurement	100%	-DO-	-DO-	-DO-		Р	R	
1.2	Winding height	Major	Measurement	100%	-DO-	-DO-	-DO-		Р	W	



SL NO	COMPONENT &	CLASS	TYPE OF	QUALITY OF	REFERENCE	ACCEPTANC	FORMAT OF	A	AGENCY		REMARKS
	CHARACTRISTICS		CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	M	0	
1	2	3	4	5	6	7	8		9		10
1.3	Visual inspection of Brazed joints as applicable	Major	Visual	100%	-DO-	-DO-	-DO-		Р	R	
1.4	Tap Leads termination in case of tap winding	Major	Visual	100%	-DO-	-DO-	-DO-		Р	R	
1.5	Current density calculation								Р	W	
2.0	Core Assembly										
2.1	Visual & Key Dimensional check										
2.1.1	Diagonal distance	Major	Measurement	100%	MFR.Drg	MFR.Drg	QC report		Р	W	
2.1.2	Window centre distance	Major	Measurement	100%	-DO-	-DO-	-DO-		Р	W	
2.1.3	Window height	Major	Measurement	100%	-DO-	-DO-	-DO-		Р	W	
2.2	Stack Thickness	Major	Measurement	100%	-DO-	-DO-	-DO-		Р	W	
2.3	High Voltage test at 2 KV AC for I min between core & core clamp, Yoke bolt	Major	Electrical	100%	-DO-	-DO-	-DO-		Р	w	
2.4	Pre-Core loss measurement	Major	Electrical	100%	-DO-	-DO-	-DO-		Р	w	
3.0	Core-Coil Assembly										
3.1	Top & Bottom insulation	Major	Visual	100%	MFR.Data	MFR.Data	QC report		Р	R	



SL NO	COMPONENT &	CLASS	TYPE OF	QUALITY OF	REFERENCE	ACCEPTANC	FORMAT OF	A	GEN	CY	REMARKS	
	CHARACTRISTICS		CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	M	0		
1	2	3	4	5	6	7	8		9		10	
	arrangement				/DRG	/DRG						
3.2	Lead arrangement	Critical	Visual	100%	-DO-	-DO-	-DO-		Р	R		
3.3	Tap & Lead End Brazing & Insulation	Critical	Visual	100%	-DO-	-DO-	-DO-		Р	R		
3.4	Dimension of Coil After Shrinkage	Major	Measurement	100%	-DO-	-DO-	-DO-		Р	R		
3.5	Verification of Major electrical clearances	Major	Visual & Measurement	100%	-DO-	-DO-	-DO-		Р	R		
3.6	HV/LV Connection	Major	Visual	100%	-DO-	-DO-	-DO-		Р	R		
4.0	Core-Coil Assembly Before Ovening											
4.1	Initial Ratio test	Major	Measurement	100%	-DO-	-DO-	-DO-		Р	R		
5.0	Core-coil assembly during drying											
5.1	Measurement & recording of temperature & drying time during vacuum treatment.	Major	Visual	100%	MFR.Data /DRG	MFR.Data /DRG	QC report		Р	R		
5.2	Check for completeness of drying	Major	Visual	100%	MFR.Data /DRG	MFR.Data /DRG	QC report		Р	R		
5.3	Certification of all test	Major	Visual	100%	MFR.Data /DRG	MFR.Data /DRG	QC report		Р	R		



SL NO	COMPONENT &	CLASS	TYPE OF	QUALITY OF	REFERENCE	ACCEPTANC	FORMAT OF	A	GEN	CY	REMARKS
	CHARACTRISTICS		CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	М	0	
1	2	3	4	5	6	7	8		9	•	10
6.0	Core-Coil Assembly After Ovening										
6.1	Ratio Test & Magnetic Balance test	Major	Electrical	100%	-DO-	-DO-	-DO-		Р	W	
6.2	Recording of time/Temp, Vacuum	Major	Measurement	100%	-DO-	-DO-	-DO-		Р	R	
6.3	Record of Moisture extract	Major	Measurement	100%	MFR. STD	MFR. STD	QC report		Р	R	
6.4	Verification of completeness & Drying	Major	Verify	100%	MFR. STD	MFR. STD	QC report		Р	R	
6.5	Insulation resistance measurement by Megger	Major	Electrical	100%	MFR. STD	MFR. STD	Test report		Р	R	
6.6	Earthing connection	Major	Visual	-DO-	MFR. STD	MFR. STD	QC Report		Р	R	
7.0	Tanking										
7.1	Electrical clearance arrangement	Major	Measurement	100%	MFR. DRG	MFR. DRG	QC report		Р	R	
7.2	Verification of Core- Frame Clamping arrangement	Major	Visual	100%	-DO-	-DO-	-DO-		Р	R	
7.3	Core to frame insulation resistance test & HV test at 2 KV for min	Major	Electrical	100%	-DO-	-DO-	-DO-		Р	R	



SL NO	COMPONENT &	CLASS	TYPE OF	QUALITY OF	REFERENCE	ACCEPTANC	FORMAT OF	P W	REMARKS		
	CHARACTRISTICS		CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	M	0]
1	2	3	4	5	6	7	8		9		10
8.0	Final Assembly for testing										
8.1	Fittings of external accessories	Major	Visual	100%	MFR. STD /DRG	MFR. STD /DRG	Job Card		Р	R	
8.2	Internal Oil leakage test on main unit	Major	Visual	100%	CBIP	CBIP	QC report		Р	R	
С	Final testing										
1	Routine Test										
1.1	Voltage Ratio test	Major	Electrical	100%	IS 2026	IS 2026	Test Report		Р	W	
1.2	Winding Resistance at all tap corrected to 75°C	Major	Electrical	100%	IS 2026	IS 2026	Test report		Р	W	
1.3	No Load Loss & Current @90%,100%&110% of rated voltage	Major	Electrical	100%	IS 2026	IS 2026	Test report		Р	W	To be repeated after type test.
1.4	Impedance Voltage/Short Circuit Impedance(Principal Tap) Load Loss @Principal, Max, Mini Tap	Major	Electrical	100%	IS 2026	IS 2026	Test report		Р	W	
1.5	Induced over voltage	Major	Electrical	100%	IS 2026	IS 2026	Test report		Р	w	To be repeated after Impulse test
1.6	Separate Source Voltage	Major	Electrical	100%	IS 2026	IS 2026	Test report		Р	W	



SL NO	COMPONENT &	CLASS	TYPE OF	QUALITY OF	REFERENCE DOCUMENT	ACCEPTANC E NORMS	FORMAT OF	AGENCY		CY	REMARKS
	CHARACTRISTICS		CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	М	0	
1	2	3	4	5	6	7	8		9	•	10
	Test										
1.7	Insulation Resistance &PI(10 min / 1 min)	Major	Electrical	100%			Test report		Р	W	By 5 KV Megger PI Shall be more than1.5
1.8	Voltage Vector Relationship & Polarity	Major	Electrical	100%	IS 2026	IS 2026	Test report		Р	W	
1.9	Magnetic Balance Test	Major	Electrical	100%	IS 2026	IS 2026	Test report		Р	W	
1.10	Oil leakage test	Major	Visual	100%	CBIP	CBIP	Test report		Р	W	
1.11	Auxiliary circuit insulation test for OLTC, 2.0 KV AC for 1 min	Major	Electrical	100%		Withstand 2 KV for 1 min	Test report		Р	W	
1.12	Polarity check & Ratio Test of LVWTI CT/ HVWTI CT & NCT	Major	Electrical	100%	IS 2026	IS 2026	Test report		Р	W	
1.13	Magnetic circuit Test at 2KV between Core & Frame	Major	Electrical	100%	IS 2026	IS 2026	Test report		Р	w	
1.14	Measurement of auxiliary losses(Losses taken by Fan)	Major	Electrical	100%	IS 2026	IS 2026	Test report		Р	W	
1.15	BDV test on Transformer Oil	Major	Electrical	100%	IS 2026	IS 2026	Test report		Р	W	



SL NO	COMPONENT & CHARACTRISTICS		CLASS	TYPE OF	QUALITY OF CHECK	REFERENCE	ACCEPTANC E NORMS	FORMAT OF	AGENCY		CY	REMARKS
			CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	M	0		
1	2	3	4	5	6	7	8		9		10	
1.16	Routine Test on Tank	Major	Electrical	100%	IS 2026	IS 2026	Test report		Р	W		
1.17	Power frequency withstand on auxiliary circuit	Major	Electrical	100%	IS 2026	IS 2026	Test report		Р	W		
1.18	Measurement of Cap & tandelta of Wdg, Oil and HV bushing	Major	Electrical	100%			Test report		Р	W		
1.19	Excitation & Knee point Vol. of PS Core of NCT.	Major	Electrical	100%	IS 2026	IS 2026	Test report		Р	W		
1.20	Routine (Functional) Test on OLTC	Major	Electrical	100%	IS 2026	IS 2026	Test report		Р	W		
1.21	SFRA	Major	Electrical	100%	IS 2026	IS 2026	Test report		Р	W		
2.0	Type test (One unit of each	h type and	rating of Transf	former)				•	•			
2.1	Heat Run Test (Temp. Rise Test)	Major	Testing	One Unit	IS 2026	IS 2026	Test Report		Р	W		
2.2	Impulse withstand Test on all HV & LV Limb for Chopped wave.	Major	Testing	One Unit	IS 2026	IS 2026	Test Report		Р	W		
2.3	DGA Test Before & After temperature rise	Major	Testing	One Unit	Relevant std.	Relevant std.	Test Report		Р	W		
2.4	Pressure relief device test	Major	Testing	One Unit	MFR. STD	MFR. STD	Test Report		Р	W		
3.0	Other test											



SL NO	COMPONENT &	CLASS	TYPE OF	QUALITY OF	REFERENCE DOCUMENT	ACCEPTANC E NORMS	FORMAT OF	AGENCY		СҮ	REMARKS	
	CHARACTRISTICS		CHECK	CHECK	DOCUMENT	E NORMS	RECORD	S	М	0		
1	2	3	4	5	6	7	8		9		10	
3.1	Marshalling cum cooler control box											
3.1.1	BOM verification	Major	Verification	100%	App MFR.Drg	App MFR.Drg	QC report		Р	W		
3.1.2	Operation / Continuity of Wiring with OTI, WTI operation & other accessories	Major	Electrical	100%	MFR. STD	MFR. STD	QC report		Р	w		
3.1.3	2 KV (HV test) on Marshalling cum cooler control box	Major	Electrical	100%	MFR. STD	MFR. STD	QC report		Р	w		
3.1.4	Operation of Instruments(BR)	Major	Electrical	100%	MFR. STD	MFR. STD	QC report		Р	W		
3.1.5	Visual & Dimensional check	Major	Measurement	100%	APPD MFR.Drg.	APPD MFR.Drg.	QC report		Р	W		
4.0	Special Test (One unit of	each type	and rating of Trai	nsformer)		•			•	•		
4.1	Zero Phase Sequence Test	Major	Testing	One Unit	IS 2026	IS 2026	Test Report		Р	W		
4.2	Noise Level Test	Major	Testing	One Unit	NEMA TR-1	NEMA TR-1	Test Report		Р	W		
4.3	No Load Harmonic Test	Major	Testing	One Unit	IS 2026	IS 2026	Test Report		Р	W		
4.4	HV Test on all auxiliary equipment and wiring after complete assembly	Major	Testing	One Unit			Test Report		Р	w		



TECHNICAL SPECIFICATION OF POWER TRANSFORMER

SL NO	COMPONENT &	CLASS	TYPE OF CHECK			ACCEPTANC E NORMS	FORMAT OF	AGENCY		CY	REMARKS
	CHARACTRISTICS		CHECK	CHECK		E NORIVIS	RECORD	S	M	0	
1	2	3	4	5	6	7	8		9		10
D	Dispatch & Packing										
1.1	Identification & packing	Major	Visual	100%	As per packing list	As per packing list	Packing List		Р		
1.2	Check for proper Packing	Major	Visual	100%	As per packing list	As per packing list	Packing List		Р		
1.3	Visual check before dispatch	Major	Visual	100%	As per packing list	As per packing list	Packing List		Р		

LEGEND:

S: Supplier
M: Main Contractor (Manufacturer)

O: Owner (BYPL)

P - Perform

V - Verify

R – Review

W- Witness



BSES-TS-13-CRDT-R0

TECHNICAL SPECIFICATION FOR POWER TRANSFORMER

ANNEXURE - H - TECHNICAL SPECIFICATION OF MATERIAL TRACKING -GPS DEVICE

Supply of GPS Device shall be in Vendors scope, however it shall be returned to Vendor once Goods are received.

Detailed requirement of GPS Device is as below:

Once the material is dispatched after Final clearance Transport Vehicle shall have GPS Tracking Device and status of dispatch of material shall be sent to all the stake holders via SMS thru GPS Device.

Approve make is Map my India Asset Tracking device.



TECHNICAL SPECIFICATION OF POWER TRANSFORMER

SCHEDULE - A -GUARANTEED TECHNICAL PARTICULARS (DATA BY SELLER)

Sr.No.	Particular	Specified / Required	Offered
1.0	General		
1.1	Make		
1.2	Type	As per Annexure C of specification	
2.0	Nominal continuous rating, KVA		
2.1	ONAN	As per Cl 11.1 of Annexure C	
2.2	ONAF	As per Cl 11.2 of Annexure C	
3.0	Rated voltage (KV)		
3.1	HV winding	As per CI 9.1 of Annexure C	
3.2	LV winding	As per CI 9.2 of Annexure C	
4.0	Rated current (Amps)		
4.1	HV winding, ONAN / ONAF		
4.2	LV winding , ONAN / ONAF		
5.0	Connections		
5.1	HV winding	As per Annexure C of specification	
5.2	LV winding	As per Annexure C of specification	
5.3	Vector group reference	Dyn11	
6.0	Impedance at principal tap rated current and frequency%	- J	
6.1	Impedance (%)	As per Cl. 12.0 of Annexure C	
6.2	Reactance (%)		
6.3	Resistance (%)		
6.4	Impedance at lowest tap rated current and frequency		
6.5	Impedance at highest tap rated current and frequency		
6.6	Transformer X/R ratio		
7.0	Resistance of the winding at 75°C at principal tap (ohm)		
7.1	a) HV		
7.2	b)LV		
8.0	Zero sequence impedance (Ohm)		
8.1	a) HV		
8.2	b) LV		
9.0	Guaranteed maximum losses at principal tap at full load and 75° C without any positive tolerance kW		
9.1	No load losses (max.)	As per Cl 13.0 Annexure C	
9.2	Load losses (max.)	As per Cl 14.0 Annexure C	
9.3	Cooler fan losses (max.)	·	
9.4	Total I ² R losses of windings @ 75 deg C		
9.5	Total stray losses @ 75 deg C		



9.6	Total losses (max.)		
9.7	No load loss at maximum		
9.1	permissible voltage and frequency		
	(approx.) kW		
10.0	Temperature rise over reference		
10.0	design ambient of 40 °C		
10.1	Top oil by thermometer ^o C	40° C	
10.2	Winding by resistance ^o C	45° C	
10.3	Winding gradient at rated current	140 0	
10.0	°C		
10.3.1	HV		
10.3.2	LV		
11.0	Efficiency		
11.1	Efficiency at 75° C and unity		
	power factor %		
11.1.1	At 110% load		
11.1.2	At 100% load		
11.1.3	At 80% load	Not less than 99.5 %	
11.1.4	At 60% load		
11.1.5	At 40% load		
11.1.6	At 20% load		
11.2	Efficiency at 75 ⁰ C and 0.8 power		
	factor lag %		
11.2.1	At 110% load		
11.2.2	At 100% load		
11.2.3	At 80% load		
11.2.4	At 60% load	Not less than 99.5 %	
11.2.5	At 40% load		
11.2.6	At 20% load		
11.3	Maximum efficiency %		
11.4	Load and power factor at which		
	Max efficiency occurs		
12.0	Regulation (%)		
12.1	Regulation at full load at 75° C		
12.1.1	At unity power factor		
12.1.2	At 0.8 power factor lagging		
12.2	Regulation at 110% load at 75 ^o C		
12.2.1	At unity power factor		
12.2.2	At 0.8 power factor lagging		
13.0	Tapping		
13.1	Type		
13.2	Capacity	As non American O of the office the	
13.3	Range-steps x % variation	As per Annexure C of specification	
13.4	Taps provided on HV winding	Yes	
14.0	(Yes/No)		
14.0	OLTC gear		
14.1	Make		
14.2	Type Poterance and		
14.3	Reference std		



14.4	No of compartment		
14.5	Mounting arrangement	Side mounted type although External	
		Intank Type is also preferable	
14.6	Rated current Amp		
14.7	Rated step capacity, kVA		
14.8	Short circuit withstand for 2 secs,		
	kA		
14.9	Time required for one step change		
	sec.		
14.10	Rated voltage for motor, V AC		
14.11	Rating of motor		
14.12	Rated voltage for auxiliaries V		
14.13	Consumption of auxiliaries		
14.14	OLTC features as per		
	specification, Yes/No		
14.15	Does the overload rating of OLTC		
	match with that of the transformer		
10.0	under all conditions Yes/No		
16.0	Cooling system	A A	
16.1	Type of cooling	As per Annexure C of specification	
16.2	No. of cooling unit groups		
16.3	Capacity of cooling units		
16.4	Mounting of radiators		
16.5	Number of radiators and Size		
16.6	Type & size of radiator header main valve		
16.7	Type & size of individual radiator		
10.7	valve		
16.8	Total radiating surface, sq mm		
16.9	Thickness of radiator tubes, mm	Minimum 1.2 mm	
16.10	Schematic flow diagram of the	TVIIIIITGITI 1.2 IIIII	
10.10	cooling system furnished (Yes/No)		
16.11	Type and make of Fan motor		
16.12	No. of fan motor per bank		
	(Working + Standby)		
16.13	Rated Power Input (kW)		
16.14	Rated Voltage, Speed of Motor		
16.15	Efficiency of motor at Full load(%)		
16.16	Locked Rotor current(Amps)		
17.0	Details of tank		
17.1	Material	Robust mild steel plate without pitting and	
		low carbon content	
17.2	Thickness of sides mm		
17.3	Thickness of bottom mm		
17.4	Thickness of cover mm		
17.5	Confirmation of tank designed and		
	tested for vacuum pressure (Ref:		
	CBIP manual) (Yes/No)		
17.5.1	Vacuum mm of Hg. / (kN/m²)	As per CBIP	



Pressure mm of Hg	Twice the normal head of oil / normal	
_	pressure + 35 kN/m ² whichever is lower,	
	As per CBIP	
Is the tank lid slopped?	Yes	
Inspection cover provided (Yes/No)		
Location of inspection cover (Yes/No)		
Min. dimensions of inspection cover (provide list of all inspection cover with dimension), mm x mm		
Core		
Type:	Core	
	Premium grade minimum M3 or better	
Thickness of lamination mm	Max. 0.23 mm with insulating coating on	
Insulation between core lamination		
Design flux density of the core at rated condition at principal tap,Tesla		
Maximum flux density allowed in the core at extreme overexcitation / overfluxing, Tesla		
Equivalent cross section area of core, mm ²		
Guaranteed No load current at 90% / 100% / 110% rated voltage & frequency (Amp)	@ 100% - 0.5% of RFLC @ 110% - 1.0% of RFLC	
HV		
LV		
Conductor material	Electrolytic copper as per relevant standard	
Maximum current density allowed, Amp per mm ²	As per Annexure C	
Gauge/area of cross section of conductor, mm ²		
HV		
LV		
Maximum current density achieved in winding (LV/HV/HVT) — Amps/ mm²		
HV turn		
HV-LV		
	Is the tank lid slopped? Inspection cover provided (Yes/No) Location of inspection cover (Yes/No) Min. dimensions of inspection cover (provide list of all inspection cover with dimension), mm x mm Core Type: Core material grade Thickness of lamination mm Insulation between core lamination Design flux density of the core at rated condition at principal tap,Tesla Maximum flux density allowed in the core at extreme overexcitation / overfluxing , Tesla Equivalent cross section area of core, mm² Guaranteed No load current at 90% / 100% / 110% rated voltage & frequency (Amp) HV LV Type of winding HV LV Conductor material Maximum current density allowed, Amp per mm² Gauge/area of cross section of conductor, mm² HV LV Maximum current density allowed, Amp per mm² Gauge/area of cross section of conductor, mm² HV LV Insulating material HV turn LV turn LV turn LV-core	Is the tank lid slopped? Is the tank lid slopped? Inspection cover provided (Yes/No) Location of inspection cover (Yes/No) Min. dimensions of inspection cover (Yes/No) Core Insulation between core lamination mm Max. 0.23 mm with insulating coating on both sides Insulation between core lamination Design flux density of the core at rated condition at principal tap, Tesla Maximum flux density allowed in the core at extreme overexcitation / overfluxing , Tesla Equivalent cross section area of core, mm² Guaranteed No load current at 90% / 100% / 110% rated voltage & frequency (Amp) HV LV Conductor material Electrolytic copper as per relevant standard Maximum current density allowed, Amp per mm² Gauge/area of cross section of conductor, mm² HV LV Maximum current density achieved in winding (LV/HV/HVT) — Amps/ mm² Insulating material HV turn LV turn LV turn LV turn LV- core



19.8	Insulating material thickness, mm		
19.8.1	HV turn		
19.8.2	LV turn	-	
19.8.3	LV to core		
19.8.4	HV to LV		
20.0	Minimum design clearance , mm		
20.1	HV to earth in air		
20.1	HV to earth in oil		
20.3	LV to earth in air		
20.4	LV to earth in oil	<u> </u>	
20.5	Between HV & LV in Air		
20.6	Between HV & LV in oil		
20.7	Top winding and yoke	<u> </u>	
20.8	Bottom winding and yoke		
21.0	Insulating oil		
21.0	Quantity of oil Ltrs	-	
21.1.1	In the transformer tank		
21.1.1	In each radiator		
21.1.2	In OLTC chamber		
21.1.4	Total quantity		
21.1.4	10% excess oil furnished?	Yes	
21.3	Type of oil	New insulating oil as per IS: 335, latest	
21.5	Type of oil	edition and CI. 4.2.7 of the specification	
21.4	Oil preservation system provided	Calcorrana Cr. 1.2.7 Cr trio openication	
	(Yes/No)		
22.0	Bushing		
22.1	Make		
22.2	Type		
22.3	Reference standard		
22.4	Voltage class, kV		
22.4.1	HV side bushing		
22.4.2	LV side line and neutral bushing		
22.5	Creepage factor for all bushing	As per Annexure C of specification	
	mm / kV		
22.6	Rated current , Amp		
22.6.1	HV bushing		
22.6.2	LV line and neutral bushing		
22.7	Rated thermal short		
	current		
22.7.1	HV bushing	As per Annexure C of specification	
22.7.2	LV line and neutral bushing	As per Annexure C of specification	
22.8	Weight Kg		
22.8.1	HV bushing		
22.8.2	LV line and neutral bushing		
22.9	Free space required for bushing		
	removal, mm		
22.9.1	HV bushing		
22.9.2	LV line and neutral bushing		



23.0	Terminal connections			
23.1	HV	As per Annexure C o	f specification	
23.2	LV	As per Annexure C o		
23.3	LV Neutral	As per Annexure C o		
24.0	H.V. Cable box/Terminals	7 to per 7 timexare 0 0	repeaneation	
24.1	Suitable for cable/conductor type	As per Annexure C o	f specification	
Z-T. I	size	713 per 7 illiexare 0 0	1 Specification	
24.2	Termination height , mm	1000 mm , minimum		
24.3	Gland plate dimension mm x mm	1000 mm , mmmam		
24.4	Gland plate material	Aluminium		
24.5	Gland plate thickness , mm	5 mm minimum		
24.6	Phase to clearance inside box /	J IIIII IIIIIIIIII		
24.0	terminals, mm			
24.7	Phase to earth inside box /			
27.1	terminals, mm			
24.8	Cable box door arrangement as			
27.0	per clause 4.2.9.2			
25.0	L.V line side cable box			
25.1	Suitable for cable type , size	As per Annexure C o	f specification	
25.2	Termination height, mm	1000 mm , minimum	representation	
25.3	Gland plate dimension mm x mm	1000 mm , mmmam		
25.4	Gland plate material	Aluminum		
25.5	Gland plate thickness , mm	5 mm minimum		
25.6	Phase to clearance inside box /	3 min minimum		
23.0	terminals, mm			
25.7	Phase to earth inside box , mm			
25.8	Cable box door arrangement as			
	per clause 4.2.9.2			
26.0	LV Neutral cable box			
26.1	Suitable for cable type , size	As per Annexure C o	f specification	
26.2	Termination height, mm	'		
26.3	Gland plate dimension mm x mm			
26.4	Gland plate material	Aluminum		
26.5	Gland plate thickness , mm	5 mm minimum		
26.6	Phase to clearance inside box,			
	mm			
26.7	Phase to earth inside box , mm			
27.0	Marshalling box cubical provided			
-	as per clause no. 4.2.11 of spec.			
	(Yes / no)			
27.1	Mounting of marshalling box	Separate mounted		
28.0	Neutral Current Transformer			
	(NCT)			
28.1	Type			
28.2	Make			
28.3	Reference standard			
28.4	Rated Voltage	12kV		
28.5	CT Ratios	20/25 MVA, Dyn11	25/31.5 MVA,	
_		, , ,	Dyn11	



		Core 1	Core 2	Core 1	Core 2
		1600/1	1600/1A	1600-	1600-
		A	1000/17	2000/1	2000/1 A
		^		A	2000/174
28.6	Burden ,VA	_	20	-	20
28.7	Class of Accuracy	PS	5P20	PS	5P20
28.8	KPV , volts , minimum	40(Rct	-	40(Rct+	-
20.0	ixi v , voits , illillillidill	+8)		8)	
28.9	Resistance, ohm @ 75 deg C, maximum	1	-	1	-
28.10	Magnetizing current @ Vk/4, mA, maximum	30	-	100	-
28.11	Short time withstand current	26.3 kA	for 3 sec.		
29.0	Winding current transformer				
	(WCT)				
29.1	Type				
29.2	Make				
29.3	Reference standard				
29.4	CT ratio				
29.5	Burden ,VA		turer Std.		
29.6	Class of accuracy	Manufac	turer Std.		
30.0	Pressure release device				
30.1	Minimum pressure the device is				
	set to rupture				
30.1.1	For main tank				
30.1.2	For OLTC				
31.0	Alarm and trip contact ratings of protective devices				
31.1	Rated/making/ breaking currents , Amp @ voltage for				
31.1.1	PRV for main tank				
31.1.2	PRV for OLTC				
31.1.3	Buchholz relay				
31.1.4	Oil surge relay for OLTC				
31.1.5	Sudden pressure relay				
31.1.6	OTI				
31.1.7	WTI				
31.1.8	Magnetic oil gauge				
32.0	Fittings accessories each				
	transformer furnished as per				
	clause No. (Bidder shall attach				
	separate sheet giving details,				
	make and bill of materials)				
33.0	Painting: as per clause for the				
	transformer , cable boxes,				
	radiator, marshalling box, etc				
	(Yes/No)				
34.0	Over all transformer dimensions				
34.1	Length , mm	6.5 metr	es maximum	1	Dogo 95 of 00



34.2	Breadth , mm	5.0 metres maximum	
34.3	Height, mm	5.0 metres maximum	
35.0	Transformer tank dimensions	5.0 metres maximum	
35.0	Length , mm		
35.1			
	Breadth , mm		
35.3	Height, mm		
36.0	Marshalling box dimensions		
36.1	Length , mm		
36.2	Breadth , mm		
36.3	Height, mm		
37.0	Weight data		
37.1	Core, kG		
37.2	Frame parts, kG		
37.3	Core and frame, kG		
37.4	Total winding, kG		
37.5	Core and frame winding, kG		
37.6	Tank, kG		
37.7	Tank lid, kG		
37.8	Empty conservator tank , kG		
37.9	Each radiator empty , kG		
37.10	Total weight of all radiator empty ,		
	kG		
37.11	Weight of oil in tank , kG		
37.12	Weight of oil in each conservator,		
	kG		
37.13	Weight of oil in each radiators , kG		
37.14	Total weight of oil in radiator , kG		
37.15	OLTC gear including oil , kG		
37.16	Total transport weight of the		
	transformer , kG		
37.17	Total transport weight of the		
	transformer with OLTC and all		
	accessories		
38.0	Volume data		
38.1	Volume of oil in main tank , liters		
38.2	Volume of oil between highest and		
	lowest levels of main conservator		
	,liters		
38.3	Volume of oil between highest and		
	lowest levels of OLTC		
	conservator, liters		
38.4	Volume of oil in each radiator ,		
	liters		
38.5	Total volume of oil in radiators ,		
	liters		
38.6	Volume of oil in OLTC , liters		
38.7	Transformer total oil volume, liters		
39.0	Shipping data		



39.1	Weight of heaviest package, kG	
39.2	Dimensions of the largest package	
	(L x B x H) mm	
40.0	Tests	
40.1	All in process tests confirmed as	
	per Cl. (Yes /No)	
40.2	All types tests confirmed as per	
	CI. (Yes /No)	
40.3	All in routine tests confirmed as	
	per Cl. (Yes /No)	
40.4	All in special tests confirmed as	
	per Cl. (Yes /No)	



TECHNICAL SPECIFICATION OF POWER TRANSFORMER

SCHEDULE - B -GUARANTEED TECHNICAL PERTICULARS OF TRANSFORMER OIL

Bidder to submit hard copy duly filled & signed along with techno commercial offer. Bidder to submit separate GTP for each type of insulating oil

S no	Item description	Specification requirement	Data by Vendor
1.0	Manufacturer Name		
1.1		Address	
1.2		Contact person	
1.3		Contact telephone no	
2.0	Function		
2.1	Viscosity		
2.1.1	Viscosity at 40°C	15 mm ² /s, Max	
2.1.2	Viscosity at 0°C	1800 mm ² /s, Max	
2.2	Pour Point	- 10°C, Max	
2.3	Water content	30 mg/Kg, Max	
2.4	Breakdown voltage		
2.4.1	New unfiltered oil	30 kV, Min	
2.4.2	After filtration	70 kV, Min	
2.5	Density at 20°C	0.895 g/ml, Max	
2.6	Dielectric dissipation factor at 90°C	0.005, Max	
	·	Manufacturer to	
2.7	Particle Content	specify the data	
3.0	Refining/Stability	1	
		Clear, free from	
3.1	Appearance of oil	sediment and	
		suspended matter	
3.2	Acidity	0.01 mg KOH/g, Max	
3.3	Interfacial tension at 27°C	0.04 N/m, Min	
0.4	Total a laboration	Manufacturer to	
3.4	Total sulphur content	specify the data	
3.5	Corrosive sulfur	Not-corrosive	
3.6	Potentially Corrosive sulfur	Not-corrosive	
		Not detectable (<5	
3.7	DBDS	mg/kg)	
		Not detectable	
3.8	Inhibitor	(<0.01%)	
		Not detectable (<5	
3.9	Metal Passivator	mg/kg)	
		Manufacturer to	
3.10	Other additives	specify the data	
		Not detectable	
3.11	2-furfural and related Compounds	(<0.05 mg/kg) for	
	content	each individual	
	Somone	compound	
4.0	Performance	Compound	



4.1	Oxidation stability, test duration 164 h	
4.1.1	Total acidity	1.2 mg KOH/g, Max
4.1.2	Sludge	0.8%, Max
4.1.3	DDF at 90 ^o C	0.5, Max
4.2	Gassing Tendency	Manufacturer to specify the data
4.3	ECT	Manufacturer to specify the data
5.0	Health,safety and Environment	
5.1	Flash point	135 ^o C, Min
5.2	PCA content Max	3%, Max
5.3	PCB content	Not detectable (<2 mg/Kg)



TECHNICAL SPECIFICATION OF POWER TRANSFORMER

SCHEDULE - C-RECOMMENDED SPARES (DATA BY SUPPLIER)

List of recommended spares as following –

Sr No	Description of spare part	Unit	Quantity
1		No	
2		No	
3			
4			
5			
6			
7			



Technical Specification

Of

Insulated Floor Coating

Specification no - BSES-TS-75-INFC-R0

Rev:		0
Pages:		1 of 7
Date:		06 May 2022
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TECHNICAL SPECIFICATION OF INSULATED FLOOR COATING

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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	 a. The Insulating coating shall be self-levelling, solvent free, and have high breakdown voltage, loaded with special insulating additives. b. The material of the insulating floor shall be epoxy resin. c. It shall be resistant to chemicals and oils. d. It shall be tough, wear & weather resistant. e. It shall exhibit high build, high adhesion with smooth and glossy finish and slip resistant. f. It shall be easy to apply/install, clean and repair on floors.
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 n	ame	
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 s	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.	
Detail handling & storage instruction sheet / manual to commencement of supply.		struction sheet / manual to be furnished before	

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

EARTHING PRACTICE IN GRID SUBSTATION

PREPARED BY	REVIEWED BY	A	PROVED BY	REV	0
d Shirt	Paristr	7	tent		DATE
A.H	G.S		A.A		18/10/2017



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1. SCOPE

This specification covers the guidelines of earthing at 66/11, 33/11, 66/33/11 kV Grid substation and the technical requirements of material required for earthing.

2. STANDARDS & CODES

2.1.	CEA guidelines	Technical standards for construction of electrical plants and electrical lines
2.2.		IE Rules of 1956
2.3.	IEEE Std 80	IEEE guide for safety in AC substation grounding
2.4.	CBIP :2006 – publication no. 229	Manual on substation layout
2.5.	IS 3043: 1987	Code of practice for earthing
2.6.	IS 2629 (1985)	Recommended practice for hot dip galvanizing of Iron & Steel
2.7.	IS 2633 (1986)	Method for testing uniformity of coating on zinc coated article
2.8.	IS 5358 (1969)	Specification for hot dip galvanized coating on fasteners
2.9.	IS 4759 (1996)	Specification of Hot dip zinc coatings on structural steel and other allied products
2.10.	IS 1239 (2004)	Steel tubes, tubular and other wrought steel fittings- specification
2.11.	IEC 62561-2	Requirements for conductors and earth electrodes
2.12.	IEC 62561-7	Requirements for earthing enhancing compounds
2.13.	UL 467	Standard for safety - Grounding and bonding equipment
2.14.		Handbook on Electrical Earthing (Ministry of Railways)



3. REQUIREMENT OF EARTHING

2.1	Primary guidelines	Following are primary guidelines for a good earthing system in a Grid
3.1.		substation: a. The impedance to ground should be as low as possible. In general it should not exceed 0.5 ohm .
		b. The step and touch potentials shall be within safe limits.
		c. The contractor shall do the calculation for number of earthing
		rods being used in a substation for achieving the desired earth
	Conthing lood sing	resistance.
3.2.	Earthing lead size	 The actual size of earthing lead will depend on the maximum fault current which the earthing lead will be required to carry safely.
		b. Please refer Annexure A1 for HT fault level.
	Earthing type	a. Rod earthing shall be provided for the Grid substation.
3.3.	3,1	b. The size of the rod depends upon the current to be carried and the type of the soil. Soil resistivity testing will be carried out by vendor.
		c. The Earth Electrode should be embedded vertically. Wherever hard rock is encountered, the rod can be inclined at an angle of
		about 30deg to the horizontal as per clause 9.2.2 of IS 3043.
		d. The vertically driven rods shall be interconnected with each
		other using horizontal grid conductors.
3.4.	Earth Pit	 As per clause 20.5.2 of IS 3043, the minimum distance between the vertical earth electrodes shall not be less than the length of rod.
		 Minimum of 1m distance of earth pit from electrical equipment and structures shall be maintained.
		c. The earth pits shall be backfilled with earth enhancing material as per Drawing .
		d. Treated Earth pits shall be used where earth resistance value is getting over the prescribed value in specification i.e. 0.5 ohms.
3.5.	Horizontal Conductor	 The entire earth rod driven in ground vertically shall be interconnected with earth grid conductors horizontally under the ground.
		b. The Horizontal conductors shall be laid 600 mm below FGL.
		c. Minimum earth coverage of 300 mm shall be provided between
		the Horizontal conductor and the bottom of
		trench/foundation/underground pipe at the crossing.
		d. Horizontal conductors around a building /switchyard fence shall be buried outside the boundary at a minimum distance of 2000
		mm. e. Risers shall be provided 300mm above the ground level for
		equipment earthing. Two number earth pits shall be provided with riser for connection of transformer neutral.
		f. All the joints between rods flats shall be exothermic type for
		creating better electrical contact between two. Welding between
		rods to flat, flat to flat should be arc welding type.
		g. Wherever bolted connection is done, it shall be done through
		two bolts at each joint to ensure tightness and avoid loosening
	Facilia na a nati e e este tre es	with passage of time.
	-authment corthing	La La ctrine chall be used for the equipment carthing
3.6.	Equipment earthing	a. GI strips shall be used for the equipment earthing.b. Two separate and distinct earth connections shall be provided



C	
	arc welding arrangement; connection of equipment with earthing
	end shall be double bolted arrangement.
	grounding conductors connected to two separate earth pits.
	Fence within the earth grid shall be bonded to the plant earth
	system at regular interval not exceeding 10 meters. Fence gate
	shall be separately earthed with flexible connection to permit
	movement.
	Bolted connection shall be made only for earthing of
	equipment/devices and for some removable structures. The
	contact surfaces shall be thoroughly cleaned before connection
	to ensure good electrical contact.
	. Cable armor shall be earthed at both ends for multi core cables.
	For single core cables, the earthing shall be at switchgear end
	only.
h	. Metallic stairs and hand rails shall be earthed as for columns.
	Additionally a 25x6 GI flat shall run the entire length of the stairs.
	The GI flat shall be welded to the stairs and hand rails at
	intervals of 1500 mm.
i.	
	/walls/trays by welding /clamping at the intervals not exceeding
	1500 mm. The earth conductors shall be interconnected
	between them and to the main earth grid through risers.

4. SPECIFICATION OF EARTHING MATERIALS

4.1.	GI earthing strip	a. b. c. d.	Fully galvanized iron strips shall be used conforming to IS 2629. The zinc deposition shall not be less than 610gm/sqm of the galvanized surface area of the MS Earthing strips. The zinc coating used for the galvanization shall be of 9.99 % purity grade as per IS 209. All the galvanized material shall be checked for uniformity and weight as per IS. The standard length of galvanized iron earthing strip shall be
4.2.	Vertical and Horizontal Earth Electrode	a. b. c. d. e. f.	minimum 7Mtrs. Copper clad steel rod driven in the earth vertically shall be a high tensile-low carbon steel rod of adequate diameter(as per the clause 6.0 of the specs) and 3 m length complying UL467, IEC62561-2 and IS 3043, molecularly bonded by 99.99% pure high conductivity copper on the outer surface with copper coating thickness 254 microns or more with sufficient amount of earth enhancement compound as per IEC 62561-7. Copper bonding must be UL/CPRI/ERDA certified. Rod shall be tested and certified from CPRI/ERDA for a short circuit current withstanding of desired value. There shall be following marking on the rod-Dimension Detail, product model no, Reference number of certification. It shall have high corrosion resistance and shall eliminate electrolytic action. The rod shall have thread profile at both the ends to ensure no copper is removed from the steel.



		a.	It shall be as per IEC 62561-7.
4.3.		b.	It shall be chemically inert to subsoil.
		C.	It shall not pollute the environment. The RoHS certificate shall
			be provided from any NABL accredited lab for not having any
			toxic chemical in earth enhance material.
		d.	It shall provide a stable environment in terms of physical and
			chemical properties and exhibit low resistivity.
	Earth enhancing	e.	The earthing enhancing compound shall not be corrosive to the
	compound		earth electrodes being used.
		f.	It shall be maintenance free.
		g.	The earth enhancement material shall be supplied in sealed,
			moisture proof bags. These bags shall be marked with
			manufacturer's name or trade name, quantity, batch no. & date
			of manufacturer, resistivity, Buyer's name, PO no. & date.
		h.	As per IEEE 80-2013 clause 14.5 d, grounding material shall be
			tested and certified for resistivity less than 0.12 Ω-m.

5. SIZES OF THE EARTHING MATERIALS FOR EQUIPMENT EARTHING

S.No.	Title	Material	Sizes of the earthing	Туре	UOM	No of Lead
	Main Earthing Grid					
5.1	Vertical Rods	Cu Bonded Rods	25	Rod	mm (dia)	
5.2	Above Ground risers	GI	50x10	Flat	sqmm	2
5.3	Horizontal Rods	Cu Bonded Rods	25	Rod	mm (dia)	
5.4	Treated Earth Pit	Cu Bonded Rods	25	Rod	mm (dia)	
	Power Transformers					
5.5	Frame	GI	75X10	Flat	sqmm	2
5.6	Marshalling Box	GI	50X6	Flat	sqmm	2
5.7	Radiator	GI	50X6	Flat	sqmm	2
5.8	Neutral	GI	65x10	Flat	sqmm	2
5.9	Fan	GI		As per size	es mentioned for t	fans
	11 KV System					
5.10	11 KV Swithcgear	GI	50X6	Flat	sqmm	2



5.11	11 KV Bus Duct	GI	50X6	Flat	sqmm	2
5.12	11 KV Cable Box	GI	50X6	Flat	sqmm	2
	415 V System					
5.13	ACDB	GI	50X6	Flat	sqmm	2
5.14	Station Trafo Frame	GI	50X6	Flat	sqmm	2
	DC System					
5.15	Battery Charger	GI	50X6	Flat	sqmm	2
5.16	DCDB	GI	50X6	Flat	sqmm	2
	Other Electrical Items					
5.17	Three phase receptacles, welding outlet	GI	25x3	Flat	sqmm	1
5.18	C&R Panel	GI	50X6	Flat	sqmm	2
5.19	Push Button	GI	8	Wire	swg	1
5.20	Cable Trays(one run along the tray section)	GI	50X6	Flat	sqmm	1
	Other Non Electrical Items					
5.21	Railway Tracks	GI	25x6	Flat	sqmm	At suitable Points
5.22	Metallic noncurrent carrying structures like stair case	GI	25x6	Flat	sqmm	1
5.23	Columns, Structures	GI	50X6	Flat	sqmm	2
5.24	Steel pipe racks	GI	25x6	Flat	sqmm	1
5.25	Fence/Gate	Gl	50X6	Flat	sqmm	At suitable Points(2 min)
5.26	Hand Rail	GI	8	Wire	swg	1



6. TESTING AND INSPECTION

6.1.	Earthing materials	a.	The purchaser reserves the right to inspect the material at the time of tests. All tests shall be performed in the presence of BYPL representative. The bidder shall give intimation in advance to witness the test.
		b.	Acceptance test for GI earthing strips – Tests for Visual examination, dimensional verification and galvanization shall be witnessed at the time of inspection.
		C.	Acceptance test of Earth enhancement compound – Tests for leaching, sulphur determination, corrosion and resistivity shall be done as per IEC 62561-7
		d.	Type test reports of the earthing materials from CPRI/ERDA/Equivalent lab shall be submitted. The bidder shall submit UL-467/CPRI/ERDA test reports for copper clad steel rod.
6.2.	Measurement of Earth resistance	a.	After the completion of work ground resistance of each installation shall be measured by BYPL/Contractor.
0.2.	Latinesistance	b.	The measurement of resistance shall be witnessed and signed by representative of BYPL as well as the contractor. The test certificates shall be generated for each installation clearly indicating the details of the transformer, name of the substation, location, district, serial no. of testing equipment and name of testing engineer.
		C.	The desire ground resistance shall be measured after interconnection of earth pits is completed. The value of earth resistance shall not be more than 0.5 ohm .
		d.	In case where this value exceeds 0.5 ohms, the earthing design shall be redesigned. The pit location, earth electrode, soil treatment, earth conductor, GI strip used shall be checked whether properly used at site. If not, these shall be changed as per the redesigned plan.

7. DEVIATIONS

	Deviation	Deviations from this Specification shall be stated in writing with the
7.1.		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.



8. DOCUMENTS SUBMISSION

The bidder has to submit the following documents along with bid:-

8.1.	Complete earthing calculation
8.2.	Complete product catalogue, Manual and calibration certificate of the equipment
8.3.	Type test reports
8.4.	Deviation Sheet (if any)

9. GUARANTEED TECHNICAL PARTICULARS

S. No	Parameter	BYPL Requirement	Vendor Data
9.1	Rod to rod welding	Exothermic	
9.2	Zinc deposition of GI earthing Strip	610gm/sqm	
9.3	Length of GI Strip	7m (Minimum)	
9.4	Diameter of Cu clad Rod	25 mm	
9.5	UL/CPRI/ERDA Certification of Cu Bonding	Test certificate to be provided	
9.6	Cu bonding	250 Micron	
9.7	Length of Copper bonded rod	3 m	
9.8	Purity of Copper	99.99%	
9.9	Short circuit withstand test of Rod	31.5kA	
9.10	Marking on the rod-Dimension Detail, product model no, Reference number of certification	Sample Required	
9.11	ROHS Certificate from NABL accredited lab for not having toxic chemical in earth enhance material	Test certificate to be provided	
9.12	Resistivity of earth enhancing material	0.12 ohm-m(Max)	

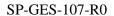




9.13	Exothermic welding material	IEEE 837 Complied	
9.14	Make of Steel	SAIL/ESSAR/TATA	

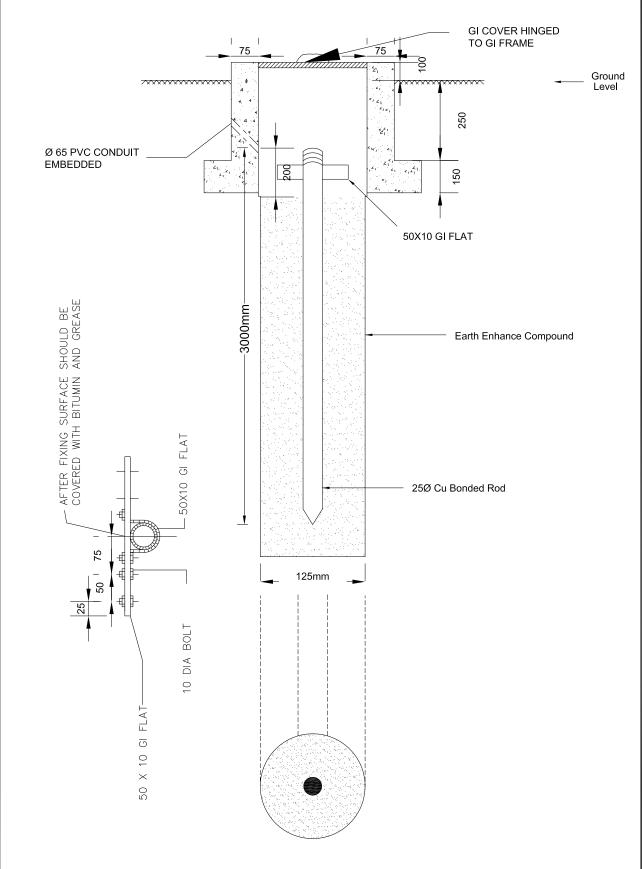
ANNEXURE A1: REFERENCE FAULT LEVEL

Voltage Level(kV)	Design Fault Level
66/11	31.5 KA
33/11	25 KA





ANNEXURE A2: REFERENCE DRAWINGS

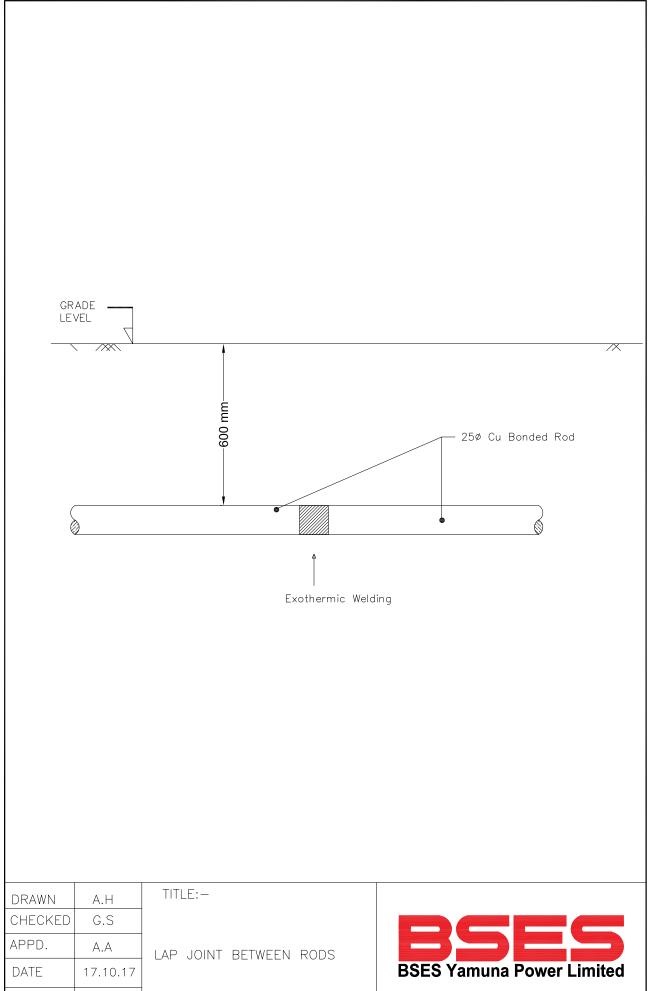


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SCALE	NTS

TITLE:-

EARTH ELECTRODE



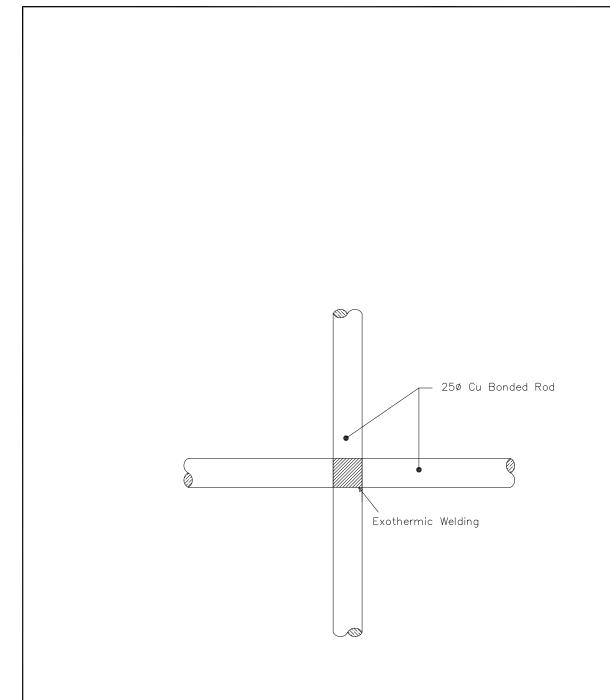


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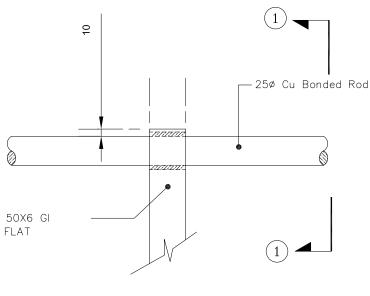
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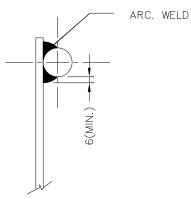


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APPD.	A.A	CROSS JOINT	BETWEEN	RODS
DATE	17.10.17			
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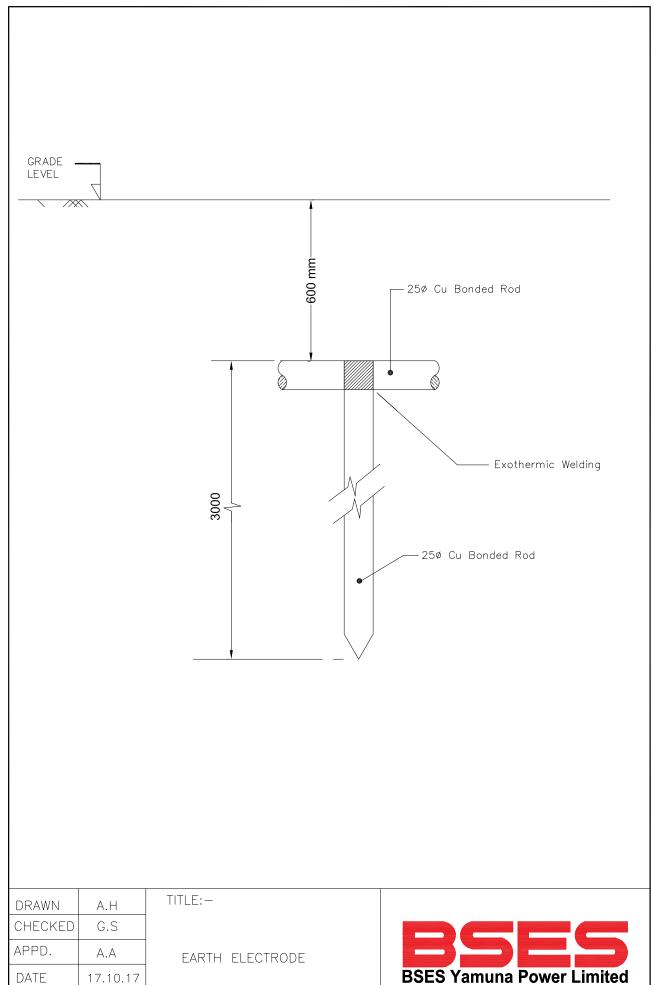
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TITLE:-

CROSS JOINT BETWEEN ROD AND GI FLATS



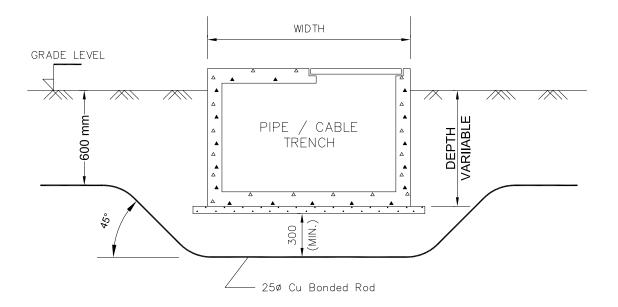


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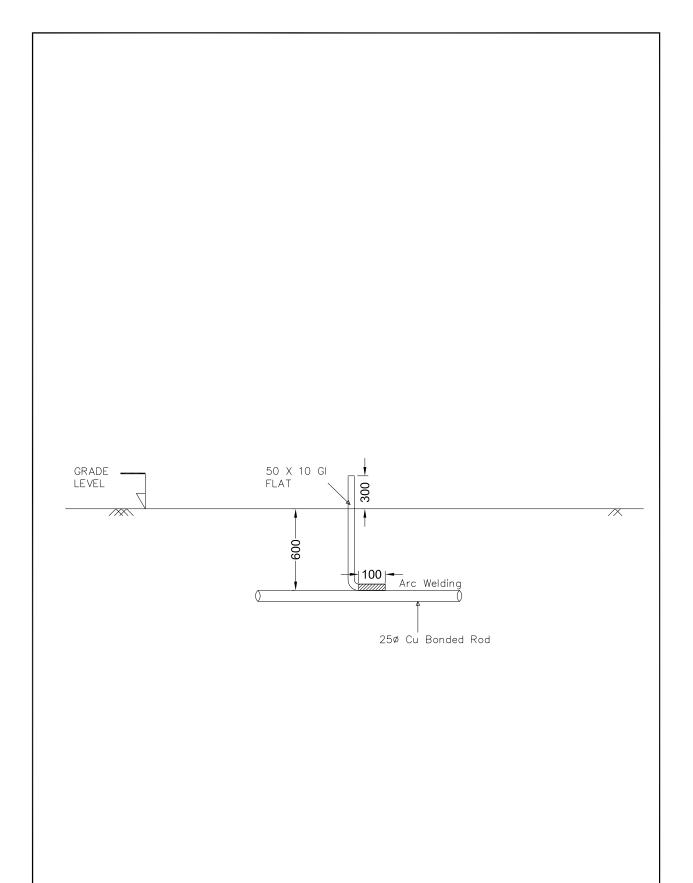
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SCALE	NTS

TRENCH CROSSING OF EARTHING CONDUCTOR





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SCALE	NTS

EARTH RISER DRAWING



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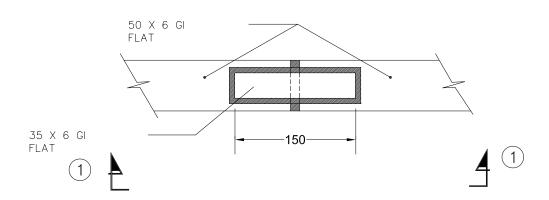
EARTHING CONDUCTOR ALONG STEEL COLUMN

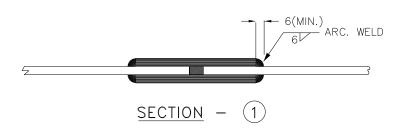


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DATE	17.10.17
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EARTHING CONDUCTOR ALONG BUILDING WALL



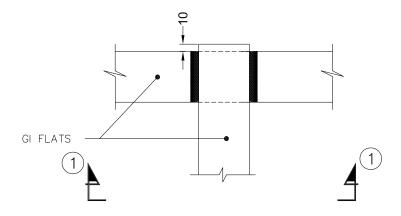


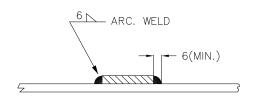


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BUTT JOINT BETWEEN GI FLATS

B 5	E5
BSES Yamuna	Power Limited





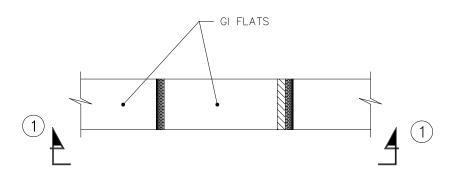
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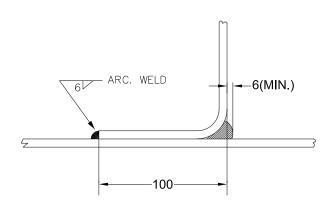
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TITLE:-

CROSS JOINT BETWEEN GI FLATS







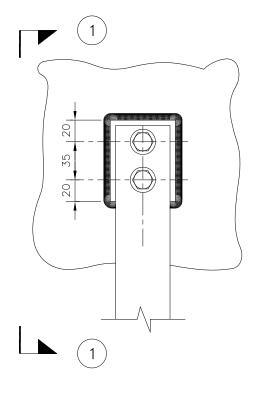
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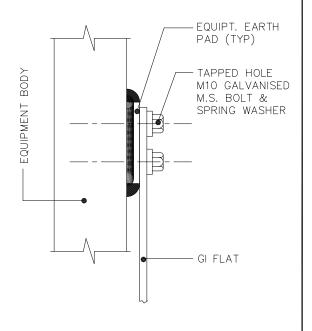
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TITLE:-

ANGULAR JOINT BETWEEN GI FLATS







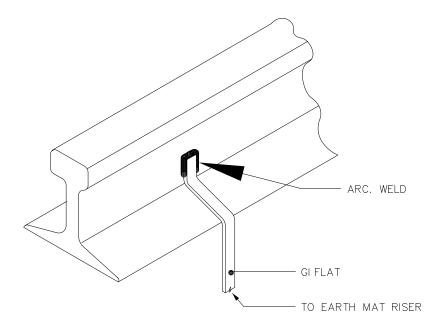
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TITLE:-

EQUIPMENT EARTHING

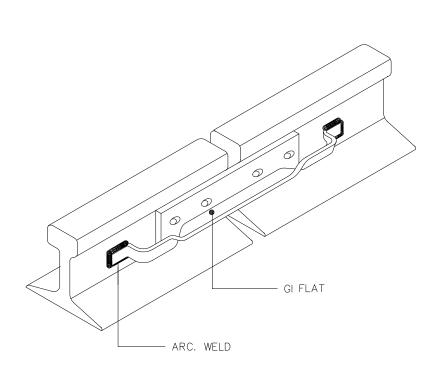




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RAIL EARTHING

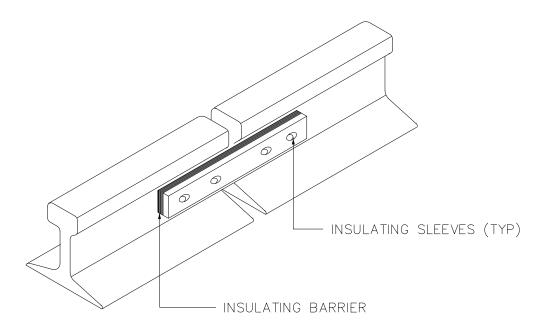
B 5	ES
BSES Yamuna	Power Limited



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RAIL BONDING

B 5	E5
BSES Yamuna	Power Limited



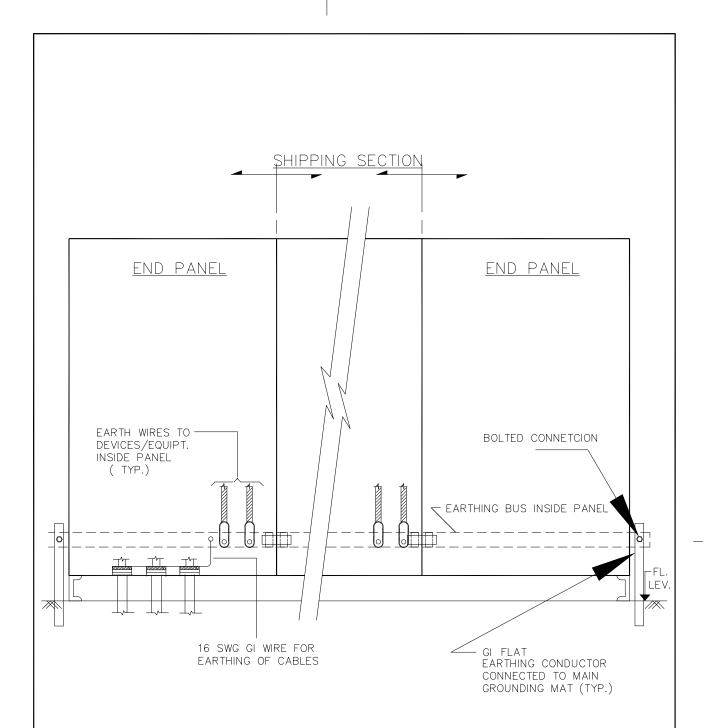
Note: Such installation shall be provided at points where the rail track leaves the earth grid(typically at the plant boundary)

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TITLE:-

RAIL SECTIONS LEAVING THE EARTH MAT





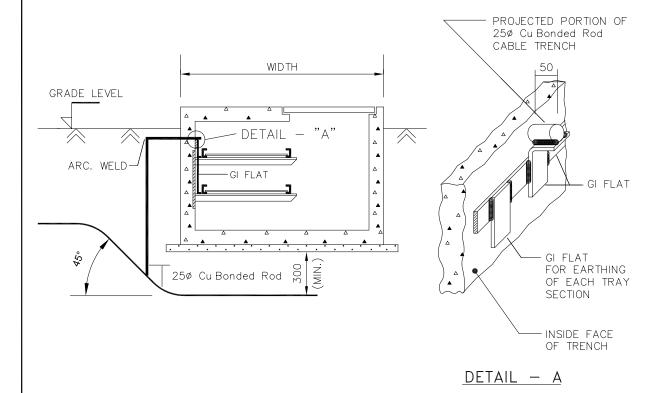
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EARTHING OF MCC, SWITCHGEAR



NAME: REL-COENG-NEE-E21-P-00085 DATE: -08.09.10

OVERHEAD CABLE TRAY EARTHING



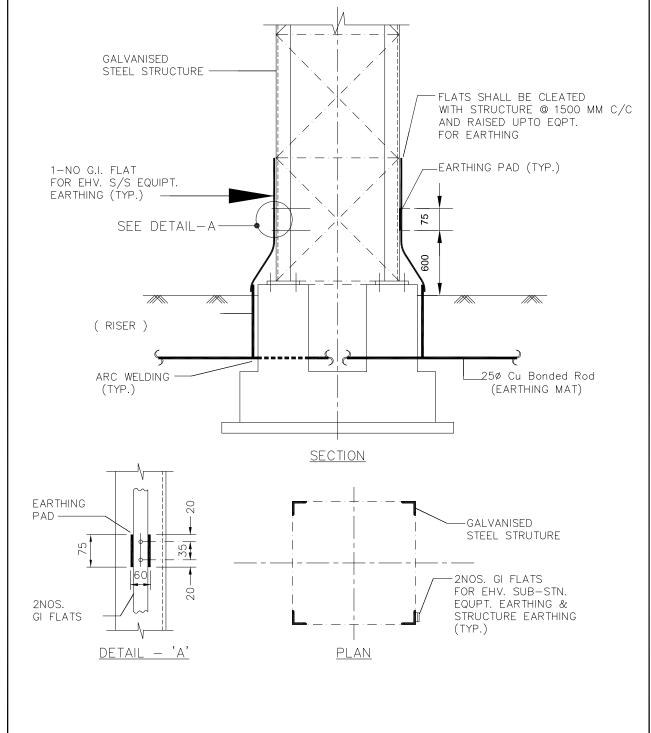
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TITLE:-

CABLE TRANCH/TRAY

EARTHING

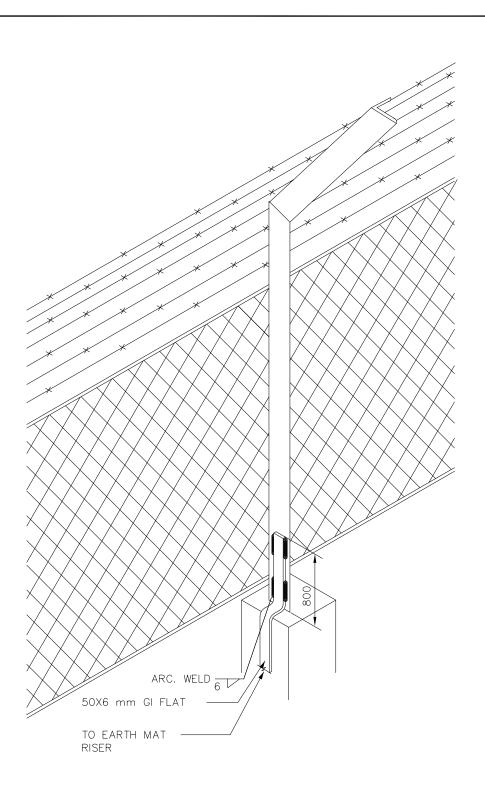




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EARTHING OF STRUCTURE MOUNTED ELECTRICAL EQUIPMENT



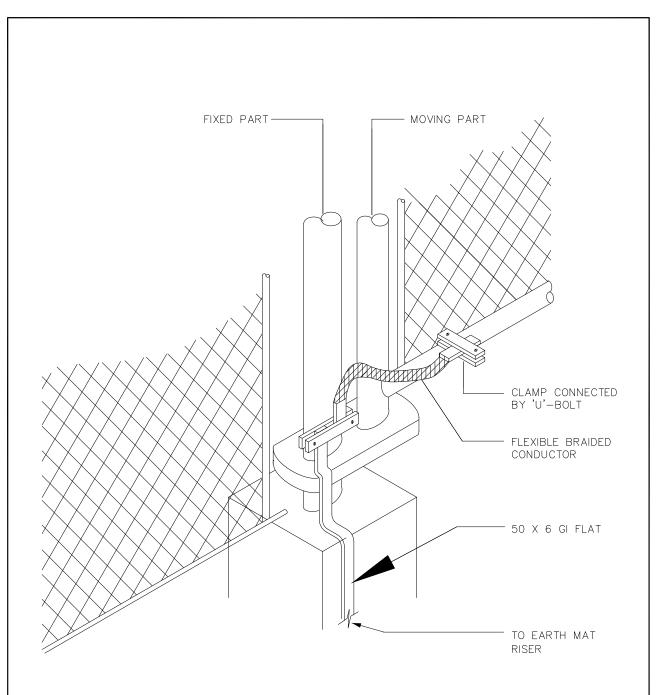


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FENCE EARTHING

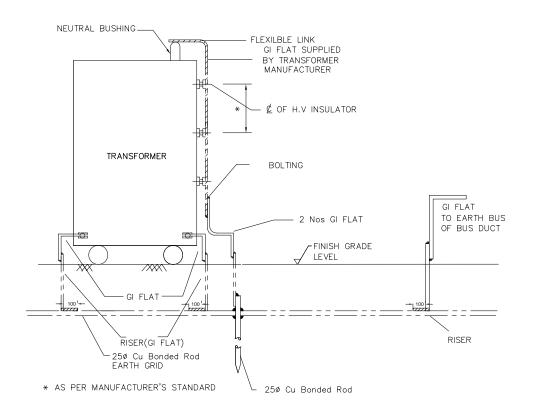




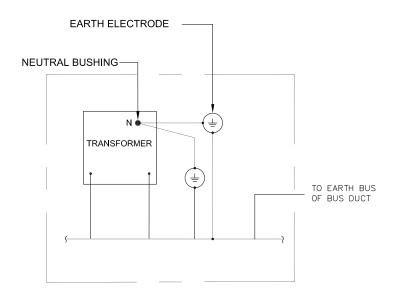
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FENCE GATE EARTHING





NOTE: APPLICABLE TO EHV WINDINGS AND LV (415V) WINDINGS OF TRANSFORMERS REQUIRING DIRECT EARTHING OF NEUTRALS.



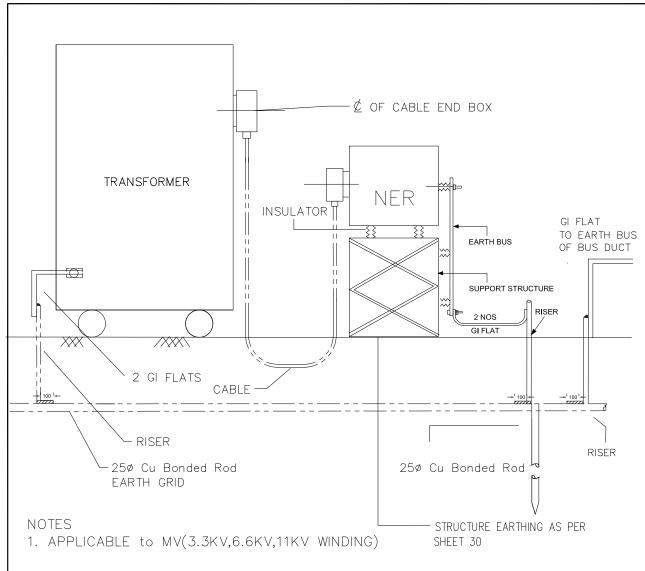
LINE DIAGRAM SOLID NEUTRAL EARTHING

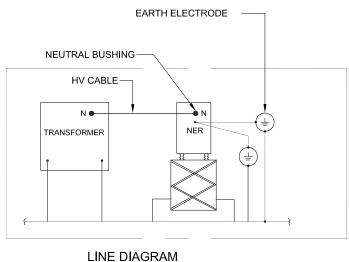
NEUTRAL

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LINE DIAGRAM
NEUTRAL EARTHING THROUGH NER

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APPD.	A.A		
DATE	17.10.17		
SCALE	NTS		

TITLE:-

TRANSFORMER NEUTRAL EARTHING (THROUGH NGR)







TECHNICAL SPECIFICATION FOR FIRE PROTECTION SYSTEM

TECHNICAL SPECIFICATION

FOR FIRE PROTECTION SYSTEM

For BYPL GRID S/STN.

Pre	epared by	Rev	Reviewed by Approved by		Reviewed by Approved by		Rev	00
Name	Sign	Name	Sign	Name	Sign	Date	2 May 2019	
GG	âr âr	JN	Colly	RK	Br			



TECHNICAL SPECIFICATION FOR FIRE PROTECTION SYSTEM

1	Automatic fire detection system	. 3
	First Aid Fire Extinguishers	
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



TECHNICAL SPECIFICATION FOR FIRE PROTECTION SYSTEM

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 ingression 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.



TECHNICAL SPECIFICATION FOR FIRE PROTECTION SYSTEM

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).



FOR SCADA NETWORK & INTEGRATION

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PREPARED BY	APPROVED BY	DATE	26th Oct 2021
RK/	AV	PAGE	1 OF 15

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SCADA, Distribution Automation
Egro, No. 41009163
Egro, No. Power Limited
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AVIL VAISHY
AVIL VER President
Add. Vice President
SCADA 1002184
SCADA 41002184
Emp. No. 41002187
Emp. No. 41002187
Emp. No. 41002187
BSES Vernuna with Court of Delhi



INDEX

1.0#	SCOPE	. 3#
2.0#	SCADA NETWORK	. 3#
	SCADA INTEGRATION	
	SPARES	
	DOCUMENTATION	
	TRAINING	
	DEVIATIONS	



1.0 SCOPE

- A. This specification is intended to cover the supply, erection, testing and commissioning of SCADA Network and Integration associated hardware/software (like protocol converters), cables, accessories and other material required for interfacing of all electrical equipments with existing ABB RTU560 for efficient and trouble free operation.
 - A.1. ABB RTU panel is multi processor CMU05/CMR02 based having required nos. of co processor and main processor and having redundant power supply. Main processor is having Ethernet ports and serial ports. Ethernet port of main processor is connected to LAN Switch (to be provided by BSES) for communication with Master Control Centre on IEC 104 Protocol.
 - A.2. The co processors are having Ethernet ports which are responsible to communicate to all numerical relays and Digital RTCC on IEC 61850 protocol.
 - A.3. The co processors are having serial ports which are responsible to communicate to all multifunction meters (MFMs) and battery charger on Modbus protocol through RS485 network.
 - A.4. The main processors and co processors are having the licenses of IEC61850, MODBUS RTU MASTER & PLC, Archive, HMI, IEC 103 and IEC 104.
- B. The devices i.e. Numerical relays, digital RTCC, MFMs, battery charger etc. on serial and LAN should have redundant media and redundant co processor connectivity.
- C. This specification shall be used in conjunction with all specifications, data sheets, single line diagrams, and other drawings attached to the specification / purchase requisition.

2.0 SCADA NETWORK

2.1	INFRASTRUCTURE	i.	All numerical relays & transformer monitoring units shall be connected to RTU in parallel redundancy protocol (PRP).
		ii.	The communication shall be made in 1+1 mode, including the links between numerical relays & TMUs to switch and up to RTU, such that failure of one set of communication shall not affect the normal operation of system. However it shall be alarmed in RTU.
		iii.	Data exchange is to be realized on dual star Bus topology using IEC 61850 protocol with a redundant managed switched on Ethernet communication infrastructure.
		iv.	MFMs shall be connected to RTU through RS485 network with SPD so loop shall be prepared in daisy chain fashion.
		V.	Devices connected to single loop shall not be more than 10 IEDs.



		vi. Network architecture shall be approved by BYPL SCADA team.
2.2	SCOPE OF WORK	 i. Laying and termination of cat 6 cables from CRP switch to RTU Switch shall be done in suitable size of PVC Pipe. ii. Laying and termination of RS 485 cables shall be done in PVC Pipe of minimum 2 inch. iii. Laying and termination of FO patch cord from IEDs to CRP LAN Switch through suitable size PVC conduit.
2.3	SCOPE OF SUPPLY	 i. All the hardware required to extend the relay signals to the RTU shall be supplied along with the switchboards. ii. Aux supply of these hardware devices shall be same as grid control voltage having wide range (-20% to +20%). iii. All communication hardware or protocol converters required for compatibility with existing RTU system shall be in bidder's scope.
2.3.1	Ethernet switches	 The IEC 61850 compliant Managed Ethernet switch shall meet the demand of power system automation systems (IEC 61850-3, IEEE 1613 compliance). i. Ethernet switch shall be layer 2 industrial grade. ii. Ethernet switch shall be modular with SFP for copper and fiber port. iii. Ethernet switch port shall be approve by engineering in charge of SCADA. iv. Ethernet switch shall be 19" rack mounted. v. Ethernet switch shall operate at grid supply voltage with range +20% to -20% VDC. vi. Operating Temperature: -40°C to +85°C. vii. All port shall be user configurable with minimum configuration of 100Mbps. viii. Communication type: Fiber Optics media and ST/LC Connector compatible with IEDs supplied with CRP, As Per Site and Ethernet copper CAT6 OR above cable. Further approval at the time of final engineering approval. ix. LED indicators on all ports shall be blinking with data transfer. x. The switch should have a diagnostic/ error/ warning LED.



	16 1 11 1 1 1 10
Xi.	It should support remote user setting
:	configuration.
xii.	It should own separate maintenance/ console port.
xiii.	Latency shall be not more than 10ms.
xiv.	Should be KEMA, CE and FCC Certified.
XV.	Switch should be extendable for future
	expansion.
xvi.	Minimum 20% spares of utilized hardware and
	accessories to be provided by the supplier/ BA.
xvii.	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.
xviii.	Shall be suitably mounted in CRP/switchgear panel.
xix.	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.
XX.	Power Supply of EFS shall be Dual redundant
	with pluggable terminal block.
XXI.	Shall have Environmental conditions compliance
	as per
•	IEC60068-2-1 COLD TEMPERATURE
•	IEC60068-2-2 DRY HEAT
•	IEC60068-2-30 HUMIDITY
	IEC60068-21-1 VIBRATION IEC60068-21-2 SHOCK
xxii.	Shall have Features:
AXII.	Management through Web-based, Telnet, CLI
	SNMP supported
	Remote Monitoring
	Diagnostics with logging and alarms
	Console ports
xxiii.	Shall have Product conformity
AAIII.	acc. to IEEE 802.3-10BaseT Yes
	acc. to IEEE 802.3u-100BaseTX Yes
	acc. to IEEE 802.3u-100BaseFX Yes
	acc. to IEEE 802.3ab-1000BaseT Yes
	acc.toIEEE802.3ad-Link Aggregation
	Yes
•	acc. to IEEE 802.3x-Flow Control Yes
•	acc. to IEEE 802.1d-MAC Bridges Yes
•	acc. to IEEE 802.1d-STP Yes



		 acc. to IEEE 802.1p-class of serviceYes acc. to IEEE 802.1Q-VLAN tagging Yes acc. to IEEE 802.1Q-2005 (formerly IEEE 802.1s) MSTP Yes acc. to IEEE 802.1w-RRS Yes acc. to IEEE 802.1x-port based Network Access Control
		xxiv. Shall have Mode Store and Forward xxv. Shall have Protection class IP4X,Conformal Coating,IPV6 xxvi. Shall have Authorized Repair center of original Ethernet switch manufacture in India. xxvii. Shall have Uplink Rate 1 GBPS and Downlink Rate 100 MBPS
		BYPL approved Makes Make 1 Ruggedcom 2 Hirschmann
		The specified makes are to be strictly adhered to and no change will be considered hereto.
2.3.2	Interface between Numerical Relay and switch	LC/ ST multimode duplex fibre optic patch cords connecting the numerical relay to switch shall be supplied by the bidder Make- Preston or equivalent
2.3.3	Interface between RTU and Ethernet switch	CAT 6 STP Cable shall be in bidder scope.
		Make- D-link, Belden or equivalent
2.3.4	Interface between MFM and RTU	RS485 Belden class cable shall be provided by bidder.
2.3.5	Communication hardware	Make- Belden or equivalent All hardware like LAN Switch, FO cables, protocol converters required for interfacing IEDs like protection relays, multifunction meters, transformer monitoring relays, battery charger controllers etc. to RTU should be included in scope of supply.

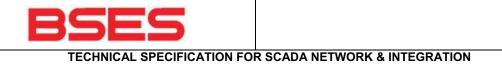


3.0 SCADA INTEGRATION

3.1	INFRASTRUCTURE	having relays exten	Numerical relays should be IEC 61850 compatible having dual fibre PRP optic ports. Through these ports relays shall be connected to CRP switches that further extended to existing RTU system through CAT6 LAN cable.	
3.2	SCOPE OF WORK	i.	Configuration of IEDs (primary, backup) and multifunction meters for SCADA signals as per Annexure 1: Signals related with 11KV panels and Annexure 2: Signals Related with MFM to communication the same in existing RTU 560A Co Processor CMU05/CMR02.	
		ii.	For communication configuration and troubleshooting of Relays and MFM, required software, ICD file (IED configuration description file), SCD file (substation configuration description file), communication cables and documents to be handed over to team SCADA BYPL.	
		iii.	Providing protocol mapping/node details for signals listed in <u>Annexure 1: Signals related with 11KV panels and Annexure 2: Signals Related with MFM</u> and communication configuration details for RTU configuration.	
		iv.	Simulation of all configured signals (Annexure 1: Signals related with 11KV panels and Annexure 2: Signals Related with MFM) over LAN on IEC 61850 and over RS 485 on modbus on separate terminal with same configuration settings.	
		V.	Testing & commissioning of Numerical relays, and Multifunction meters for all related signals upto RTU.	
		vi.	Testing of Indications, Command, Interlocks as per scheme, Relay soft interlock testing from Relay HMI as well as simulation of SCADA command through configured output of Relay.	
		vii.	Downloading of Disturbance records and uploading/downloading of configuration file to and from IEDs facility from remote through switches at pre decided IPs shall be provided.	
		viii.	Demonstration of operational compatibility with SCADA.	
		ix.	Point to Point testing all signals to BYPL SCADA at MCC and BCC.	



3.3	SCOPE OF SUPPLY	
3.3.1	Configuration Software and Tools	All software and configuration tools required for configuration of SCADA Network should be included in scope of supply.
4.0	SPARES	
4.1		 i. Bidder shall submit list of recommended spares for BSES BYPL SCADA approval. ii. Recommended minimum 20% spares of supplied SCADA accessories for SCADA interface to be supplied by bidder. Price for spares shall be included in CRP package. All spares shall be tested in our premises
5.0	DOCUMENTATION	
5.1	Documents for approval	 i. The bidder shall ensure that all necessary drawings, write-up, information, etc required to fully describe the equipment are to be submitted for approval. ii. The manual shall clearly indicate in English the installation and connection method. Check up, maintenance and calibration method shall also be provided in the manuals.
6.0	TRAINING	
5.1	Training at site	Training to BYPL SCADA's engineers at site by domain expert (two day training- one day in classroom and one day on site) with hands on.
7.0	DEVIATIONS	
6.1	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.



Annexure 1 (Signal List- 11kV)

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	✓		SPI
4.	Spring Charge	✓		SPI
5.	Breaker in Service	✓		SPI
6.	Breaker in Test	✓		SPI
7.	Auto Trip (86) Operated	✓		SPI
8.	Panel DC Fail	✓		SPI
9.	L/R switch in SCADA	✓		SPI
10.	Relay Int Fault	✓		SPI
11.	Over Current Operated	✓		SPI
12.	Earth Fault Operated	✓		SPI
13.	BKR Close COMMAND	MAND		DCC
14.	BKR Open COMMAND]	DCO
15.	Auto Trip (86) relay reset from Remote		✓	SCO
16.	3Phase R, Y, B- Current & Voltage, Active Power, Reactive Power, Power factor, Max. Demand, Neu. Current	✓		AI/ MV
17.	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

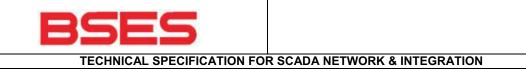
Note: Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel



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	✓		SPI
4.	Spring Charge	✓		SPI
5.	Breaker in Service	✓		SPI
6.	Breaker in Test	✓		SPI
7.	Auto trp (86) Operated	✓		SPI
8.	VT fuse Blown- Metering	✓		SPI
9.	VT fuse Blown- Protection	✓		SPI
10.	Panel DC 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.	Under Voltage Prot. Operated	✓		SPI
16.	Over Voltage Prot. Operated	✓		
17.	REF Operated	✓		SPI
18.	BKR Close COMMAND		1	DCO
19.	BKR Open COMMAND		V	
20.	Auto trip (86) relay reset from Remote		✓	SCO
21.	3Phase R, Y, B- Current & Voltage, Active Power, Reactive Power, Power factor, Max. Demand, Neu. Current	✓		AI/ MV
22.	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

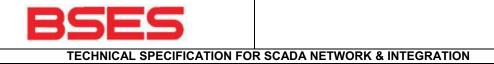
Note: Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel



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	✓		SPI
4.	Spring Charge	✓		SPI
5.	Breaker in Service	√		SPI
6.	Breaker in Test	V		SPI
7.	Auto trip (86) Operated	✓		SPI
8.	Panel DC Fail	✓		SPI
9.	L/R Switch in SCADA			SPI
10.	Relay Int. Fault	✓		SPI
11.	PT MCB- Metering	✓		SPI
	operated	•		
12.	PT MCB- Protection operated	✓		SPI
13.	Over Current Operated	✓		SPI
14.	Earth Fault Operated	✓		SPI
15.	BKR Close COMMAND		√	DCO
16.	BKR Open COMMAND		7	
17.	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	√		Al

Note: Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel



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	V		
3.	Bank ISO ON	✓		DPI
4.	Bank ISO OFF			
5.	Trip Ckt Healthy	✓		SPI
6.	Spring Charge	✓		SPI
7.	Breaker in Service	✓		SPI
8.	Breaker in Test	✓		SPI
9.	Master Trip (86) Operated	✓		SPI
10.	Bus PT fuse Blown- Metering	✓		SPI
11.	Bus PT fuse Blown- Protection	✓		SPI
12.	Panel DC Fail	✓		SPI
13.	L/R Switch in SCADA	✓		SPI
14.	Over Current Operated	✓		SPI
15.	Earth Fault Operated	✓		SPI
16.	Under Volt. Prot. Operated	✓		SPI
17.	Over Volt. Prot. Operated	✓		SPI
18.	Neg. Phase sequence Operated	✓		SPI
19.	Timer Relay operated/ Normal	✓		DPI
20.	Relay Int. Fault	✓		SPI
21.	BKR Close COMMAND		√	DCO
22.	BKR Open COMMAND		"	
23.	BANK ISO OPN		√	DCO
24.	BANK ISO CLS		<u> </u>	
25.	Master trip (86) reset from remote		✓	SCO
26.	3phase R, Y, B- Curr & Volt, React. Pow, Neu. Curr	4		AI/ MV
27.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbalance (O/C & E/F Relay), Disturbance	✓		Al



TECHNICAL SPECIFICATION FOR SCADA NETWORK & INTEGRATION

Records, Fault Graphs for		
•		
Remote diagnosis		
purpose		

Annexure 2: Signals Related with MFM

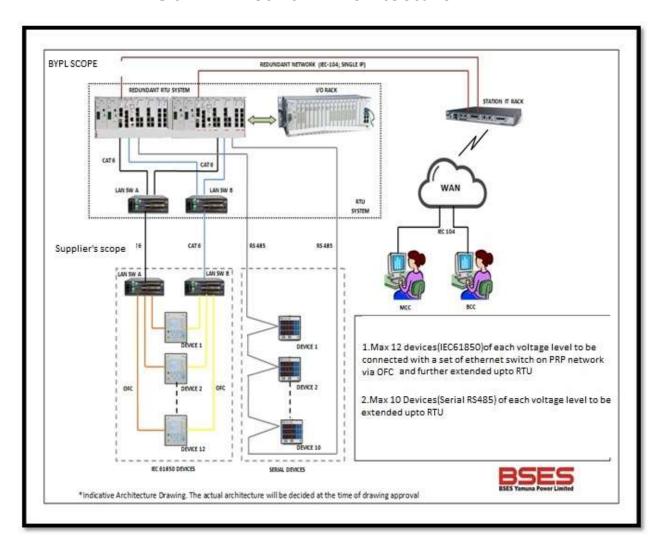
Sr. No.	Signal Detail	Type of Signal on Modbus
	Measurement Signals	
1	Active Power	Measured Float
2	Current Bph	Measured Float
3	Current Rph	Measured Float
4	Current Yph	Measured Float
5	Frequency	Measured Float
6	Power Factor	Measured Float
7	Reactive Power	Measured Float
8	Voltage BR	Measured Float
9	Voltage RY	Measured Float
10	Voltage YB	Measured Float
11	Neutral Current	Measured Float
12	THD	Measured Float
13	Max Demand	Measured Float
14	Apparent power	Measured Float

(This is the indicative IO list, however the signal list may vary during the engineering time)



Annexure 4:

SCADA Network Architecture





TECHNICAL SPECIFICATION FOR SCADA NETWORK & INTEGRATION

Annexure 5: (List of Abbreviations)

- 1. SCADA: Supervisory Control and Data Acquisition
- 2. RTU: Remote Terminal Unit
- 3. C&R: Control and Relay
- 4. MFM: Multi Function Meter
- 5. BYPL: BSES Yamuna Power Ltd.
- 6. MCC: Master Control Center
- 7. BCC: Business Continuity Center
- 8. IED: Intelligent Electronic Devices
- 9. IEC: International Electrotechnical Commisssion
- 10. KEMA: Keuring van Elektrotechnische Materialen te Arnhem
- 11. CE: Conformité Européene
- 12. FCC: Federal Communications Commission
- 13. PRP: Parallel Redundancy Protocol
- 14. LAN: Local Area Network
- 15. NIFPS: Nitrogen Injection Fire Protection System
- 16. APFC: Automatic Power factor Controller
- 17. HMI: Human Machine Interface
- 18. PVC: Polyvinyl Chloride
- 19. OFC: Optical Fiber Cable
- 20. MV: Measured Value
- 21. SPD: Surge Protection Device
- 22. DCO: Double Command Input
- 23. DPI: Double Point Indication
- 24. MV: Measured Value
- 25. SCO: Single Command Input
- 26. SPI: Single Point Indication



Technical Specification For High Voltage Test set

Specification No. \$P-HVTS-26-R0

PREPARED BY	REVIEWED BY	APPROVED BY	REV	
Minita Kumari	Gaurav Sharma Devender Sharma	DATE	10/10/2013	
WW 15 10/10/13		amon	PAGE	Page 1 of 7





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SP-HVTS-26-R0

TECHNICAL SPECIFICATION FOR HIGH VOLTAGE TEST SET

Record of Revision

Clause No.	Change in Specification	Approved by	Rev



1.0 SCOPE OF SUPPLY

This specification covers the general requirements of design, manufacture, testing at manufacturer's works, packing and delivery at site of the **High voltage test set** along with necessary accessories, demonstration and training of use of the equipment at site.

2.0 STANDARDS & CODES

The manufacturing, rating & performance of **High voltage test set** shall conform to the latest edition of following standards:-

S No.	STANDARD	TITLE OF THE STANDARD
2.1	Latest Edition	Indian Electricity Rules 1956
2.2	Latest Edition	Indian Electricity Act 1910
2.3	IEC 61010	Safety requirements for electrical equipments for measurement, control & laboratory use
2.4	IS:2071 (part 1) / IEC:60060-1	High voltage test techniques Part 1 : General definitions & test requirements
2.5	IS 2071 (Part 3)	Methods of High voltage testing Part 3 : Measuring devices

3.0 SERVICE CONDITIONS

High voltage testing kit to be supplied against this specification shall be suitable for satisfactory operation under the following conditions:-

S No.	ENVIRONMENTAL CONDITION	REQUIREMENT
3.1	Ambient air temperature	0 deg C to 50 deg C
3.2	Relative Humidity	100%



4.0 DESIGN FEATURES

SI. No.	Specifications	BSES Requirements
4.1	Application	Field testing of equipment
4.2	Make	Required
4.3	Type / Model No	Required
4.4	Rating	0-80kVdc, 5 mA continuous / 0-20kV dc, 10mA continuousm
4.5	Control	i. Continuously variable output with manual / microprocessor control based ii. Inbuilt dwell timer and preset timer functions iii. Backlit LCD panel to display all the test parameters and error messages iv. Voltage display: Accuracy 1.0%, resolution 0.1kV v. Current display: Accuracy 1.0%, resolution 0.1mA
4.6	Design	i. Rugged portable wheel mounted design ii. No assembly at site, except plugging of one control and one HV cable iii. HV transformer shall be air cooled & dry type. iv. HV terminals shall be corona free v. Protections like AC backfeed, return wave, transient and surge protection shall be provided vi. Indications like Mains On/Off and HV On/Off shall be provided
4.7	Metering	i. Digital output voltmeter with metering from HT side ii. Digital leakage ammeter with metering from the return leg
4.8	Safety provisions	i. Zero-start interlock and Safety interlock switch (hand-held) ii. Auto discharge facility iii. Earth connection open interlock with indication iv. Steel covers to be provided on the meters for protection
4.9	Power supply	240V AC±10%, 50Hz+3% / -5%
4.10	Ripple	HV DC output in full waves with less than 3% ripple
4.11	Essential Accessories	i. Water proof carry case ii. Flexible, screened HV cable, 15 meters iii. Power supply cable, 10 meters iv. Grounding cable, 10 meters



		v. Discharge rod with cable and earth-end clamp vi. Covers for HV male & female socket vii. Anodized aluminium instruction plate to be provided on equipment. Details to be mentioned on instruction plate will be provided post order.
4.12	Electromagnetic Compatibility (EMC)	Shall be suitable for 66kV substations
4.13	Safety category for the instrument	CAT IV as per IEC 61010
4.14	Valid calibration certificate	Shall be submitted
4.15	Other included features	
4.16	Warranty period	Shall be specified by the manufacturer
4.17	Weight	i. Specify the weight of test setii. Specify the weight of complete package i.e test set and accessories along with carry case
4.18	Dimensions	i. Specify the dimensions of test set (L x W x H)ii. Specify the dimensions of carry case (L x W x H)
4.19	Type test reports	Shall be submitted
4.20	Demonstration of the test set	Shall be provided
4.21	Training for use of the equipment at site	Required

5.0 PACKING, SHIPPING, HANDLING & SITE SUPPORT

5.1	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.
5.2	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.
5.3	Packing Identification Label	On each packing case, following details are required:
5.3.1	Individual serial number	
5.3.2	Purchaser's name	
5.3.3	PO number (along with SAP item code, if any) & date	
5.3.4	Equipment Tag no. (if any)	



5.3.5	Destination		
5.3.6	Manufacturer / Supplier's nar	ne	
5.3.7	Address of Manufacturer / Su	ıpplier / it's agent	
5.3.8	Description		
5.3.9	Country of origin		
5.3.10	Month & year of Manufacturing	ng	
5.3.11	Case measurements		
5.3.12	Gross and net weight		
5.3.13	All necessary slinging and stacking instructions		
5.4	Shipping The seller shall be responsible for all transit damage due to improper packing.		
5.5	Handling and Storage Manufacturer instruction shall be followed.		
5.6	Detail handling & storage instruction sheet / manual to be furnished before commencement of supply.		

6.0 DEVIATIONS

List of deviations shall be stated in writing with the tender by reference to the Specification clause / GTP/ Drawing. In absence of such a statement, requirements of the Specification shall be assumed to be met without exception by the bidder.

7.0 DOCUMENT SUBMISSION

The bidder has to submit the following documents along with bid:-

7.1	List of major customers using the offered product from last 5 years specifying details like customer name, PO no. and PO date, year of supply and supply quantity
7.2	Completely filled compliance GTP sheet as per clause 4.0 of this specification
7.3	Complete product catalogue, Manual and calibration certificate of the equipment
7.4	Type test reports
7.5	Deviation Sheet (if any)

SP-IRT-19-R0



TECHNICAL SPECIFICATION FOR INSULATION RESISTANCE TESTER

TECHNICAL SPECIFICATION FOR INSULATION RESISTANCE TESTER

PREPARED BY	REVIEWED BY	APPROVED BY	REV	00
RISHABH LOHIYA	GAURAV SHARMA	DEVENDER SHARMA	DATE	28.10.2013
Rishabh	Coweal	Browning	PAGE	01 of 06





TECHNICAL SPECIFICATION FOR INSULATION RESISTANCE TESTER

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SP-IRT-19-R0

TECHNICAL SPECIFICATION FOR INSULATION RESISTANCE TESTER

Record of Revision

Clause No.	Change in Specification	Approved by	Rev



TECHNICAL SPECIFICATION FOR INSULATION RESISTANCE TESTER

1.0. SCOPE OF SUPPLY

This specification covers the general requirements of design, manufacture, testing at manufacturer's works, packing and delivery at site of the **Insulation Resistance Tester** along with necessary accessories.

2.0. STANDARDS & CODES

The manufacturing, rating & performance of the Insulation Tester shall conform to the latest edition of following standards:-

S No.	STANDARD	TITLE OF THE STANDARD
2.1	Latest Edition	Indian Electricity Rules 1956
2.2	Latest Edition	Indian Electricity Act 1910
2.3	IEC : 61326	Electromagnetic Compatibility Requirement
2.4	IEC: 61010	Safety Requirement

3.0. SERVICE CONDITIONS

Insulation Tester to be supplied against this specification shall be suitable for satisfactory operation under the following conditions:-

S No.	ENVIRONMENTAL CONDITION	REQUIREMENT
3.1	Ambient air temperature	Highest 50Deg C Average 40Deg C
3.2	Minimum ambient air temperature	0 Deg C
3.3	Relative Humidity	100%

4.0. DESIGN FEATURES

S No.	SPECIFICATION	REQUIREMENT
4.1	Construction	Rugged fire retardant casing
4.2	Display	3 ½ Digital Backlit LCD type
4.3	Power supply	Line supply & Battery operated
4.4	Battery Type	To be specified by manufacturer



SP-IRT-19-R0

TECHNICAL SPECIFICATION FOR INSULATION RESISTANCE TESTER

4.5	Battery Life	To be specified by manufacturer
4.6	Test Voltage Range	Adjustable from 500V - 5 KV (500,1000,2500 & 5000V range)
4.6.1	Resolution	To be specified by manufacturer
4.6.2	Voltage output accuracy	To be specified by manufacturer
4.7	Insulation Resistance Range	Upto 10TΩ
4.7.1	Resolution	To be specified by manufacturer
4.7.2	Accuracy	±1%
4.8	Timer	0 – 20 minutes
4.9	Facility for Polarisation Index measurement	Required (Applicable for EHV measurement)
4.10	Suitable for operations in 66KV switchyard	Required
4.11	Power Consumption	To be specified by manufacturer
4.12	Interference Rejection	2mA rms at 200V and above
4.13	Operating Temperature	-10 to 50 Deg C
4.14	Low Battery indication	Required
4.15	Size (Dimensions)	To be specified by manufacturer
4.16	Weight	To be specified by manufacturer
4.17	Ingress Protection	To be specified by manufacturer
4.18	Overload Protection	Required
4.19	Warranty	To be specified by manufacturer
4.20	Special Features (if any)	To be specified by manufacturer
4.21	Equipment Demonstration	Required
4.22	Training of use of equipment to be provided	Required
4.23	Standard Accessories with device	Required
4.23.1	Carry case	Required
4.23.2	Testing leads (15m)	Required
4.23.3	Test Probes & Alligator Clips	Required
4.23.4	Operating Manual / Catalogue	Required



TECHNICAL SPECIFICATION FOR INSULATION RESISTANCE TESTER

5.0. PACKING, SHIPPING, HANDLING & SITE SUPPORT

5.1	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.	
5.2	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.	
5.3	Packing Identification Label	On each packing case, following details are required:	
5.3.1	Individual serial number		
5.3.2	Purchaser's name		
5.3.3	PO number (along with SAP item code, if any) & date		
5.3.4	Equipment Tag no. (if any)		
5.3.5	Destination		
5.3.6	Manufacturer / Supplier's name		
5.3.7	Address of Manufacturer / Supplier / it's agent		
5.3.8	Description		
5.3.9	Month & year of Manufacturing		
5.3.10	Case measurements		
5.3.11	Gross and net weight		
5.3.12	All necessary slinging and stacking instructions		
5.4	Shipping	The seller shall be responsible for all transit damage due to improper packing.	
5.5	Handling and Storage	Manufacturer instruction shall be followed.	
5.6	Detail handling & storage instruction sheet / manual to be furnished before commencement of supply.		

6.0. DOCUMENT SUBMISSION

The bidder has to submit the following documents along with bid:-

6.1	Detailed list (clearly specifying PO No. with date, PO Quantity & Year of supply) of your major customer utilities like NTPC, Power Grid, State Electricity Boards, etc. for last five years. Provide performance certificates also.
6.2	Completely filled compliance GTP sheet as per clause 4.0 of this specification
6.3	Complete product catalogue and Manual
6.4	Relevant type test report/certificate (not more than 5 years old) from CPRI/ERDA.
6.5	Deviation Sheet (if any) List of deviations shall be stated in writing with the tender by reference to the Specification clause / GTP/ Drawing. In absence of such a statement, requirements of the Specification shall be assumed to be met without exception by the bidder.