BSES Yamuna Power Limited

NOTICE INVITING TENDER (NIT)
FOR
SURVEY, DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, & COMMISSIONING OF NEW 11kV SWITCHGEAR PANELS INCLUDING MINOR CIVIL WORKS AND DISMANTLING OF EXISTING EQUIPMENTS ON TURNKEY BASIS AT KAILASH NAGAR & DALLUPURA GRID, DELHI.

NIT NO: CMC/BY/22-23/RS/MD/34

Due Date for Submission: 31.08.2022, 15:00 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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SECTION – I: REQUEST FOR QUOTATION

1.00 EVENT INFORMATION

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

S N	Items	Estimate Cost Value In INR	EMD Value In INR
1	SURVEY, DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, & COMMISSIONING OF NEW 11kV SWITCHGEAR PANELS INCLUDING MINOR CIVIL WORKS AND DISMANTLING OF EXISTING EQUIPMENTS ON TURNKEY BASIS AT KAILASH NAGAR GRID, DELHI.	6.66 Crore	6.66 Lakh
2	SURVEY, DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, & COMMISSIONING OF NEW 11kV SWITCHGEAR PANELS INCLUDING MINOR CIVIL WORKS AND DISMANTLING OF EXISTING EQUIPMENTS ON TURNKEY BASIS AT DALLUPURA GRID, DELHI		

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

All envelopes shall be duly superscribed "BID FOR SURVEY, DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, & COMMISSIONING OF NEW 11kV SWITCHGEAR PANELS INCLUDING MINOR CIVIL WORKS AND DISMANTLING OF EXISTING EQUIPMENTS ON TURNKEY BASIS AT KAILASH NAGAR & DALLUPURA GRID, DELHI., NIT NO: CMC/BY/22-23/RS/MD/34, DUE ON 31.08.2022, 15:00 Hrs."

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 **Rs 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 **31.08.2022, 15:00 Hrs.** at the address given below.
Part A of the Bid shall be opened on **01.09.2022, 16:30 Hrs.**

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

BSES Yamuna Power Limited

Delhi 110032

1.3 BSES Yamuna Power Ltd reserves the right to accept/reject any or all tenders without assigning any reason thereof. Bids are liable for rejection in the following events:

a) Tender fee of requisite value is not deposited.

b) Earnest Money Deposit (EMD) of requisite value & validity is not deposited in the form of Bank Guarantee drawn in favor of BSES Yamuna Power Ltd, payable at Delhi or through Online transfer through NEFT/RTGS.

c) The offer does not contain prices indicating break-up towards all taxes & duties in prescribed format.

d) Complete Technical details are not enclosed as per the Technical Bid Submission Checklist

e) Tender is received after due date and time.

f) Technical offer contains any prices.

g) Prices are not FIRM and subject to Price Variation.

2.00 QUALIFICATION CRITERIA

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

2.01 Technical Criteria:

SN	Qualification Criteria	Documents to be submitted by bidder
1	The bidder should have own manufacturing facility in India for 11KV Switchgear Panels for last 3 years.	Factory incorporation certificate / Undertaking. Details of manufacturing units, locations and works from where supply against this tender shall be proposed to be furnished.
2	The bidder should have servicing , repairing, testing & refurbishment facility in INDIA with necessary spares and testing equipment for providing prompt after sales service for switchgear panels.	Relevant Details/certificates/Undertaking (Details of the set-up available shall be brought out in the offer.The bidder shall also submit undertaking along with the bid confirming the infrastructure details submitted)
3	The bidder should have manufacturing capacity for a minimum of 10-15 nos. 11KV switchgear panels per month.	Installed Capacity Certificate
4	The bidder should have successfully designed, supplied, installed/errected & commissioned a minimum of two projects of 11KV AIS Switchboards during the last 5 years.	a. Work Order copies b. Work completion certificates c. List of projects executed including customer name, PO number (with date), date of completion and rating (Capacity/Voltage etc) shall be provided.
5	Performance certificate for minimum 2 years satisfactory performance of projects of 11 kV switchgears,executed during the last 5 years from at least two utilities/ SEB/ PSUs / reputed firm wherin the end user shall be Utility/SEB's/PSU's. In case of bidder has previous association with BYPL/BRPL for similar product and service,the performance feedeback from BYPL/BRPL shall only be considered irrespective of performance	Performance certificate

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	certificates issued by any third party organization.	
7	The Bidder must posses valid ISO 9001:2015 certification	Valid ISO 9001:2015 certificate

2.02 **Commercial Criteria:**

SN	Qualification Criteria	Documents to be submitted by bidder
1	Bidder should have Average Annual Sales Turnover of Rs 500 Crores or more during last three (3) Financial Years (i.e., FY 2019-20, 2020-21 & 2021-22).	Balance Sheet and Duly certified CA certificate with UDIN no. to be submitted
2	The Bidder shall submit an undertaking that "No Litigation" is pending with BYPL or its Group/Associates Companies.	Self Undertaking
3	An undertaking that the bidder has not been blacklisted/debarred by any central/state government institution/Electricity utilities	Self Undertaking
4	The bidder must have valid PAN No., GST Registration Number, in addition to other statutory compliances. The bidder must submit the copies 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
5	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 wherein copy of valid license shall be submitted to BYPL before the start of the work OR Bidder to give undertaking that it will be obtained by them before the start of the work at site.	a. Electrical Contractor License Copy b. Self undertaking if not available

The subsidiaries of global/Indian companies are also eligible to bid if the qualification requirements stated above are met independently or in combination with parent/sister concern/group Company. However, the bidder should have an establishment of permanent nature in India.

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 website/e-mail.
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: -"CMC/BY/22-23/RS/MD/34, DUE ON 31.08.2022, 15:00 Hrs". 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 mail within 02 hours from 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 Mahesh Dariyal, E-mail: Mahesh.Dariyal@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.

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PART A :: TECHNICAL **BID** comprising of following (1 Original copy + 1 soft copy in pen drive):

S. N	Descriptions	Type of Documents
Commercial :		
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 stamp paper & 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 company (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 3. Supportive document on Positive Net worth. Credit rating/solvency certificate from competent authority. 4. 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
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	**Commercial Terms and Conditions**	Acceptance on Commercial Terms and Conditions viz Delivery schedule/period, Payment terms, PBG etc.
8	**Acceptance on Reverse Auction**	Duly signed Acceptance Form For Participation In Reverse Auction Event as per attached format
9	**Bid Form (Unpriced) Duly Signed**	Duly Signed Bid Form as per attached format
10	**Un price Bid Duly Signed**	Duly Signed Un price Bid as per attached format
Technical:		
11	**Technical Details/ Filled in GTP/Drawings**	Bidder shall submit duly filled GTP with all Technical documents and Drawings.
12	**Type Test Reports**	Bidders shall submit the copy of type test reports in their technical bids in support of technical specifications
13	**Testing Facilities**	Bidder shall submit the details of testing facilities available at their works/factory.
14	**Organization Chart & Manpower Details.**	Bidder shall submit the details of Organization & Manpower with qualification and experience.
15	**Pen drive**	Bidder shall submit above all document (technical bid) in Pen drive also.

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PART B **:: FINANCIAL BID** comprising of (01 original only)

- Price strictly in the Format enclosed indicating Break up of basic price, taxes & duties, transportation etc

3.02 TIME SCHEDULE

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

S.No.	Steps	Due date
1	Last Date of Sale of Bid Documents	29.08.2022, 17:00HRS
2	Pre-Bid meeting :- Pre-Bid Meeting will be done via Zoom Meeting - https://us05web.zoom.us/j/7859623585?pwd=bjcwcWFYL1cvT3daNGNyY2xkVW9YQT09 Meeting ID: 785 962 3585 For Passcode, bidder may submit their request via email to Mr. Mahesh Dariyal, E-mail: mahesh.dariyal@relianceada.com	17.08.2022, 11:30HRS
3	Last Date of receipt of pre-bid queries, if any (Queries to be submitted via e-mail)	19.08.2022, 17:00HRS
4	Last Date of replies to all the pre-bid queries as received	25.08.2022, 18:00HRS
4	Last date and time of receipt of Complete Bids (Tender Fees, EMD, Part A & Part B)	31.08.2022, 15:00HRS
5	Date & Time of Opening of PART A - Technical and Commercial Bid	01.09.2022, 16:30HRS

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

Part – A:: Technical Bid should not contain any cost information whatsoever and shall be submitted within the due date. Bids shall be liable to reject if any price part is attached in Part-A technical bid.

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

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.

REVERSE AUCTION CLAUSE: Purchaser reserves the right to use the online reverse Auction as optional tool through SAP – SRM as an integral part of the entire tendering Process. All the bidders who are techno-commercially qualified on the basis of tender Requirements shall participate in reverse auction.

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

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

4.03 In the event of your bid being selected by purchaser (and / or its affiliates) and you subsequently 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.

4.04 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.

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 reserve 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

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

Address	Name/ Designation	E-mail Address
Technical		
CES Dept. 3rd Floor, B-Block, BSES Yamuna Power Ltd Shaktikiran Building, Karkardooma, Delhi 110032	Gaurav Sharma Addl. VP (HOD-CES)	gaurav.a.sharma@relianceada.com
	Srinivas Gopu GM (CES)	srinivas.gopu@relianceada.com
	Abhishek Harsh DGM (CES)	abhishek.harsh@relianceada.com
Commercial		
C&M Dept. 3rd Floor, A-Block, BSES Yamuna Power Ltd Shaktikiran Building, Karkardooma, Delhi 110032	Robin Sebastian VP (HOD-C&M)	robin.sebastian@relianceada.com
	Santosh Singh Addl. VP (Head-Procurement)	Santosh.kum.singh@relianceada.com
	Mahesh Dariyal Asst. Manager (C&M)	mahesh.dariyal@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 of work under this contract shall include the turnkey execution on End to End Basis , including Survey, Designing, manufacturing, inspection & testing, dispatches, loading , unloading ,storage at site, dismantling of existing equipment, installation, testing of the installation, commissioning ,handing over to the purchaser.

3.0 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

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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 COST OF BIDDING

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

B. BIDDING DOCUMENTS

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

(a) Request for Quotation (RFQ)
(b) Instructions to Bidders
(c) General Terms & Conditions of Contract (T&C)
(d) Delivery schedule
(e) Price Formats & Summary T&C
(f) Bid Form
(g) Acceptance Format – RA
(h) EMD BG Format
(i) Vendor code of conduct
(j) Appendix
(k) Technical Specifications (TS)

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

6.0 AMENDMENT OF BIDDING DOCUMENTS

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

6.02 The Amendment shall be part of the Bidding Documents, pursuant to Clause 5.01, and it will be notified in web site **www.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**

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6.04 Purchaser shall reserve the rights to following:
a) extend due date of submission,
b) modify tender document in part/whole,
c) cancel the entire tender

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

C. PREPARATION OF BIDS

7.0 LANGUAGE OF BID

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

8.0 DOCUMENTS COMPRISING THE BID

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

(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 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 Twenty (120) days after due date of submission drawn in favour of BSES Yamuna Power Ltd

The EMD may be forfeited in case:

(a) the Bidder withdraws its bid during the period of specified bid validity
Or
(b) in the case of a successful Bidder, if the Bidder does not

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(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 work 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.

10.03 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.**

10.04 The quantity break up shown else-where other than Price Schedule is tentative. The bidder shall ascertain himself regarding material required for completeness of the entire work. Any items not indicated in the price schedule but which are required to complete the job as per the Technical Specifications/ Scope of Work/ SLA mentioned in the tender, shall be deemed to be included in prices quoted.

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 120 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 one copy 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.

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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**

15.01 Bid submission: One original (hard copy) & one pen drive (sort copy without price bid) 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.

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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 except due to any corrigendum/addendum/modifications in the tender documents uploaded in website.

E. EVALUATION OF BID

20.0 **PROCESS TO BE CONFIDENTIAL**

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

21.0 **CLARIFICATION OF BIDS**

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

22.0 **PRELIMINARY EXAMINATION OF BIDS / RESPONSIVENESS**

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

22.02 Arithmetical errors will be rectified on the following basis. If there is a discrepancy between the unit price and the total price per item that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price per item will be corrected. If there is a discrepancy between the Total Amount and the sum of the total price per item, the sum of the total price per item shall prevail and the Total Amount will be corrected.

22.03 Prior to the detailed evaluation, Purchaser will determine the substantial responsiveness of each Bid to the Bidding Documents including production capability and acceptable quality of the Goods offered. A substantially responsive Bid is one, which conforms to all the terms and conditions of the Bidding Documents without material deviation.

22.04 Bid determined as not substantially responsive will be rejected by the Purchaser and/or the Purchaser and may not subsequently be made responsive by the Bidder by correction of the non - conformity.

23.0 **EVALUATION AND COMPARISON OF BIDS**

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23.01 The evaluation of Bids shall be done based on the delivered cost competitiveness basis.

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

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

23.03 The Purchaser's evaluation of a Bid will take into account, in addition to the Bid price, the following factors, in the manner and to the extent indicated in this Clause:

(a) Delivery Schedule

(b) Conformance to Qualifying Criteria

(c) Deviations from Bidding Documents

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

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

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

F. AWARD OF CONTRACT

24.0 CONTACTING THE PURCHASER

24.01 If any Bidder wishes to contact the Purchaser on any matter related to the Bid, from the time of Bid opening to the time of contract award, the same shall be done in writing only.

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

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

Submission of bids shall not automatically construe qualification for evaluation. The Purchaser reserves the right to accept or reject any Bid and to annul the Bidding process and reject all Bids at anytime prior to award of Contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders of the grounds for the Purchaser's action.

26.0 AWARD OF CONTRACT

The Purchaser will award the Contract to the successful Bidder whose Bid has been Determined to be the lowest-evaluated responsive Bid, provided further that the Bidder has been determined to be qualified to satisfactorily perform the Contract. Purchaser reserves the right to award order to

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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/PO from the Purchaser, the successful Bidder shall furnish the Performance Bank Guarantee towards faithful performance of Contract for an amount of 10% (Ten percent) of the Contract Price. The Performance Bond shall be valid up to completion period/handing over, whichever is earlier plus 3 months claim period. Upon submission of the performance security, the EMD shall be released. 2 (two) nos. separate CPBG's shall be submitted against Supply, ETC.

Bidder shall submit separate performance bank guarantee for the two project/grid. Value of the performance bank guarantee shall be 10% of the order value of the each project/grid.

30.0 **WORKMANSHIP/EQUIPMENT PERFORMANCE BANK GUARANTEE**

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 (Supply and Erection, Testing & Commissioning),with the validity of the bank guarantee till Defect Liability Period i.e. 60 months from the date of Handing over of entire package plus 3 months towards claim period.

Bidder shall submit separate performance bank guarantee for the two project/grid. Value of the performance bank guarantee shall be 10% of the order value of the each project/grid.

31.0 **CORRUPT OR FRADULENT PRACTICES**

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

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

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

(ii) "Fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Purchaser, and includes

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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.

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

32.00 COMPLETION PERIOD

05 Months from the date of LOA/PO for each project/grid.

04 months: Engineering - Drawing submission & approval, Electrical equipment Manufacturing, inspection & delivery at BYPL site. Detailed L2 schedule shall be finalized after award of contract.

01 month: Erection, Testing and Commissioning of electrical equipment and related accessories and handing over.

Detailed L2 schedule for both project/Grid shall be submitted separately by bidder.

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

Sealed with the Common Seal of the said Bank this_____ day of_____ 20____.

The conditions of this obligation are:

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

2. If the Bidder, having been notified of the acceptance of its Bid by the Purchaser during the period of bid validity:

(a) fails or refuses to execute the Contract Form, if required; or

(b) fails or refuses to furnish the performance security, In accordance with the Instructions to Bidders/ Terms and Conditions;

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

This guarantee will remain in force up to and including One Hundred Twenty (120) days after the due date of submission bid, and any demand in respect thereof should reach the Bank not later than the above date.

(Stamp & signature of the bank)

Signature of the witness

BSES Yamuna Power Limited

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

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

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

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

5 We agree to abide by this Bid for a period of 120 days from the due date of bid submission and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

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

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

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

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

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

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

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

(IN BLOCK CAPITALS) .....

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ACCEPTANCE FORM FOR PARTICIPATION IN REVERSE AUCTION EVENT

(To be signed and stamped by the bidder)

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

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

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

Signature & seal of the Bidder

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ANNEXURE - SCHEDULE OF DEVIATIONS

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

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

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

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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 strictly submitted in Box file/spiral binding. Any other format is not acceptable. Bid submitted in loose paper shall be rejected without any clarification to bidder.	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.**	N/A	

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

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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 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

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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:

. 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)

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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.

. 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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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.

1.0 General Instructions

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

1.02 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.

1.03 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 the other party.

1.04 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 RFQ requirement is incomplete.

1.05 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.

2.0 Definition of Terms

2.01 "Purchaser" shall mean BSES Yamuna Power Limited, on whose behalf this bid enquiry is issued by its authorized representative / officers.

2.02 "Bidder" shall mean the firm who quotes against this bid enquiry issued by the Purchaser. "Supplier" or "Supplier" shall mean the successful Bidder and/or Bidders whose bid has been accepted by the Purchaser and on whom the "Letter of Acceptance" is placed by the Purchaser and shall include his heirs, legal representatives, successors and permitted assigns wherever the context so admits.

2.03 "Supply" shall mean the Scope of Contract as described.

2.04 "Specification" shall mean collectively all the terms and stipulations contained in those portions of this bid document known as RFQ, Commercial Terms & Condition, Instructions to Bidders, Technical Specifications and the Amendments, Revisions, Deletions or Additions, as may be made by the Purchaser from time to time.

2.05 "Letter of Acceptance" shall mean the official notice issued by the Purchaser notifying the Supplier that his proposal has been accepted and it shall include amendments thereto, if any, issued by the Purchaser. The "Letter of Acceptance" issued by the Purchaser shall be binding on the "Supplier" The date of Letter of Acceptance shall be taken as the effective date of the commencement of contract.

2.06 "Month" shall mean the calendar month and "Day" shall mean the calendar day.

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2.07 "Codes and Standards" shall mean all the applicable codes and standards as indicated in the Specification.

2.08 "Offer Sheet" shall mean Bidder's firm offer submitted to BYPL in accordance with the specification.

2.09 "Contract" shall mean the "Letter of Acceptance/Purchase Order" issued by the Purchaser.

2.10 "Contract Price" shall mean the price referred to in the "Letter of Acceptance/Purchase Order".

2.11 "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.

2.12 "Acceptance" shall mean and deemed to include one or more of the following as will be stipulated in the specification:

a) The written acceptance of material by the inspector at suppliers works to ship the materials.
b) Acceptance of material at Purchaser site stores after its receipt and due inspection/ testing and release of material acceptance voucher.
c) Where the scope of the contract includes supply, acceptance shall mean issue of necessary equipment / material takeover receipt after installation & commissioning and final acceptance.

3.0 Contract Documents & Priority

3.01 Contract Documents: The terms and conditions of the contract shall consist solely of these RFQ conditions and the offer sheet.

4.0 Scope of Supply -General

4.01 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.

4.02 Bidder shall have to quote for the Bill of quantities as listed in Volume-II of this RFQ.

4.03 Quantity variation and additional requirement if any shall be communicated to successful bidder during project execution.

4.04 All relevant drawings, data and instruction manuals.

5.0 Quality Assurance and Inspection

5.01 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.

5.02 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

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

5.03 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.

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

5.05 All in-house testing and inspection shall be done with out any extra cost. The in-house inspection shall be carried out in presence of BSES/BSES authorized third party inspection agency. Cost of Futile/abortive visit(s) shall be debited from the invoices.

5.06 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. To avoid any complaint the supplier is advised to send his representative to the stores to see that the material sent for testing is being sealed in the presence of bidder's representative.

6.0 INSPECTION & TEST CHARGES:

6.01 GOODS shall be inspected by BUYER and/or third party inspection agency nominated by BUYER. Inspection shall carry out stage wise/final inspection as per agreed QA /QC procedure.
In addition, inspection of GOODS shall be carried out at our Site/stores. SELLER shall, however, repair/replace the damaged/rejected GOODS to the satisfaction of BUYER at no extra cost.

6.02 Inspection charges are included in total order value, however BUYER will bear third party inspection charges. In case of futile/abortive visit of BUYER's inspector at SELLER'S works, the cost towards the same shall be debited from the SELLER's invoices.

6.03 GOODS covered by this PURCHASE ORDER shall not be dispatched in whole or in part until SELLER has received a written Release for Shipment Notice from BUYER or their designated representative.

6.04 Inspection call shall be raised minimum 15(fifteen) days in advance from delivery schedule mentioned in PO and duly filled Format issued by BYPL

7.0 HANDLING AND STORAGE:

7.01 Material Safety Data Sheet (MSDS), detail handling & storage instruction sheet/manual, wherever applicable, to be furnished before commencement of supply and one copy is to be submitted in store/site with First Lot.

8.0 Packing, Packing List & Marking

8.01 **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

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damage in transit. All the packaging materials as prescribed shall be supplied preferably bio-degradable material.

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

9.0 Prices/Rates/Taxes

9.01 **Price basis for supply of materials**

a) Bidder to quote their prices on Landed Cost Basis and separate price for each item for supply to BYPL Delhi/New Delhi stores inclusive of packing, forwarding, loading at manufacturer's premises, payment of GST, Freight, any other local charges. **Octroi is presently not applicable in Delhi and however if applicable shall be reimbursed at actuals.**

b) The above supply prices shall also include unloading at BYPL Delhi/New Delhi stores/site.

c) Transit insurance will be arranged by bidder.

10.0 TAXES & DUTIES:

10.01 Prices for Goods are on Ex- Works basis. For the Goods covered under the GST laws, all taxes that are applicable under CGST, SGST, UGST, IGST and GST Compensation Cess shall be payable extra.

10.02 For the Goods not covered in the GST laws, the applicable ED, VAT / CST shall be payable extra at applicable rates.

10.03 GSTIN of BSES YAMUNA POWER LTD - 07AABCC8569N1Z0
CST No of BSES YAMUNA POWER LTD -07740254593
TIN NO of BSES YAMUNA POWER LTD - 07740254593
PAN NO of BSES YAMUNA POWER LTD - AABCC8569N

10.04 At the end of each month, the SELLER must submit their detail of invoices and amount thereof to the concerned officer in charge, within 07 days after the close of the respective month of which supply relates. Non submission of the said request would be treated as good as that the SELLER has no requirement of reconciliation.

11.0 INVOICING INSTRUCTIONS:

11.01 Invoices in triplicate [1) Original for recipient, 2) Duplicate for Transporter, 3) Triplicate for supplier] shall be made out and delivered to the following address: BSES YAMUNA POWER LIMITED, SHAKTI KIRAN BUILDING, KARKARDOOMA, DELHI-110032.
Material despatch clearance certificate (MDCC) will be released separately for Capex & Opex. Invoice will be submitted by supplier as per the MDCC.

11.02 Vendor shall obtain GST registration in the State from where the supply will be carried out. Vendors supplying Goods to the Purchaser shall have a valid GST registration number and shall submit GST Tax Invoice and other documents as per SGST Act, CGST Act, IGST Act, UTGST Act, GST Compensation Cess Act and Rules made there under. Failure to submit GST Tax Invoice shall be liable for withholding SGST, CGST, IGST, UTGST, GST Compensation Cess amount charged by the vendor while releasing the payment.

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11.03 Invoice in the name of BSES YAMUNA Power Limited & address of the store/site mentioned in the MDCC. Invoice should contain all information as required under GST Invoice, Debit Note and Credit Rules. The government has notified rules of invoicing under GST along with a template of invoice(GST INV-01) covering the elements such as supplier's details, GSTIN No, HSN Codes, item details, GST tax rates, etc that need to be presented by the supplier.

11.04 Vendor to carefully examine and charge relevant CGST / SGST, UGST, IGST and GST compensation cess as applicable to the transactions.

11.05 Timely provision of invoices / Debit Notes / Credit Notes:

11.05.1 Vendor to timely provide invoice / Debit note / Credit note to enable Purchaser to claim tax benefit on or before stipulated time period. All necessary adjustment entries (Credit Note, Purchase Returns, Debit Notes) shall be made within the time lines prescribed under the GST Laws.

11.05.2 In case of receipt of advance, the Vendor undertakes to raise the tax invoice. Purchaser, upon payment of advance, shall issue payment voucher as per applicable GST laws and rules. Four copies of the invoices need to be provided by suppliers and wherever the law requires, an Electronic Reference Number for each invoice.
Documents and devices to be carried by a person-in-charge of a conveyance under.

12.0 Terms of payment and billing

12.01 For Supply of Equipment:

A. 90% of basic value with 100% taxes and duties shall be payable against R/A bills for supply of equipment and materials within 45 days against receipt & acceptance of material at site and submission of following documents duly certified by BYPL Project-in-charge:-

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 certified by BYPL Stores/site & Original certificate issued by BYPL confirming receipt of the subject material at Stores/Site and acceptance of the same as per the provisions of the contract.
f) Two (02) copies Packing List / Detailed Packing List
g) Approved Test certificates / Quality certificates, if applicable
h) Certificate of Origin, if applicable
i) Material Dispatch Clearance Certificate (MDCC)
j) Insurance Policy / Certificate, if applicable
k) Warranty / Guarantee Certificate, if applicable
l) Check list for bill submission.

B. Balance 10% of supply value shall be paid within 45 days on completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by BYPL Engineer-in-Charge, on submission of Performance Bank Guarantee equivalent to 10% of contract value in the specified format and valid up to defect liability period plus three months towards claim period, submission of Electrical Inspector Clearance Certificate as applicable, 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

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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.

12.02 Purchaser has the right to recover tax loss, interest and penalty suffered due to any non-compliance of tax laws by the Vendor. In the event, Purchaser is not able to avail any tax credit due to any short coming on the part of the Vendor (which otherwise should have been available to Purchaser in the normal course), then the Vendor at his own cost and effort will get the short coming rectified. If for any reason the same is not possible, then the Vendor will make 'good' the loss suffered by Purchaser due to the tax credit it lost. In such event, any amount paid to the Vendors shall be first attributable to the tax (GST) charged in the invoice and the balance shall be considered towards the 'value' of supply of goods/ services.

12.03 Purchaser shall deduct "Tax Deducted at Source" wherever applicable and at the rate prescribed under the GST Laws or any other Indian law and remit the same to the Government. Necessary TDS certificates as per law shall be issued by the purchase to the vendor.

12.04 Any liability arising out of dispute on the tax rate, classification under HSN, calculation and payment of tax to the Government will be to the Vendor's account.

12.05 Where the supply of Goods are liable to GST under reverse charge mechanism, then the supplier should clearly mention the category under which it has been registered and also that "the liability of payment of GST is on the Recipient of Supply".

13.0 TAX INDEMNITY CLAUSE:

13.01 Vendor (along with its affiliates in India or overseas including any agent/ third party contractor or any other person appointed by such affiliates for the purpose of this agreement) agrees that it will be solely responsible for performing all compliances and making payments of all taxes (direct tax or indirect tax including but not limited to income-tax, transfer pricing, value added tax, SGST, CGST, IGST, UTGST, GST Compensation Cess custom duty, excise duty, Research and Development Cess, etc.), cesses, interest, penalties or any other tax/ duty/ amount/ charge/ liability arising either out of laws/ regulations applicable in India and overseas or because of a demand/ recovery initiated by any revenue authority under laws/ regulations applicable in India or overseas.

13.02 In case any tax liability (including but not limited to income-tax, transfer pricing, value added tax, SGST, CGST, IGST, UTGST, GST Compensation Cess custom duty, excise duty, Research and Development Cess, etc.), cesses, interest, penalties or any other tax/ duty/ amount/ charge/ liability becomes payable by Purchaser due to failure of the Vendor, or any of its affiliates in India or overseas including any agent/ third party contractor or any other person appointed by such affiliates for the purpose of this agreement, to comply with the relevant laws/ regulations applicable in India or overseas, Vendor undertakes to indemnify Purchaser for an amount equal to amount payable by Purchaser.

13.03 Further, Vendor undertakes to keep Purchaser indemnified at all times against and from all other actions, proceedings, claims, loss, damage, costs and expenses which may be brought against Purchaser or suffered or incurred by Purchaser and which shall have arisen either directly or indirectly out of or in connection with failure of The Vendor, or any of its affiliates in India or overseas including any agent/ third party contractor or any other person appointed by such affiliates for the purpose of this agreement, to comply with relevant obligations/ compliance under any law/ regulations applicable in India and overseas.

13.04 The parties agree to follow the following process in case any communication of demand, arising out non-compliance by Vendor (along with its affiliates in India or overseas including any agent/ third party contractor or any other person appointed by such affiliates for the purpose of this agreement), is received by Purchaser :

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13.04.1 On Purchaser receiving any communication from a competent authority demanding tax liability (including but not limited to income-tax, transfer pricing, value added tax, SGST, CGST, IGST, UTGST, GST Compensation Cess custom duty, excise duty, Research and Development Cess, etc.), cesses, interest, penalties or any other tax/ duty/ amount/ charge/ liability, Purchaser shall, within 5 common working days from the date of receipt of such communication (save where the period to respond to the relevant authority is less than five days, in which case, as soon as reasonably possible) inform Vendor in writing of such communication.

13.04.2 Pursuant to receiving communication from Purchaser, Vendor shall suggest to accept the communication and pay the demand amount to the competent authority. In such an event, Vendor shall reimburse such amount paid to Purchaser within 5 working days from the date of payment by Purchaser to the competent authority.

13.04.3 If Vendor advises in writing and Purchaser agrees to dispute the demand, then Purchaser shall dispute the matter with competent authority as per due process prescribed under the regulations and Purchaser shall not pay the Tax Demand. In such scenario, cost of litigation including but not limited to Counsel cost, filing fees, other related charges, should be reimbursed by Vendor to Purchaser. Additionally, If any coercive steps of recovery are initiated by the department, then Purchaser would pay such amount (including by way of adjustment of refunds due to it) and the same would be reimbursed by Vendor within 5 working days from date of such recovery from Purchaser. Purchaser will take all necessary steps to avoid such recovery measures.

13.04.4 On determination of the demand through an Order issued by a Tribunal or any other similar Authority, by whatever name called, under any law applicable in India or overseas, if the demand or any part thereof becomes payable and is paid by Purchaser, then Vendor undertakes to reimburse such amount to Purchaser within 10 days from the date of payment. Alternatively, if on determination of the demand through an Order, no amount is payable by Purchaser then any refund arising to Purchaser due to such an Order shall be passed on to Vendor within 10 days from the date of receipt of refund.

14.0 The Micro, Small and Medium Enterprises (MSME):

14.01 If the SELLERS establishment is covered under the purview of The Micro, Small and Medium Enterprises Development Act, 2006, he shall declare so within the bid of its status failing which it will be presumed that it is a non-MSME unit. Also submit a copy of Udyog Aadhaar (UA) if available.

15.0 Price Validity

15.01 All bids submitted shall remain valid, firm and subject to unconditional acceptance by BRPL Delhi for 120 days from the due date of submission & subsequent corrigendum/amendment/extension of due date of submission. For awarded suppliers/contractors, the prices shall remain valid and firm till contract completion.

16.0 Performance Guarantee

16.01 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.

16.02 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.

Bidder shall submit separate performance bank guarantee for the two project/grid. Value of the performance bank guarantee shall be 10% of the order value of the each project/grid.

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16.03 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 (Supply and Erection, Testing & Commissioning),with the validity of the bank guarantee till Defect Liability Period i.e. 60 months from the date of Handing over of entire package plus 3 months towards claim period.

Bidder shall submit separate performance bank guarantee for the two project/grid. Value of the performance bank guarantee shall be 10% of the order value of the each project/grid.

17.0 Forfeiture

17.01 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.

18.0 Release

18.01 All Performance Bonds will be released without interest within seven (7) days from the last date up to which the Performance Bond has to be kept valid (as defined in Clause 16.0) except for the case set forth in Clause 24.0.

19.0 Defects Liability Period/Guarantee/Warranty

19.01 The bidder to Guarantee the materials / items supplied against any defect of failure, which arise due to faulty materials, workmanship or design for the entire defects liability period. The Defect liability period shall be 60 months from the date of commissioning or 66 months from the date of delivery whichever is earlier.

19.02 If during the Defects Liability Period any GOODS are found to be defective, they shall be promptly replaced or rectified by BIDDER at its own cost (including the cost of dismantling and (reinstallation) on the instructions of BUYER and if removed from SITE for such purpose, shall be removed and re-delivered to SITE by BIDDER at its own cost.

20.0 Return, Replacement or Substitution.

20.01 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. BUYER at its sole discretion shall have the opinion to dispose the material or GOODS so rejected and not taken back within forty-five days from the date of intimation of rejection.

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21.0 Effective Date of Commencement of Contract:

21.01 The date of the issuance of the Letter of Acceptance/Purchase Order shall be treated as the effective date of the commencement of Contract.

22.0 Time – The Essence Of Contract

22.01 The time and the date of completion of the "Supply" as stipulated in the Letter Of Acceptance / Purchase order issued to the Supplier shall be deemed to be the essence of the "Contract". The Supply has to be completed not later than the aforesaid Schedule and date of completion of supply.

23.0 The Laws and Jurisdiction of Contract:

23.01 The laws applicable to this Contract shall be the Laws in force in India.

23.02 All disputes arising in connection with the present Contract shall be settled amicably by mutual consultation failing which shall be finally settled as per the rules of Arbitration and Conciliation Act, 1996 at the discretion of Purchaser. The venue of arbitration shall be at Delhi in India

24.0 Events of Default

24.01 Events of Default. Each of the following events or occurrences shall constitute an event of default ("Event of Default") under the Contract:

(a) Supplier fails or refuses to pay any amounts due under the Contract;

(b) Supplier fails or refuses to deliver Commodities conforming to this RFQ/ specifications, or fails to deliver Commodities within the period specified in P.O. or any extension thereof

(c) 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;

(d) 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.

25.0 Consequences of Default.

(a) If an Event of Default shall occur and be continuing, BYPL may forthwith terminate the Contract by written notice.

(b) In the event of an Event of Default, BYPL may, without prejudice to any other right granted to it by law, or the Contract, take any or all of the following actions;

(i) present for payment to the relevant bank the Performance Bond;

(ii) purchase the same or similar Commodities from any third party; and/or

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(iii) recover any losses and/or additional expenses BYPL may incur as a result of Supplier's default.

26.0 Penalty for Delay

26.01 If supply of items/equipments is delayed beyond the delivery schedule as stipulated in purchase order then the Supplier shall be liable to pay to the Purchaser as penalty for delay, a sum of 1% (one percent) of the Total price for every week delay of undelivered units or part thereof for individual mile stone deliveries.

26.02 The total amount of penalty for delay under the contract will be subject to a maximum of ten percent (10%) of the Total price of total undelivered units.

26.03 The Purchaser may, without prejudice to any method of recovery, deduct the amount for such damages from any amount due or which may become due to the Supplier or from the Performance Bond or file a claim against the supplier.

22.4 If Penalty is levied as per the Order terms & conditions; BYPL will raise Invoice of the penalty amount along with applicable GST rates. Accordingly, after set off of the penalty Invoice amount, net payment shall be made.

27.0 VARIATION IN TAXES, DUTIES & LEVIES

27.1 The total order value shall be adjusted on account of any variations in Statutory Levies imposed by Competent Authorities by way of fresh notification(s) within the stipulated delivery period only. In case of reduction in taxes, duties and levies, the benefits of the same shall be passed on to BUYER.

27.2 No other Taxes, Duties & Levies other than those specified above will be payable by BUYER except in case of new Levies, Taxes & Duties imposed by the Competent Authorities by way of fresh notification(s) subsequent to the issue of PURCHASE ORDER but within the stipulated delivery period.

27.3 Notwithstanding what is stated above, changes in Taxes, Duties & Levies shall applied only to that portion of PURCHASE ORDER not executed on the date of notification by Competent Authority. Further, changes in Taxes, Duties & Levies after due date of Delivery shall not affect PURCHASE ORDER Terms and Value.

27.4 PURCHASE ORDER value shall not be subject to any variation on account of variation in Exchange rate(s).

28.0 TAXES & DUTIES ON RAW MATERIALS & BOUGHT OUT COMPONENTS:

28.01 Taxes & Duties on raw materials & bought out components are included in Order Value and are not subject to any escalation or variation for any reason whatsoever.

28.02 Taxes & Duties on raw materials & bought out components procured indigenously are included in Order Value and are not subject to any escalation or variation for any reason whatsoever.

29.0 Force Majeure

29.01 General

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An "Event of Force Majeure" shall mean any event or circumstance not within the reasonable control directly or indirectly, of the Party affected, but only if and to the extent that:

(i) Such event or circumstance materially and adversely affects the ability of the affected Party to perform its obligations under this Contract, and the affected Party has taken all reasonable precautions, due care and reasonable alternative measures in order to prevent or avoid the effect of such event on the affected party's ability to perform its obligations under this Contract and to mitigate the consequences thereof.

(ii) For the avoidance of doubt, if such event or circumstance would not have materially and adversely affected the performance of the affected party had such affected party followed good industry practice, such event or circumstance shall not constitute force majeure.

(iii) Such event is not the direct or indirect result of the failure of such Party to perform any of its obligations under this Contract.

(iv) Such Party has given the other Party prompt notice describing such events, the effect thereof and the actions being taken in order to comply with above clause.

29.02 Specific Events of Force Majeure subject to the provisions of above clause, Events of Force Majeure shall include only the following to the extent that they or their consequences satisfy the above requirements :

(i) The following events and circumstances :

a) Effect of any natural element or other acts of God, including but not limited to storm, flood, earthquake, lightning, cyclone, landslides or other natural disasters.

b) Explosions or fires

(ii) War declared by the Government of India, provided that the ports at Mumbai are declared as a war zone.

(iii) Dangers of navigation, perils of the sea.

29.03 Notice of Events of Force Majeure If a force majeure event prevents a party from performing any obligations under the Contract in part or in full, that party shall:

i) Immediately notify the other party in writing of the force majeure events within 7(seven) working days of the occurrence of the force majeure event

ii) Be entitled to suspend performance of the obligation under the Contract which is affected by force majeure event for the duration of the force majeure event.

iii) Use all reasonable efforts to resume full performance of the obligation as soon as practicable

iv) Keep the other party informed of all such efforts to resume full performance of the obligation on a regular basis.

v) Provide prompt notice of the resumption of full performance or obligation to the other party.

29.04 Mitigation of Events of Force Majeure Each Party shall:

(i) Make all reasonable efforts to prevent and reduce to a minimum and mitigate the effect of any delay occasioned by an Event of Force Majeure including recourse to alternate methods of satisfying its obligations under the Contract;

(ii) Use its best efforts to ensure resumption of normal performance after the termination of any Event of Force Majeure and shall perform its obligations to the maximum extent practicable as agreed between the Parties; and

(iii) Keep the other Party informed at regular intervals of the circumstances concerning the event of Force Majeure, with best estimates as to its likely continuation and what measures or contingency planning it is taking to mitigate and or terminate the Event of Force Majeure.

29.05 Burden of Proof In the event that the Parties are unable in good faith to agree that a Force Majeure event has occurred to an affected party, the parties shall resolve their dispute in accordance with the provisions of this Agreement. The burden of proof as to whether or not a

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force majeure event has occurred shall be upon the party claiming that the force majeure event has occurred and that it is the affected party.

29.06 Termination for Certain Events of Force Majeure. If any obligation of any Party under the Contract is or is reasonably expected to be delayed or prevented by a Force Majeure event for a continuous period of more than 3 months, the Parties shall promptly discuss in good faith how to proceed with a view to reaching a solution on mutually agreed basis. If a solution on mutually agreed basis cannot be arrived at within a period of 30 days after the expiry of the period of three months, the Contract shall be terminated after the said period of 30 days and neither Party shall be liable to the other for any consequences arising on account of such termination.

29.07 Limitation of Force Majeure event. The Supplier shall not be relieved of any obligation under the Contract solely because cost of performance is increased, whether as a consequence of adverse economic consequences or otherwise.

29.08 Extension of Contract Period due to Force Majeure event The Contract period may be extended by mutual agreement of Parties by way of an adjustment on account of any period during which an obligation of either Party is suspended due to a Force Majeure event.

29.09 Effect of Events of Force Majeure. Except as otherwise provided herein or may further be agreed between the Parties, either Party shall be excused from performance and neither Party shall be construed to be in default in respect of any obligations hereunder, for so long as failure to perform such obligations shall be due to and event of Force Majeure."

30.0 **Transfer And Sub-Letting**

30.01 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.

31.0 **Recoveries**

31.01 When ever 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 detecting 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.

32.0 **Waiver**

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

33.0 **Indemnification**

33.01 Notwithstanding contrary to anything contained in this RFQ, 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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34.0 **Problem Troubleshooting & Restoration In Warranty Period For A Particular Equipment:**

34.01 a) Service Engineer Availability to Attend, Identify & Restore Defects (Minor) Of Equipments under Guarantee Period within 48 Working Hours (Exclusion of Material Support Cases)
b) Spare Material Delivery For Restoration Of Grid Equipment (Major Defect) Under Guarantee Period Within Two Weeks. Seller must keep Requisite Inventory of Critical Switchgear Spares & Other Equipment's Covered in Guarantee Period to Restore Equipment within Two Weeks.
c) In Case Of Complete Replacement of Equipment, Complete Equipment to Be Replaced Within a Period Of 4 Weeks.

35.00 **DOCUMENTATION**

35.01 The Bidder shall procure all equipment from BYPL approved sources as per attached specifications. The Bidder's shall submit 5 copies of Material/Type Test Certificates, O&M Manuals, and Approved & As-built drawings, related to various equipment. The Bidder's shall ensure for the strict compliance to the specifications and Field Quality Procedures issued by BYPL Engineer in-charge.

36.0 **Limitation of Liability**

36.01 Except as provided otherwise in the Contract and except for willful misconduct or gross negligence, neither Party shall be liable to the other Party for loss of use of any Works, loss of profit, loss of any contract or any other indirect or consequential loss or damage which may be suffered by the other Party in connection with the Contract. The total liability of the Contractor to the Purchaser under the Contract shall not exceed the Contract Value except that this Clause shall not limit the liability of the Contractor:
(a) In cases of fraud, willful misconduct or illegal or unlawful acts, or
(b) In cases of acts or omissions of the Contractor which are contrary to the most elementary rules of diligence which a conscientious Contractor would have followed in similar circumstances.

37.0 **Liability of Contractors**

37.01 Subject to the due discharge of its obligations under the Contract and except in case of gross negligence or willful misconduct on the part of the Contractor or on the part of any person acting on behalf of the Contractor, with respect to any loss or damage caused by the Contractor to the Purchaser's property or the Site, the Contractor shall not be liable to the Purchaser for the following:
(a) For any indirect or consequential loss or damage; and
(b) For any direct loss or damage that exceeds:
(i) The total payments made and expected to be made to the Contractor under the Contract including reimbursements, if any; or
(ii) The insurance claim proceeds which the Contractor may be entitled to receive from any insurance purchased by the Contractor to cover such a liability, whichever is higher.

37.02 This limitation of liability shall not affect the Contractor's liability, if any, for damage to any third party, caused by the Contractor or any Person or firm acting on behalf of the Contractor in executing the Works.

37.03 Notwithstanding anything contained in the Contract, the Contractor shall not be liable for any gross negligence or willful misconduct on the part of the Purchaser or any of its affiliates, any vendor, or any party, other than Contractor and/or, its directors, officers, agents or representatives or its affiliates, or Subcontractor, or the vendor or any third party engaged by it.

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37.04 Notwithstanding anything contained in the Contract, including but not limited to approval by the Purchaser of any drawings, documents, vendor list, supply of information or data or the participation of the Purchaser in any meeting and/or discussion or otherwise, shall not absolve the Contractor from any of its liabilities or responsibilities arising in relation to or under the Contract.

38.0 **Intellectual Property Rights and Royalties**

38.01 The Contractor shall indemnify the Purchaser and the Purchaser's Representative from and against all claims and proceedings on account of infringement (or alleged infringement) of any patent rights, registered designs, copyright, design, trademark, trade name, know-how or other intellectual property rights (hereinafter collectively referred to as "Intellectual Property Rights") in respect of the Works, Contractor's Equipment, machines, Works method, Plant, Materials, or anything whatsoever required for the execution of the Works and from and against all claims, demands, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto. In the event of infringement of any Intellectual Property Rights of any third party as a result of the execution of the Works (or any part thereof) by the Contractor, the Contractor shall rectify, modify or replace, at its own cost, the Works, Plant or Materials or anything whatsoever required for the Works so that infringement ceases to exist or, in the alternative, the Contractor shall procure necessary rights/ licenses from the affected third party so that there is no infringement of Intellectual Property Rights.

38.02 The Contractor shall be promptly notified of any claim made against the Purchaser. The Contractor shall, at its cost, conduct negotiations for the settlement of such claim, and any litigation or arbitration that may arise from it. The Purchaser or the Purchaser's Representative shall not make any admission which might be prejudicial to the Contractor, unless the Contractor has failed to take over the conduct of the negotiations, litigation or arbitration within a reasonable time after having been so requested. In the event of Contractor failing to act at the Purchaser's Representative's notice, the Purchaser shall be at full liberty to deduct any such amount of pending claim from any amount due to the Contractor under the Contract or any other contract and the balance portion of claim shall be treated as debt due from the Contractor.

38.03 All Intellectual Property Rights in respect of any Plant, Materials, Drawings and Designs, plans, documents, specifications, data, materials, know how, charts, information, etc., provided to the Contractor by the Purchaser pursuant to this Contract for the execution of the Works, belongs to and shall continue to belong to the Purchaser and the Contractor shall not have any rights in the same other than the limited right for its use for the purpose of execution of the Works.

38.04 Intellectual Property Rights in respect of any Plant, Materials, Drawings and Designs, plans, calculations, drawings, documents, know-how and information relating to the Works which are proprietary to the Contractor and/ or its third party licensors ("Contractor's IPR") shall continue to vest with the Contractor and/ or its third party licensors and the Contractor shall grant and/ or procure from its third party licensors, at its own cost, a worldwide, perpetual, royalty free, non-exclusive license (along with the right to sub-license) to use and reproduce such Contractor's IPR for the use, operation, maintenance and repair of the Works.

38.05 If any patent, trademark, trade name, registered design or software is developed by the Contractor or its Subcontractor specifically for the execution of the Works, then all Intellectual Property Rights in respect of such design, trademark, trade name or software shall be the absolute property of the Purchaser and shall not be utilized or retained by the Contractor (or its Subcontractors) for any purpose other than with the prior written consent of the Purchaser.

38.06 If the Contractor uses proprietary software (whether customized or off the shelf) for the purpose of storing or utilizing records in relation to the Works, the Contractor shall obtain at its own expense, the grant of a worldwide, royalty-free, perpetual licence or sublicence (including the right to sublicense) to use such software, in favour of the Purchaser provided that the use of such software

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under the licence or the sublicense may be restricted to use any such software only for the design, construction, reconstruction, manufacture, installation, completion, reinstatement, extension, repair and operation of the Works or any part thereof.

38.07 If any software is used by the Contractor for the execution of the Works over which the Contractor or a third party holds pre-existing title or other rights, the Contractor shall obtain for the Purchaser, a worldwide, royalty free, perpetual license for the right to use and apply that software (together with any modifications, improvements and developments thereof).

39.00 **Commissioning Spares**

39.01 Commissioning Spares shall be deemed to be included in the quoted prices.

40.0 **Transit Insurance:**

40.01 Transit Insurance shall be arranged by the Bidder.

40.02 DAMAGE / LOSS OF CARGO IN TRANSIT: Vendor shall be solely responsible for coordinating with the concerned insurance company for procuring insurance for material and/or Goods, processing claim lodgment and settlement. Notwithstanding the insurance cover, in case of loss / damage to material and/or Goods, in any manner and for any cause whatsoever, Vendor shall cause the damaged cargo to be replaced and delivered to the Purchaser with new material and/or Goods within 30 days of such loss / damage. The Vendor shall be solely responsible for all expenses in relation to the replacement and delivery in such circumstances.

41.0 **Acceptance:**

41.01 Vendor confirms to have gone through the Policy of BYPL on legal and ethical code required to be followed by vendors encapsulated in the "Vendor Code of Conduct" displayed on the official website of BYPL (www.bsesdelhi.com) also, which shall be treated as a part of the contract/PO/WO.
Vendor undertakes that he shall adhere to the Vendor code of Conduct and also agrees that any violation of the Vendor Code of Conduct shall be treated as breach of the contract/PO/WO.
In event of any such breach, irrespective of whether it causes any loss/damage, Purchaser (BYPL) shall have the right to recover loss/damage from Vendor.
The Contractor/Vendor herby indemnifies and agrees to keep indemnified the Purchaser (BYPL) against any claim/litigation arising out of any violation of Vendor Code of Conduct by the Contractor/Vendor or its officers, agents & representatives etc.

41.02 Acceptance of the CONTRACT implies and includes acceptance of all terms and conditions enumerated in the CONTRACT in the technical specification and drawings made available to Contractor consisting of general conditions, detailed scope of work, detailed technical specification, detailed equipment drawing and complete scope of work.

41.03 Contractor and Company contractual obligation are strictly limited to the terms set out in the CONTRACT. No amendments to the concluded CONTRACT shall be binding unless agreed to in writing for such amendment by both the parties

41.04 We expect your services and supplies are aligned to our Vision, Mission and Values. Please refer to the following link to know about our Vision, Mission and Values; https://www.bsesdelhi.com/web/bypl/about-bses.

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GENERAL CONDITIONS OF CONTRACT (GCC-ETC)

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GENERAL TERMS & CONDITIONS - ERRECTION, TESTING, & COMISSIONING

1. DEFINITIONS and INTERPRETATION:

The following terms shall have the following meanings:

1.1 "Company": means BSES Yamuna Power Ltd, a company incorporated under the Companies Act 1956 and having its office at BSES Yamuna Power Limited having its office at Shaktikiran Building, Karkardooma, Delhi -110032, which expression shall include its authorized representatives, agents, successors and assigns.

1.2 "Contractor": shall mean the successful Tenderer / vendor to whom the contract has been awarded

1.3 "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.

1.4 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.

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

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

2. EXAMINATION OF SITE AND LOCAL CONDITIONS:

2.1 The contractor is deemed to have visited the site of the work and ascertained therefore all site conditions and information pertaining to his work. The company shall not accept any claim whatsoever arising out of the difficult site/terrain/local conditions, if any.

3. LANGUAGE AND MEASUREMENT:

3.1 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.

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

4. SCOPE OF WORK:

4.1 The scope of work under this contract shall include the turnkey execution on End to End Basis , including Survey, Designing, manufacturing, inspection & testing, dispatches, loading , unloading, storage at site, erection & installation, testing of the installation, commissioning ,handing over to the purchaser.

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4.2 A Separate order will be placed for supply & ETC which inter-alia includes the Scope of Work as mentioned/required for satisfactory operation of the Scheme shall be in Bidder's scope. Bidder(s) must provide goods and services that conform to these specifications for the entire term of the agreement.

4.3 All the labour, cranes, tool and tackles, and technical supervision etc. are including 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 (with in seven days) after award of contract.

4.4 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.

4.5 The scope shall also include installation, transportation, loading & unloading of free-issued materials if any and transportation of scrap (generated at Site), balance free-issued material, dismantled material from site to BYPL store including loading & unloading and no additional charges shall be paid against these activities.

4.6 After completion of E/T/C work , contractor has to obtain Electrical Inspector/BYPL's clearance certificate of the electrical installation.

5. RATES:

5.1 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.

5.2 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.

6. TAXES AND DUTIES:

6.1 Prices are inclusive of all taxes and duties including labour cess and GST as applicable. However, IT as per applicable rate will be deducted from your bills as Tax Deduction at Source (TDS). The total order value shall remain **FIRM** and shall only be adjusted on account of any variations in Statutory Taxes, duties and Levies imposed by Competent Authorities by way of fresh notification(s) within the stipulated delivery period.

7. BILL SUBMISSION PROCEDURE:

7.1 All bills shall be submitted to the Engineer In charge for certification. Bills shall be complete in all respect including ESI / HR compliance, Quality compliance, HSE compliance, Store compliance, Finance compliance etc. An established procedure is followed at site. Incomplete bills / invoices will not be considered for processing payments.

8. TERMS OF PAYMENT:

8.1 Payment shall be made as under:

A. 90% pro-rata payment of total installation value corresponding to actual executed value shall be made progressively on submission of your running invoices on Monthly basis duly certified by our Engineer In charge & shall be paid within 45 days on receipt of such bills at our office.

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B. Balance 10% on account of total installation value of the actual executed value shall be paid within 45 days after completion of successful acceptance testing, commissioning and handing over of complete systems duly certified by BYPL Engineer-in-Charge, submission of performance Bank Guarantee equivalent to 10% of contract value in the specified format and valid up to defect liability period plus three months towards claim period, submission of Electrical Inspector Clearance Certificate as applicable, 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.

8.2 Company shall make payments of the bills by electronic transfer directly to Contractor's designated bank account.

9. COMPLETION PERIOD:

9.1 For completion period, refer "Information to bidder" Clause 32.00 - Completion period.

10. PERFORMANCE GUARANTEE

10.01 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.

10.02 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.

Bidder shall submit separate performance bank guarantee for the two project/grid. Value of the performance bank guarantee shall be 10% of the order value of the each project/grid.

10.03 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 (Supply and Erection, Testing & Commissioning),with the validity of the bank guarantee till Defect Liability Period i.e. 60 months from the date of Handing over of entire package plus 3 months towards claim period.

Bidder shall submit separate performance bank guarantee for the two project/grid. Value of the performance bank guarantee shall be 10% of the order value of the each project/grid.

11. CLEANLINESS & PRECAUTIONS INSTRUCTIONS:

Bidder has to take precaution while doing work at site to ensure cleanliness and prevent dust pollution:

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

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

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

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iii. 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.
iv. Bidder 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.
v. Over loading of vehicles shall be strictly prohibited
vi. The construction material at site shall be stored under wet and covered condition.
vii. The dumping sites for temporarily storing the excavated earth shall be properly leveled, watered and rehabilitated by plantation to avoid flying of dust.
viii. The worker at the site shall be sensitized to adopt / observe the dust controlled measures in true spirit.
ix. 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.
x. Wet jet in grinding and stone cutting is being permitted at site.
xi. The necessary record for dust control is being maintained by the department on day to day basis and being monitored regularly.
xii. Bidder shall ensure that no tree shall be harmed and no tree roots shall be destroyed/cut while performing the task under contract.
xiii. Bidder shall comply the provisions of The Delhi Preservation of Trees Act 1994.

11.3 Bidder 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. Bidder shall be liable for the penalties / other action by the authorities, Bidder shall indemnify BYPL/its employees/officers/directors from all liabilities on this account.

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

i. The sites of all manholes, pits, holes, tanks or any other opening in the ground of any kinds shall be regularly inspected and maintained.
ii. Schedule and protocols of inspections and maintenance shall be drawn up and notified to BYPL.
iii. These sites shall be cordoned off to render them inaccessible to the public.
iv. The existence of these sites shall be clearly & visibly marked by the display of signboards/ signages.
v. If they are required to be covered, it shall be ensured that the covers are in place.
vi. If required, as per law, prior permission from authorities shall be secured before the commencement of work.
vii. Bidder shall follow all law of the land and prevailing borders issued by various Govt departments like Dept of Power / DERC /NGT/ Dept of forest /Dept of environment/DPCB/Court Orders etc.

12. COMMISSIONING & ACCEPTANCE TEST:

12.1 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.

12.2 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.

13. WORK COMPLETION CERTIFICATION, HANDING OVER:

13.1 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

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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.

14. PENALTY AND LIQUIDATED DAMAGES:

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

14.2 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.

14.3 If the Contractor failed perform the services within the time period specified in the order, the Company shall, without prejudice to its other remedies under the contract, deduct liquidated damages a sum equivalent to 1% of the Total order value for each week or part there of delay until the actual date of completion up to a maximum deduction of 10% of Total order value. Once the maximum is reached to Company may consider termination of contract without any liabilities to Company.

14.4 Engineer In charge should specifically mention the amount of LD levied on the bill of contractor.

15. SAFETY CODE:

15.1 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.

15.2 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.

15.3 The contractor employing two hundred employees or more, including contract workers, shall have a safety co-ordinator 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 co-ordinator 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.

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

15.5 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 casualities, 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.

16. STATUTORY OBLIGATIONS:

16.1 The Contractor shall take all steps as may be necessary to comply with various Acts, Rules, including but not limited to The Child Labour (Prohibition & Regulation) Act, 1986, The Contract Labour (Regulation & Abolition) Act, 1970. The Employees Pension scheme , The Employees Provident Funds and miscellaneous provisions Act, 1952 ,The Employees state Insurance

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Act,1948,The Equal Remuneration Act, The Industrial Dispute Act,1947, The Maternity Benefit Act , 1961, The Minimum Wages Act, 1948, The payment of Bonus Act ,1965, The Payment of Gratuity Act,1972, The Payment of wages Act, 1936, The Shops & Establishment Act, The Workmen's Compensation Act , 1923, Building and Other Construction Workers (Employment and Regulations) Act 1996, Building and Other Construction Workers (Cess) Act 1996, The Employers Liability Act,1938, Indian Electricity Act, 2003 and Indian Electricity Rules, VAT and Service tax etc., and all other applicable laws as amended 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.
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) Sales Tax registration number, if applicable.
f) PAN No.
g) Work Contract Tax Registration Number/ VAT Registration.
h) Labour License under Contract Labour Act (R & A) Act 1970.
i) Delhi Building and other Construction Worker (Regulation of Employment and Conditions of Services) Rules, 2002(B.O.C.W.)

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

16.2 The Contractor must follow:

a) Third party Insurance Policy before start of work.
b) To follow Minimum Wages Act prevailing in the state.
c) The Salary/wages to all deployed manpower is to be distributed through ECS only into the bank accounts of all individuals and not later than 7th of succeeding month. In case of unavoidable circumstances the payment may be made through crossed cheques in the name of the individual and information of all such cases need to be submitted to HR(CMC).
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}.

16.3 Before commencing the work it would be mandatory for the Contractor to furnish the Company the permanent PF code no and ESI of the employees.

17. WORKMAN COMPENSATION:

17.1 The Contactor shall take insurance policy 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.

17.2 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

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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.

17.3 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.

18. STAFF AND WORKMAN:

(I) It shall be responsibility of contractor:

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

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

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

(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 our Engineer in charge to assist him to discharge the overall responsibility of the execution of the project.

19. THIRD PARTY INSURANCE:

19.1 Before commencing the execution of the work the Bidder shall take third party insurance policy to insure against any damage or loss or injury which may occur to any property / public property or

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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 Bidder 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 Bidder's own cost.

20 ENVIRONMENTAL, HEALTH & SAFETY PLAN:

20.1 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 contractor's staff are accountable for the following:

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.

21. TEST CERTIFICATE & QUALITY ASSURANCE:

21.1 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.

22. SUB-CONTRACTING / SUBLETTING:

22.1 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.

22.2 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.

22.2 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

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all respects in accordance with this Work Order, specification, approved drawings and data sheets.

23. INDEMNITY:

23.1 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.

23.2 Contractor shall at all times indemnify COMPANY against all liabilities to other persons, including he employees or agents of COMPANY or contractor for bodily injury, damage to property or other loss which may arise out of or in consequence of the execution or completion of Works and against all costs charges and expenses that may be occasioned to COMPANY by the claims of such person.

24. **EVENTS OF DEFAULTS**:

24.1 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.

24.2 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.

25. RISK & COST:

25.1 If the Contractor fails to execute the work as per specification / as per the direction of Engineer's In-charge within the scheduled period and even after the extended period, the contract shall 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 Contractor.

26. ARBITRATION:

BSES Yamuna Power Limited

26.1 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.

27. FORCE MAJEURE:

27.1 General:

An "Event of Force Majeure" shall mean any event or circumstance not within the reasonable control, of the Party affected, but only if and to the extent that:

(i) Such event or circumstance, despite the exercise of reasonable diligence, could not have been prevented, avoided or reasonably foreseen by such Party;

(ii) Such event or circumstance materially and adversely affects the ability of the affected Party to perform its obligations under this Contract, and the affected Party has taken all reasonable precautions, due care and reasonable alternative measures in order to prevent or avoid the effect of such event on the affected parties ability to perform its obligations under this Contract and to mitigate the consequences thereof. For the avoidance of doubt, if such event or circumstance would not have materially and adversely affected the performance of the affected party had such affected party followed good industry practice, such event or circumstance shall not constitute force majeure.

(iii) Such event is not the direct or indirect result of the failure of such Party to perform any of its obligations under this Contract; and

(iv) Such Party has given the other Party prompt notice describing such events, the effect thereof and the actions being taken in order to comply with above clause

27.2 Specific Events of Force Majeure:

Subject to the provisions of above clause, Events of Force Majeure shall include only the following to the extent that they or their consequences satisfy the above requirements: The following events and circumstances:

(i) Effect of any natural element or other acts of God, including but not limited to storm, flood, earthquake, lightning, cyclone, landslides or other natural disasters, and

(ii) Explosions or fires

(iii) Declaration of the Site as war zone

Any order, regulation, directive, requirement from any Governmental, legislative, executive or judicial authority.

27.3 Notice of Events of Force Majeure:

If a force majeure event prevents a party from performing any obligations under the Contract in part or in full, that party shall:

BSES Yamuna Power Limited

(i) Immediately notify the other party in writing of the force majeure events within 2 working days of the occurrence of the force majeure event

(ii) Be entitled to suspend performance of the obligation under the Contract which is affected by force majeure event for the duration of the force majeure event

(iii) Use all reasonable efforts to resume full performance of the obligation as soon as practicable

(iv) Keep the other party informed of all such efforts to resume full performance of the obligation on a regular basis.

(v) Provide prompt notice of the resumption of full performance or obligation to the other party.

27.4 Mitigation of events of force majeure:

The Contractor shall:

(i) Make all reasonable efforts to prevent and reduce to a minimum and mitigate the effect of any delay occasioned by an Event of Force Majeure, including applying other ways in which to perform the Contract;

(ii) Use its best efforts to ensure resumption of normal performance after the termination of any Event of Force Majeure and shall perform its obligations to the maximum extent practicable as agreed between the Parties; and

(iii) Keep the Company informed at regular intervals of the circumstances concerning the event of Force Majeure, with best estimates as to its likely continuation and what measures or contingency planning it is taking to mitigate and or terminate the Event of Force Majeure.

27.5 Burden of proof:
In the event that the Parties are unable in good faith to agree that a Force Majeure event has occurred to an affected party, the parties shall resolve their dispute in accordance with the provisions of this Contract. The burden of proof as to whether or not a force majeure event has occurred shall be upon the party claiming that the force majeure event has occurred and that it is the affected party.

27.6 Terminations for certain events of force majeure:

27.7 If any obligation of any Party under the Contract is or is reasonably expected to be delayed or prevented by a Force Majeure event for a continuous period of more than 1 (one) month during the Term of the Contract the Contract shall be terminated at the discretion of the Company and neither Party shall be liable to the other for any consequences arising on account of such termination.

28. SECRECY CLAUSE:

28.1 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. This 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 Bidder

BSES Yamuna Power Limited

during the executions of this work order, if any, immediately after they have been used for agreed purpose.

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

29. TERMINATION:

29.1 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.

30. QUALITY:

30.1 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.

30.1 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.

31. **INSURANCE POLICY FOR LIFE COVER:**

31.1 Before commencing the execution of the work the CONTRACTOR shall take Life 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.

31.2 The policy shall have coverage of Rs. 10 Lacs (Table C- Death + Permanent Total Disability + Partial permanent Disability due to external accidents). The premium amount for such life cover policy shall be in contractor scope. The policy document shall be submitted before commencement of the work by the contractor.

32. ACCEPTANCE:

32.1 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 Bidder'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.

32.2 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 Bidder.

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

BSES Yamuna Power Limited

APPENDIX II

FORMAT OF PERFORMANCE BANK GUARANTEE
(To be executed on a Non-Judicial Stamp Paper of appropriate value)

This Guarantee made at _____ this [___] day of [_____] 20XX

1. WHEREAS M/s BSES Yamuna Power Limited, a Company incorporated under the provisions of Companies Act, 1956 having its Registered Office at Shaktikiran Building, Karkardooma, Delhi 110032, India hereinafter referred to as the " Owner ", (which expression shall unless repugnant to the context or meaning thereof include its successors, administrators, executors and assigns).

2. AND WHEREAS the Owner has entered into a contract for _____(Please specify the nature of contract here) vide Contract No. _____dated _____(hereinafter referred to as the "Contract") with M/s._____, (hereinafter referred to as "the Supplier", which expression shall unless repugnant to the context or meaning thereof be deemed to mean and include each of their respective successors and assigns) for providing services on the terms and conditions as more particularly detailed therein.

3. AND WHEREAS as per clause ____of conditions of Contract, the Suppliers are obliged to provide to the Owners an unconditional bank guarantee for an amount equivalent to ten percent (10%) of the total Contract Value for the timely completion and faithful and successful execution of the Contract from **[_____]** *pl. specify the name of Bank)* having its head/registered office at **[_____]** through its branch in _____*(pl. specify the name of Branch through which B.G is issued)* hereinafter referred to as "the Bank", (which expression shall unless it be repugnant to the context or meaning thereof be deemed to include its successors and permitted assigns).

4. NOW THEREFORE, in consideration inter alia of the Owner granting the Suppliers the Contract, the Bank hereby unconditionally and irrevocably guarantees and undertakes, on a written demand, to immediately pay to the Owner any amount so demanded (by way of one or more claims) not exceeding in the aggregate [Rs.].....*(in words)* without any demur, reservation, contest or protest and/or without reference to the Supplier and without 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.

BSES Yamuna Power Limited

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

(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.

BSES Yamuna Power Limited

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.

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

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

(Signature)

.....

(Name)

.....

(Designation with Bank Stamp)
Attorney as per
Power of Attorney No.....
Date.....

BSES Yamuna Power Limited

BYPL 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: 911020005246583

5. IFSC Code: UTIB0000055

BSES Yamuna Power Limited

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

UNDERTAKING GST

The Vendor shall give an undertaking in the following words on each invoice in the absence of which tax payment as on the Vendor's invoice may be withheld.

"The tax component as mentioned in the invoice shall be deposited with GST Department as per law by way of actual payment or by way of legal set off as per law. The turnover billed shall be duly declared in my GST returns a copy of which shall be filed with the Purchaser. Should the input tax credit to the Purchaser be denied by way of any lapse on the part of the Vendor, the same shall be paid on demand and in any case the Purchaser is authorized to deduct the tax equivalent amount from the amount payable to the Vendor"

BSES Yamuna Power Limited

FORMAT OF NO DEMAND CERTIFICATE

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

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

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

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

(a) we confirm that BSES Yamuna Power Limited stands fully discharged of all its obligations,

(b) we shall make no claim of any nature on BSES Yamuna Power Limited or any of its affiliates or personnel, and

(c) we waive all our rights to lodge any claim or protest in future, in respect of the said Contract.

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

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

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

Date:
Place:

Signature:
Name:
Designation:
(Company Seal)

BSES Yamuna Power Limited

FORMAT FOR LETTER OF INDEMNITY

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

Place:_____
Date: _____

To,

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

Dear Sirs,

WO/PO/Contract No. _____Dated _/__/___

For _____

Settlement of Dues
In consideration of your awarding the subject Work Order/Purchase Order/Contract to us and in further consideration of your having agreed to pay our final bill towards settlement of the dues in respect of the subject Work Order/Purchase Order/Contract, inter alia, on our assurances and representations that :
(a) We have paid in full all amounts payable by us including but not limited to duties, levies, taxes, cess, octroi, royalties, statutory payments, amounts payable to or in relation to third parties engaged by us including our contractors, suppliers, employees and labour, and
(b) we have fully complied with all requirements under applicable laws in connection with the subject Purchase Order/Work Order/Contract,
We_____,
unconditionally and irrevocably agree and undertake, to pay and/or settle entirely at our own cost and indemnify, defend and hold harmless you, your affiliates and your/your affiliates' personnel, directors and representatives, (hereinafter collectively referred to as "Indemnified Parties") from and against any and all liabilities, judgments, damages, losses, claims, costs and expenses, claimed, suffered or incurred or, likely to be claimed, suffered or incurred at any time by or against the Indemnified Parties or any of them as a result of, or arising out of, or in any way related to any failure or delay in payment of any of the amounts or compliances by us as aforesaid for any reason whatsoever.
Any notice(s) or communication(s) by you shall be sufficient proof that the Indemnified Parties have suffered or incurred loss, damages, liabilities etc. as aforesaid and we shall upon receipt of such notice(s) or communication(s) immediately, without any delay or demur or contest, make payment to you of the entire amount demanded under the said notice(s) or communication(s).
This letter of indemnity shall be in addition to and not in derogation of any other indemnity/ guarantee and/or security which we may have executed in your favor or your rights and entitlements under the contract.
This letter shall be governed by and construed and interpreted to accordance with the laws of India, and shall be subject to the exclusive jurisdiction of the courts of law at Mumbai.

Yours faithfully,

For M/s_____
Authorized Signatory

BSES Yamuna Power Limited

COMMERCIAL TERMS AND CONDITIONS SUMMARY

Sl N	Item Description	AS PER BYPL	BIDDER'S CONFIRMATION
1	Validity	120 days from the date of submission of bid	
2	Price basis	a) **"Firm"**, FOR Delhi store basis. Prices shall be inclusive of all taxes & duties, freight upto Delhi stores. b) Unloading at stores shall be in vendor's scope c) Transit insurance in Bidders scope	
3	Payment terms	For supply:- As per NIT (Clause 12.01 of GCC-SUPPLY) For ETC:- As per NIT (Clause 8 of GCC-ETC)	
4	Completion period	As per NIT (Clause 32.00 of INFORMATION TO BIDDER)	
5	Defect Liability period	60 months after commissioning or 66 months from the last date of dispatch, whichever is earlier	
6	Penalty for delay	Supply:- 1% per week of delay of the Total price of undelivered units or part thereof subject to maximum of 10% of total price of undelivered units ETC:- 1% of the Total order value for each week or part there of delay until the actual date of completion up to a maximum deduction of 10% of Total order value.	
7	Contract Performance/security Bank Guarantee	10% (Ten Percent) of contract Price valid up to completion period/ handing over of entire project	
8	Performance Bank Guarantee	10% (Ten Percent) each of PO(supply) & WO(Erection, testing & commissioning) value valid for 60 months after commissioning or 66 months from the last date of dispatch, whichever is earlier plus 3 months towards claim period	

BSES Yamuna Power Limited

VOLUME – II

PRICE BID FORMAT

BSES Yamuna Power Limited

GRAND SUMMARY

ALL PRICES IN INR (Rs)

Item Name/Work -	SURVEY, DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, & COMMISSIONING OF NEW 11kV SWITCHGEAR PANELS INCLUDING MINOR CIVIL WORKS AND DISMANTLING OF EXISTING EQUIPMENTS ON TURNKEY BASIS.				
Grid Name	Quantity (Q)	Supply Price Landed (A)	ETC price Landed (B)	Total Cost (C=A+B)	Total Cost (D=C*Q)
KAILASH NAGAR	1 Lot				
DALLUPURA	1 Lot				
				GRAND TOTAL	

The Un-priced bid should be marked as **"Quoted"** and to be submitted with Part – A

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

Date: Bidders Name:

Place: Bidders Address:

Signature: ..... Designation: .....

Printed Name: ..... Common Seal: .....

BSES Yamuna Power Limited

PRICE FORMAT – SUPPLY - KAILASH NAGAR GRID (A) (Kindly refer detail SCOPE OF SUPPLY attached as Volume III for Indicative Description of Goods/BOM, BOQ)

ALL PRICES IN INR (Rs)

GRID NAME - KAILASH NAGAR							
S No.	DESCRIPTION OF GOODS	UOM	QTY	UNIT BASIC PRICE INCL FREIGHT(Rs)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (Rs)	UNIT LANDED COST(Rs)	TOTAL LANDED COST (Rs)
			(A)	(B)	(C)	(D = B+C)	(E = DXA)
1	**11 kV Switchgear**						
1.1	Incomer Line Feeder Panel with Line PT	Nos	2				
1.2	Adaptor for Incomer Panel	Nos	2				
1.3	Outgoing Panel	Nos	16				
1.4	Bus Riser Cum Bus PT Panel	Nos	2				
1.5	Adaptor Panel For 11 kV Bus Extension through Cables	Nos	2				
1.6	Adaptor Panel for Existing Bus Extension	Nos	1				
1.7	Station Transformer Panel	Nos	1				
1.8	Bus Coupler Panel	Nos	2				
1.9	Cap Bank Panel	Nos	2				
2	**End Termination Kit**						
2.1	End termination kit for 11kV, 1C x 1000sqmm cable	Set	54				
2.2	End Termination kit for 11kV, 3C x 300 sqmm cable	Set	8				
2.3	End termination kit for 11kV, 3C x 300 sqmm cable	Set	2				
2.4	End Termination kit for 0.415 kV 4C X 300 sqmm cable	Set	4				
3	**Cables and Associated Items**						
3.1	LT Power Cable	Lot	1				
3.2	Control And Auxiliary Cables with proper ferruling and tagging along with glands and lugs	Lot	1				
3.3	Cable Tray including bends etc with 50% spare capacity in each	Lot	1				

BSES Yamuna Power Limited

3.4	Cable Support Structure along with Clamping Arrangement	Lot	1					
4	Earthing	Lot	1					
5	Angle Channel Arrangement	Lot	1					
6	Conduits	Lot	1					
7	Insulated Floor Coating	Lot	1					
8	SCADA Works	Lot	1					
9	Painting of Feeder names (SCADA code, Asset Code, etc)	Lot	1					
10	Licensed programming software	Nos	1					
11	Communication Cord	Lot	1					
12	Recommended & Mandatory Spares	Lot	1					
13	Accessories	Lot	1					
14	SLD of Grid	Nos	1					
15	Emergency Exit Floor Marking	Lot	1					
16	Civil	Lot	1					
GRAND TOTAL LANDED COST								
In words ……								
Note: All quantities mentioned above are estimated quantities. Actual quantities may vary as per actual site requirement								

BSES Yamuna Power Limited

PRICE FORMAT – E/T/C - KAILASH NAGAR GRID (B) (Kindly refer detail SCOPE OF WORK attached as Volume III for Indicative Description of Services/BOM, BOQ)

ALL PRICES IN INR (Rs)

GRID NAME - KAILASH NAGAR							
S No.	DESCRIPTION OF SERVICES	UOM	QTY	UNIT BASIC PRICE (Rs)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (Rs)	UNIT LANDED COST(Rs)	TOTAL LANDED COST (Rs)
			(A)	(B)	(C)	(D = B+C)	(E = DXA)
1	**11 kV Switchgear**						
1.1	Incomer Line Feeder Panel with Line PT	Nos	2				
1.2	Adaptor for Incomer Panel	Nos	2				
1.3	Outgoing Panel	Nos	16				
1.4	Bus Riser Cum Bus PT Panel	Nos	2				
1.5	Adaptor Panel For 11 kV Bus Extension through Cables	Nos	2				
1.6	Adaptor Panel for Existing Bus Extension	Nos	1				
1.7	Station Transformer Panel	Nos	1				
1.8	Bus Coupler Panel	Nos	2				
1.9	Cap Bank Panel	Nos	2				
2	**End Termination Kit**						
2.1	End termination kit for 11kV, 1C x 1000sqmm cable	Set	54				
2.2	End Termination kit for 11kV, 3C x 300 sqmm cable	Set	8				
2.3	End termination kit for 11kV, 3C x 300 sqmm cable	Set	2				
2.4	End Termination kit for 0.415 kV 4C X 300 sqmm cable	Set	4				
3	**Cables and Associated Items**						
3.1	LT Power Cable	Lot	1				
3.2	Control And Auxiliary Cables with proper ferruling and tagging along with glands and lugs	Lot	1				
3.3	Cable Tray including bends etc with 50% spare capacity in each	Lot	1				
3.4	Cable Support Structure along with Clamping Arrangement	Lot	1				

BSES Yamuna Power Limited

4	Earthing	Lot	1					
5	Angle Channel Arrangement	Lot	1					
6	Conduits	Lot	1					
7	Insulated Floor Coating	Lot	1					
8	SCADA Works	Lot	1					
9	Painting of Feeder names (SCADA code, Asset Code, etc)	Lot	1					
10	Communication Cord	Lot	1					
11	Emergency Exit Floor Marking	Lot	1					
12	ETC of all items specified in "Free Issue Items"	Lot	1					
13	Dismantling of Equipment with their Associated items Including Cables	Lot	1					
14	Disconnection of Power Cables	Lot	1					
15	Training on application, programming, testing and commissioning of Numerical Relays	Days	2					
16	Training on IEC 61850	Days	2					
17	**Civil Works**							
17.1	Modification in Existing 11 kV Switchgear Room	Lot	1					
17.2	Illumination and lighting system	Lot	1					
17.3	Exhaust fan	Nos	2					
17.4	Gate	Nos	1					
GRAND TOTAL LANDED COST								
In words								
Note: All quantities mentioned above are estimated quantities. Actual quantities may vary as per actual site requirement								

BSES Yamuna Power Limited

PRICE FORMAT – SUPPLY - DALLUPURA GRID (A) (Kindly refer detail SCOPE OF SUPPLY attached as Volume III for Indicative Description of Goods/BOM, BOQ)

ALL PRICES IN INR (Rs)

GRID NAME - DALLUPURA								
S No.	DESCRIPTION OF GOODS	UOM	QTY	UNIT BASIC PRICE INCL FREIGHT(Rs)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (Rs)		UNIT LANDED COST(Rs)	TOTAL LANDED COST (Rs)
			(A)	(B)	(C)		(D = B+C)	(E = DXA)
1	**11 kV Switchgear**							
1.1	Incomer Line Feeder Panel with Line PT	Nos	2					
1.2	Outgoing Panel	Nos	16					
1.3	Bus Riser Cum Bus PT Panel	Nos	1					
1.4	Bus PT Panel	Nos	1					
1.5	Adaptor Panel For 11 kV Bus Extension through Cables	Nos	1					
1.6	Station Transformer Panel	Nos	1					
1.7	Bus Coupler Panel	Nos	1					
1.8	Cap Bank Panel	Nos	2					
2	**End Termination Kit**							
2.1	End termination kit for 11kV, 1C x 1000sqmm cable	Set	54					
2.2	End Termination kit for 11kV, 3C x 300 sqmm cable	Set	8					
2.3	End termination kit for 11kV, 3C x 300 sqmm cable	Set	2					
2.4	End Termination kit for 0.415 kV 4C X 300 sqmm cable	Set	4					
3	**Cables and Associated Items**							
3.1	LT Power Cable	Lot	1					
3.2	Control And Auxiliary Cables with proper ferruling and tagging along with glands and lugs	Lot	1					

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3.3	Cable Tray including bends etc with 50% spare capacity in each	Lot	1					
3.4	Cable Support Structure along with Clamping Arrangement	Lot	1					
4	Earthing	Lot	1					
5	Angle Channel Arrangement	Lot	1					
6	Conduits	Lot	1					
7	Insulated Floor Coating	Lot	1					
8	SCADA Works	Lot	1					
9	Painting of Feeder names (SCADA code, Asset Code, etc)	Lot	1					
10	Licensed programming software	Nos	1					
11	Communication Cord	Lot	1					
12	Recommended & Mandatory Spares	Lot	1					
13	Accessories	Lot	1					
14	SLD of Grid	Nos	1					
15	Emergency Exit Floor Marking	Lot	1					
16	Civil	Lot	1					
GRAND TOTAL LANDED COST								
In words								
Note: All quantities mentioned above are estimated quantities. Actual quantities may vary as per actual site requirement								

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PRICE FORMAT – E/T/C - DALLUPURA GRID (B) (Kindly refer detail SCOPE OF WORK attached as Volume III for Indicative Description of Services/BOM, BOQ)

ALL PRICES IN INR (Rs)

GRID NAME - DALLUPURA							
S No.	DESCRIPTION OF SERVICES	UOM	QTY	UNIT BASIC PRICE (Rs)	UNIT GST & CESS AS APPLICABLE (CGST & SGST/UTGST or IGST) (Rs)	UNIT LANDED COST(Rs)	TOTAL LANDED COST (Rs)
			(A)	(B)	(C)	(D = B+C)	(E = DXA)
1	**11 kV Switchgear**						
1.1	Incomer Line Feeder Panel with Line PT	Nos	2				
1.2	Outgoing Panel	Nos	16				
1.3	Bus Riser Cum Bus PT Panel	Nos	1				
1.4	Bus PT Panel	Nos	1				
1.5	Adaptor Panel For 11 kV Bus Extension through Cables	Nos	1				
1.6	Station Transformer Panel	Nos	1				
1.7	Bus Coupler Panel	Nos	1				
1.8	Cap Bank Panel	Nos	2				
2	**End Termination Kit**						
2.1	End termination kit for 11kV, 1C x 1000sqmm cable	Set	54				
2.2	End Termination kit for 11kV, 3C x 300 sqmm cable	Set	8				
2.3	End termination kit for 11kV, 3C x 300 sqmm cable	Set	2				
2.4	End Termination kit for 0.415 kV 4C X 300 sqmm cable	Set	4				
3	**Cables and Associated Items**						
3.1	LT Power Cable	Lot	1				
3.2	Control And Auxiliary Cables with proper ferruling and tagging along with glands and lugs	Lot	1				
3.3	Cable Tray including bends etc with 50% spare capacity in each	Lot	1				
3.4	Cable Support Structure along with Clamping Arrangement	Lot	1				
4	Earthing	Lot	1				
5	Angle Channel Arrangement	Lot	1				
6	Conduits	Lot	1				

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7	Insulated Floor Coating	Lot	1					
8	SCADA Works	Lot	1					
9	Painting of Feeder names (SCADA code, Asset Code, etc)	Lot	1					
10	Communication Cord	Lot	1					
11	Emergency Exit Floor Marking	Lot	1					
12	ETC of all items specified in "Free Issue Items"	Lot	1					
13	Dismantling of Equipment with their Associated items Including Cables	Lot	1					
14	Disconnection of Power Cables	Lot	1					
15	Training on application, programming, testing and commissioning of Numerical Relays	Days	2					
16	Training on IEC 61850	Days	2					
17	**Civil Works**							
17.1	Dismantling of Wall	Nos	1					
17.2	Modification in Existing 11 kV Switchgear Room	Lot	1					
17.3	Illumination and lighting system	Lot	1					
17.4	Exhaust fan	Nos	2					
17.5	Gate	Nos	1					
GRAND TOTAL LANDED COST								
In words								
Note: All quantities mentioned above are estimated quantities. Actual quantities may vary as per actual site requirement								

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VOLUME – III

SCOPE OF TURNKEY EXECUTION & TECHNICAL SPECIFICATIONS

SCOPE OF TURNKEY EXECUTION

FOR

REPLACEMENT OF 11 kV AIS

AT

KAILASH NAGAR & DALLUPURA GRID SUBSTATION

Revision			0
Date			19.06.2022
Prepared by	Abhishek Harsh	**CES**	3267d7c3-82b5-46cb-b5a6-867ee7820a34
Reviewed by	Srinivas Gopu	**CES**	5d32525e-ed3a-4f41-b1c7-b8a5e77d1519
	Manoj Vidhyarthi	**P&E**	Manoj Vidyarthi 482e4648-110f-4dbf-9528-b52a523b0db5
Approved by	Gaurav Sharma	**CES**	23dc2de2-95de-4472-99a7-dea873f472b6
	Pramod Kumar	**P&E**	Pramod J Kumar 8bbc64b3-a9d3-4fce-a14e-527ef4e0034f

Contents

1 INTENT

a. This document defines the scope for turnkey execution for Replacement of 11 Kv Switchgears at Kailash Nagar and Dallupura Grid S/S.

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. Kailash Nagar Grid Substation is Situated Near Gandhi Nagar Shahdara, Delhi 110031.

b. Latitude and Longitude of the same is 28°39'55.9"N 77°15'20.0"E.

c. Dallupura Grid Substation is Situated Near Paryatan Vihar Vasundhara Enclave Delhi 110096.

d. Latitude and Longitude of the same is 28°35'58.5"N 77°18'39.9"E

3 BIDDER'S SCOPE

a. Bidder's Scope includes design, engineering, manufacture, shop testing, inspection, packing, dispatch, supply, loading, unloading, storage at site, civil works, 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.

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

3.2 SCOPE OF SUPPLY

S. No	Items	UOM	Qty		Remarks
			Kailash Nagar	Dallupura	
3.2.1	11 kV Switchgear				a) For Kailash Nagar Substation, Depth of Switchgear shall be ≤ 1550 mm b) For Dallupura Grid S/S, adaptor panel to avoid fouling with middle wall shall be considered by

					bidder if required
3.2.1.1	Incomer Line Feeder Panel with Line PT	Nos	2	2	
3.2.1.2	Adaptor for Incomer Panel	Nos	2	0	
3.2.1.3	Outgoing Panel	Nos	16	16	
3.2.1.4	Bus Riser Cum Bus PT Panel	Nos	2	1	
3.2.1.5	Bus PT Panel	Nos	0	1	
3.2.1.6	Adaptor Panel For 11 kV Bus Extension through Cables	Nos	2	1	Provision for termination of 3RX1CX1000 sqmm 11 kV cable per phase
3.2.1.7	Adaptor Panel for Existing Bus Extension	Nos	1	0	Existing Panels are of ABB make
3.2.1.8	Station Transformer Panel	Nos	1	1	
3.2.1.9	Bus Coupler Panel	Nos	2	1	
3.2.1.10	Bus PT Panel	Nos	0	1	
3.2.1.11	Cap Bank Panel	Nos	2	2	
3.2.2	End Termination Kit				
3.2.2.1	End termination kit for 11kV, 1C x 1000sqmm cable	Set	54	54	a) For Terminating 11 kV Cables at 11 kv incomer end b) For Terminating 11 kV Cables at Transformer end c) For interconnection of 11 Kv Switchgears
3.2.2.2	End Termination kit for 11kV, 3C x 300 sqmm cable	Set	8	8	For Terminating 11 kV Cables at 11 kV Capacitor Bank end and 11 kV Capacitor Panel end
3.2.2.3	End termination kit for 11kV, 3C x 300 sqmm cable	Set	2	2	For Terminating 11 kV Cables at 11 kV Station Transformer Panel and Station Transformer
3.2.2.4	End Termination kit for 0.415 kV 4C X 300 sqmm cable	Set	4	4	For Terminating 0.415 kV Cables at ACDB and Station Transformer
3.2.3	Cables and Associated Items				
3.2.3.1	LT Power Cable	Lot	1	1	For items specified in “Scope of Supply”
3.2.3.2	Control And Auxiliary Cables with proper ferruling and tagging along with glands and lugs	Lot	1	1	For items specified in “Scope of Supply”

3.2.3.3	Cable Tray including bends etc with 50% spare capacity in each	Lot	1	1	a) For items specified in "Scope of Supply" b) 50% spare capacity in each is tray is required
3.2.3.4	Cable Support Structure along with Clamping Arrangement	Lot	1	1	For items specified in "Scope of Supply"
3.2.4	Earthing	Lot	1	1	a) Earthing of items specified in "Scope of Supply" with 50x6 GI flat b) Two earthing per equipment shall be considered c) Connection of GI Flat with existing earth mesh shall be in bidder's scope.
3.2.5	Angle Channel Arrangement	Lot	1	1	For items specified in "Scope of Supply"
3.2.6	Conduits	Lot	1	1	For Items specified in "Scope of Supply"
3.2.7	Insulated Floor Coating	Lot	1	1	For Items specified in "Scope of Supply"
3.2.8	SCADA Works	Lot	1	1	As per Specification
3.2.9	Painting of Feeder names (SCADA code, Asset Code, etc)	Lot	1	1	As per Engineer Incharge Guidance
3.2.10	Licensed programming software	No	1	1	
3.2.11	Communication Cord	Lot	1	1	
3.2.12	Recommended & Mandatory Spares	Lot	1	1	For Items specified in "Scope of Supply"
3.2.13	Accessories	Lot	1	1	For Items specified in "Scope of Supply"
3.2.14	SLD of Grid	No	1	1	Covered in Acrylic Sheet
3.2.15	Emergency Exit Floor Marking	Lot	1	1	For Items specified in "Scope of Supply"
3.2.16	Civil	Lot	1	1	a) All Material Required for civil works b) Kindly refer "Scope of Work"

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
			Kailash Nagar	Dallupura	
3.3.1	Erection, Testing and Commissioning of all items specified in "Scope of Supply" and "Free Issue Items"	Lot	1	1	
3.3.2	Dismantling of Equipment with their Associated items Including Cables	Lot	1	1	For Kailash Nagar a) Existing 11 kV Switchgear (Old Ones) b) Bus Coupler and Bus Riser Panel of ABB make Panel c) Bus Trunk with Cable Adaptor Panels d) Existing 11 kV CRP with Its Associated Items For Dallupura a) Existing 11 kV Switchgear (Old Ones) with its Associated Items b) Existing 11 kV CRP with Its Associated Items
3.3.3	Disconnection of Power Cables	Lot	1	1	For all 11 kV Switchgears
3.3.4	Training on application, programming, testing and commissioning of Numerical Relays	Days	2	2	One-day classroom training at BYPL Training Centre and one-day onsite training. Training shall be provided by Domain experts only
3.3.5	Training on IEC 61850	Days	2	2	Classroom Training
3.3.6	Civil Works				
3.3.6.1	Dismantling of Wall	No	0	1	Wall to dismantled in Old Switchgear Room to Erect New Panels
3.3.6.2	Modification in Existing 11 kV Switchgear Room	Lot	1	1	a) All Civil Works Required for Erection, Testing and Commissioning of 11 kV Switchgear b) Dismantling of Cable Trench wherever required c) New trench/repairing of cable

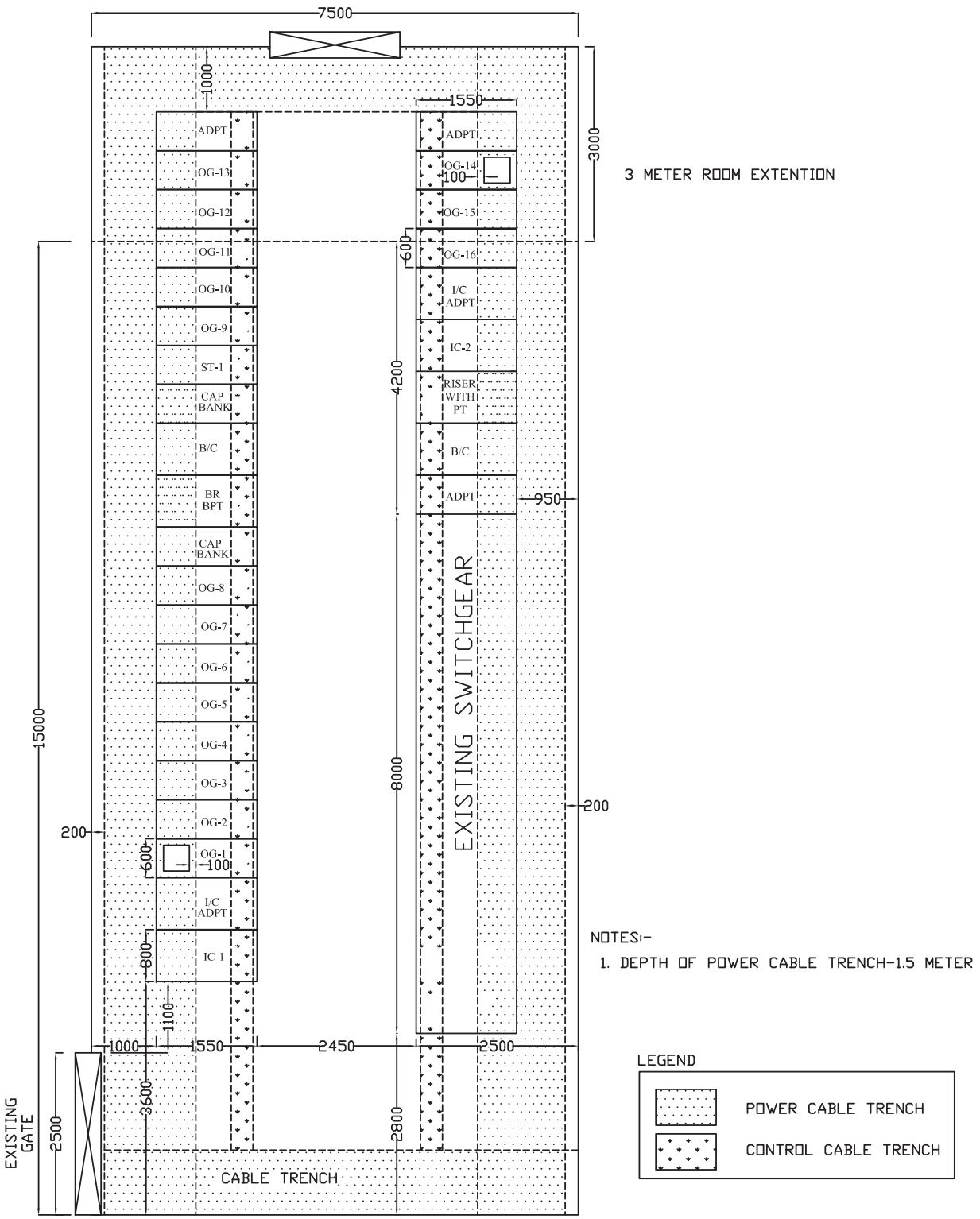
					trench within 11 kV Switchgear Room for power and control cables d) Depth of power cable trench shall be 1.5 meters e) Cable trench shall be of RCC type f) Cable trench covers shall be in bidder's scope g) Two Stairs to approach Power cable trench h) 50% spare capacity in each trench for future use shall be considered i) Extension of switchgear room as per layout including j) Flooring, Levelling and Finishing (Finishing of walls shall be with three coats of Plastic Paint i.e. two coats during installation and one coat at the time of handover) k) Foundation and Grouting Work for 11 kV Switchgears
3.3.6.3	Illumination and lighting system	Lot	1	1	a) For 11 kV Switchgear Room b) Note that existing distribution boards shall be used for power extension
3.3.6.4	Exhaust fan	Nos	2	2	Sweep shall be as per 600 mm
3.3.6.5	Gate	No	1	1	a) Total Width of Double leaf gate shall be 2 meter b) Height of gate shall be 3 m. c) Gate shall be of Mild Steel having powder coating

3.4 FREE ISSUE ITEMS

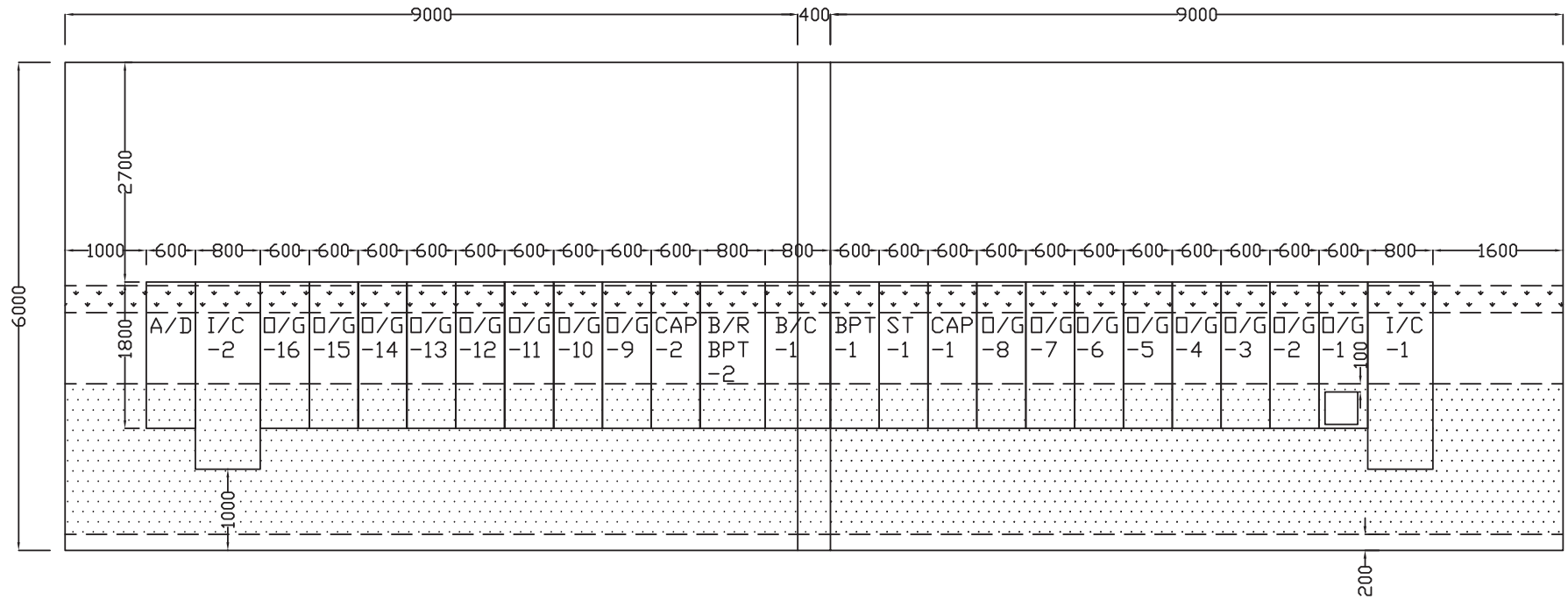
S. No	Items	UOM	Qty		Remarks
			Kailash Nagar	Dallupura	
3.4.1	11 kV 1CX1000 sqmm XLPE insulated, stranded Aluminium conductor, PVC outer sheath cable	Lot	1	1	a) From Supplied 11 kV Incomer Panel to Power Transformer b) For interconnection of 11 kV Switchgears

3.4.2	11 kV 3CX300 sqmm XLPE insulated, stranded aluminum conductor, PVC outer sheath Power cable	Lot	1	1	From Supplied 11 kV Capacitor Panel to Power Transformer
3.4.3	11 kV 3CX300 sqmm XLPE insulated, stranded aluminum conductor, PVC outer sheath Power cable	Lot	1	1	For Station transformer
3.4.4	0.415 kV 2R X 4C X 300 sqmm XLPE Insulated stranded conductor, PVC outer Sheath Power Cable	Lot	1	1	For Station Transformer

3.5 REFERENCE LAYOUT



DRAWN	RAJESH	TITLE:- TENTATIVE LAYOUT OF KAILASH NAGAR GRID	BSES Yamuna Power Limited
CHECKED	A.H/S.G		
APPD.	G.S		
DATE	22.06.22		



LEGEND

POWER CABLE TRENCH

CONTROL CABLE TRENCH

DRAWN	RAJESH
CHECKED	A.H/.S.G
APPD.	G.S
DATE	22/06/22
SCALE	NTS

BSES Yamuna Power Limited

TITLE:- TENTATIVE LAYOUT OF DALLUPURA GRID

NOTES:-

1. DEPTH OF POWER CABLE TRENCH-1.5 METER

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3.6 SCOPE DEMARCATION

S. No	Head	BYPL	Bidder's Scope	Remarks
3.6.1	Permissions from Various External and Internal Agencies other than Tree Cutting permission	✗	✓	Statutory fees will be borne by BYPL if applicable
3.6.2	Permit to work request to BYPL authority	✗	✓	Permit Should be applied to Engineer Incharge prior to work through proper procedure
3.6.3	Permit to work issuance from BYPL authority	✗	✓	
3.6.4	Testing Equipment	✗	✓	
3.6.5	Lighting Arrangement	✗	✓	
3.6.6	Construction Power and Construction Water	✗	✓	For construction power, bidder may take temporary connection from BYPL on chargeable basis.
3.6.7	Safety and Security of Manpower(Labor, Engineers, Supervisors etc)	✗	✓	
3.6.8	Various Tools and Tackles related to Job	✗	✓	
3.6.9	Loading, Unloading and Transportation of Material	✗	✓	a) It includes transportation of dismantled equipment to BYPL store in stacked manner. b) It also includes items specified in "Free Issue Items"
3.6.10	Cleanliness around work premises	✗	✓	
3.6.11	Document/Drawing Submission	✗	✓	
3.6.12	Document/Drawing Approval	✓	✗	
3.6.13	Security and Safety of material until handover	✗	✓	
3.6.14	Various Machines e.g. Crane, Hydra, JCB etc to complete the Job	✗	✓	
3.6.15	Maintenance of Equipment Until Handover to Engineer Incharge and EHV O&M	✗	✓	

3.6.16	Electrical Inspector Clearance	✗	✓	Only statutory fees will be borne by BYPL if applicable
3.6.17	Permit issuing agency for Works inside BYPL Premises	✓	✗	
3.6.18	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.
3.6.19	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
3.6.20	Temporary store at work premises	✗	✓	
3.6.21	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
3.6.22	Any damages done to the existing system, shall be repaired/ rectified/ replaced	✗	✓	
3.6.23	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.
3.6.24	External Agency Clearance	✗	✓	Statutory fee shall be borne by BYPL
3.6.25	Various compliances pertaining to Job	✗	✓	IE rules, CEA Regulation 2010
3.6.26	Any accident of employee & its liabilities after accident / death during work	✗	✓	

3.7 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
3.7.1	Tender No.	Required			
3.7.2	Communication Details				
3.7.2.1	Name of the Bidder	Required			
3.7.2.2	Name of Authorized contact person	Required			
3.7.2.3	Contact No. of Authorized contact person	Required			
3.7.2.4	E-mail id of Authorized contact person	Required			
3.7.3	Document Submission Format				
3.7.3.1	Documents shall be submitted in Box file/spiral binding. Any other format is not acceptable	Required			
3.7.3.2	Index of documents with page numbers for each document	Required			
3.7.3.3	Separator with document description shall be provided before each document	Required			
3.7.4	Qualifying Requirement Compliance				
3.7.4.1	Summary of compliance of qualifying criteria in tabular form along with summary of documentary proof provided	Required			
3.7.4.2	Detailed Documents supporting compliance of qualifying criteria	Required			
3.7.5	Drawings/ Documents as per Technical Specification.				
3.7.5.1	Signed copy of technical specification	Required			

S. No.	Description	Technical Bid	Drawing Approval	Pre-Dispatch	Pre-Closure
3.7.5.2	Type Test reports of offered model/ type/ rating	Required	Required		
3.7.5.3	Deviation Sheet	Required	Required		
3.7.5.4	Detailed Drawings	Required	Required		
3.7.5.5	Other drawing/ documents mentioned in technical specification	Required	Required		
3.7.5.6	Soft copy of complete technical bid in pen drive	Required			
3.7.5.7	Samples as per technical specification.	Required			
3.7.5.8	Design Calculation		Required		
3.7.5.9	Manufacturer's quality assurance plan		Required		
3.7.5.10	GTP		Required		
3.7.5.11	Inspection Reports			Required	
3.7.5.12	As manufacturing Drawings			Required	
3.7.5.13	Operation and Maintenance Manual			Required	
3.7.5.14	As built Drawings				Required
3.7.6	Soft Copy				
3.7.6.1	In Pen drive	Required			
3.7.6.2	Through Mail		Required	Required	Required

4 APPROVED MAKE LIST

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

S. No	Equipment	MAKE
4.1.1	11 kV AIS	ABB/Siemens/Schneider
4.1.2	11 kV End Termination kit	Raychem/3M/Yamuna Cable Accessories
4.1.3	Control cable	Universal/KEI/GEMSCAB/Polycab/ Cords Cable
4.1.4	Numerical relays	Siemens (Siprotec series), Siemens (7SR5 Series), Schneider / GE (Micom Series) , Schneider (P5) Series,
4.1.5	Ethernet Switch	Ruggedcom, Hirschman
4.1.6	Fire retardant coating for cables	3M/Demech/Stanvac
4.1.7	Floor coating	3M/Demech/Stanvac

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BSES

Technical Specification

Of

HT Indoor Switchgear (33 & 11 kV)

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

Rev:		0
Date:		22 Jun 2022
Prepared by	Abhishek Harsh	
	Hemanshi Kaul	
Reviewed by	Srinivas Gopu	
	Abhinav Srivastava	
Approved by	Gaurav Sharma	
	Gopal Nariya	

INDEX

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

3 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

4.1	Enclosure Type	Free standing, Indoor, Fully compartmentalised, Metal clad, Vermin proof
4.2	Enclosure degree of protection	IP 4X for high voltage compartment 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
4.3.3	Gland plate	3.0 mm MS for multicore and 5. 0 mm Aluminium for single core cables. All gland plates should be detachable type with gasket
4.4	Dimension of Panel	Maximum 2700mm, Operating height maximum 1600mm. In case of Extension of Existing make panels, vendor shall match the dimension of existing panel.
4.5	Extensibility	On either side
4.6	Separate Compartments for	Bus bar, Circuit Breaker, HV incoming cable, HV 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
4.9	Rear Doors	Rear doors shall not be interlocked i.e. all door opening shall be independent to each other.

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

4.19	APFC	a. Controlling of Capacitor Banks' switching shall be done by APFC. Although APFC shall not be in bidder's scope, Space for cut out shall be provided in the Capacitor panel. Space 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	Type	Truck or cassette type
5.2	Mounting	On withdrawable truck or carriage, with locking facility in service position.
5.3	Switching duty	c. Transformer (oil filled and dry type) d. Motor (of small and large ratings – DOL starting 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
5.5	Contact	Tulip contact shall be provided without any gap between contacts
5.6	Breaker operation	Three separate identical single pole units operated through the common shaft
5.7	Operating Mechanism	Re-strike free, Trip free, with electrical anti-pumping feature
5.7.1	Type	Motor wound, spring charged, stored energy type with manual charging facility
5.7.2	Operation on supply failure	One O-C-O operation possible after failure of power supply to the spring charging motor
5.8	Breaker indications & push buttons	

5.8.1	ON/ OFF / Emergency trip push button	a. Manual / mechanical. 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

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

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

7 SURGE SUPPRESSOR

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

8 CURRENT TRANSFORMER

8.1	Type	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	CBCT	If specified, bidder shall clearly mention his proposal for mounting the same.

9 POTENTIAL TRANSFORMER

9.1	Type	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 earthing truck	Equal to rating of breaker. Refer technical parameters.
10.3	Operation from front	Mechanically operated by separate switch.

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10.4	Interlocks and Alarm	To prevent inadvertent closing on live circuit, with 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 connection of two bolts.
11.4	Rating	Sized for rated short circuit current for 3 seconds
11.5	Enclosure & non -current carrying part of the switchboard / components	Effectively bonded to the earth bus.
11.6	Hinged doors	Earthed through flexible copper braid
11.7	Circuit breaker frame /carriage	Earthed before the main circuit breaker contacts/ control circuit contacts are plugged in the associated stationary contacts
11.8	Metallic cases of relays, instruments and other LT panel mounted equipment	Connected to the earth bus by independent copper wires of size not less than 2.5 sq. mm with green colour insulation. For this purpose LT compartment should have a clear designated earth bus to which earth connections from all components are to be connected.
11.9	CT and PT neutral	Earthed at one place at the terminal blocks through 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

12.2.3	Panels where to be provided	All panels except Bus PT Panel
12.2.4	Accuracy Class	0.2
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

13.1.9	Heater circuit healthy	Yellow (Indication with integrated push button for checking)
13.1.10	Trip circuit healthy	White
13.1.11	PT supply as applicable	R,Y B
13.2	Annunciator (For 33kV Panels only)	
13.2.1	Type	Static type alongwith alarm. Annunciations shall be repetitive type and shall be capable of registering the fleeting signal. Fascia test facility should also be provided.
13.2.2	Note	LED type indications may not be provided for alarm signals provided on annunciator.
13.2.3	Mounting	Flush mounted
13.2.4	Fascia	12 window
13.2.5	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 Window 4 – CB Autotrip 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
13.3	Alarm scheme with isolation switch	a. For DC fail, TC fail and CB auto trip in 11kV panels b. For all signals wired to annunciator in 33kV panels

Sequence of operation of the annunciator shall be as follows-

S No.	Alarm Condition	Fault Contact	Visual Annunciation	Audible 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 normal	Close	Flashing	On

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	
15.3.1	CT & PT	R Ph – Red Y Ph – Yellow B Ph – Blue Neutral – Black

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)
15.6	Lugs	Tinned copper, pre-insulated, ring type, fork type and pin type as applicable. CT circuits should use ring type lugs only.
15.7	Spare contacts	Spare contacts of relays and contactors etc. should be wired upto the terminal block.
15.8	Wiring enclosure	Plastic channels, Inter panel wiring through PVC sleeves
15.9	Interpanel wiring	Wires with ferrule to be terminated in the adjacent shipping section should be supplied with one end terminated and the other end bunched and coiled.
15.10	Auxiliary supply	Auxiliary bus wiring for AC and DC supplies, voltage transformer circuits, annunciation circuits and other common services shall be provided on the same set of terminals in all the panels with proper segregation.

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.
16.3	Suitability	Terminal Block shall be Stud Type Screw Driver Operated suitable for 6sqmm control cable. 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

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

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

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		minimum of two setting groups.
17.1.13	GOOSE Messaging	Relays shall communicate all status signals, commands and events on GOOSE messaging.
17.1.14	Event and Fault records	Relay shall have the facility of recording of various parameters during event/fault with option to set the duration of record through settable pre fault and post fault time. Relay shall store records for last 10 events and 10 faults (minimum). It should be possible to download records locally to PC and remotely to SCADA.
17.1.15	Self diagnosis	Relay shall be able to detect internal failures. A watchdog relay with changeover contact shall provide information about the failure.
17.1.16	Time synchronization	All relays shall be capable of being synchronized 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 Incomer panel	
17.2.1	Relay 1	3-phase Directional Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		Undervoltage and overvoltage protection
		Trip Circuit Supervision
		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 ,

		DOs etc to SCADA
17.2.2	Relay 2	Auto Re-closer (If Specified in Tender document)
		High Impedance Restricted Earth fault protection.
17.2.3	User Configurable DIs and Dos	Relay-1 & 2 should have a total of 16 Dis and 10 Dos (minimum). Each relay should have atleast 2 Dis and 4 Dos
17.2.4	Note	Combining functions of Relay-1 and Relay-2 in single relay is not acceptable.
17.2.5	SLD	Refer annexure – F1
17.3	Protection Relays for 11kV Bus Section panel	
17.3.1	Relay 1	3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		Sync Check function
		Trip Circuit Supervision
		PT supervision (fuse failure monitoring)
		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
		Auto Re-closer (If Specified in Tender document)
17.3.2	SLD	Refer annexure – F2
17.4	Protection Relays for 11kV Outgoing panel	
17.4.1	Relay 1	3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		Trip Circuit Supervision
		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
		Auto Re-closer (If Specified in Tender document)
17.4.2	SLD	Refer annexure – F3
17.5	Protection Relays for 11kV Station Transformer panel	
17.5.1	Relay 1	3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		Trip Circuit Supervision
		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
		Auto Re-closer (If Specified in Tender document)
17.5.2	SLD	Refer annexure – F4
17.6	Protection Relays for 11kV Capacitor panel	
17.6.1	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 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
		Auto Re-closer (If Specified in Tender document)
17.6.2	SLD	Refer annexure – F5.
17.7	Protection Relays for 33kV Incomer	
17.7.1	Relay 1	Line differential protection (Dual channel, ST Port Compatible for Single Mode Fibre having wavelength 1310 nm)
		Distance Protection
		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.
17.7.2	Relay 2	Bay control unit having MIMIC with 3-phase Directional Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics.
		Trip Circuit Supervision
		Sync check function
		Under Frequency, Over Frequency, Rate of Change of Frequency
		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
		Auto Re-closer (If Specified in Tender document)
17.7.3	User Configurable DIs and Dos	Relay-1 & 2 should have a total of 16 DIs and 12 DOs (minimum). Each relay should have atleast 2 DIs and 6 Dos

17.7.4	Note	Combining functions of Relay-1 and Relay-2 in single relay is not acceptable.
17.7.5	SLD	Refer annexure – F6
17.8	Protection Relays for 33kV Transformer Feeder Panel	
17.8.1	Relay 1	Biased differential protection
		REF protection
		Software based ratio and vector correction feature (without ICT)
		H2 and H5 harmonic restraint
17.8.2	Relay 2	Bay control unit having MIMIC with 3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		Trip Circuit Supervision
		Under Frequency, Over Frequency, Rate of Change of Frequency
		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
		Auto Re-closer (If Specified in Tender document)
17.8.3	User Configurable DIs and DOs	Relay-1 & 2 should have a total of 16 DIs and 12 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 Buscoupler Panel	
17.9.1	Relay 1	Bay control unit having MIMIC with 3-phase Overcurrent and earthfault protection with IDMT,

		Definite time and instantaneous characteristics.
		Trip Circuit Supervision
		Sync check function
		Reverse Blocking Function
		Circuit Breaker failure protection
		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
17.9.2	Relay 2	Under Frequency, Over Frequency, Rate of Change of Frequency
		PT supervision (fuse failure monitoring) for Bus PT-2
		Auto Re-closer (If Specified in Tender document)
17.9.3	SLD	Refer annexure – F8
17.10	Protection Relays for 33kV Outgoing Panel (For Installation at KCC Consumer Premises)	
17.10.1	Relay 1	Bay control unit having MIMIC with 3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		Trip Circuit Supervision
		Reverse Blocking Function
		Under Frequency, Over Frequency, Rate of Change of Frequency
		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
		Auto Re-closer (If Specified in Tender document)
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
17.11.2	Relay 2	Bay control unit having MIMIC with 3-phase Overcurrent and Earthfault protection with IDMT, Definite time and instantaneous characteristics
		Trip Circuit Supervision
		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
		Auto Re-closer (If Specified in Tender document)
17.11.3	User Configurable DIs and DOs	Relay-1 & 2 should have a total of 16 DIs and 12 DOs (minimum). Each relay should have atleast 2 DIs and 6 Dos
17.11.4	Note	Combining functions of Relay-1 and Relay-2 in single relay is not acceptable
17.11.5	SLD	Refer annexure – F10
17.12	Protection Relays for 33kV Outgoing from 66/33kV Autotransformer	
17.12.1		Power swing blocking
	Relay 1	Line differential protection(Dual channel, ST Port

		Compatible for Single Mode Fibre having wavelength 1310 nm)
		Distance Protection
		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.
17.12.2	Relay 2	Bay control unit having MIMIC with 3-phase Overcurrent and Earthfault protection with IDMT, 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
		Auto Re-closer (If Specified in Tender document)
17.12.3	User Configurable DIs and Dos	Relay-1 & 2 should have a total of 16 DIs and 12 DOs (minimum). Each relay should have atleast 2 DIs and 6 Dos
17.12.4	Note	Combining functions of Relay-1 and Relay-2 in single relay is not acceptable.
17.12.5	SLD	Refer annexure – F11
17.13	Protection Relays for 33kV Buscoupler for Switchboard of 66/33kV Autotransformer	
17.13.1	Relay 1	Bay control unit having MIMIC with 3-phase Overcurrent and earthfault protection with IDMT, Definite time and instantaneous characteristics.
		Trip Circuit Supervision

		Sync check function
		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
17.13.2	Relay 2	Under Frequency, Over Frequency, Rate of Change of Frequency
		PT supervision (fuse failure monitoring) for Bus PT-2
		Auto Re-closer (If Specified in Tender document)
17.13.3	SLD	Refer annexure – F12
17.14	Protection Relays – SCADA Interfacing	
17.14.1	Configuration and wiring of DIs in Protection Relays (All panels) for routing status signals to SCADA	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 DI-7 – CB in test DI-8 – Spring Charged DI-9 – L/R switch Remote DI-10 – AC fail 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.
17.14.2	Configuration and wiring of	DO-1 – CB Open

	DOs in Protection relays (all panels) for execution of SCADA commands through SCADA interface port (refer clause 16.1.5).	DO-2 – CB close DO-3-Electrical Reset Sequence of DOs should be strictly as mentioned above. Change in sequence of DOs will not be acceptable.
17.14.3	Looping of numerical relays	All relays in the switchboard have to be looped to 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 AVR 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 Features	
17.16.1	Relays for auxiliary, supervision, trip and timer relays	Static or electromechanical type.
17.16.2	Reset mechanism for auxiliary relays	Self reset contacts except for lock-out relays.
17.16.3	Reset mechanism for lockout relays	Electrical reset type for 11kV outgoing panels only. Hand reset type for all other panels.
17.16.4	Operation indicators	With hand-reset operation indicators (flags) or LEDs with pushbuttons for resetting.
17.17	Auxiliary relays – Requirement	
17.17.1	Anti pumping (94), lockout (86),	a. For each breaker b. 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.
17.17.3	Switchgear with two incomer & bus coupler	Lockout relay (86) contact of each incoming breakers to be wired in series in closing circuit of other incoming breakers & bus coupler.
17.17.4	Contact Multiplication Relay for Tripping and closing of Breaker	a. One for Tripping and one for closing with each breaker b. Current Rating shall be 30 percent more than closing and tripping coil current rating c. Shall be of closed type i.e. direct

		unauthorised access shall not be provided.
17.17.5	Auxiliary Relays, contact multiplication relays etc.	To effect interlocks and to exchange signals of status & control
17.17.6	Transformer trouble relays (For 33kV Transformer feeder panel only)	Auxiliary relays with indicating flags (contactors will not be accepted) should be provided for the following trip and alarm commands – a. Buchholz trip b. OSR trip c. PRV trip d. SPR trip e. WTI Trip f. OTI Trip g. Buchholz Alarm 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 will 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.

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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.
18.5	Live Bus – Live Bus	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 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

20 SPACE HEATERS

20.1	Type	Thermostat controlled with switch for isolation
20.2	Location	In Breaker & HV cable compartment, mounted on an insulator. Heater position in cable compartment 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
21.3	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 between c. Rating of MCB shall be 300% of full load current of relevant circuit

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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.
22.1.2	Feeder Nameplates	a. Large and bold name plate carrying the feeder identification/ numbers shall be provided on the top of each panel on front as well as rear side. On rear side, nameplate should be provided on frame. 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

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		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 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	Paint shade	RAL 7032 for external & internal surface
23.4	Paint thickness	Minimum 50 microns

24 APPROVED MAKES OF COMPONENTS

24.1	Numerical Relays	Siprotec series of Siemens, Micom series of Schneider/Alstom. Numerical relays used in complete switchboard should be of same make. Use of two different makes of relays in a switchboard is not acceptable.
24.2	Transformer monitoring cum AVR relay	A-eberle
24.3	Electromechanical Relays	Alstom/Schneider/Siemens/ABB/ER
24.4	Aux Relays	ABB/Jyoti/Omran
24.5	Contactors	ABB/Siemens/Telemechanique

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24.6	Instrument transformers	ECS/ Pragati/ 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
24.12	Surge Suppressors	Oblum/Tyco
24.13	Meters	Rishabh(Rish delta Energy)/Conzerv
24.14	Ethernet Switch	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	Vendor quality plan	To be submitted for purchaser approval
25.5.2	Inspection points	To be mutually identified & agreed in quality plan

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

27 SHIPPING

27.1	Shipping	The bidder shall ascertain at an early date and definitely before the commencement of manufacture, any transport limitations such as weights, dimensions, road culverts, Overhead lines, free access etc. from the Manufacturing plant to the project site. Bidder shall furnish the confirmation that the proposed Packages can be safely transported, as normal or oversize packages, up to the site. Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser.
		The seller shall be responsible for all transit damage due to improper packing.

28 HANDLING AND STORAGE

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

29 DEVIATION

29.1	Deviation	Deviations from this Specification shall be provided 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.

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

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 Functionality	Microprocessor based with provision for multifunction control and monitoring.
1.2	Mounting	Flush Mounting
1.3	Architecture	Hardware and software architecture shall be modular and disconnectable to adapt the control unit to the required level of complexity as per the application.
1.4	Programming and configuration	AVR shall utilize a user friendly setting and operating multilingual software in windows environment with menus and icons for fast access to the data required.
1.5	User Machine Interface	UMI with an alphanumeric key pad and graphical LCD display with backlight indicating measurement values and operating messages. Capability to access and change all settings and parameters.
1.6	PC Interface port	Front port (preferably serial) for configuration using PC. Cost of licensed software and communication cord, required for programming of offered protection relays using PC, shall be mentioned separately in the bid.
1.7	SCADA Interface port	LC Type Dual fibre optic port for interfacing with SCADA on IEC 61850 & PRP compatible. Through these ports relays shall be connected to Ethernet switches.
1.8	Self diagnosis	Shall be able to detect internal failures. A watchdog relay 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 logics
3.2	Voltage setting	Programmable Voltage set point
3.3	Voltage Regulation	Raise/Lower tap position to maintain the preset value of voltage.
3.4	Voltage Regulation modes	Automatic and Manual
3.5	Operation Modes	Local and Remote
3.6	Fan and Pump control	To be provided
3.7	Transformer Paralleling	Capability to parallel transformers whose AVRs are interconnected via a communication network.
4	SCADA Interfacing	
4.1	Configuration of DIs for routing alarm/trip signals to SCADA.	DI-1 – Buchholz trip DI-2 – OSR Trip DI-3 – PRV trip DI-4 – SPR trip DI-5 – OTI trip DI-6 – WTI trip DI-7 – Buchholz alarm DI-8 – Oil Level low alarm (MOG alarm) DI-9 – WTI alarm DI-10 – OTI alarm DI-11 – Tap changer trouble/stuck/out of step DI-12 – Tap changer motor supply fail DI-13 – Tap changer in local control All signals from DI-1 to DI-10 are to be wired up from transformer trouble auxiliary relays.
4.2	Configuration of DOs for	DO-1 – Tap raise

	executing commands from SCADA through interface port/CRP	DO-2 – Tap lower DO-3 – Fan group 1 control DO-4 – Fan group 2 control
4.3	Spare DIs and DOs	To be wired upto the terminal block.
5	Measurement, Event Recording and Monitoring	
5.1	Measured Quantities (optional)	Voltage, Current, Active Power, Reactive Power, Apparent Power, Power factor, frequency
5.2	Event Recording	Facility for recording parameters during various events such as tap change, change in binary input status etc.
5.3	Monitoring	Capability to monitor important transformer parameters such as Oil temperature, Winding Temperature etc and give indication/alarm when the value of a particular parameter exceeds the preset value.

ANNEXURE – C - TECHNICAL PARTICULARS

1.0	SWITCHGEAR		
1.1	Type	Metal clad, air insulated with VCB type circuit breaker	
1.2	Service	Indoor	
1.3	Mounting	Free standing, floor mounted	
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 (PF rms / Impulse peak)	28 kV / 75 kV	70 kV/ 170 kV
1.13	System ground	Effectively earthed	Effectively earthed
1.14	Enclosure degree of protection	IP – 4X for high voltage compartment and 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 1.10.	
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	
1.16	Auxiliary bus bar	Electrolytic grade tinned copper	

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 applicable)	
1.22	Power cable entry	From bottom and rear	
1.23	Control cable entry	From bottom and front (i.e breaker compartment)	
2.0	CIRCUIT BREAKER		
2.1	Voltage class, insulation level, short time rating	As specified for switchgear	
2.2	Rated current	As per SLDs given in annexure - F. Use of two breakers in parallel to meet the required current rating shall not be acceptable.	
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 of Breaker, for Owner's use.	Minimum 6 NO + 6 NC	
2.8	No. of spare contacts of Service and Test position limit switch	2 NO	

3.0	CURRENT TRANSFORMERS		
3.1	Voltage class, insulation level and short time rating	As specified for switchgear	
3.2	Type	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 Class CTs	30 mA at Vk/4	
3.8	Knee Point Voltage of PS Class CTs (Vk)	>= 40 (Rct + 4)	
3.9	Primary operating current sensitivity of CBCTs	5A	
4.0	VOLTAGE TRANSFORMERS		
4.1	Type	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	
4.6	Rated voltage factor	1.2 continuous, 1.9 for 30 seconds	
4.7	Class of insulation	Class E or better	

4.8	Accuracy class		
4.8.1	Protection	3P	
4.8.2	Metering	0.2	
4.9	Primary and secondary fuses	HRC current limiting type, Primary fuse replacement shall be possible 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 operating voltage (MCOV)	7.65kV	25kV
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

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.

DocUUID : 23f7dc1d-9724-406f-b48e-bdff68bb2c4f

ANNEXURE – E – SPARES REQUIREMENT

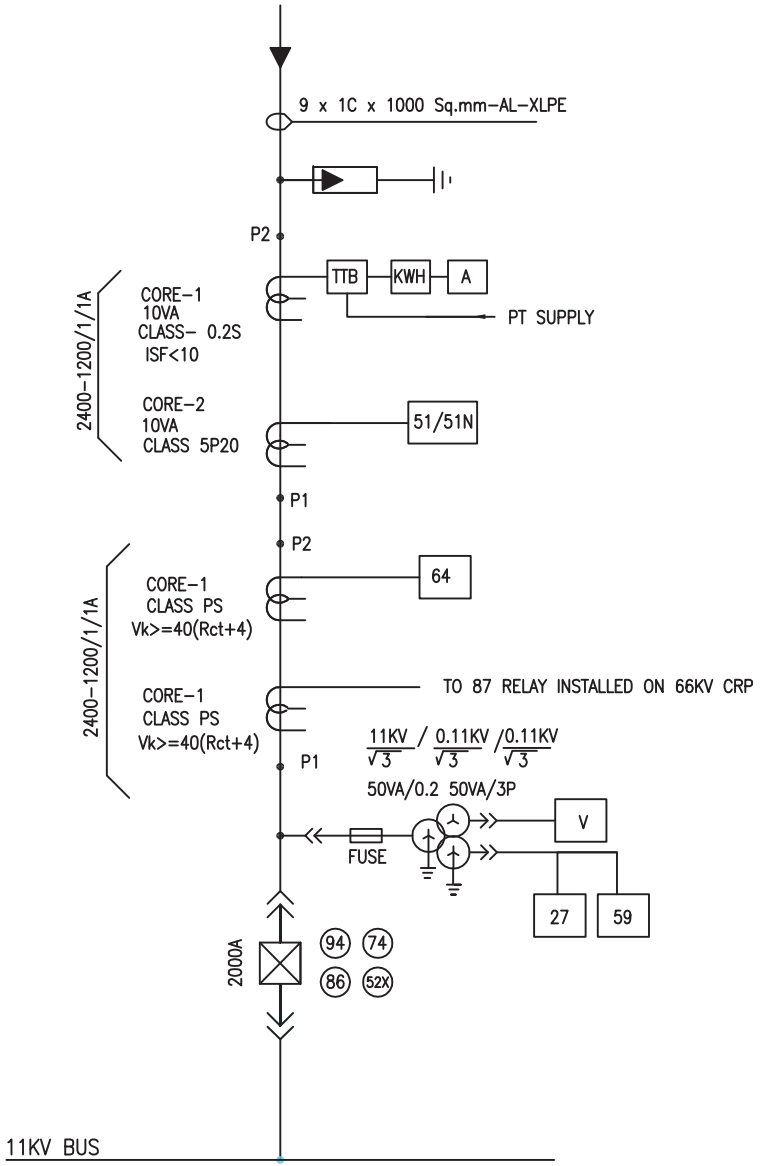
Unit rate of all below mentioned spares have to be provided in the bid.

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

DocUUID : 23f7dc1d-9724-406f-b48e-bdff68bb2c4f

ANNEXURE–F1



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

LEGEND

SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
52X	BREAKER AUX CONTACT MULTIPLIER
74	TRIP CIRCUIT SUPERVISION RELAY
94	ANTI PUMPING RELAY
86	HIGH SPEED TRIP RELAY
V	VOLTMETER
A	AMMETER

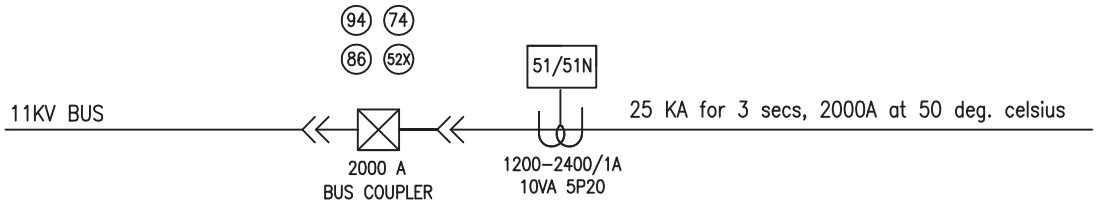
SYMBOL	DESCRIPTION
KWH	ENERGY METER
46	NEGATIVE PHASE SEQUENCE PROTECTION
25	SYNC CHECK
51/51N	O/C & E/F RELAY
27	UNDER VOLTAGE RELAY
87	DIFFERENTIAL RELAY
21	DISTANCE RELAY
59	OVER VOLTAGE RELAY
64	REF RELAY
67/67N	DIRECTIONAL O/C & E/F RELAY
TTB	TEST TERMINAL BLOCK

NOTE:–

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

DRAWN	R.K/A.H H.K	TITLE:– STANDARD SLD FOR 11KV INCOMER	BSES
CHECKED	S.G/A.S		
APPD.	G.S/G.N		
DATE	29.04.22		SPECIFICATION NO. BSES–TS–66–HTSWG–R0
SCALE	NTS		SLD–SWG–11KV–01

ANNEXURE–F2



LEGEND

SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
52X	BREAKER AUX CONTACT MULTIPLIER
74	TRIP CIRCUIT SUPERVISION RELAY
94	ANTI PUMPING RELAY
86	HIGH SPEED TRIP RELAY
V	VOLTMETER
A	AMMETER

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

NOTE:–

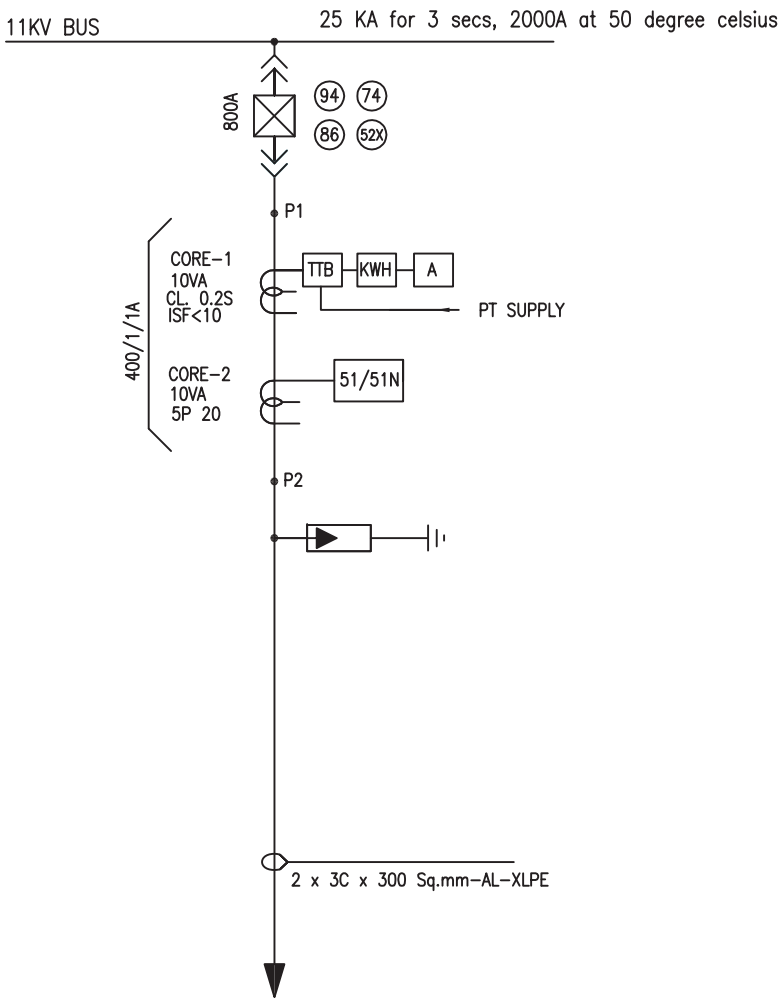
1. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS

DRAWN	R.K/A.H H.K	TITLE:– STANDARD SLD FOR 11KV BUS SECTION	BSES
CHECKED	S.G/A.S		
APPD.	G.S/G.N		
DATE	29.04.22		
SCALE	NTS		

SPECIFICATION NO. BSES–TS–66–HTSWG–R0

SLD–SWG–11KV–02

ANNEXURE–F3



LEGEND

SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
52X	BREAKER AUX CONTACT MULTIPLIER
74	TRIP CIRCUIT SUPERVISION RELAY
94	ANTI PUMPING RELAY
86	HIGH SPEED TRIP RELAY
V	VOLTMETER
A	AMMETER

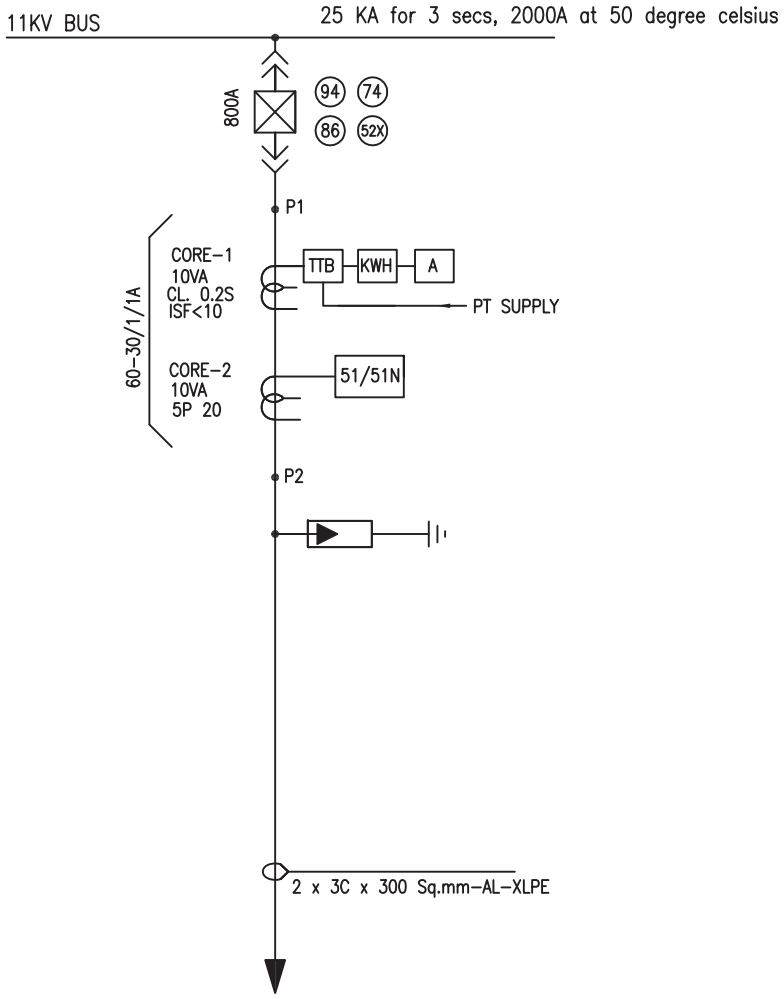
SYMBOL	DESCRIPTION
KWH	ENERGY METER
46	NEGATIVE PHASE SEQUENCE PROTECTION
25	SYNC CHECK
51/51N	O/C & E/F RELAY
27	UNDER VOLTAGE RELAY
87	DIFFERENTIAL RELAY
21	DISTANCE RELAY
59	OVER VOLTAGE RELAY
64	REF RELAY
67/67N	DIRECTIONAL O/C & E/F RELAY
TTB	TEST TERMINAL BLOCK

NOTE:–

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

DRAWN	R.K/A.H H.K	TITLE:– STANDARD SLD FOR 11KV OUTGOING FEEDER	BSES
CHECKED	S.G/A.S		
APPD.	G.S/G.N		SPECIFICATION NO. BSES–TS–66–HTSWG–R0
DATE	29.04.22		SLD–SWG–11KV–03
SCALE	NTS		

ANNEXURE–F4



LEGEND

SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
52X	BREAKER AUX CONTACT MULTIPLIER
74	TRIP CIRCUIT SUPERVISION RELAY
94	ANTI PUMPING RELAY
86	HIGH SPEED TRIP RELAY
V	VOLTMETER
A	AMMETER

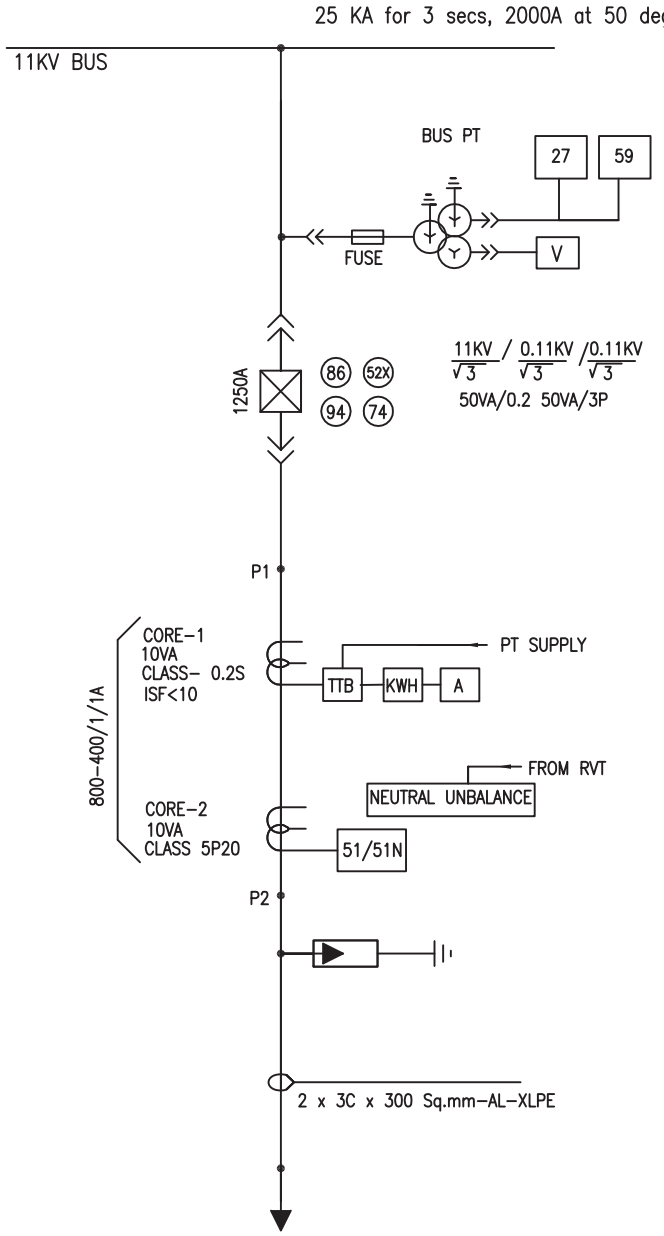
SYMBOL	DESCRIPTION
KWH	ENERGY METER
46	NEGATIVE PHASE SEQUENCE PROTECTION
25	SYNC CHECK
51/51N	O/C & E/F RELAY
27	UNDER VOLTAGE RELAY
87	DIFFERENTIAL RELAY
21	DISTANCE RELAY
59	OVER VOLTAGE RELAY
64	REF RELAY
67/67N	DIRECTIONAL O/C & E/F RELAY
TTB	TEST TERMINAL BLOCK

NOTE:–

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

DRAWN	R.K/A.H H.K	TITLE:– STANDARD SLD FOR 11KV STATION TRANSFORMER FEEDER	BSES
CHECKED	S.G/A.S		SPECIFICATION NO. BSES–TS–66–HTSWG–R0
APPD.	G.S/G.N		SLD–SWG–11KV–04
DATE	29.04.22		
SCALE	NTS		

ANNEXURE–F5



LEGEND

SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
52X	BREAKER AUX CONTACT MULTIPLIER
74	TRIP CIRCUIT SUPERVISION RELAY
94	ANTI PUMPING RELAY
86	HIGH SPEED TRIP RELAY
V	VOLTMETER
A	AMMETER

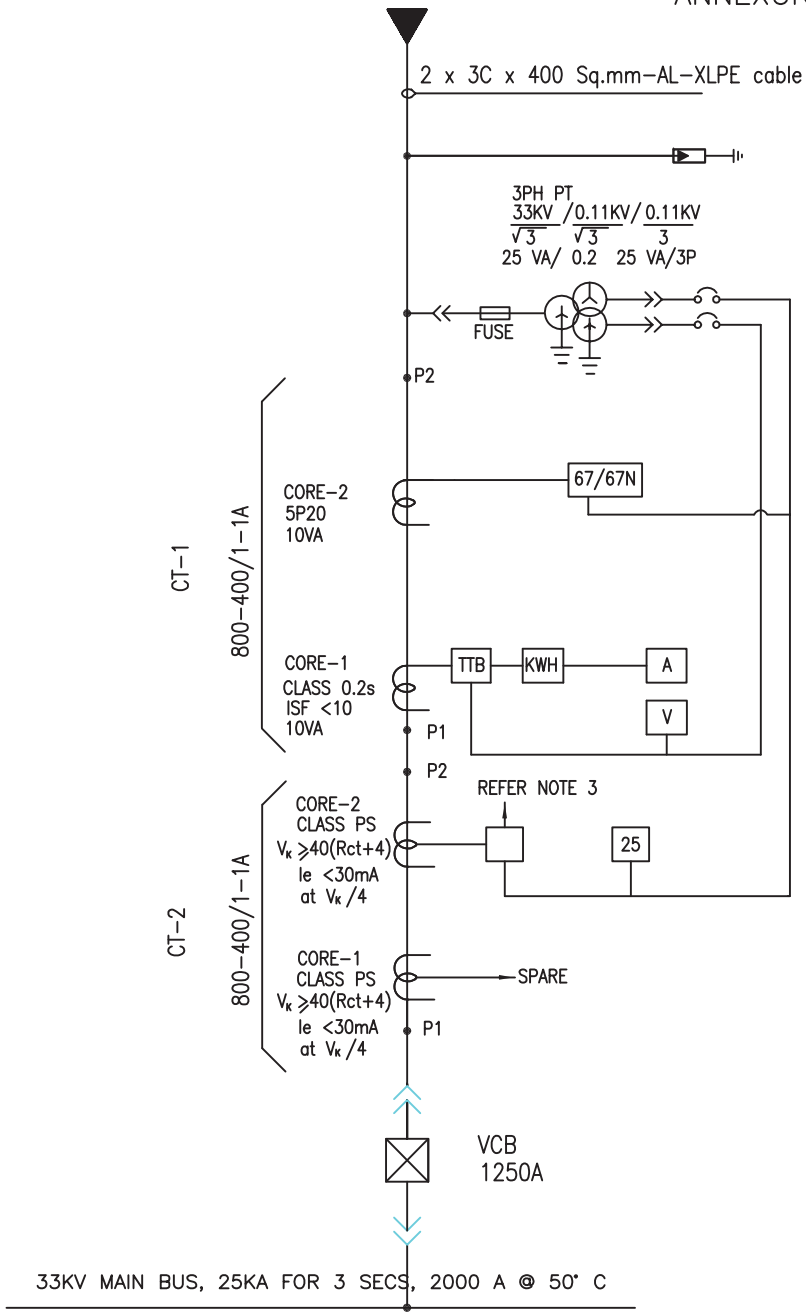
SYMBOL	DESCRIPTION
KWH	ENERGY METER
25	SYNC CHECK
51/51N	O/C & E/F RELAY
27	UNDER VOLTAGE RELAY
87	DIFFERENTIAL RELAY
21	DISTANCE RELAY
59	OVER VOLTAGE RELAY
64	REF RELAY
67/67N	DIRECTIONAL O/C & E/F RELAY
TTB	TEST TERMINAL BLOCK

NOTE:–

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

DRAWN	R.K/A.H H.K	TITLE:– STANDARD SLD FOR 11KV CAPACITOR FEEDER	BSES
CHECKED	S.G/A.S		SPECIFICATION NO. BSES–TS–66–HTSWG–R0
APPD.	G.S/G.N		SLD–SWG–11KV–05
DATE	29.04.22		
SCALE	NTS		

ANNEXURE–F6



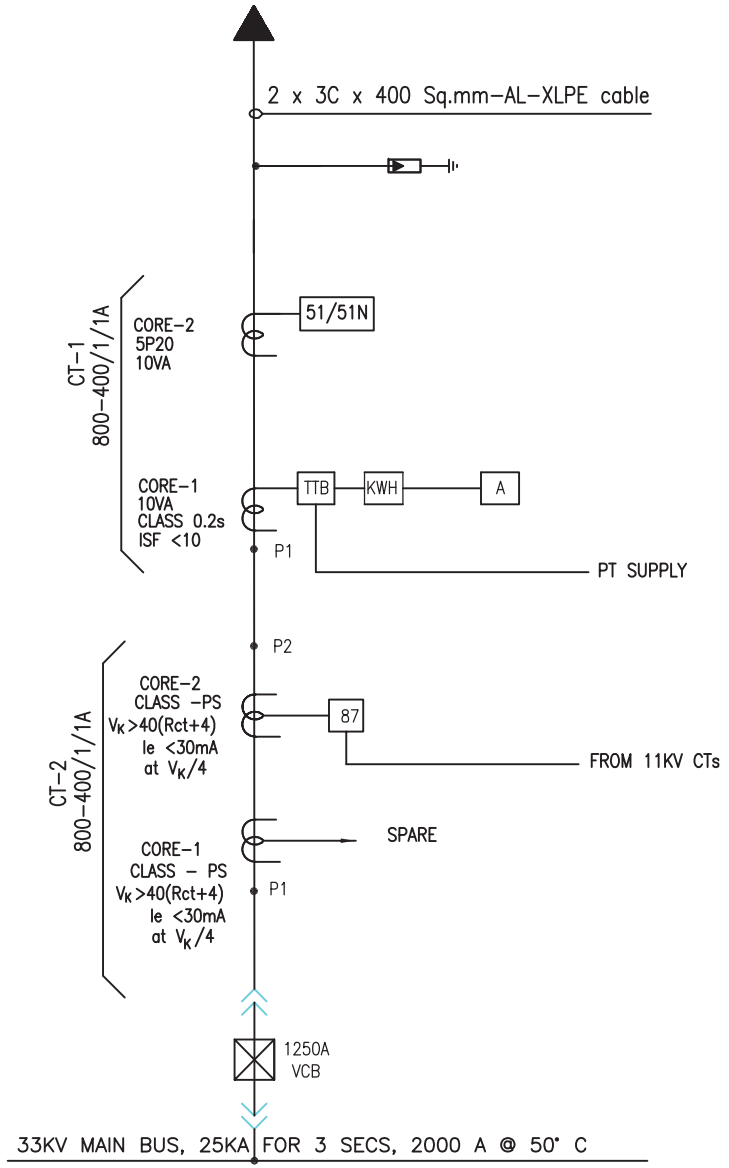
LEGEND

SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
52X	BREAKER AUX CONTACT MULTIPLIER
74	TRIP CIRCUIT SUPERVISION RELAY
94	ANTI PUMPING RELAY
86	HIGH SPEED TRIP RELAY
V	VOLTMETER
A	AMMETER

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

NOTE:
1. KWH METER NOT IN SUPPLIER'S SCOPE
2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS
3. LINE DIFFERENTIAL OR DISTANCE RELAY. REFER CLAUSE 16.7.1 OF SPECIFICATION

DRAWN	R.K/A.H H.K	TITLE TYPICAL SLD FOR 33KV INCOMER	BSES
CHECKED	S.G/A.S		SPECIFICATION NO. BSES-TS-66-HTSWG-R0
APPD.	G.S/G.N		SLD-SWG-33KV-01
DATE	29.04.22		
SCALE	NTS		



LEGEND

SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
52X	BREAKER AUX CONTACT MULTIPLIER
74	TRIP CIRCUIT SUPERVISION RELAY
94	ANTI PUMPING RELAY
86	HIGH SPEED TRIP RELAY
V	VOLTMETER
A	AMMETER

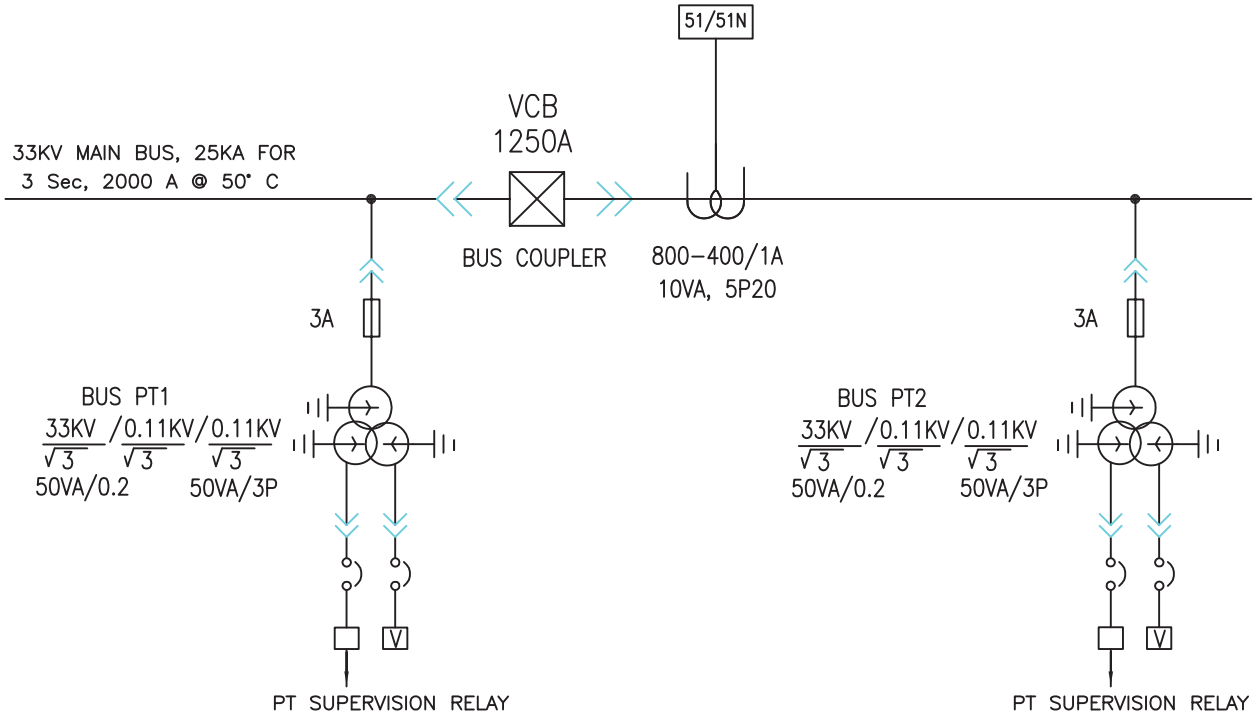
SYMBOL	DESCRIPTION
KWH	ENERGY METER
46	NEGATIVE PHASE SEQUENCE PROTECTION
25	SYNC CHECK
51/51N	O/C & E/F RELAY
27	UNDER VOLTAGE RELAY
87	DIFFERENTIAL RELAY
21	DISTANCE RELAY
59	OVER VOLTAGE RELAY
64	REF RELAY
67/67N	DIRECTIONAL O/C & E/F RELAY
TTB	TEST TERMINAL BLOCK

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

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

DRAWN	R.K/A.H H.K	TITLE TYPICAL SLD FOR 33/11KV TRANSFORMER FEEDER	BSES
CHECKED	S.G/A.S		SPECIFICATION NO. BSES-TS-66-HTSWG-R0
APPD.	G.S/G.N		SLD-SWG-33KV-02
DATE	29.04.22		
SCALE	NTS		

ANNEXURE–F8



LEGEND

SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
52X	BREAKER AUX CONTACT MULTIPLIER
74	TRIP CIRCUIT SUPERVISION RELAY
94	ANTI PUMPING RELAY
86	HIGH SPEED TRIP RELAY
V	VOLTMETER
A	AMMETER

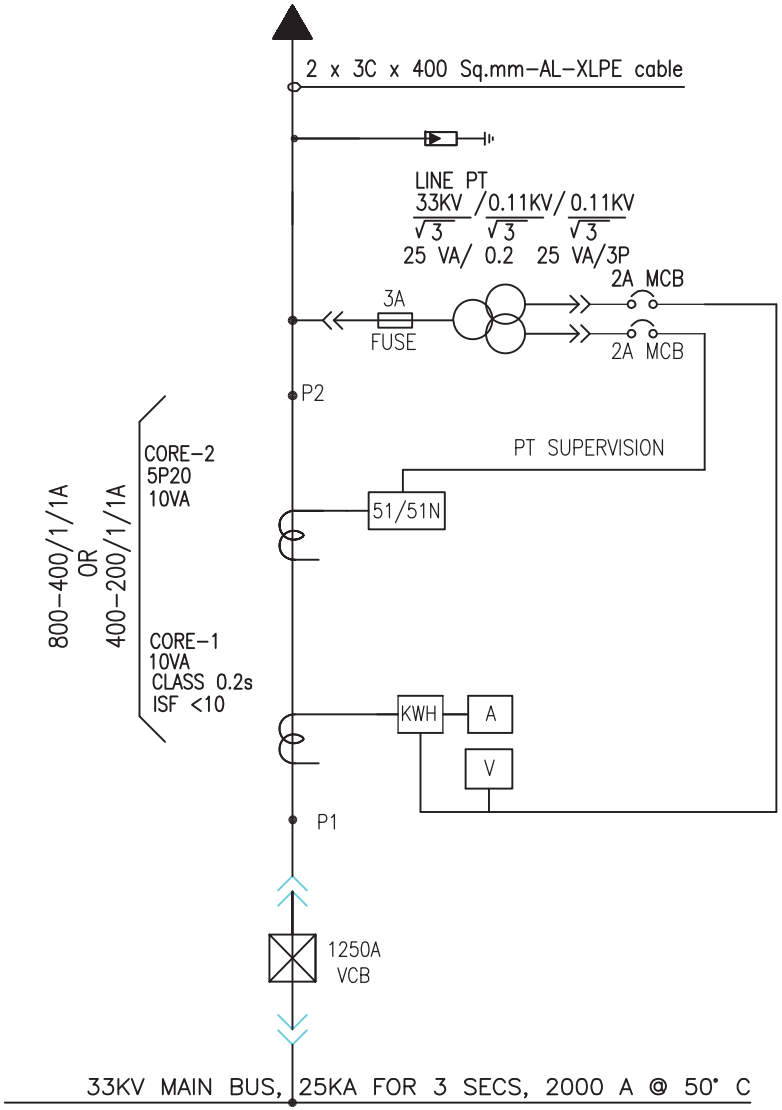
SYMBOL	DESCRIPTION
KWH	ENERGY METER
46	NEGATIVE PHASE SEQUENCE PROTECTION
25	SYNC CHECK
51/51N	O/C & E/F RELAY
27	UNDER VOLTAGE RELAY
87	DIFFERENTIAL RELAY
21	DISTANCE RELAY
59	OVER VOLTAGE RELAY
64	REF RELAY
67/67N	DIRECTIONAL O/C & E/F RELAY
TTB	TEST TERMINAL BLOCK

NOTE:–

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

DRAWN	R.K/A.H H.K	TITLE	BSES
CHECKED	S.G/A.S	TYPICAL SLD FOR 33KV BUS COUPLER CUM BUS PT	SPECIFICATION NO. BSES-TS-66-HTSWG-R0
APPD.	G.S/G.N		SLD-SWG-33KV-03
DATE	29.04.22		
SCALE	NTS		

ANNEXURE–F9



LEGEND

SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
52X	BREAKER AUX CONTACT MULTIPLIER
74	TRIP CIRCUIT SUPERVISION RELAY
94	ANTI PUMPING RELAY
86	HIGH SPEED TRIP RELAY
V	VOLTMETER
A	AMMETER

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

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

DRAWN	R.K/A.H H.K
CHECKED	S.G/A.S
APPD.	G.S/G.N
DATE	29.04.22
SCALE	NTS

TITLE

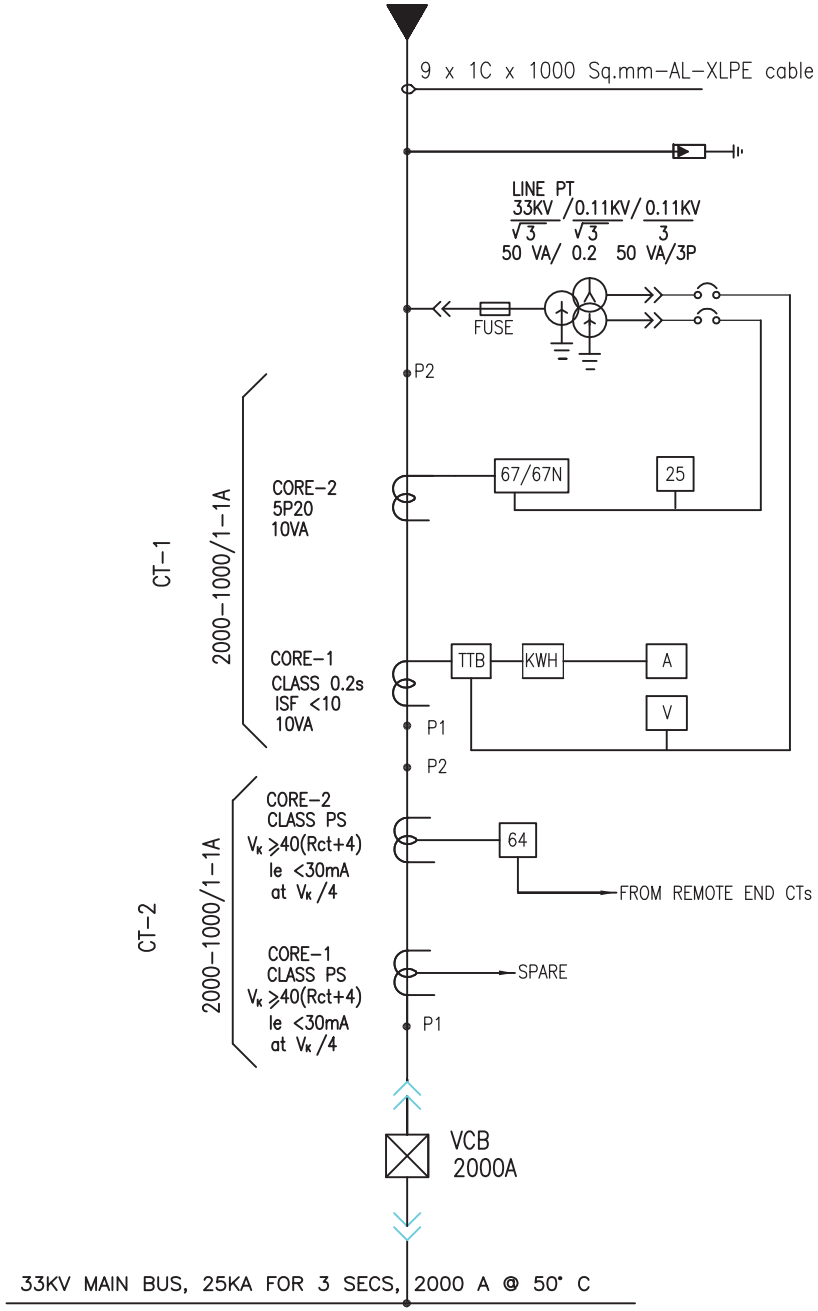
TYPICAL SLD FOR 33 KV OUTGOING FEEDER (FOR INSTALLATION AT KCC CONSUMERS PREMISES)

BSES

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

SLD-SWG-33KV-04

ANNEXURE–F10



LEGEND

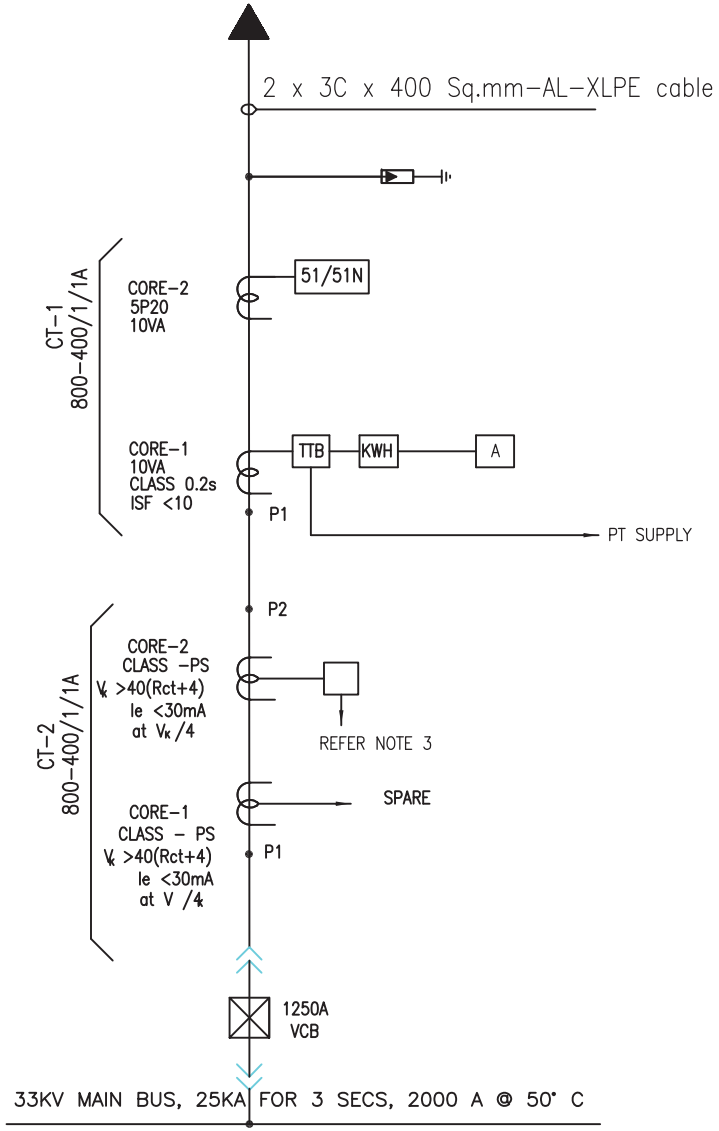
SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
52X	BREAKER AUX CONTACT MULTIPLIER
74	TRIP CIRCUIT SUPERVISION RELAY
94	ANTI PUMPING RELAY
86	HIGH SPEED TRIP RELAY
V	VOLTMETER
A	AMMETER

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

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

DRAWN	R.K/A.H H.K	TITLE: TYPICAL SLD FOR 33KV INCOMER FROM 66/33KV AUTO TRANSFORMER	BSES
CHECKED	S.G/A.S		SPECIFICATION NO. BSES-TS-66-HTSWG-R0
APPD.	G.S/G.N		SLD-SWG-33KV-05
DATE	29.04.22		
SCALE	NTS		

ANNEXURE–F11



LEGEND

SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
52X	BREAKER AUX CONTACT MULTIPLIER
74	TRIP CIRCUIT SUPERVISION RELAY
94	ANTI PUMPING RELAY
86	HIGH SPEED TRIP RELAY
V	VOLTMETER
A	AMMETER

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

NOTE:
1. KWH METER NOT IN SUPPLIER'S SCOPE
2. REFER CLAUSE 16 OF SPECIFICATION FOR DETAILED FUNCTIONAL REQUIREMENTS OF PROTECTION RELAYS
3. LINE DIFFERENTIAL OR DISTANCE RELAY. REFER CLAUSE 16.12.1 OF SPECIFICATION

DRAWN	R.K/A.H H.K
CHECKED	S.G/A.S
APPD.	G.S/G.N
DATE	29.04.22
SCALE	NTS

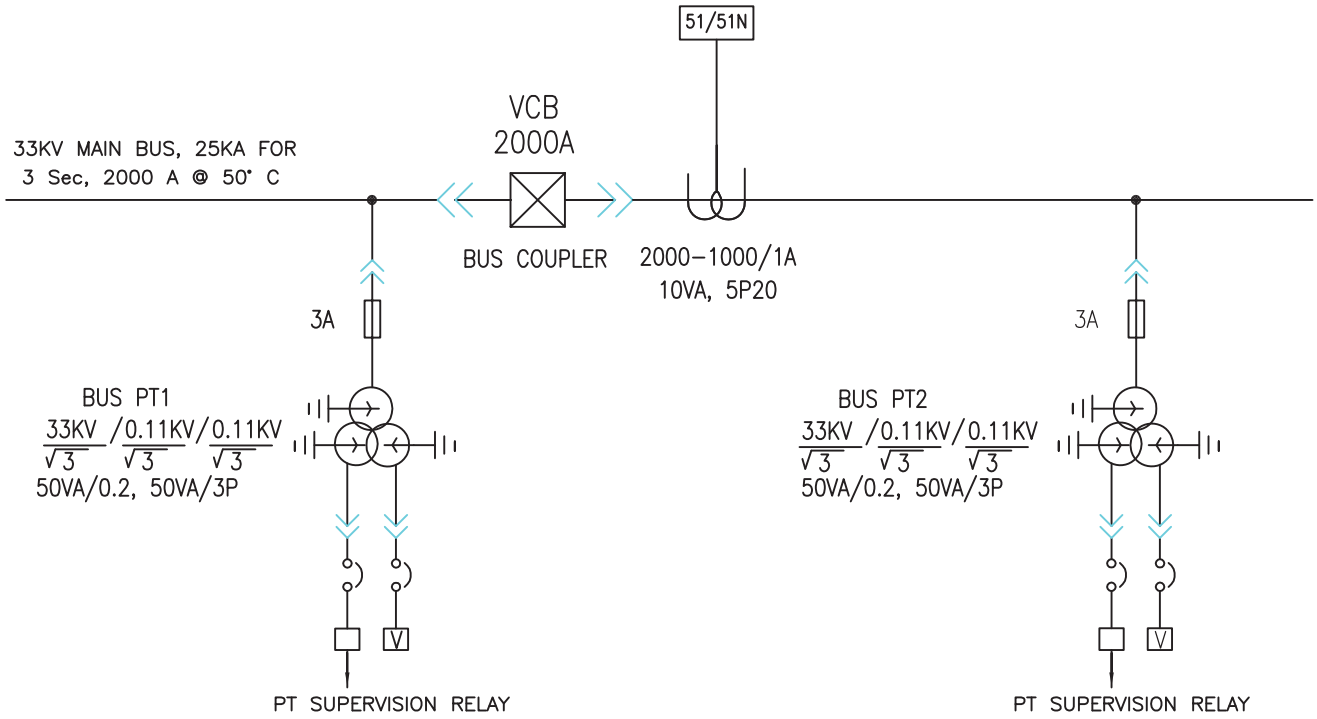
TITLE
TYPICAL SLD FOR 33KV OUTGOING FROM 66/33KV AUTO TRANSFORMER

BSES

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

SLD-SWG-33KV-06

ANNEXURE–F12



LEGEND

SYMBOL	DESCRIPTION
	11KV SF6/VACUUM CKT. BKR. DRAWOUT TYPE
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	SURGE ARRESTOR
	FUSE
52X	BREAKER AUX CONTACT MULTIPLIER
74	TRIP CIRCUIT SUPERVISION RELAY
94	ANTI PUMPING RELAY
86	HIGH SPEED TRIP RELAY
V	VOLTMETER
A	AMMETER

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

NOTE:–

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

DRAWN	R.K/A.H H.K
CHECKED	S.G/A.S
APPD.	G.S/G.N
DATE	29.04.22
SCALE	NTS

TITLE

TYPICAL SLD FOR BUS COUPLER CUM BUS PT PANEL FOR 33KV SWITCH BOARD OF 66/33KV AUTO TRANSFORMER

BSES

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

SLD-SWG-33KV-07

BSES

Technical Specification

Of

Conventional Oil filled Distribution Transformer

Specification no – BSES-TS-12-TRDU-R0

Rev:		0
Date:		01 Apr 2022
Prepared by	Vani Sood / Pronab Bairagi	
	Abhishek Harsh	
Reviewed by	Srinivas Gopu	
	Amit Tomar	
Approved by	Gaurav Sharma	
	K. Sheshadri	

BSES	BSES-TS-12-TRDU-R0
TECHNICAL SPECIFICATION OF CONVENTIONAL OIL FILLED DISTRIBUTION TRANSFORMER	

INDEX

BSES	BSES-TS-12-TRDU-R0
TECHNICAL SPECIFICATION OF CONVENTIONAL OIL FILLED DISTRIBUTION TRANSFORMER	

Record of Revision

SI No.	Revision No	Item/Clause No.	Nature of change	Approved by

1.0 Scope of Supply

For scope of supply, refer annexure – A.

2.0 Codes & standards

a) Materials, equipment and methods used in the manufacture of Transformer shall conform to the latest edition of below mentioned standards.

b) Vendor shall possess valid BIS Certification.

IS 1180	Outdoor type oil immersed distribution transformer upto and including 2.5MVA,33kV
IS 2026	Power Transformers
IS 2026-4	Terminal Marking, tappings and Connections for Power 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 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.
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 -

i. Guaranteed Technical Particulars (GTP)

ii. This Specification

iii Indian Standards / IEC standards

iv Approved Vendor Drawings

iv. Other documents

3.0 Major Design Criteria & Parameters of the Transformer

Sr No	Description	Data by purchaser
3.1	Voltage variation on supply side	+ / - 10 %
3.2	Frequency variation on supply side	+/ - 5 %
3.3	Transient condition	- 20 % or + 10 % combined variation of voltage and frequency
3.4	Service Condition	Refer Annexure B
3.5	Insulation level	Class A

3.6	Location of equipment	Generally Outdoor but may be located indoor also with poor ventilation
3.7	Reference design ambient temperature	50 deg C
3.8	Type	Oil immersed, core type, step down
3.9	Type of cooling	ONAN
3.10	Reference standard	IS 2026/IS 1180
3.11	No. of phases	3
3.12	No. of windings per phase	2
3.13	Rated frequency (Hz)	50 Hz
3.14	Highest system voltage HV side	12 kV
3.15	Highest system voltage LV side	460 volt
3.16	Lightning Impulse withstand voltage , kV peak	
3.16.1	For nominal system voltage of 11 kV	75
3.17	Power Frequency Withstand Voltage kV rms	
3.17.1	For nominal system voltage of 11 kV	28
3.17.2	For nominal system voltage of 415 V	3
3.18	Clearances Phase to Phase , mm	
3.18.1	For nominal system voltage of 11 kV	180
3.18.2	For nominal system voltage of 415 V	25
3.19	Clearances Phase to Earth , mm	
3.19.1	For nominal system voltage of 11 kV	120
3.19.2	For nominal system voltage of 415 V	25
3.20	System Fault Level , HV side	350 MVA
3.21	System Fault Level , LV side	35 MVA
3.22	System earthing	
3.22.1	HV	Solidly earthed
3.22.2	LV	Solidly earthed
3.23	Ratings	250/400/630/1000/1600/2000 kVA
3.24	Percentage Impedance at 75 deg C	

3.24.1	250/400/630 kVA	4.5 % with IS tolerance
3.24.2	1000 kVA	5.0 % with IS tolerance
3.24.3	1600/2000 kVA	6.25% with IS tolerance
3.25	Max Total losses(No Load+ Load Losses at 75ºC) at 50% of the rated load , kW	
3.25.1	250 kVA	0.98
3.25.2	400 kVA	1.225
3.25.3	630 kVA	1.86
3.25.4	1000 kVA	2.79
3.25.5	1600 kVA	4.2
3.25.6	2000 kVA	5.05
3.26	Max Total losses(No Load+ Load Losses at 75ºC) at 100% of the rated load , kW	
3.26.1	250 kVA	2.93
3.26.2	400 kVA	3.45
3.26.3	630 kVA	5.3
3.26.4	1000 kVA	7.7
3.26.5	1600 kVA	11.8
3.26.6	2000 kVA	15
3.27	Phase CT Ratio , Amp	
3.27.1	250 kVA	400/5
3.27.2	400 kVA	600/5
3.27.3	630 kVA	1000/5
3.27.4	1000 kVA	1500/5
3.27.5	1600 kVA	2500/5
3.27.6	2000 kVA	3000/5
3.28	HV cable size for all sizes / Conductor size	11 kV (E) grade , A2XCEWY 3C x 150 sqmm
3.29	Busbar size on HV side for cable termination, mm x mm	50x10-Aluminium/Tinned Copper

3.30	LV cable size, 650 /1100 V grade , A2XY cable single core 630 sqmm unarmoured (approx cable dia 40 mm)/ A2XY Cable single core 1000sqmm(Approx dia. 48mm)	Cable
3.30.1	250 kVA	1 runs per phase + 1 runs in Neutral
3.30.2	400 kVA	2 runs per phase + 2 runs in Neutral
3.30.3	630 kVA	3 runs per phase + 2 runs in Neutral
3.30.4	1000 kVA	4 runs per phase + 3 runs in Neutral
3.30.5	1600 KVA	6 runs per phase + 3 runs in Neutral-single core 630 sqmm 3 runs per phase + 2 runs in Neutral-single core 1000 sqmm
3.30.6	2000 kVA	7 runs per phase + 4 runs in Neutral-single core 630 sqmm 4 runs per phase + 3 runs in Neutral-single core 1000 sqmm
3.31	Busbar size on LV side for cable termination, mm x mm	
3.31.1	250/400/630 kVA	
3.31.1.1	Phase	100 x 12-Tinned Copper/Alumium
3.31.1.2	Neutral	100 x 12-Tinned Copper/Alumium
3.31.2	1000kVA	
3.31.2.1	Phase	100 x 12-Tinned Copper 2 runs 100 x 12-Aluminium
3.31.2.2	Neutral	100 x 12-Tinned Copper 2 runs 100 x 12-Aluminium
3.31.3	1600kVA	
3.31.3.1	Phase	160 x 12-Tinned Copper 2 runs 160 x 12-Aluminium
3.31.3.2	Neutral	160 x 12-Tinned Copper 2 runs 160 x 12-Aluminium
3.31.4	2000kVA	

3.31.4.1	Phase	2 runs 100 x 12-Tinned Copper 2 runs 160 x 12-Aluminium
3.31.4.2	Neutral	2 runs 100 x 12-Tinned Copper 2 runs 160 x 12-Aluminium
3.32	Maximum Overall Dimension Acceptable (length x width x height), mm x mm x mm	
3.32.1	250 KVA	1500 x1300x 1700
3.32.2	400 kVA	1500X1500X2000
3.32.3	630 kVA	1700X1700X2200
3.32.4	1000 kVA	1900X1900X2500
3.32.5	1600 kVA	2300X2000X2600
3.32.6	2000 kVA	2500X2000X2600
3.33	Short Circuit withstand Capacity of the transformer	
3.33.1	Three phase dead short circuit at secondary terminal with rated voltage maintained on the other side	For 3 secs.
3.33.2	Single phase short circuit at secondary terminal with rated voltage maintained on other side	For 3 secs.
3.34	Overload Capability	As per IS 2026/IEC 60905
3.35	Noise Level	400/630/1000/1600/2000 KVA- 56/57/58/60/61 Db respectively
3.36	Radio Influence Voltage	Maximum 250 microvolt
3.37	Harmonic suppression	Transformer to be designed for suppression of 3rd, 5th, 7th harmonic voltages and high frequency disturbances.

3.38	Partial Discharge	Transformer to be free from partial discharge upto 120 % of rated voltage as the voltage is reduced from 150 % of rated voltage i.e. there shall be no significant rise above background level
3.39	Tappings	Off Circuit taps on HV winding , +10% to - 10% in steps of 2.5 % , change of taps by externally operated switch
3.39.1	Rotary tap switch operating voltage	11 kV
3.39.2	Rotary tap switch current rating, Amp.	
3.39.2.1	250 KVA	20 Amps
3.39.2.2	400 kVA	60 Amp
3.39.2.3	630 / 1000 kVA	100 Amp
3.39.2.4	1600/2000 kVA	150 Amp

4.0 Construction & Design

4.1	Type	Double Copper wound, three phase, oil immersed, with ONAN cooling, with off circuit tap changer
4.2	**Major Parts**	
4.2.1	**Tank**	
4.2.1.1	Type	Non sealed type with conservator as per manufacturer's standard.
4.2.1.2	Material of Construction	Robust mild steel plate without pitting and low carbon content
4.2.1.3	Plate Thickness	Adequate for meeting the requirements of pressure and vacuum type tests as per IS
4.2.1.4	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
4.2.1.5	Tank features	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 pocket 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) Tank cover fitted with lifting lug xi) Tank cover bent at all the ends xii) Minimum disconnection of pipe work and accessories for cover lifting
4.2.1.6	Flanged type adequately sized inspection cover rectangular in shape required for	i) HV line bushing ii) LV line bushing iii) LV neutral bushing iv) Core / Winding
4.2.1.7	Fittings and accessories on main tank	See under fittings and accessories.
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 maximum operating temperatures.
4.2.2.2	Conservator oil preservation system	Conventional
4.2.2.3	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) Conservator to main tank piping shall be supported at minimum two points.

4.2.2.4	Fittings and accessories on main tank conservator	i) Prismatic oil gauge with MINIMUM, NORMAL and MAXIMUM marking ii) End Cover iii) Oil Filling Hole with cap iv) Silica Gel Dehydrating Breather with oil seal and dust filter with clear acrylic single piece clearly transparent cover resistant to UV rays(1kg). Breather shall be of Flanged type in circular shape with 4 no.holes of ½ inches with hardware of M10 bolts. Silica gel shall be of round ball type of 2.5mm dia. v) Drain Plug vi) Air release plug as required vii) Pressure/ Vacuum gauge viii) Magnetic Oil Gauge with LOW LEVEL ALARM
4.2.3	**Radiators**	Detachable type
4.2.3.1	Thickness	Minimum 1.2 mm
4.2.4.2	Features	With lifting lugs, air release plug,
4.2.5	**Core**	
4.2.5.1	Material	High grade , non ageing, low loss, high permeability, grain oriented, cold rolled silicon steel lamination. Core shall be low loss of 1Watt/kG (max)
4.2.5.2	Grade	Premium Grade minimum M3 or better
4.2.5.3	Lamination thickness	0.23 mm Max.
4.2.5.4	Design Flux Density at rated conditions at principal tap	As per Manufacturer design.
4.2.5.5	Maximum Flux Density at 12.5 % over	1.9 T

	excitation / over fluxing	
4.2.5.6	Core Design Features	i) Core shall be in the form of step and stack in three limb format. Note: Wound core shall not be acceptable ii) Magnetic circuit designed to avoid short circuit paths within core or to the earthed clamping structures iii) Magnetic circuit shall not produce flux components at right angles to the plane of lamination to avoid local heating iv) Least possible air gap and rigid clamping for minimum core loss and noise generation v) Adequately braced to withstand bolted faults on secondary terminals without mechanical damage and damage/ displacement during transportation and positioning. vi) Percentage harmonic potential with the maximum flux density under any condition limited to avoid capacitor overloading in the system vii) All steel sections used for supporting the core shall be thoroughly sand blasted after cutting , drilling, welding viii) Provision of lifting lugs for core coil assembly ix) Supporting framework designed not to obstruct complete drainage of oil from transformer

4.2.6	**Winding**	
4.2.6.1	Material	Electrolytic Copper
4.2.6.2	Maximum Current Density allowed	3 Amp per sq mm at all taps.
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) Type of winding a. LV: Sprial/Helical b. HV: Crossover/Disc Note: Foil winding shall not be acceptable ii) Stacks of winding to receive adequate shrinkage treatment iii) Connections braced to withstand shock during transport, switching, short circuit, or other transients. iv) Minimum out of balance force in the transformer winding at all voltage ratios. v) Conductor width on edge exceeding six times its thickness vi) Transposed at sufficient intervals. vii) Coil assembly shall be suitably supported between adjacent sections by insulating spacers + barriers viii) Winding leads rigidly supported , using guide tubes if practicable ix) Winding structure and major insulation not to obstruct free flow of oil through ducts x) Provision of taps as per clause 3.39

4.2.7	**Transformer Oil**	
4.2.7.1	Type	Should be in accordance with specification as per Annex C of this document
4.2.8	**Bushings and Terminations**	
4.2.8.1	Type of HV side bushing	HV bushing should be top mounted. Outdoor, Pocelain, rated voltage and creepage as per 31mm/kV with voltage class of 12kV respectively
4.2.8.2	Type of LV side bushing	LV bushing should be top mounted. Outdoor, Porcelain, rated voltage and creepage as per 31mm/kV with voltage class of 1.1 kV respectively Additional neutral bushing of porcelain outside on top of LT cable box with brass palm connector (as per IS 3347) shall be provided. Connection between the main neutral and additional neutral shall be provided. For extra neutral bushing, protection box shall be provided in order to prevent ingress of water.
4.2.8.2.1	Essential provision for LV side line bushing	It shall be complete with copper palm complete with tinned copper busbar of size shall be as per clause 3.31.
4.2.8.2.2	Essential provision for LV side neutral bushing	In case of neutral bushing the stem and busbar shall be integral without bolted, threaded, brazed joints. Busbar size shall be as per clause 3.31
4.2.8.3	Arcing Horns	Not required
4.2.8.4	Support insulators inside HV cable box if provided	Epoxy resin cast, rated voltage 12 kV
4.2.8.5	Termination on HV side bushing	By bimetallic terminal connectors

		suitable for ACSR/AAAC conductor / Cable connection through cable box with disconnecting link suitable for 11kV(E) grade,A2XFY 3Cx 150sqmm
4.2.8.6	Termination of LV side bushing	By bimetallic terminal connectors suitable for LV Cable size of 650/1100VGrade, A2XY Cable single core 630sqmm (Approx dia 40mm) / A2XY Cable single core 1000sqmm (Approx dia. 48mm) for 1600/2000 KVA.
4.2.8.7	Minimum creepage distance of all bushings and support insulators.	31mm/KV
4.2.8.8	Protected creepage distance	At least 50 % of total creepage distance
4.2.8.9	Continuous Current rating	Minimum 20 % higher than the current corresponding to the minimum tap of the transformer
4.2.8.10	Rated thermal short time current	25 times the rated current for 2 sec
4.2.8.11	Atmospheric protection for clamp and fitting of iron and steel	Hot dip galvanizing as per IS 2633
4.2.8.12	Bushing terminal lugs in oil and air	Tinned copper
4.2.8.13	Sealing washers /Gasket ring	Nitrile cork rubber(RC70C)/ Expanded TEFLON(PTFE) as applicable.
4.2.9	**HV & LV cable box**	Required
4.2.9.1	Material of Construction	Sheet Steel min. 2.5 mm thick
4.2.9.2	Cable entry	At bottom through detachable gland plate with cable clamps of non magnetic material
4.2.9.3	Cable size for HV	11 kV (E) grade , A2XFY 3C x 150 sqmm
4.2.9.4	Cable size for LV	LV cable size, 650 /1100 V grade, A2XY cable single core 630 sqmm

		unarmoured (approx cable dia 40 mm) / A2XY Cable single core 1000sqmm (Approx dia. 48mm) for 1600/2000 KVA.
4.2.9.5	Cable size for LV Neutral	LV cable size, 650 /1100 V grade, A2XY cable single core 630 sqmm unarmoured (approx cable dia 40 mm) / A2XY Cable single core 1000sqmm (Approx dia. 48mm) for 1600/2000 KVA.
4.2.9.6	Detachable Gland Plate material for HV, LV, LV Neutral box	i) MS for HV cable box ii) Al for LV cable box.
4.2.9.7	Gland plate thickness for HV, LV, LV Neutral box	i) 3 mm for HV side cable box ii) 5 mm for LV cable box.
4.2.9.8	Cable gland for HV cables	Nickel plated brass double compression weatherproof cable gland
4.2.9.9	Cable lug for HV, LV, LV Neutral cables	i) Double hole Aluminium lugs for LV & Neutral side ii) Single hole Aluminum lugs for HV side
4.2.9.10	Essential parts	i) Flange type removable front cover with handles min two nos. ii) Tinned Copper Busbar of adequate size for Purchaser's cable termination with busbar supports iii) Earthing boss for the cable box iv) Earthing link for the gasketted joints at two point for each joint v) Earthing provision for cable Armour/ Screen vi) Flanged type inspection cover on top for bushing inspection and maintenance with handle vii) Drain plug viii) Rainhood on gasketted vertical joint ix) Danger / caution plate

4.2.9.11	Terminal Clearances	700mm, Minimum
4.2.9.12	Termination height required for cable termination	1000mm, Minimum
4.2.10	**Current Transformers**	
4.2.10.1	Provision	On all three phases on LV side
4.2.10.2	Mounting	On LV side bushings on all three phases with the help of fibre glass mounting plate affixed to main tank by nut bolt arrangement
4.2.10.3	Maintenance requirements	Replacement should be possible by removing fixing nut of mounting plate after removal of LT cable without disturbing LT bushing
4.2.10.4	Accuracy Class	0.5
4.2.10.5	Burden	10VA
4.2.10.6	Type	Resin Cast Ring type suitable for outdoor use.
4.2.10.7	CT ratio	
	250 KVA	400/5
	400kVA	600/5
	630kVA	1000/5
	1000kVA	1500/5
	1600kVA	2500/5
	2000kVA	3000/5
4.2.10.8	**CT terminal Box**	
4.2.10.8.1	Size	650 mm height x 750 mm width x 275 mm depth.
4.2.10.8.2	Fixing of instrument / meters within box	On slotted channel 40 x 12 mm size, channel fixed on vertical slotted angle 40 x 40 mm size at two ends
4.2.10.8.3	No of horizontal channels to be provided	Four
4.2.10.8.4	Fixing of terminals within the box	On horizontal slotted channel with the

		help of C channel available with the terminals
4.2.10.8.5	Location	On tank wall
4.2.10.8.6	Box door design	Openable from outside with antitheft hinge, padlock facility, door fixed by stainless steel allen screw M6 size , door shall have canopy for rain protection
4.2.10.8.7	Terminal strip	Nylon 66 material, minimum 4 sq mm, screw type for control wiring and potential circuit.
4.2.10.8.8	Cables and wires	PVC insulated, extruded PVC inner sheathed, armoured, extruded PVC outer sheathed 1100 V grade control cable as per latest edition of IS 1554 part 1 minimum 2.5 sq mm for signals and 4 sq mm for CT with multi strand copper conductor
4.2.10.8.9	Cable Glands	Nickel plated brass double compression weatherproof cable gland
4.2.10.8.10	Lugs on wires	Tinned copper pre insulated Pin, Ring, Fork type as applicable
4.2.10.8.11	Potential signal in CT box	i) Tapped from main LV busbar ii) Neutral Link and Fuse to be provided by bidder for PT
4.2.10.8.12	Essential provision	Wiring diagram to be fixed on the back of door along with CT spec. on Aluminum engraved plate fixed by rivet.
4.2.11	**Off Circuit tap Switch**	
4.2.11.1	Range /Step	Off circuit taps on HV winding, +10% to -10% in steps of 2.5%, change of taps by externally operated switch.
4.2.11.2	Type	Rotary type, 3 pole gang operated,

		draw out type
4.2.11.3	Operating Voltage	11kV
4.2.11.4	Rated Current for tap Switch	i) 400 kVA - 60 Amps ii) 630/1000 kVA - 100 Amps iii) 1600/2000kVA-150 Amps
4.2.11.5	Operating Handle	External at suitable height to be operated from ground level.
4.2.11.6	Essential provision	Tap position indicator, direction changing facility, locking arrangement, and caution plate metallic fixed by rivet.
4.2.12	**Pressure Relief Device**	
4.2.12.1	Type	Pressure Relief Valve (PRV)
4.2.12.2	Auxiliary contacts	2 NO
4.2.13	**Winding and Oil Temperature scanner**	Required
4.2.13.1	PT 100 sensor	For measurement of Oil temperature LV winding temperature.
4.2.13.2	No of potential free trip contacts	2 NO
4.2.13.3	No of potential free alarm contacts	2 NO
4.2.13.4	Auxiliary Supply	240 AC, Single phase, 50Hz. Tapped from LV side busbar through a MCB located inside box.
4.2.13.5	Communication port	RS 485 port for interfacing with FRTU on Modbus protocol. Battery/Super capacitor for data transmission to SCADA in the event of Auxiliary supply fail
4.2.13.5	Fixing of instrument	On side wall of tank
4.2.14	**Auxiliary Relay (hand reset type)**	Required to identify the type of fault/indication.
4.2.14.1	Quantity	4 no's Separate auxiliary relay to be provided for PRV, MOG,WTI/OTI,

		Buchholz relay.
4.2.14.2	Potential free contacts	2 NO
4.2.14.3	Auxiliary supply	240V AC
4.3	**Hardware**	
4.3.1	External	Hot dip galvanized bolts
4.3.2	Internal	Cadmium plated except special hardware for frame parts and core assembly as per manufacturer's design
4.4	**Gasket**	
4.4.1	For Transformer , surfaces interfacing with oil like inspection cover etc.	Nitrile cork rubber RC70C grade
4.4.2	For Cable boxes, Marshalling box, etc.	Neoprene rubber based/ cork nitrile
4.5	Valves	
4.5.1	Material of construction	Brass / gun metal
4.5.2	Type	Both end flanged gate valve / butterfly valve depending on application
4.5.3	Size	As per manufacturer's standard
4.5.4	Essential provision	Position indicator, locking rod, padlocking facility, valve guard, cover plate.
4.6	Cable routing on Transformer	Control cables for accessories on transformer tank shall be routed through perforated GI trays
4.6.1	Control cable specification	PVC insulated, extruded PVC inner sheathed, armoured, extruded PVC outer sheathed 1100 V grade control cable as per latest edition of IS 1554 part 1 minimum 2.5 sq mm for signals and 4 sq mm for CT with multi strand copper conductor
4.6.2	Specification of wires to be used inside marshalling box.	PVC insulated multi-strand flexible copper wires of minimum 2.5 sq mm size, 1100 V grade as per latest edition

		of relevant IS
4.7	Terminal Blocks to be used by the vendor	Nylon 66 material, minimum 4 sq mm, Stud type screw driver operated type for control wiring and potential circuit.
4.7.1	Essential provision for CT terminals	Sliding link type disconnecting terminal block Stud type screwdriver operated with facility for CT terminal shorting material of housing melamine/ Nylon66
4.8	Cable glands to be 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 Aluminium lug with knurling on inside surface.
4.9.2	For Control Cable	Tinned copper pre insulated Pin, Ring, Fork type as applicable
4.10	Painting of transformer, Radiator, marshalling box for CT, cable boxes etc.	
4.10.1	Surface preparation	By 7 tank pretreatment process or shot blasting method
4.10.2	Finish on internal surfaces of the transformer	Bright Yellow heat resistant and oil resistant paint two coats. Paint shall neither react nor dissolve in hot transformer insulating oil.
4.10.3	Finish on inner surface of the CT terminal box, HV/LV/LVN cable box	White Polyurethane paint anti condensation type two coats , minimum dry film thickness 80 microns
4.10.4	Finish on outer surface of the transformer, radiator, CT terminal box, HV/LV/LVN cable box	Battle ship Grey shade 632 Polyurethane paint two coats, minimum dry film thickness 80 microns
4.10.5	Frame parts	Battle ship grey shade 632 IS 5, 80 micron minimum insulating oil resistant

		paint. Paint shall neither react nor dissolve in hot transformer insulating oil.

5.0 Fittings and Accessories on Transformer

5.1	Rating and Diagram Plate	Required
5.1.1	Material	Anodized aluminum 16SWG
5.1.2	Background	SATIN SILVER
5.1.3	Letters, diagram & border	Black
5.1.4	Process	Etching
5.1.5	Rating and Diagram 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) manufacturer's name; iv) transformer serial number; v) month and year of 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 connection 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) Max. Total losses at 50 % rated

		load xvii) Max. Total losses at 100 % rated load xviii) Load loss at 50% & 100% rated load xix) No-load loss at rated voltage and frequency xx) Energy efficiency level. xxi) continuous ambient temperature at which ratings apply in deg C xxii) top oil and winding temperature rise at rated load in deg C; xxiii) winding connection diagram with taps and table of tapping voltage, current and power xxiv) transport weight of transformer xxv) weight of core and windings xxvi) Weight of core xxvii) Weight of winding xxviii) total weight xxix) volume of oil xxx) weight of oil xxxi) name of the purchaser xxxii) PO no and date xxxiii) Guarantee period
5.2	Terminal marking Plate for Bushing, anodized aluminium black lettering on satin silver background both inside cable boxes near termination and on cable box cover (all fixed by rivet)	Required
5.3	Company Monogram Plate fixed by rivet	Required
5.4	Lifting Lug to lift complete	Required

	transformer with oil	
5.5	Lifting lug for top cover	Required
5.6	Lashing Lug	Required
5.7	Jacking Pad with Haulage hole to raise or lower complete transformer with oil	Required
5.8	Detachable Bidirectional flat roller Assembly	Required
5.8.1	Roller center to center distance	Minimum 900 mm on the side of HV and LV cable box Maximum 800 mm on the other side (perpendicular to HV, LV cable box).
5.8.2	Essential provision	Roller dia 150 mm min., roller to be fixed in such a way so that the lowermost part of the skid is above ground by at least 100 mm when the transformer is installed on roller.
5.9	Pockets for ordinary thermometer on tank cover with metallic identification plate fixed by rivet.	Required
5.10	Drain valve (gate valve) for the main tank with cork above ground by 150mm minimum with padlocking and valve guard with metallic identification plate fixed by rivet.	Required
5.11	Filter valve (gate valve) at top with padlocking and valve guard with metallic identification plate fixed by rivet.	Required
5.12	Air Release Plug on tank cover with metallic identification plate fixed by rivet.	Required
5.13	Earthing pad on tank for	Required

	transformer earthing complete with non ferrous nut ., bolt, washers, spring washers etc. with metallic identification plate fixed by rivet	
5.14	Rainhood for vertical gasketted joints , in cable boxes, Conservator	Required Not required as per Annexure A Scope of supply
5.15	Earthing bridge by copper strip jumpers on all gasket joints at at least two points for electrical continuity	Required
5.16	Skid base welded type with haulage hole	Required
5.17	Core , Frame to tank Earthing	Required
5.18	Danger plate made of Anodized aluminum with white letters on red background on Transformer, cable boxes (all fixed by rivet)	Required
5.19	Caution plate for Off Circuit tap changer fixed by rivet.	Required
5.20	MOG with auxiliary contact wired upto Terminal Box	Required
5.21	Buchholz relay for transformer above 1000kVA	Required
5.22	Pressure relief valve	Required
5.23	WTI & OTI Temperature Scanner	Required
5.24	Auxiliary relays (4 no's)	Required
5.25	LT cable support-By aluminium clamp fixed on the on MS bracket of size 50x 10 supported from the tank wall shall be provided .	Required
5.26	HT cable support-By GI clamp fixed on the on MS bracket of size 50x 10 supported from the tank wall shall	Required

	be provided.	

6.0 Approved make of components

6.1	CT	Pragati / ECS / Kappa/Mehru/Continental/Nortex
6.2	Bushings	Baroda Bushing/Jaipur glass/CJI
6.3	Tap Changer	Alwaye /Paragon
6.4	MOG	Sukrut/Atvus
6.5	Valves	Newman/ATAM
6.6	CRGO	Nippon/JFE/Posco/Thyson kkurup
6.7	Copper	Birla copper/Sterlite
6.8	Pre compressed Pressboard	Raman Board, Mysore/ Senapathy Whiteley
6.9	Laminated Wood	Permalli Wallance / Rochling Engineers
6.10	Oil	Apar/Savita/Raj Petro/Gandhaar
6.11	Steel	TATA/Jindal/SAIL
6.12	Lugs/Glands	Jainson/Dowells/Comet
6.13	Radiators	CTR/Hi-Tech Radiators /Tarang Engineers
6.14	WTI/OTI	Precimeasure/ Pecon
6.15	Buchholz Relay	Sukrut/Atvus
6.16	Auxiliary Relay	GE/Alstrom

Note – Any other make of component offered by the bidder maybe reviewed & approved by purchaser

7.0 Quality assurance

7.1	Quality Assurance program	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 bidder should have qualified technical & dedicated QA

		personnel at various stages of manufacture & testing. iv) Factory inspection of bidder may be carried out to ascertain the quality system and process in place at manufacturing facility. The same is applicable to bidders not approved with BSES. v) The system for purchasing, taking delivery and verification of materials vi) The system for ensuring quality of workmanship vii) The system for control of documentation viii) The system for the retention of records ix) The arrangements for the Supplier's internal auditing x) A list of the administration and work procedures required to achieve and verify Contract's quality requirements. These procedures shall be made readily available to the Purchaser for inspection on request
7.2	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 programm sequence ii) The structure of the Supplier's organisation for the contract iii) The duties and responsibilities assigned to staff ensuring quality of work for the contract iv) Inspection Hold and notification points mutually agreed. v) Submission of engineering documents required by the specification vi) The inspection of materials and components on receipt vii) Reference to the Supplier's work

		procedures appropriate to each activity viii) Inspection during fabrication/ construction ix) Final inspection and test x) Successful bidder shall include submittal of Mills invoice, Bill of lading, Mill's 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
7.3	Manufacturing Quality Assurance Plan	Refer Annexure D

8.0 Progress Reporting

8.1	Outline Document	To be submitted for purchaser approval for outline of production, inspection, testing, packing, dispatch, documentation programme
8.2	Detailed Progress report	To be submitted to 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 ix) Forward path

9.0 Inspection & testing

9.1	Inspection and Testing during manufacture	Only type tested equipment shall be acceptable
9.1.1	Tank and Conservator	i) Check correct dimensions between wheels demonstrate turning of wheels through 90 deg and further dimensional check. ii) Check for physical properties of

		materials for lifting lugs, jacking pads etc. All load bearing welds, including lifting lug welds shall be subjected to iii) required load tests. iv) Leakage test of the conservator. v) Certification of all test results. vi) Oil leakage test . vii) Vacuum and Pressure test on tank as type test as per IS
9.1.2	Core	
9.1.2.1	Mother Core coil	Verification & inspection of the mother coil at port & putting stamp & seal may be inspected by BSES.
9.1.2.2	Core sample type testing	Reconciliation of mother coil by checking stamp & seal at factory before slitting. One sample of CRGO to be 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)
9.1.2.3	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.
9.1.2.4	Core physical verification	i) Check on the quality of varnish if used on the stampings. 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 clamps. ix) High voltage test (2 KV for one minute) between core and clamps. Certification of all test results.
9.1.2.5	Documents verification	Following documents to be submitted during the stage inspection i) Invoice of supplier ii) Mills test certificates iii) Packing list iv) Bill of lading v) Bill of entry certificates by customs
9.1.3	Insulating Materials	i) Sample check for physical properties of materials. 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.
9.1.4	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 bending 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.
9.1.4.1	Checks before drying process	i) Check conditions of insulation on the conductor and between the windings. ii) Check insulation distance between high voltage connection distance between high voltage connection cables and earthed and other live parts. iii) Check insulation distance between low voltage connection 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 movement. vii) Certification of all test results.
9.1.4.2	Checks during drying process	i) Measurement and recording of temperature and drying time during vacuum treatment. ii) Check for completeness of drying. iii) Certification of all test results.
9.1.5	Oil sample testing	One sample of oil drawn from every lot of transformer offered for inspection should be tested at CPRI/ERDA lab for tests as listed under Table-1 of IS:1866 (2000). The cost of this testing should be included within the cost of transformer.

9.1.6	Test on fittings and accessories	As per manufacturer's standard
9.2	Routine 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* vi) Separate sources voltage withstand test. vii) Measurement 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 at 50 % & 100 % of load. x) Impedance measurement of 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 test are conducted). xiv) Measurement of capacitance and Tan Delta for transformer winding and Tan Delta for transformer oil (for all transformers). xv) Ratio of CT xvi) Oil leakage test on completely assembled transformer xvii) Magnetic balance test xviii) Power frequency voltage withstand test on all auxiliary circuits xix) Certification of all test results. xx) Temperature Rise Test # Note: a) *Insulation resistance measurement shall be carried out at 5kV for HV and 1kV

		for LV. Value of IR should not be less than 1000 Mohms. Polarization Index (PI = IR_{10min}/IR_{1min}) should not be less than 1.5 (If one minute IR value is above 5000 Mohms 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 one unit/lot. Purchaser's engineer, will at its discretion, select transformer for temp. rise test from any lot offered for inspection at manufacturer's works and witness the same for comparison with ERDA/CPRI type test results c) BSES may appoint recognized testing authority like CPRI /ERDA lab with their instruments & engineer's team and measure no load loss, load loss and percentage impedance of the transformer at supplier's works at our own 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.
9.3	Acceptance test at NABL lab	Bidder should have in-house NABL accredited testing facility. In case of unavailability of same, one Transformer of each rating shall be randomly selected and sealed by BSES representative for complete acceptance test as per IS 1180 (including temperature test) at third party NABL Lab. Tests shall be conducted once per Rate contract.
9.4	Type Tests	On one transformer of each rating and type at CPRI/ERDA. i) Impulse withstand test on all three HV 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 iv) Pressure and Vacuum test on tank

		Note – Purchaser may choose to carry out short circuit, impulse & temperature rise test on one unit from a lot offered from inspection at CPRI/ERDA
9.5	Special Tests	On one transformer of each rating and type i) Dynamic & Thermal (3 sec) Short Circuit Test as per IS 2026 ii) Measure of zero seq. impedance (Cl. 16.10 IS 2026 Part I). iii) Measurement of acoustic noise level (Cl. 16.12 of IS 2026 Part I). iv) Measurement of harmonic level on no load current. v) Paint adhesion test. vi) High voltage withstand test shall be performed on the auxiliary equipment and wiring after complete assembly. Cost of such tests, if extra, shall be quoted separately by the Bidder.
9.6	Notification to bidders	In case bidder had conducted type & special tests from CPRI/ERDA on BSES design and there is no design change in the transformer less than 10 years from the date of the bid opening, then bidder need not to conduct the type test from CPRI/ERDA lab. The bidder shall submit the under taking that there is no change in design with respect to type tested design.
		The product offered must be of type tested quality. In case the product offered is never type & special tested the same (as per above clause 9.4.& 9.5), is to be conducted by bidder at his own cost at CPRI/ERDA
9.7	Customer Hold Point	i) GTP & Drawings approval ii) Core Inspection(See Cl No 9.1.2) Sample to be tested at CPRI/ERDA for each lot. iii) Tank Pressure & vacuum Test iv) Core & Coil Stage inspection of each lot to be offered for final testing.

10.0 Packing , Shipping, Handling and Storage

10.1	Packing	
10.1.1	Packing protection	Against corrosion, dampness, heavy rains, breakage and vibration
10.1.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection
10.1.3	Packing details	On each packing case details required as follows i) Individual serial number; ii) Purchaser's name; iii) PO number; iv) Destination; v) Supplier's name; vi) Name and address of supplier's agent vii) Description and quantity viii) Manufacturer's name ix) Country of origin x) Case measurements xi) Gross and net weights in kilograms xii) All necessary slinging and stacking instructions.
10.2	Shipping	i) The bidder shall ascertain at an early date and definitely before the commencementof manufacture, any transport limitations such as weights, dimensions, road culverts, overhead lines, free access etc. from the manufacturing plant to the project site; and furnish to the Purchaser confirmation that the proposed packages can be safely transported, as normal or oversize packages, upto the plant site. ii) Any modifications required in the infrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser
10.3	Handling and Storage	As per manufacturer's instruction

11.0 Deviations

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, requirements of the Specification shall be met without exception.

12.0 Drawings& Data Submission Matrix

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.

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

S.no	Documents to be submitted	With the bid	After Award	
			For Approval	Prior to dispatch
9	Transport / shipping dimension and weights, space required for handling parts for maintenance	✓		
10	Write up on oil preservation system.		✓	✓
11	Quality assurance program.	✓	✓	
12	Programme for production and testing		✓	
13	General description of the equipment and all components, including brochures		✓	
14	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 OTI/WTI scanner, PRV, Buchhloz relay. Auxiliary relays		✓	
15	Calculations to substantiate choice of electrical, structural, mechanical component size, ratings		✓	
16	Detailed loading drawing to enable the purchaser to design and construct foundations for the transformer.		✓	
17	Transport /shipping dimension with weights ,wheel base details, untanking height etc.		✓	
18	Terminal arrangements and cable box details		✓	
19	Flow diagram of cooling system showing no. of cooling banks		✓	
20	Drawings of major components like bushing,CT, OTI/WTI Scanner, PRV, Buchholz relay, Auxiliary relays, Valves, radiators etc		✓	
21	Lists of makes of all fittings and accessories		✓	
22	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		✓	
23	Detailed installation and commissioning instructions			✓

S.no	Documents to be submitted	With the bid	After Award	
			For Approval	Prior to dispatch
24	Inspection and test reports carried out in manufacturers works			✓
25	Test certificates of all bought out items. and catalogues			✓
26	Operation and maintenance instructions as well as trouble shooting charts.			✓

Annexure A Scope of supply

1.0 The scope of supply shall include following

1.1 Design, manufacture, assembly, testing at stages of manufacture as per Cl. 9 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

Sr. No	Description	Scope of Supply
1.1.1	Fully assembled transformer with all major parts like conservator, Radiators, CT box, Fittings and accessories as per Clause 5.0 of this specification	YES
1.1.2	Off circuit tap changer as per this specification	YES
1.1.3	HV, LV, cable boxes	YES
1.1.4	Support steel material for support of cable boxes from ground	YES
1.1.5	Foundation Bolts for complete transformer	YES
1.1.6	Support structure to support of cable from the transformer tank	YES
1.1.7	Nickel Plated brass double compression glands for HV and LV, LVN cables (in case of termination by cable)	YES
1.1.8	Long barrel medium duty Aluminium lugs for power cables (in case of termination by cable)	YES
1.1.9	Nickel Plated brass double compression glands and tinned copper lugs for control cable termination in CT box for vendor's cables	YES
1.1.10	Cables and wires for transformer accessories and internal wiring of CT box	YES
1.1.11	Touch up paint, minimum 2 litres	YES
1.1.12	Extra Transformer oil 10 % in non returnable drums	YES
1.1.13	One spare complete set of gaskets	YES
1.1.14	Routine testing as per Cl. 9.2 & 9.3 of this specification	YES
1.1.15	Type testing as per Cl. 9.4 of this specification	YES
1.1.16	Special testing as per Cl. 9.5 of this specification	YES
1.1.17	Submission of Documentation as detailed below	YES

Annexure B Service Conditions

1.0.0	Delhi Atmospheric conditions	
a)	Average grade atmosphere :	Heavily polluted, dry
	Maximum altitude above sea level	1000 M
b)	Ambient Air temperature	Highest 50 deg C, Average 40 deg C
	Design ambient temperature	50 deg C
c)	Relative Humidity	90 % Max
d)	Seismic Zone	4
e)	Rainfall	750 mm concentrated in four months

Annexure C Technical Particulars of transformer oil

Transformer oil shall be new and conform to the following requirements:

1.0 Codes & standards

Latest revision of following codes & standards with all amendments –

	Standard no	Title
1.1	IS 335	New insulating oils
1.2	IS 1783	Drums for oils

2.0 Properties

The insulating material shall have following features

Sr No	Item description	Specification requirement
2.1	**Function**	
2.1.1	Viscosity	
2.1.1.1	Viscosity at 40^0C	15 mm^2/s, Max
2.1.1.2	Viscosity at 0^0C	1800 mm^2/s, Max
2.1.2	Pour Point	- 10^0C, 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 20^0C	0.895 g/ml, Max
2.1.6	Dielectric dissipation factor at 90^0C	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 27^0C	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 90^0C	0.5, Max

Sr No	Item description	Specification requirement
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	135^0C, Min
2.4.2	PCA content Max	3%, Max
2.4.3	PCB content	Not detectable (<2 mg/Kg)

Annexure D Manufacturing Quality Assurance Plan

SL NO	CHARACTRISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
								S	M	O	
1	2	3	4	5	6	7	8	9			10
A	**RAW Material**										
1	**Winding Conductor (PICC)**										
1.1	Bare Dimensions & Finish of Conductor	Major	Measurement	1 sample per size per lot	IEC 13730 Part 27,IEC 60317,IS 7404,IS 6160,IS 613	IEC 13730 Part 27,IEC 60317,IS 7404,IS 6160,IS 613	Supplier's TC	P	V	R	
1.2	Increase in dimensions due to Paper covering	Major	Measurement	-DO-	-DO-	-DO-	-DO-	P	V	R	
1.3	Resistivity @ 20°C	Major	Electrical	-DO-	-DO-	-DO-	-DO-	P	V	R	
1.4	No of Layers	Critical	Measurement	-DO-	-DO-	-DO-	-DO-	P	V	R	
1.5	Conductor Tensile strength	Critical	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
1.6	Conductor Elongation	Critical	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
1.7	% Overlap of Paper	Critical	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	

SL NO	CHARACTRISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
								S	M	O	
1	2	3	4	5	6	7	8	9			10
1.8	Corner Radius	Critical	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
1.9	**Kraft Paper Insulation**										
1.9.1	Thickness	Major	Measurement	1 sample per size per lot	IEC:60554, IS:9335	IEC:60554, IS:9335	Supplier's TC	P	V	R	
1.9.2	Apparent Density	Major	Chemical	-DO-	-DO-	-DO-	-DO-	P	V	R	
1.9.3	Air Permeability	Major	Chemical	-DO-	-DO-	-DO-	-DO-	P	V	R	
1.9.4	Tensile Index (Longitudinal and Transverse)	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
1.9.5	Electrical Strength in Air	Major	Electrical	-DO-	-DO-	-DO-	-DO-	P	V	R	
1.9.6	Ash Content	Major	Chemical	-DO-	-DO-	-DO-	-DO-	P	V	R	
1.9.7	pH of 5% Aqueous Extract	Major	Chemical	-DO-	-DO-	-DO-	-DO-	P	V	R	
1.9.8	Conductivity of 5% Aqueous Extract	Critical	Chemical	-DO-	-DO-	-DO-	-DO-	P	V	R	
1.9.9	Moisture Content	Major	Chemical	-DO-	-DO-	-DO-	-DO-	P	V	R	
1.9.10	Heat Stability	Major	Chemical	-DO-	-DO-	-DO-	-DO-	P	V	R	
1.9.11	Degree of Polymerization	Major	Chemical	-DO-	-DO-	-DO-	-DO-	P	V	R	

SL NO	CHARACTRISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
								S	M	O	
1	2	3	4	5	6	7	8	9			10
1.9.12	Elongation (MD & CMD)	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
1.9.13	Tear index	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
2.0	**CRGO Laminations (Watt absorption)**										
2.1	Specific Core Loss	Major	Electrical	Random	IEC 60404, IS 3024, IS 649	IEC 60404, IS 3024, IS 649	Supplier's TC	P	V	R	
2.2	Surface Insulation resistance	Major	Electrical	-DO-	-DO-	-DO-	-DO-	P	V	R	
2.3	Ageing Test	Major	Measurement	-DO-	-DO-	-DO-	-DO-	P	V	R	
2.4	Stacking Factor	Major	Measurement	-DO-	-DO-	-DO-	-DO-	P	V	R	
2.5	Waviness	Major	Measurement	-DO-	-DO-	-DO-	-DO-	P	V	R	
2.6	Edge Burr	Major	Visual	-DO-	-DO-	-DO-	-DO-	P	V	R	
2.7	Sample testing for Checking Specific Core loss, accelerated ageing test, Surface insulation resistivity, AC permeability and magnetization, stacking	Major	Electrical	100%	-DO-	-DO-	--	--	P	W	Sample will be randomly selected by BSES & will be send for testing at CPRI/ERDA

SL NO	CHARACTRISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
								S	M	O	
1	2	3	4	5	6	7	8	9			10
	factor, Ductility										lab.
3.12	Core Cutting	Major	Visual	Random	-DO-	-DO-	-DO-	P	W	W	
3.0	**Un-impregnated Laminated Wood**										
3.1	Thickness	Major	Visual	1 sample size / LOT	IS 3513/IEC 61061	IS 3513/IEC 61061	Supplier's TC	P	V	R	
3.2	Density	Major	Chemical	-DO-	-DO-	-DO-	-DO-	P	V	R	
3.3	Moisture Content	Major	Chemical	-DO-	-DO-	-DO-	-DO-	P	V	R	
3.4	Oil Absorption	Major	Chemical	-DO-	-DO-	-DO-	-DO-	P	V	R	
3.5	Cross breaking strength	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
3.6	Compressive Strength	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
3.7	Electric Strength in Oil	Major	Electrical	-DO-	-DO-	-DO-	-DO-	P	V	R	
3.8	Shrinkage in oil	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
3.9	Tensile Strength,compressive strength	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
4.0	**Press Boards (Pre-compressed)**										

SL NO	CHARACTRISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
								S	M	O	
1	2	3	4	5	6	7	8	9			10
4.1	Thickness	Major	Measurement	1 sample/Size/LOT	IEC:60641, IS:1576	IEC:60641, IS:1576	Supplier's TC	P	V	R	
4.2	Tensile Strength (MD & CMD)	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
4.3	Shrinkage in Air (MD & CMD)	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
4.4	Moisture Content	Major	Chemical	-DO-	-DO-	-DO-	-DO-	P	V	R	
4.5	Oil Absorption	Major	Chemical	-DO-	-DO-	-DO-	-DO-	P	V	R	
4.6	Electrical Strength in Oil and air	Major	Electrical	-DO-	-DO-	-DO-	-DO-	P	V	R	
4.7	pH of 5% aqueous extract	Major	Chemical	-DO-	-DO-	-DO-	-DO-	P	V	R	
4.8	Conductivity of 5% aqueous extract	Major	Chemical	-DO-	-DO-	-DO-	-DO-	P	V	R	
4.9	Compressibility	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
4.10	Ash Content	Major	Chemical	-DO-	-DO-	-DO-	-DO-	P	V	R	
4.11	Apparent density	Major	Chemical	-DO-	-DO-	-DO-	-DO-	P	V	R	
4.12	Elongation (MD & CMD)	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
5.0	**Tank and its**										

SL NO	CHARACTRISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
								S	M	O	
1	2	3	4	5	6	7	8	9			10
	accessories										
5.1	Structural steel										
5.1.1	Thickness	Major	Measurement	Random	IS 2062/ IS:1576	IS 2062/ IS:1576	Suppliers TC	P	V	R	
5.1.2	Yield Strength	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
5.1.3	Tensile Strength	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
5.1.4	Elongation	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
5.1.5	Bend test	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
5.1.6	Chemical composition	Major	Chemical	-DO-	-DO-	-DO-	-DO-	P	V	R	
5.2	**Manufacturing of Tank and accessories**										
5.2.1	Dimension check	Major	Measurement	100%	MFR. Spec/ DRG/BSES approved document	MFR. Spec/ DRG/ BSES approved document	MFR. Fabrication report	P	W	R	
5.2.2	Joint preparation	Major	Measurement	100%	-DO-	-DO-	-DO-	P	V	R	
5.2.3	Assembly and alignment	Major	Visual and measurement	100%	MFR. Spec/ DRG	MFR. Spec/ DRG	MFR. Fabrication report	P	V	R	

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								S	M	O	
1	2	3	4	5	6	7	8	9			10
5.2.4	DP Test on Welds on Load bearing members eg. Jack Pads	Major	DP Test	100%	-DO-	-DO-	-DO-	P	W	R	
5.2.5	Pressure test	Major	Mechanical	On One unit	CBIP	CBIP	Test Report	--	P	W	**STAGE INSPECTION**
5.2.6	Vacuum test	Major	Mechanical	On One unit	CBIP	CBIP	Test Report	--	P	W	**STAGE INSPECTION**
5.2.7	**Leakage test**										
5.2.7.1	Main Unit	Major	Mechanical	100%	MFR. STD	MFR. STD	Test report	P	W	R	
5.2.7.2	Conservator	Major	Mechanical	100%	MFR. STD	MFR. STD	Test report	P	W	R	
5.2.7.3	Pipes	Major	Mechanical	100%	MFR. STD	MFR. STD	Test report	P	W	R	
5.2.8	Surface preparation	Major	Visual	100%	MFR. STD	MFR. STD	MFR. Fabrication report	P	V	R	
5.2.9	Final Paint Coat (including Primer), Thickness & Shade	Major	Measurement	100%	MFR. STD	MFR. STD	Test report	P	V	R	
5.2.10	Paint Peel off test	Major	Visual	100%	MFR. STD	MFR. STD	Test report	--	P	R	

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								S	M	O	
1	2	3	4	5	6	7	8	9			10
6.0	**Bushing/Insulators**										
6.1	Make and rating	Critical	Visual	100%	IS 8603/IS 2099/App.Drg.	IS 8603/IS 2099/App.Drg.	Supplier's TC	P	V	R	
6.2	Visual inspection for surface smoothness, any damage, etc.	Critical	Visual	100%	-DO-	-DO-	-DO-	P	V	R	
6.3	Important dimension including Creepage distance	Major	Measurement	One sample /size / lot	-DO-	-DO-	-DO-	P	V	R/W	
6.4	Dry Power Frequency voltage withstabd test	Major	Electrical	100%	-DO-	-DO-	-DO-	P	V	R	
6.5	Air pressure test in water	Major	Electrical	100%	-DO-	-DO-	-DO-	P	V	R	
6.6	Electro -Tinning	Major	Electrical	100%	-DO-	-DO-	-DO-	P	V	R	
6.7	All routine electrical tests	Major	Electrical	-do-	-do-	-do-	-do-	P	V	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	P	V	R	
7.2	Test for level (eg at 30°	Major	Mechanical	100%	-DO-	-DO-	-DO-	P	V	R	

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								S	M	O	
1	2	3	4	5	6	7	8	9			10
	Max)										
7.3	Switch contact test	Major	Electrical	100%	-DO-	-DO-	-DO-	P	V	R	
7.4	Leakage test	Major	Mechanical	100%	-DO-	-DO-	-DO-	P	V	R	
7.5	Switch operating and setting	Major	Electrical	100%	-DO-	-DO-	-DO-	P	V	R	
7.6	Di-electric test at 2 KV AC between live terminal and body	Major	Electrical	100%	-DO-	-DO-	-DO-	P	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	P	V	R	
8.2	Bore size	Major	Measurement	One/size	-DO-	-DO-	-DO-	P	V	R	
8.3	Porosity and element test	Major	Critical	100%	-DO-	-DO-	-DO-	P	V	R	
8.4	Gas volume and surge test	Major	Mechanical	One/Size	-DO-	-DO-	-DO-	P	V	R	
8.5	HV test at 2 KV AC & IR test	Major	Electrical	100%	-DO-	-DO-	-DO-	P	V	R	

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								S	M	O	
1	2	3	4	5	6	7	8	9			10
8.6	Continuity for alarm/Trip	Major	Electrical	100%	-DO-	-DO-	-DO-	P	V	R	
9.0	**Radiator**										
9.1	Dimension, number of sections	Major	Measurement	100%	MFR. DRG	VTD DRG	Supplier's TC	P	V	R	
9.2	Leakage Test with Air	Major	Visual	100%	As per CBIP	As per CBIP	Supplier's TC	P	V	R	
9.3	Paint shade	Major	Visual & Measurement	Random	MFR. Specs /Drg	MFR. Specs /Drg	Supplier's TC	P	V	R	
9.4	Surface Preparation	Major	Measurement	100%	SA 2.5 of ISO 8503/2	SA 2.5 of ISO 8503/2	Supplier's TC	P	V	R	
10	**Off Circuit Tap Changer**										
10.1	Make, Rating and model	Major	Visual	100%	MFR. Spec/ IS 8468 /IEC 214-1989	MFR. Spec/ IS 8468 /IEC 214-1989	Supplier's TC	P	V	R	
10.2	Contact Resistance test	Major	Visual	100%	Supplier's STD	Supplier's STD	Supplier's TC	P	V	R	
10.3	Electrical Routine test	Major	Electrical	100%	IS 8468/ IEC 214	IS 8468/ IEC 214	Supplier's TC	P	V	R	
10.4	Mechanical test on diverter switch including	Major	Mechanical	100%	-DO-	-DO-	-DO-	P	V	R	

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								S	M	O	
1	2	3	4	5	6	7	8	9			10
	pressure test										
10.5	HV test for Auxiliary circuit	Major	Electrical	100%	-DO-	-DO-	-DO-	P	V	R	
10.6	Mechanical test on Tap selector switch with motor drive	Major	Mechanical	100%	-DO-	-DO-	-DO-	P	V	R	
10.7	Pressure test for Oil Compartment	Major	Mechanical test	100%	-DO-	-DO-	-DO-	P	V	R	
11.0	**Transformer Oil**	Major	Testing	One Sample from each lot	Annexure D of BSES spec.	Annexure D of BSES spec.	STC	P	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

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								S	M	O	
1	2	3	4	5	6	7	8	9			10
											lab as per relevant std.
12.0	**OTI / WTI Scanner**										
12.1	Make and Model	Critical	Visual	100%	MFR. STD/App. Drg.	MFR. STD/App. Drg.	Suppliers TC	P	P	R	
12.2	Calibration	Major	Electrical	100%	-DO-	-DO-	-DO-	P	P	R	
12.3	Check for alarm & trip signal operation against set value	Major	Electrical	100%	-DO-	-DO-	-DO-	P	P	R	
12.4	HV test	Major	Electrical	100%	-DO-	-DO-	-DO-	P	V	R	
12.5	Switch Setting	Major	Mechanical	100%	-DO-	-DO-	-DO-	P	P	R	
13.0	**Bushing Metal parts**										
13.1	Dimension Checks	Major	Mechanical	100%	MFR. STD /IS 3347	MFR. STD /IS 3347	Supplier's TC	P	V	R	
13.2	Surface Finish	Major	Visual	100%	-DO-	-DO-	-DO-	P	V	R	
14.0	**Current Transformers**										
14.1	Dimensions, make	Major	Measurement	100%	MFR. STD /App. DRG. / IS 2705	MFR. STD /App. DRG. / IS 2705	Supplier's TC	P	P	R	

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								S	M	O	
1	2	3	4	5	6	7	8	9			10
14.2	Rating and terminal marking	Major	Physical	100%	MFR. APPD. DRG	MFR. APPD. DRG	Supplier's TC	P	P	R	
14.3	Measurement of ratio and phase angle error	Major	Electrical	100%	IS 2705	IS 2705	Supplier's TC	P	V	R	
14.4	High Voltage test	Major	Electrical	100%	-DO-	-DO-	-DO-	P	V	R	
14.5	Inter-Turn insulation test	Major	Electrical	100%	-DO-	-DO-	-DO-	P	V	R	
14.6	Polarity	Major	Electrical	100%	-DO-	-DO-	-DO-	P	V	R	
14.7	Knee point voltage	Major	Electrical	-do-	-do-	-do-	-do-	P	V	R	Only for Class-PS NCT
14.8	Excitation current	Major	Electrical	-do-	-do-	-do-	-do-	P	V	R	Only for Class-PS NCT
14.9	Secondary winding resistance	Major	Electrical	-do-	-do-	-do-	-do-	P	V	R	Only for Class-PS NCT
15.0	**Valves/ Butterfly valves**										
15.1	Make & operation	Critical	Visual	100%	APP.drg./MFR. STD/IS 778	APP.drg./MFR. STD/IS 778	Supplier's TC	P	P	R	
15.2	Leakage test for body	Major	Mechanical	100%	-DO-	-DO-	-DO-	P	P	R	

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								S	M	O	
1	2	3	4	5	6	7	8	9			10
15.3	Leakage test for top spindle	Major	Mechanical	100%	-DO-	-DO-	-DO-	P	P	R	
15.4	Mounting dimensions	Major	Measurement	100%	-DO-	-DO-	-DO-	P	P	R	
15.5	Material of Body & Seat	Major	Chemical & measurement	1 sample per lot	-DO-	-DO-	-DO-	P	V	R	
16.0	**Pressure relief Valve/Device**										
16.1	Make	Critical	Visual	100%	MFR. STD/ App. Drg.	MFR. STD/ App. Drg.	-DO-	P	P	R	
16.2	Operating pressure	Major	Mechanical	100%	-DO-	-DO-	-DO-	P	P	R	
16.3	Switch Contact test	Major	Electrical	100%	-DO-	-DO-	-DO-	P	P	R	
16.4	Mounting dimensions	Major	Measurement	100%	-DO-	-DO-	-DO-	P	V	R	
16.5	HV test between body & terminal	Major	Electrical	100%	-DO-	-DO-	-DO-	P	V	R	
17.0	**Gasket**										
17.1	Appearance & Finish	Major	Mechanical	1 sample per size per lot	IS 4253-II, 1980/IS 3400	IS 4253-II, 1980/IS 3400	Supplier's TC	P	V	R	
17.2	Hardness, IRHD	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
17.3	Tensile Strength	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	

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								S	M	O	
1	2	3	4	5	6	7	8	9			10
17.4	Compressibility	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
17.5	Compression set	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
17.6	Flexibility	Major	Mechanical	-DO-	-DO-	-DO-	-DO-	P	V	R	
18.0	**Silica gel Breather with oil seal**										
18.1	Type / model/weight	Major	Visual	100%	MFR. STD /DRG	MFR. STD /DRG	Supplier's TC	P	V	R	
18.2	Color of Gel	Major	Visual	100%	-DO-	-DO-	-DO-	P	V	R	
19	**Control cubicle/CT terminal Box**										
19.1	Dimensions	Major	Measurement	100%	BSES Approved document	BSES Approved document	Supplier's TC	P	V	R	
19.2	Hi-voltage test at 2kV RMS for one minute	Major	Electrical	-DO-	-DO-	-DO-	-DO-	P	V	R	
19.3	Insulation resistance at 5000 V DC	Major	Electrical	-DO-	-DO-	-DO-	-DO-	P	V	R	
19.4	Verification of component & Fittings	Major	Visual	-DO-	-DO-	-DO-	-DO-	P	V	R	

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								S	M	O	
1	2	3	4	5	6	7	8	9			10
19.5	Wiring check	Major	Visual	-DO-	-DO-	-DO-	-DO-	P	V	R	
19.6	Welding, grinding, chipping	Major	Visual	--DO-	-DO-	-DO-	-DO-	P	V	R	
19.7	Paint	Major	Visual	-DO-	-DO-	-DO-	-DO-	P	V	R	
B	**In Process**										
1	**Winding(LV and HV)**										
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/BSES approved document	MFR. Data/Drg/BSES approved document	QC report/Test report	--	P	W	
1.1.2	Copper Conductor size (Bare & covered)	Major	Measurement	100%	-DO-	-DO-	-DO-	--	P	W	
1.1.3	No. of Turns / Disc	Major	Measurement	100%	-DO-	-DO-	-DO-	--	P	R	
1.2	Winding height	Major	Measurement	100%	-DO-	-DO-	-DO-	--	P	W	

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								S	M	O	
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-	--	P	R	
1.4	Tap Leads termination in case of tap winding	Major	Visual	100%	-DO-	-DO-	-DO-	--	P	R	
1.5	Current density calculation	--	--	--	--	--	--	--	P	W	
1.6	**Weight**	Major	Visual	100%	-DO-	-DO-	-DO-	--	P	W	
2.0	**Core Assembly**										
2.1	Visual & Key Dimensional check										
2.1.1	Diagonal distance	Major	Measurement	100%	MFR.Drg/BSES approved document	MFR.Drg/BSES approved document	QC report/Test report	--	P	W	
2.1.2	Window centre distance	Major	Measurement	100%	-DO-	-DO-	-DO-	--	P	W	
2.1.3	Window height	Major	Measurement	100%	-DO-	-DO-	-DO-	--	P	W	
2.2	Stack Thickness	Major	Measurement	100%	-DO-	-DO-	-DO-	--	P	W	
2.3	High Voltage test at 2 KV AC for I min between core & core clamp, Yoke	Major	Electrical	100%	-DO-	-DO-	-DO-	--	P	W	

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								S	M	O	
1	2	3	4	5	6	7	8	9			10
	bolt										
2.4	Pre-Core loss measurement	Major	Electrical	100%	-DO-	-DO-	-DO-	--	P	W	
2.5	Weight	Major	Visual	100%	-DO-	-DO-	-DO-	--	P	W	
3.0	**Core-Coil Assembly**										
3.1	Top & Bottom insulation arrangement	Major	Visual	100%	MFR.Data /DRG/BSES approved document	MFR.Data /DRG/BSES approved document	QC report	--	P	R	
3.2	Lead arrangement	Critical	Visual	100%	-DO-	-DO-	-DO-	--	P	R	
3.3	Tap & Lead End Brazing & Insulation	Critical	Visual	100%	-DO-	-DO-	-DO-	--	P	R	
3.4	Dimension of Coil After Shrinkage	Major	Measurement	100%	-DO-	-DO-	-DO-	--	P	R	
3.5	Verification of Major electrical clearances	Major	Visual & Measurement	100%	-DO-	-DO-	-DO-	--	P	R	
3.6	HV/LV Connection	Major	Visual	100%	-DO-	-DO-	-DO-	--	P	R	
3.7	Cleanliness	Major	Visual	100%	-DO-	-DO-	-DO-	-	P	R	
4.0	**Core-Coil Assembly**										

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								S	M	O	
1	2	3	4	5	6	7	8	9			10
	Before Ovening										
4.1	Initial Ratio test	Major	Measurement	100%	-DO-	-DO-	-DO-	--	P	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	--	P	R	
5.2	Check for completeness of drying	Major	Visual	100%	MFR.Data /DRG	MFR.Data /DRG	QC report	--	P	R	
5.3	Certification of all test	Major	Visual	100%	MFR.Data /DRG	MFR.Data /DRG	QC report	--	P	R	
6.0	**Core-Coil Assembly After Ovening**										
6.1	Ratio Test,Vector Group & Magnetic Balance test	Major	Electrical	100%	-DO-	-DO-	QC report /Test report	--	P	W	
6.2	Recording of time/Temp, Vacuum	Major	Measurement	100%	-DO-	-DO-	-DO-	--	P	R	
6.3	Record of Moisture extract	Major	Measurement	100%	MFR. STD	MFR. STD	QC report	--	P	R	

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								S	M	O	
1	2	3	4	5	6	7	8	9			10
6.4	Verification of completeness & Drying	Major	Verify	100%	MFR. STD	MFR. STD	QC report	--	P	R	
6.5	Insulation resistance measurement by Megger	Major	Electrical	100%	MFR. STD	MFR. STD	Test report	--	P	R	
6.6	Earthing connection	Major	Visual	-DO-	MFR. STD	MFR. STD	QC Report	--	P	R	
7.0	**Tanking**										
7.1	Electrical clearance arrangement	Major	Measurement	100%	MFR. DRG	MFR. DRG	QC report	--	P	R	
7.2	Verification of Core-Frame Clamping arrangement	Major	Visual	100%	-DO-	-DO-	-DO-	--	P	R	
7.3	Core to frame insulation resistance test & HV test at 2 KV for min	Major	Electrical	100%	-DO-	-DO-	-DO-	--	P	R	
8.0	**Final Assembly for testing**										
8.1	Fittings of external accessories	Major	Visual	100%	MFR. STD /DRG	MFR. STD /DRG	Job Card	--	P	R	
8.2	Internal Oil leakage test on main unit	Major	Visual	100%	CBIP	CBIP	QC report	--	P	R	

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								S	M	O	
1	2	3	4	5	6	7	8	9			10
8.3	Oil filtration & pressure test	Major	Visual	-DO-	IS 1180	IS 1180	-DO-	-	P	R	
C	**Final testing**										
1	**Routine Test**										
1.1	Voltage Ratio test and check of phase displacement	Major	Electrical	100%	IS 2026/IS 1180	IS 2026/IS 1180	Test Report	--	P	W	
1.2	Winding Resistance at all tap corrected to 75°C	Major	Electrical	100%	IS 2026/IS 1180	IS 2026/IS 1180	Test report	--	P	W	
1.3	No Load Loss & Current @90%,100%&112.5% of rated voltage	Major	Electrical	100%	IS 2026/IS 1180	IS 2026/IS 1180	Test report	--	P	W	To be repeated after type test.
1.4	Impedance Voltage/Short Circuit Impedance(Principal Tap)	Major	Electrical	100%	IS 2026/IS 1180	IS 2026/IS 1180	Test report	--	P	W	
1.5	Load Loss measurement at 50% and 100% of load @Principal, Max, MinTap	Major	Electrical	100%	IS 2026/IS 1180	IS 2026/IS 1180	Test report	--	P	W	

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								S	M	O	
1	2	3	4	5	6	7	8	9			10
1.6	Induced over voltage	Major	Electrical	100%	IS 2026/IS 1180	IS 2026/IS 1180	Test report	--	P	W	To be repeated after type test
1.7	Separate Source Voltage Test	Major	Electrical	100%	IS 2026/IS 1180	IS 2026/IS 1180	Test report	--	P	W	
1.8	Insulation Resistance &PI(10 min / 1 min)	Major	Electrical	100%	--	--	Test report	--	P	W	IR shall be more than 2000 MΩ PI Shall be more than1.5
1.9	Voltage Vector Relationship & Polarity	Major	Electrical	100%	IS 2026/IS 1180	IS 2026/IS 1180	Test report	--	P	W	
1.10	Magnetic Balance Test	Major	Electrical	100%	IS 2026/IS 1180	IS 2026/IS 1180	Test report	--	P	W	
1.11	Oil leakage test on transformer with complete fitting and accessories	Major	Visual	100%	CBIP	CBIP	Test report	--	P	W	
1.12	Polarity check & Ratio Test of LVWTI CT/	Major	Electrical	100%	IS 2026/IS 1180	IS 2026/IS 1180	Test report	--	P	W	

SL NO	CHARACTRISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
								S	M	O	
1	2	3	4	5	6	7	8	9			10
	Metering CT										
1.13	BDV test on Transformer Oil	Major	Electrical	100%	IS 2026/IS 1180	IS 2026/IS 1180	Test report	--	P	W	
1.14	Power frequency withstand on auxiliary circuit	Major	Electrical	100%	IS 2026/IS 1180	IS 2026/IS 1180	Test report	--	P	W	
1.15	Heat Run Test (Temp. Rise Test)	Major	Testing	One Unit (each lot)	IS 2026/IS 1180	IS 2026/IS 1180	Test Report	--	P	W	
1.16	Pressure relief device test	Major	Testing	One Unit (each lot)	MFR. STD	MFR. STD	Test Report	--	P	W	
1.17	Visual and dimensional check	Major	Visual	100%	Approved drawings	Approved drawings	Test Report	--	P	W	
1.18	Measurement of Cap & tandelta of Wdg, Oil and HV bushing	Major	Electrical	One unit	--	--	Test report	--	P	W	
1.19											
2.0	**Type test (One unit of each type and rating of Transformer at CPRI/ERDA)**										
2.1	Heat Run Test (Temp. Rise Test)	Major	Testing	One Unit	IS 2026	IS 2026	Test Report	**CPRI/ERDA**			

SL NO	CHARACTRISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
								S	M	O	
1	2	3	4	5	6	7	8	9			10
2.2	Dynamic & Thermal (3 sec) Short Circuit Test	Major	Testing	One Unit	IS 2026	IS 2026	Test Report	**CPRI/ERDA**			
2.3	Impulse withstand Test on all HV & LV Limb for Chopped wave.	Major	Testing	One Unit	IS 2026	IS 2026	Test Report	**CPRI/ERDA**			
2.4	DGA Test Before & After temperature rise	Major	Testing	One Unit	Relevant std.	Relevant std.	Test Report	**CPRI/ERDA**			Test shall be conducted once per PO
3.0	**Special Test (One unit of each type and rating of Transformer)**										
3.1	Zero Phase Sequence Test	Major	Testing	One Unit	IS 2026	IS 2026	Test Report	--	P	W	
3.2	Noise Level Test	Major	Testing	One Unit	NEMA TR-1	NEMA TR-1	Test Report	--	P	W	
3.3	No Load Harmonic Test	Major	Testing	One Unit	IS 2026	IS 2026	Test Report	--	P	W	
3.4	HV Test on all auxiliary equipment and wiring after complete assembly	Major	Testing	One Unit	--	--	Test Report	--	P	W	
D	**Dispatch & Packing**										
1.1	Identification & packing	Major	Visual	100%	As per packing list	As per packing list	Packing List	--	P	--	

BSES	BSES-TS-12-TRDU-R0

TECHNICAL SPECIFICATION OF
CONVENTIONAL OIL FILLED DISTRIBUTION TRANSFORMER

SL NO	CHARACTRISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
								S	M	O	
1	2	3	4	5	6	7	8	9			10
1.2	Check for proper Packing	Major	Visual	100%	As per packing list	As per packing list	Packing List	--	P	--	
1.3	Visual check before dispatch	Major	Visual	100%	As per packing list	As per packing list	Packing List	--	P	--	

Note:

- Transformer from each lot may be opened for core and winding verification. BSES approval is be taken prior to opening the transformer.
- Type Test shall be valid for 10 years.

All IS and IEC standards with their latest revisions/amendments shall be applicable

LEGEND:

S: Supplier
M: Main Contractor (Manufacturer)
O: Owner (BSES)

P - Perform
V - Verify
R – Review
W- Witness

Schedule A Guaranteed Technical Particulars (Data by Seller)

Sr.	Particulars	Specified / Required	Offered
1.0	General		
1.1	Make		
1.2	Type	Oil immersed, core type, step down located generally outdoor but may be located indoor also with poor ventilation. Bidder shall confirm full rating available in indoor location also	
2.0	Nominal Continuous Rating, KVA		
2.1	HV winding	250/400/630/1000/1600/2000kVA	
2.2	LV winding	250/400/630/1000/1600/2000kVA	
3.0	Rated voltage (kV)		
3.1	HV Winding	11 kV	
3.2	LV Winding	415 volt	
4.0	Rated current (Amps)	250/400/630/1000/1600/2000kVA	
4.1	HV Winding		
4.2	LV Winding		
5.0	Connections		
5.1	HV Winding	Delta	
5.2	LV Winding	Star with neutral	
5.3	Vector Group reference	Dyn11	
6.0	Impedance at principal tap rated current and frequency, ohm @75 deg C		
6.1	Impedance	4.5%/4.5% / 4.5%/ 5.0/6.25/6.25 % with IS tolerance	
6.2	Reactance		
6.3	Resistance		
6.4	X/R ratio		
6.5	Impedance at lowest tap at rated		

	current and frequency		
6.6	Impedance at highest tap at rated current and frequency		
7.0	Resistance of the winding at 75^0 C in ohm		
7.1	a) HV		
7.2	b) LV		
8.0	Zero sequence impedance in ohm		
8.1	a) HV		
8.2	b) LV		
9.0	Guaranteed maximum Total losses at principal tap at 75°C, kW		
9.1	50 % of Load	as per Spec Cl 3.25	
9.2	100% of Load	as per Spec Cl 3.26	
9.3	No Load Loss (Max)		
9.4	Total I^2R losses of windings @ 75 deg C, KW		
9.5	Total stray loses @ 75 deg C, KW		
9.6	Total Load losses (Max.), KW		
9.7	No load loss at maximum permissible voltage and frequency (approx.),kW		
10.0	Temperature rise over reference ambient of 40 ^{0}C		
10.1	Top oil by thermometer ^{0} C	40 ^{0}C	
10.2	Winding by resistance^0 C	45 ^{0}C	
11.0	Efficiency		
11.1	Efficiency at 75^0C 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 75^0C 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		
11.2.5	at 40% load		
11.2.6	at 20% load		
11.3	Maximum efficiency at 75^0C %		
11.4	Load and power factor at which it occurs		
12.0	Regulation , (%)		
12.1	Regulation at full load at 75^0 C		
12.1.1	at unity power factor		
12.1.2	at 0.8 power factor lagging		
12.2	Regulation at 110% load at 75^0 C		
12.2.1	at unity power factor		
12.2.2	at 0.8 power factor lagging		
13.0	Tappings		
13.1	Type		
13.2	Capacity		
13.3	Range-steps x % variation		
13.4	Taps provided on HV winding (Yes / No)		
13.5	Rated current of rotary switch		
14.0	Cooling system		
14.1	Type of cooling	ONAN	
14.2	No. of cooling unit Groups		
14.3	Capacity of cooling units		
14.4	Mounting of radiators		
14.5	Number of Radiators		
14.8	Total radiating surface , sqmm		
14.9	Thickness of radiator tubes, mm	Minimum 1.2 mm	

15.0	Details of Tank		
15.1	Material	Robust mild steel plate without pitting and low carbon content	
15.2	Thickness of sides mm		
15.3	Thickness of bottom mm		
15.4	Thickness of cover mm		
15.5	Confirmation of Tank designed and tested for Vacuum, Pressure (Ref: CBIP Manual) , (Yes/ No)		
15.5.1	Vacuum mm of Hg. / (kN/m^2)	As per IS	
15.5.2	Pressure mm of Hg.		
15.6	Is the tank lid sloped?	Yes	
15.7	Inspection cover provided (Yes / No)	as per spec	
15.8	Location of inspection cover (Yes / No)		
15.9	Min. dimensions of inspection cover (provide list of all inspection cover with dimension), mm x mm		
16.0	Core		
16.1	Type:	Core	
16.2	Core material grade	Premium grade minimum M3 or better	
16.3	Core lamination thickness in mm		
16.4	Insulation of lamination	With insulation coating on both sides	
16.5	Design flux density at rated condition at principal tap, Tesla		
16.6	Maximum flux density at 12.5 % overexcitation /overfluxing, Tesla	1.9 Tesla Max allowed	
16.7	Equivalent cross section area mm^2		

16.8	Guaranteed No Load current at 100% rated voltage , Amps		
16.8.1	HV		
16.8.2	LV		
16.9	Guaranteed No Load current At 110% rated voltage, Amps		
16.9.1	HV		
16.9.2	LV		
17.0	Type of Winding		
17.1	HV		
17.2	LV		
17.3	Conductor material	Electrolytic Copper	
17.4	Current density (HV/LV)	Maximum allowed 3.0 A per sq mm at all taps	
17.5	Gauge/area of cross section of conductor		
17.5.1	a) HV		
17.5.1	b) LV		
17.6	Insulating material		
17.6.1	HV Turn		
17.6.2	LV Turn		
17.6.3	LV Core		
17.6.4	HV - LV		
17.7	Insulating material thickness, mm		
17.7.1	HV Turn		
17.7.2	LV Turn	-	
17.7.3	LV to Core		
17.7.4	HV to LV		
18.0	Minimum design clearance, mm		
18.1	HV to earth in Air		
18.2	HV to earth in oil		
18.3	LV to earth in Air		
18.4	LV to earth in oil		
18.5	Between HV & LV in Air		

18.6	Between HV & LV in oil		
18.7	Top winding and yoke		
18.8	Bottom winding and yoke		
19.0	**Insulating oil**		
19.1	Quantity of oil Ltrs		
19.1.1	In the Transformer tank		
19.1.2	In each radiator		
19.1.4	Total quantity		
19.2	10% excess oil furnished?	Yes in separate non returnable drums with each transformer	
19.3	Type of Oil	As per cl 4.2.7	
20.0	**Bushing / Support Insulator**		
20.1	Make	-	
20.2	Type		
20.2.1	HV side	As per Cl. 4.2.8.1 of the spec	
20.2.2	LV side	As per Cl. 4.2.8.2 of the spec	
20.3	Reference Standard		
20.4	Voltage class, kV		
20.4.1	HV side Bushing/ Support Insulator	12 kV	
20.4.2	LV side line and neutral bushing/ Support Insulator	1.1 kV	
20.5	Creepage factor for all bushing / Support Insulator mm/KV	31 mm / kV	
20.6	Rated thermal short time current		
20.6.1	HV bushing	25 times rated current for 2 secs.	
20.6.2	LV line and neutral bushing	25 times rated current for 2 secs.	
20.7	Weight, Kg		
20.7.1	HV bushing		
20.7.2	LV line and neutral bushing		
20.8	Free space required for bushing removal, mm		
20.8.1	HV bushing		
20.8.2	LV line and neutral bushing		

21.0	**Terminal connections**		
21.1	HV	Cable size as per Cl no 3.28	
21.2	LV	Cable size as per Cl no 3.30	
21.3	LV Neutral	Cable size as per Cl no 3.30	
22.0	**HV cable box**	Required	
22.1	Suitable for cable type,size	Cable size as per Cl no 3.28	
22.2	Termination height	750 mm min.	
22.3	Gland plate dimension, mm x mm		
22.4	Gland plate Material	MS	
22.5	Gland plate thickness	3 mm min.	
22.6	Phase to phase clearance inside box,mm	180 mm	
22.7	Phase to earth inside box,mm	120 mm	
23.0	**LV Cable box**	Required	
23.1	Suitable for cable type , size	Cable size as per Cl no 3.30	
23.2	Termination height	1000 mm, min.	
23.3	Gland plate dimension, mmxmm		
23.4	Gland plate material	Aluminium	
23.5	Gland plate thickness	5 mm min.	
23.6	Phase to phase	25 mm	
23.7	Phase to earth	25 mm	
24.0	L.V neutral Cable termination arrangement	Separate cable box not required (LV-N to be provided in LV cable box.)	
25.0	Current Transformer on LV phases		
25.1	Type		
25.2	Make		
25.3	Reference Standard		
25.4	CT Ratio		
25.5	Burden, VA		
25.6	Class of Accuracy		
25.7	CT terminal box size		

26.0	Pressure release device		
26.1	Minimum pressure the device is set to rupture		
26.1.1	For Main Tank		
26.1.2	Alarm and trip contact ratings of protective devices		
27.0	Fittings Accessories Each Transformer furnished as per Clause No 5. (Bidder shall attach separate sheet giving details, make and bill of materials)		
27.1	OTI/WTI Scanner		
27.1.1	Make		
27.1.2	Model no		
27.1.3	Auxiliary supply		
27.1.4	Manual submitted (Yes/No)		
27.2	Buchholz Relay		
27.2.1	Make		
27.2.2	Model no		
27.2.3	Auxiliary supply		
27.2.4	Manual submitted (Yes/No)		
27.3	Auxiliary relays for Fault/indication identification (PRV, Buchholz relay, MOG)		
27.3.1	Make		
27.3.2	Model no		
27.3.3	Auxiliary supply		
27.3.4	Potential free contacts		
27.3.5	Manual submitted (Yes/No)		
28.0	Painting: as per clause for the transformer, cable boxes, radiator, Marshalling box (Yes/No)		
29.0	Max over all transformer dimensions	As per Clause 3.32	

29.1	Length, mm		
29.2	Breadth, mm		
29.3	Height, mm		
30.0	Transformer Tank Dimensions		
30.1	Length, mm		
30.2	Breadth, mm		
30.3	Height, mm		
31.0	Weight data		
31.1	Core, kG		
31.2	Frame parts, kG		
31.3	Core and frame, kG		
31.4	Total Winding, kG		
31.5	Core , Frame, Winding, kG		
31.6	Tank, kG		
31.7	Tank lid, kG		
31.8	Empty conservator tank, kG		
31.9	Each radiator empty, kG		
31.10	Total weight of all radiators empty, kG		
31.11	Weight of oil in Tank, kG		
31.12	Weight of oil in Conservator, kG		
41.13	Weight of oil in each Radiators, kG		
31.14	Total weight of oil in Radiators, kG		
31.16	Total Transport weight of the transformer, kG		
32.0	Volume Data		
32.1	Volume of oil in main tank, litres		
32.2	Volume of oil between highest and lowest levels of main conservator, litres		
32.4	Volume of oil in each radiator, litres		
32.5	Total volume of oil in radiators,		

	litres		
32.7	Transformer total oil volume, litres		
33.0	Shipping Data		
33.1	Weight of heaviest package, kG		
33.2	Dimensions of the largest package (L x B x H) mm		
34.3	Tests		
34.1	All in process tests confirmed as per Cl. (Yes/ No)		
34.2	All Type Tests confirmed as per Cl. (Yes / No)		
34.3	All Routine Tests confirmed as per Cl. (Yes/ No)		
34.4	All Special Tests confirmed as per Cl. (Yes/ No)		

Schedule B Guaranteed Technical Particulars 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 –

Sr 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 40^0C	15 mm^2/s, Max	
2.1.2	Viscosity at 0^0C	1800 mm^2/s, Max	
2.2	Pour Point	- 10^0C, 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 20^0C	0.895 g/ml, Max	
2.6	Dielectric dissipation factor at 90^0C	0.005, Max	
2.7	Particle Content	Manufacturer to specify the data	
3.0	**Refining/Stability**		
3.1	Appearance of oil	Clear, free from sediment and suspended matter	
3.2	Acidity	0.01 mg KOH/g, Max	
3.3	Interfacial tension at 27^0C	0.04 N/m, Min	
3.4	Total sulphur content	Manufacturer to specify the data	
3.5	Corrosive sulfur	Not-corrosive	
3.6	Potentially Corrosive sulfur	Not-corrosive	
3.7	DBDS	Not detectable (<5 mg/kg)	
3.8	Inhibitor	Not detectable (<0.01%)	
3.9	Metal Passivator	Not detectable (<5 mg/kg)	
3.10	Other additives	Manufacturer to specify the data	
3.11	2-furfural and related Compounds content	Not detectable (<0.05 mg/kg) for each individual compound	
4.0	**Performance**		
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 90^0C	0.5, Max	
4.2	Gassing Tendency	Manufacturer to specify the data	

Sr No	Item description	Specification requirement	Data by Vendor
4.3	ECT	Manufacturer to specify the data	
5.0	**Health,safety and Environment**		
5.1	Flash point	135^0C, Min	
5.2	PCA content Max	3%, Max	
5.3	PCB content	Not detectable (<2 mg/Kg)	

Schedule C Recommended Spares (Data by Seller)

List of recommended spares as following –

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

BSES

Technical Specification
For Heat Shrinkable &
GIS Cable Termination Kit
(11 kV, 33 kV, 66 kV XLPE Insulated Cables)

Specification no – BSES-TS-45-TERM-R0

Rev:		0
Pages		22
Date:		19 Apr 2022
Prepared by	Abhishek Vashistha	
	Gautam Deka/Pronab Bairagi	19/4/22
Reviewed by	Puneet Duggal	
	Amit Tomar	
Approved by	Gaurav Sharma	
	Gopal Nariya	

Index

BSES	BSES-TS-45-TERM-R0
Technical Specification For Heat Shrinkable And GIS Cable Termination Kit (11 kV, 33 kV, 66 kV Cables)	

Record of Revision

Item/Clause No.	Change in Specification	Approved By	Rev

1.0.0 Scope of work

Heat Shrinkable & GIS Termination Kits, suitable for 11 kV & 33 kV, 66 kV XLPE / PILC cables, shall be designed, manufactured, tested, packed and delivered by the Vendor, as per Purchaser's requirements.

2.0.0 Codes & standards

2.1.0 National Standards:

SL	Standard Number	Title
2.1.1	IS – 13573: 2011	Joints & Terminations of Polymeric Cables for working voltages from 6.6 kV up to and including 33 kV Performance Requirements and Type Tests
2.1.2	IS – 7098 Part 2 : 2011	Cross-linked Polyethylene (XLPE) Insulated PVC sheathed cables : Part 2 : For working voltages from 3.3 kV up to and including 33 kV
2.1.3	IS – 692: 1994	Paper insulated lead-sheathed cables (PILC) for rated voltages up to and including 33 kV specification
2.1.3	IS – 10810: 1984	Methods of test for cables
2.1.4	IS – 7098 Part 3 : 2019	Cross-linked polyethylene insulated thermoplastic sheathed Cables specification: Part 3 - For working voltages from 66 kV up to and including 220 KV

2.1.1 International Standards:

S No.	Standard Number	Title
2.2.1	EA TS – 09 – 13	Electricity Association – Technical Specification -09-13 Material component for use in Electric Power Cable Termination & Joints for System voltage above 1000 V up to 36 kV
2.2.2	IEEE – 48	Standards Test Procedures and requirements for high voltage alternating current cable termination
2.2.3	IEC – 60183	Guide to the selection of high voltage cables
2.2.4	IEC – 885 Part 1-3	Electric test methods for electric cables
2.2.5	IEC – 60840	Power cable with extruded insulation and their accessories for rated voltage above 30 Kv (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:

a. 11 kV, 3-core x 150 sq mm AL
b. 11 kV, 3-core x 300 sq mm AL
c. 11 kV, 3-core x 400 sq mm AL
d. 11 kV, 3-core x 400 sq mm AL(OFC Embedded)
e. 11 kV, 1-core x 1000 sq mm AL
f. 11 kV, 1-core x 150 sq mm AL HTAB with copper metallic screen
g. 11 kV, 1-core x 150 sq mm AL HTAB with Aluminium wire metallic screen
h. 11 kV, 1-core x 95 sq mm AL HTAB with copper metallic screen
i. 11 kV, 1-core x 95 sq mm AL HTAB with Aluminium wire metallic screen
j. 33 kV, 3-core x 400 sq mm AL
k. 33 kV, 3-core x 400 sq mm AL (OFC Embedded)
l. 33 kV, 1-core x 1000 sq mm AL
m. 66 kV, 1-core x 630 sq mm AL
n. 66 kV, 1 core x 1000 sq mm AL
o. 66 kV, 3-core x 300 sq mm AL
p. 66 kV, 3-core x 300 sq mm AL(OFC Embedded)

PILC type Cables:

3-core 240 or 300 sq. Mm. Al

3.1.0	Conductor	For XLPE : a) Electrolytic Grade stranded Aluminium Conductor / Annealed Copper Conductor b) Grade: H2/ H4 as per IS: 8130/84 (For Al) c) Shape: Compacted Circular d) Class 2 For PILC : a) 11 kV : sector-shaped b) 33Kv: oval-shaped
3.2.0	Conductor Screen	For XLPE : Extruded Semi Conducting material For PILC : 11 kV : no conductor screen 33 kV : carbon paper
3.3.0	Insulation	For XLPE: Extruded TR XLPE For PILC: Layers of impregnated papers

3.4.0	Insulation Screen	**Non Metallic Screen:** For XLPE Insulated cable: a) For 11, 33 U/G cable and HTAB cable - Freely strippable Semi Conducting (without application of heat) b) For 66kV cable - Firmly bonded semi conducting **Metallic Screen:** a) For For 11, 33 & 66 Kv U/G cable – Copper Tape b) For HTAB – option 1 – Copper Tape (old installations) and option 2 – Aluminium wire (new installations) For PILC : a) 11 kV : absent (Belted) b) 33kV: metallised paper tape
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. Note- In special cases, for 66kV 3CX300 sqmm, 33kV, 3CX400 and 11kV 3CX400 cable are with-36 nos. Single mode and 12 nos. Multi modes OFC are also inbuilt as filler.Requirement of cable joint kit with OFC shall be fulfilled as per tender requirement For PILC : a) 11 kV : Crushed paper filler b) 33kV: Jute twine
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
3.11.0	Armour	For XLPE : a) Galvanised Steel round Wires/ Galvanised steel flat strip armour (For 3 core cables) b) Hard drawn Aluminium Wire (For 1 core cables) c) Aluminium or lead sheathed for 1Core 66kV cables For PILC : a) 11 kV double steel tape armour
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 66kV Cable- HDPE extruded semicon layer or HDPE with graphite layer. For PILC : compounded (bituminised) Jute/PVC
3.14.0	HTAB Cable (1CX150 and 1CX95) core construction	Aluminium conductor-conductor semicon screen- TR XPLE insulation-insulation semicon screen–Water Swell-able tape –Round wire armou installation) / Copper Tape (old installation)) Water Swell-able tape-outer sheath

4.0.0 Cable Termination Kits

General Technical Requirements for Cable Termination Kits are as follows:

4.1.0	Scope	Design, manufacture, testing and supply of Cable Termination Kits for H. T. Power Cables.
4.2.0	Functional Requirements	
4.2.1	Conductor Connection	

Voltage Grade	Cable Size	Application	Material of Lug	Connection Method
11 kV	3Cx150, 3Cx300 and 3Cx400 sq mm	Indoor	Bi-Metal	Crimping
		Outdoor	Bi-Metal/ Aluminium as per tender requirement	Crimping
	1Cx1000 sq mm	Indoor	Aluminium	Crimping
		Outdoor	Aluminium	Crimping
HTAB (indoor not required)	1Cx95	Outdoor	Aluminium	Crimping
	1Cx150	Outdoor	Aluminium	Crimping
33 kV	3Cx400 sq mm	Indoor	Aluminium	Crimping
		Outdoor	Aluminium	Crimping
	1Cx1000 sq mm	Indoor	Aluminium	Crimping
		Outdoor	Aluminium	Crimping
66 kV	3Cx300	Indoor	Aluminium	Crimping
		Outdoor	Aluminium	Crimping
	1Cx630, 1Cx1000 sq mm	Indoor	Aluminium	Crimping
		Outdoor	Aluminium	Crimping

* For Bimetallic Lug Copper portion shall be tinned

		a) For GIS cable termination kits: Plug in type, Conductor connection assembly shall be by standard method of split, silver-plated copper cone and pressure-fit contact assembly or as per manufacturer's standard. b) Top corners of all lugs shall be circular shape not rectangular. Refer Annexure F for details.(Except GIS kit)
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 up to an operating temperature and shall be within the range $1x10^{08}$ ohm-cm to $8x10^{08}$ ohm-cm. d) Length of stress control tube for 11 kV and 33 kV shall be 130 mm and 260 mm respectively or according to insulation tube length. For 66kV termination kits, stress control tube shall be as per type tested design. e) The physical and electrical properties shall conform to ESI 09: 13. f) For GIS cable termination kits Stress control shall be by means of a polymeric stress cone. External profile of the cone shall match inner profile of GIS epoxy bushing. Vendor shall specify the material (EPDM / Silicone) of the cone.
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. d) Insulation Tube length for termination- shall be 650 mm for both Indoor and Outdoor Termination kits of 11kV, 3CX150, 3CX300 and 3CX400 sqmm cable. All other accessories related to termination shall be according to 650mm insulation tube length.
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: Creepage distance shall be 31mm/kV minimum.
4.2.3.2	OFC (66kV, 3CX300 sqmm , 33kV, 3Cx400 sqmm and 11kV, 3Cx400 sqmm cable)	Termination kit for OFC (36 single mode and 12 nos. Multi mode) shall be supplied along with termination kit.

Cable System		Length of tube (mm)		Creepage Extension Shed (No.)	
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.
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	Minimum Armour Fault Current Carrying capacity of cbles is as following: 11 kV U/G Cable – 11 kA for 1 sec 33 kV Cable – 31.5 kA for 1 sec 66 kV Cable – 31.5 kA for 1 sec 11 kV HTAB Cable – 11 kA for 1 sec Fault current requirement shall be met by Tinned copper braid as per following: 11 kV U/G cables – Three No's 25 sq mm each 33 kV Cable – Four No's of 50 sq mm each 66 kV Cable – Four No's of 50 sq mm each HTAB Cable with copper tape metallic screen – Three No's of 25 sq mm each Length of the copper braided conductor shall be 750 mm. Each copper braided conductor shall be supplied with copper lug, crimped at one end For HTAB Cable with Aluminium wire metallic screen – Tinned copper braid is not required. 1 No's of Aluminium crimping lug of 120 sq mm cross section area shall be provided instead
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 semicon screen, for, eliminating any air-entrapment at any cut point on the surface. It should have sufficient elongation and electrical properties compatible with stress control tube.
4.2.7	Installation. Instruction Sheet	It shall be in English and Hindi language and shall be provided inside every kit.
4.2.8	Paper Measuring Tap	Required for use during cable preparation / terminations.
4.2.9	Identification Tag (for traceability)	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 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 In addition to above Stainless Steel Tag shall be provided with following details for straight through joint a. Manufacturing month and year (MM/YY format) b. Manufacturer name i.e Comp c. Manufacturer own sl no for future tracing
4.3.0	Technical Particulars	Vendor shall submit Guaranteed Technical Particulars (GTP) as per Annexure A.
4.4.0	Type Tests	i. Termination Kit shall be of type-tested quality from CPRI/ERDA/KEMA/CESI as per the BIS/IEC/IEEE within last 5 years. ii. In case of type test is more than 5 years old but less than 10 years old, bidder has to give undertaking that there is no changes in design. iii. In case of type test report is more than 10 years old, bidder has to conduct type test from CPRI/ERDA/KEMA/CESI as per the BIS/IEC/IEEE without any cost implications to BSES
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 10 days 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.
4.6.0	Documents	"Documents" refer to Documents, Data, Manuals, etc. (Scanned copy of signed documents also shall be part of entire soft file (e-file) or CD.)

4.6.1	Along with the Bid	Vendor shall submit signed 3 sets (plus 1 set of soft copy) of following documents: a) GTP (duly filled-in) (as per Annexure - A). b) Cross-sectional drawings for components Assembly c) Type Test Certificates d) Complete Catalogue and Instructions. e) Any other document.
4.6.2	After Award of Contract	Vendor shall submit signed 2 sets (plus 1 set of soft copy) of above mentioned documents within 15 days, for Purchaser's approval.
4.6.3	"As-Built" documents	Final signed "As-built" documents for the equipment in 3 sets (hard copy), 1 no. soft copy and 1 no. CD. These documents shall include signed Routine & Acceptance Test Certificates also.
4.7.0	Packing, Marking, Shipping, Handling and Storage	Every component/kit/box shall be properly sealed/ packed for protection against damage.
a)	Identification Labels:	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) Purchaser's name c) BSES's SAP code number 6) Weight (kg) of each Cable Termination Kit and of each box containing kits. 7) Manufacturer's name 8) Month & Year of Manufacturing 9) Date of packing, Shelf life (if applicable) 10) In case, the termination kit is for RMU, following text shall be written in bold letters, with higher font size : "For RMU Application".
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 shall be listed by bidder clause wise along with optional offer and has to submit the list along with bid./quotation. BSES will review the deviations and if BSES is agreed with the deviation, seller has to take written confirmation from BSES on deviation during tender evaluation.. b) In the absence of any list of deviations from the Seller with bid as well as written confirmation from BSES on deviations, it will be assumed by the Buyer that the Seller complies with the Specification fully. 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.

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.

8.0.0 Inspection Expenses

Not Applicable

9.0.0 Penalty

Joint/Termination failure under warranty in regards to poor quality joint, poor work man ship, etc. shall be in the account of vendors. All kind of losses due to Joint/Termination failure shall be recovered from vendor.

Annexure – A: Guaranteed Technical Particulars (GTP)

The Seller is deemed to have examined all parts of the Specification documents and to have been fully informed, as to the nature of work and the conditions related to its performance.

S No.	Description	Purchase requirement	Vendor's data
1	Manufacturer's name		
2	Purchase Order no. & date		
3	Guarantee Period (minimum)	60 Months (from date of commissioning) / 66 Months (from date of receipt at Purchaser's store), whichever is earlier	
4	Applicable IS / IEC Standard followed by Vendor (incl. type test standard)		
5	Voltage Grade (kV)		
5.1	Lightning Impulse Voltage Withstand Test		
5.2	4Uo AC voltage withstand test for 4 hours	To be conducted on Installed joint at works	
6	Continuous operating temperature	90 deg. C	
7	Functional Requirements		
7.1	Method of Stress Control and Discharge Suppression		
7.2	Method of Insulation build-up and screening		
7.3	Method of earth bond a) Size and no. of braids b) Size of armour support c) No. of hose clips		
7.4	Method of mechanical protection a) for 3-core Cable b) for 1-core Cable		
7.5	Method of protection against corrosion (type & coating thickness of protective layer on steel mat)		
7.6	Method of conductor continuity a) For crimping connector b) For mechanical connector		

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.)	
17	Type Test Reports (TTR) (Relevant test report no. & date, With type, size, other details of each type of Kit.) a) Prepared Joint: CPRI TTR as per BIS / IEC enclosed? b) Loose Components: CPRI TTR as per EA TS 09-13 enclosed?	 Yes/No Yes/No	

18	Printing details on each of the Heat- shrinkable and Moulded components	(Mention the text, presently printed on each of the component)	
19	OFC kit (For OFC embedded cable only 66Kv, 3CX300 sqmm , 33Kv, 3cx400 sqmm and 11kv, 3cx400 sqmm)	Yes/no	

Annexure – B: Kit Content Table (KCT)

Vendor shall submit KCT as a consolidated table, consisting of all data, such as:

A. Heading

1. Voltage grade, size, description of the Kit
(Including the voltage grade, size, type of the cables, for which it is to be used)

2. Type designation (as per manufacturer's standard)

B. Details / Parameters

(For each component/item of the KCT)
1. Lot no. /Batch no., etc.
2. Item number (manufacturer's standard)
3. Description
a) Material, type, make and grade
b) Dimensions cross sectional area
c) Colour,
d) Other description, if any
4. Function of the item
5. Quantity
6. Make/Name/Location of manufacturer/sub-vendor
7. a) Minimum supplied (or in expanded form) diameter
   b) Maximum freely recovered diameter
8. a) Minimum supplied (or in expanded form) thickness
   b) Maximum freely recovered thickness

C. Notes on the KCT

Markings, printings, other details for individual/group of components are to be mentioned on KCT. For example:
a) Printing of item code, size, batch no., etc.
b) Printing on components
c) Other embossing or engraving, 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)

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

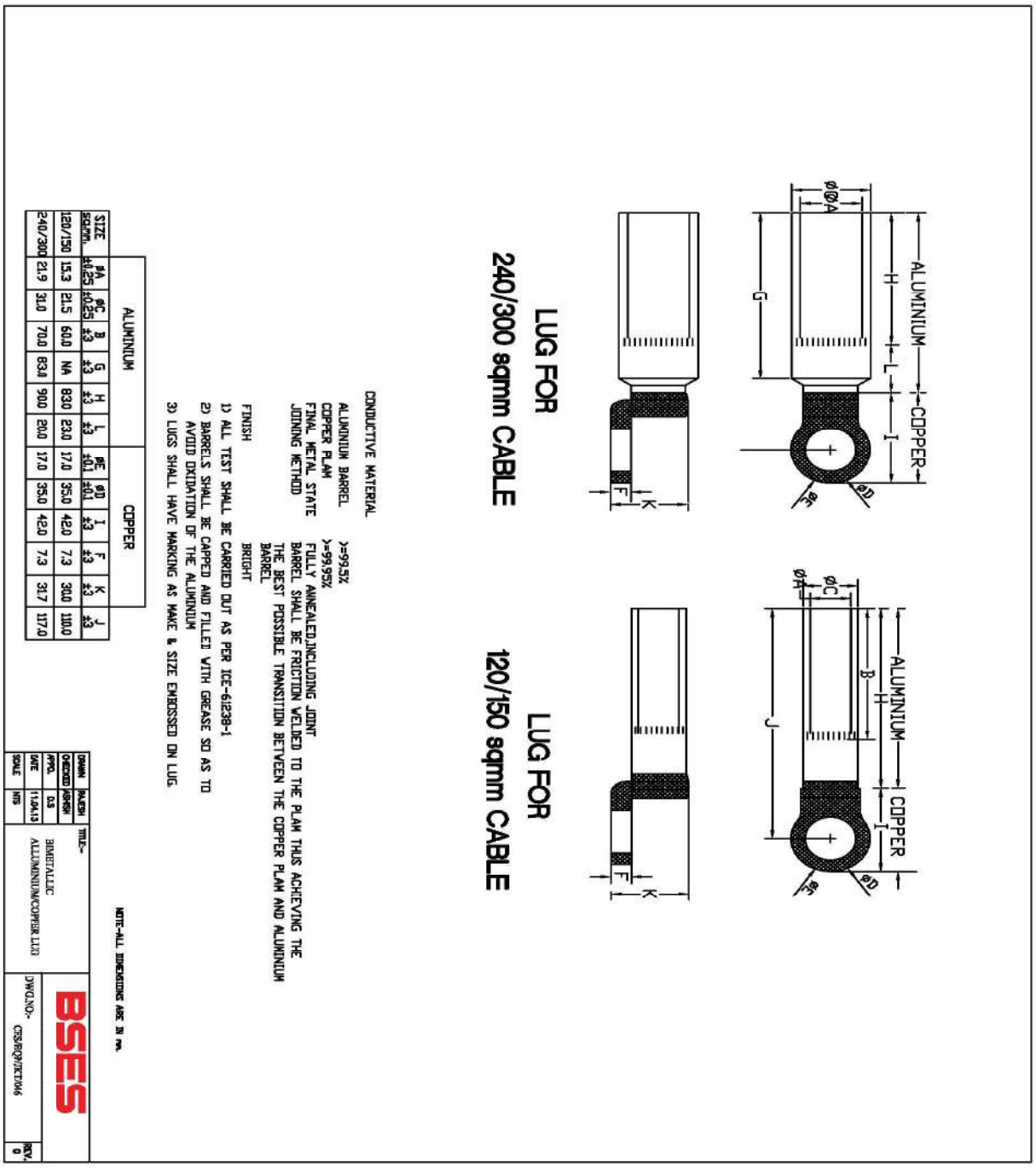
Sr No.	Clause No.	Deviation

Annexure – E: Service Conditions

(Atmospheric conditions at Site)

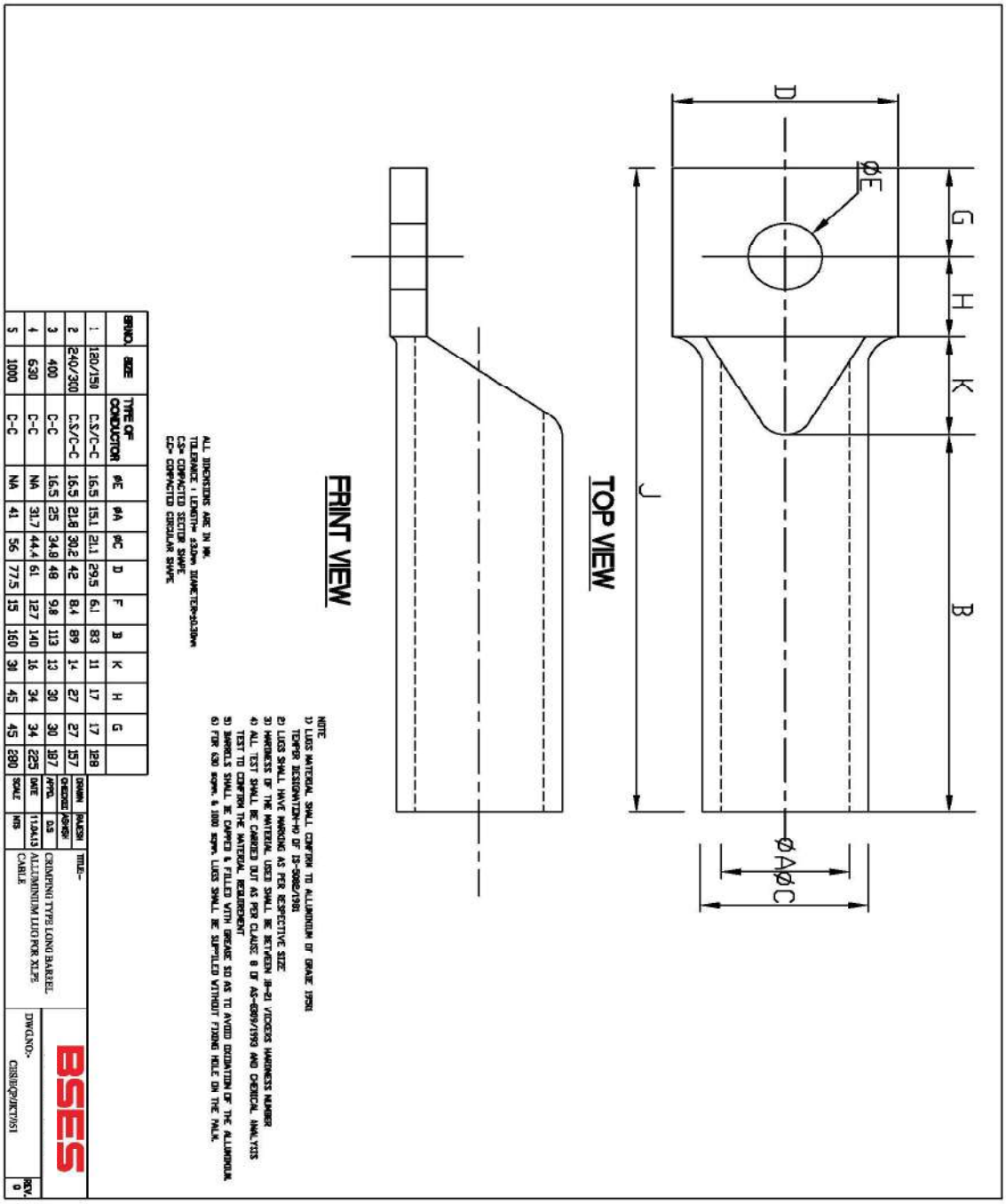
1	Delhi	
a)	Average grade Atmospheric Condition:	Heavily Polluted, Dry
b)	Maximum altitude above sea level	1000 M
c)	Ambient Air temperature	Highest 50 deg C, Average 40 deg C
d)	Minimum ambient air temperature	0 deg C
e)	Relative Humidity	90 % Max
f)	Thermal Resistivity of Soil	150 Deg. C cmm
g)	Seismic Zone	4
h)	Rainfall	750 mm concentrated in four months

Annexure – F: Bimetallic Aluminium / Copper Lug



SIZE sq.mm.	ALUMINIUM						COPPER			
	øA ±0.25	øC ±0.25	B ±3	G ±3	H ±3	L ±3	øE ±0.1	øD ±0.1	I ±3	F ±3	K ±3	J ±3
120/150	15.3	21.5	60.0	NA	830	230	17.0	35.0	42.0	7.3	30.0	110.0
240/300	21.9	31.0	70.0	834	900	200	17.0	35.0	42.0	7.3	31.7	117.0

Annexure – G: Aluminum/Copper Lug For XLPE Cable



SR.NO.	SIZE	TYPE OF CONDUCTOR	ØE	ØA	ØC	D	F	B	K	H	G
1	120/150	C.S/C-C	16.5	15.1	21.1	29.5	6.1	83	11	17	17	128
2	240/300	C.S/C-C	16.5	21.8	30.2	42	8.4	89	14	27	27	157
3	400	C-C	16.5	25	34.8	48	9.8	113	13	30	30	187
4	630	C-C	NA	31.7	44.4	61	127	140	16	34	34	225
5	1000	C-C	NA	41	56	77.5	15	160	36	45	45	280

Annexure-H

SOP FOR REPAIRING OF CABLE FAULT (Shall be part of PO)		
Sl. No.	Activity	Responsibility
Initiation		
1	Identify and isolate fault and inform GNIIT in case of cable fault	Break down team
2	Updation of the details in OMS against respective feeder tripping event.	GNIIT
Fault Location		
1	Information sent to FLC team and SDO.	GNIIT
2	Mobilize FLC team and cable jointing contractor.	SDO
3	Identification of fault location	FLC Team
Preparation for Jointing		
1	Seeking permission from road owning agency	SDO
2	Payment of RR charges to Road owning agency	Finance
3	Digging	Cable jointing contractor
4	Cut faulty section and Pre-test (HV test) cable for multiple fault	Cable jointing contractor
5	BOQ estimation for jointing work (type, size and length of cable, type of jointing kit)	Cable jointing contractor
6	Filling material reservation slip (MRS) in SAP	SDO
7	Issuing and transporting material from store.	Cable jointing contractor
Jointing		
1	Cable preparation (overlap length of cable, slide of armour, build up with inner sheath etc)	Cable jointing contractor (for jointing details refer to manufacturer instruction manual)
2	Copper tape shields	
3	Core preparation	
4	Location of parts in completed joints	
5	Earthing of connection	
6	Completion of joints	
7	Take Photographs before, during and after jointing and send to CES	SDO
8	Supervision during jointing	SDO
9	Sending failed joint to Division store	Cable jointing contractor
Completion and reporting		
1	Intimate to breakdown team about joint completion.	Cable jointing contractor
2	Conduct HV test	Break down team
3	Restore of Supply through jointed cable	Break down team
4	Backfilling, compaction of excavated soil and removing of excess earth from the site	Cable jointing contractor

5	Completion information in Job Card (Details of work done, material consumption, location, feeder name and joint tag no., date, supervisor name, jointer name) sent to SDO	Cable jointing contractor
6	Above information sent to GNIIT	SDO
7	Send information about GPS location of Cable fault to GIS	SDO
8	Daily report of cable jointing to CES	Division Head
9	Updating of information in OMS including supervisor name, jointer name, feeder name	GNIIT
10	Information to include GPS location of cable fault.	GNIIT

Special Note-

1) Joints to be done preferably during day. In case of constraints, DGM (O&M) to authorize for night time jointing with supervisor
2) Daily joint report to be shared with CES
3) Bi-monthly analysis of faulty joint for ensuring warranty compliance to be organized at circle level by contractor in presence of DGM (O&M) and CES
4) Certification of job card for payment by DGM (O&M) subject to OMS compliance CES to check any gaps.
5) After completion of jointing (33kV and 66kV), all the joints shall be covered with RCC coffin. Coffin shall be filled with white sand complete from the hole provided at the top of the coffin.

Technical Specification

For LT Cable Joints and Terminations

Specification no – SP-LTJKT-06-R1

Prepared by		Reviewed by		Approved by		Rev	Date
Name	Sign	Name	Sign	Name	Sign		
AV		GS		AA		R1	02/06/2017

Index

BSES	SP-LTJKT-06-R1
Technical Specification For LT Cable Joints and Terminations	

Record of Revision

Cl 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	1. 2C X 10 Sqmm – circular 2. 2C X 25 Sqmm - filler 3. 4C X 25 Sqmm 4. 4C X 50 Sqmm 5. 4C X 95 Sqmm 6. 4C X 150 Sqmm 7. 4C X 300 Sqmm
5.2	Conductor	a. Electrolytic Grade stranded Aluminum Conductor b. Grade: H2/ H4 as per IS: 8130/84 (For Al) 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	Type	Heat Shrinkable straight through joint Kits.
6.2	Size	Suitable for cable sizes mentioned in clause no. 3.1 and Purchaser's Requisition.
6.3	Conductor Connection	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.

		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 -09-1 3.
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

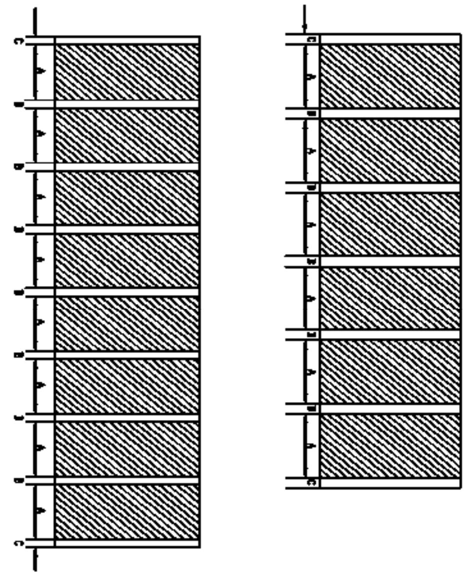
11.0.0 Deviations

12.1	Deviations to this specification to be submitted in writing by Vendor. Bidder to submit copy of this specification along with company seal & signature on each page.

12.0.0 Drawing Submission:

12.1	The seller has to submit following: along with bid
12.1.1	GTP (duly filled-in)
12.1.2	Deviation sheet, if any.
12.1.3	GA / cross sectional drawing of complete joint/ termination and individual components.
12.1.4	01 no's sample of each type of kit.
12.1.5	Detailed reference list of customers using the offered product during the last 5 years with similar design and rating
12.1.6	Manufacturer's quality assurance plan and certification for quality standards
12.1.7	Type test reports for the same type, size & rating.
12.1.8	Complete product catalogue and Manual.
12.1.9	Recommended accessories or any other hardware for five years of operation.
12.2	Seller has to submit following drawings for buyer's Approval (A) / Reference (R) After award of contract -
12.2.1	Program for production and testing (A)
12.2.3	Guaranteed Technical Particulars (A) and Kit contents.
12.2.4	GA drawing
12.2.5	Detailed installation and commissioning instructions
12.2.6	Quality plan and field quality plan.
12.3	Submittals required prior to dispatch
12.3.1	Inspection and test reports, carried out in manufacturer's works
12.3.2	Test certificates of all bought out items
12.3.5	Number of Documents required at different stages shall be per Annexure- A
12.3.6	Duly signed & stamped copies of the drawings / documentation are required to be submitted to BSES for approval.

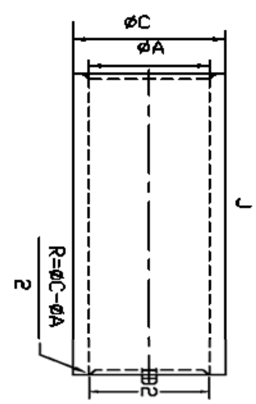
Annexure A: Drawing of Al Crimping Ferrule



SIZE SQ/mm	A	B	C	TOTAL No. OF CRIMPS
25	5	5	5-10	6
50	9	4	3-8	6
70	9	3	3-8	8
120/150	9	5	6-11	8
240/300	9	5	3-8	10

SPACING OF CRIMPS FOR FERRULES TOLERANCE±1MM

NOTE
1) FERRULE MATERIAL SHALL CONFIRM TO ALLUMINIUM OF GRADE 1950I (TEMPER DESIGNATION-M) OF IS-5082/1981
2) FERRULE SHALL HAVE MARKING AS PER RESPECTIVE SIZE
3) HARDNESS OF THE MATERIAL USED SHALL BE BETWEEN 18-21 VICKERS HARDNESS NUMBER
4) CLEAR AND DISTINCT MACHINE MARKING AS SPECIFIED DISTANCE ON OUTER SURFACE OF FERRULE TO FACILITATE BETTER CRIMPING.
5) ALL TEST SHALL BE CARRIED OUT AS PER CLAUSE 8 OF IS-8309/1993 AND CHEMICAL ANALYSIS TEST TO CONFIRM THE MATERIAL REQUIREMENT.

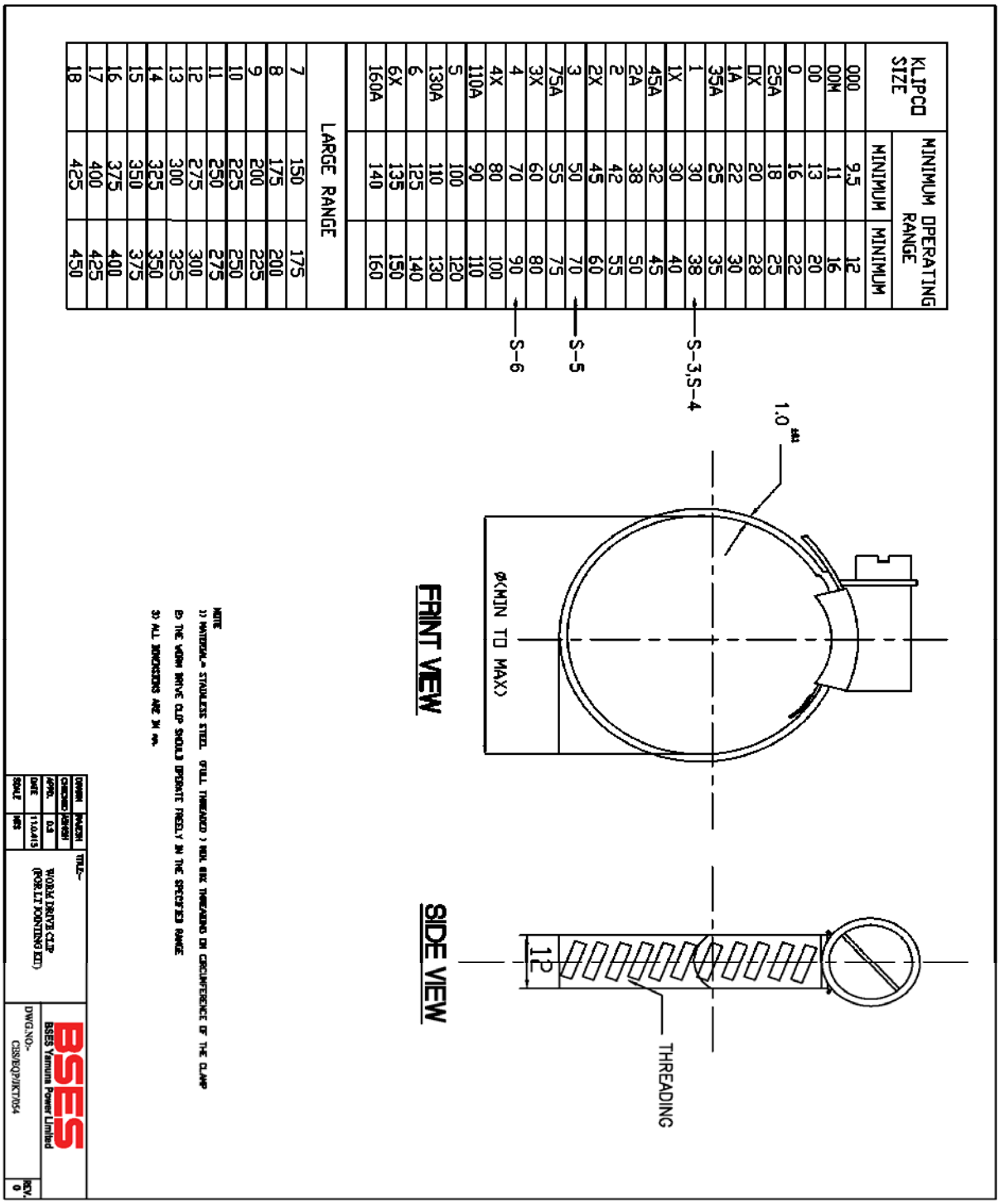


SIZE SQ/mm	ØA	ØC	J
25	6.8-7.1	9.6-9.8	65-75
50	9.1-9.4	12.9-13.1	88-98
70	11.1-11.4	15.4-15.6	100-110
120/150	16.2-16.6	21.4-21.6	120-130
240/300	23.5-24.1	30.9-31.2	140-150

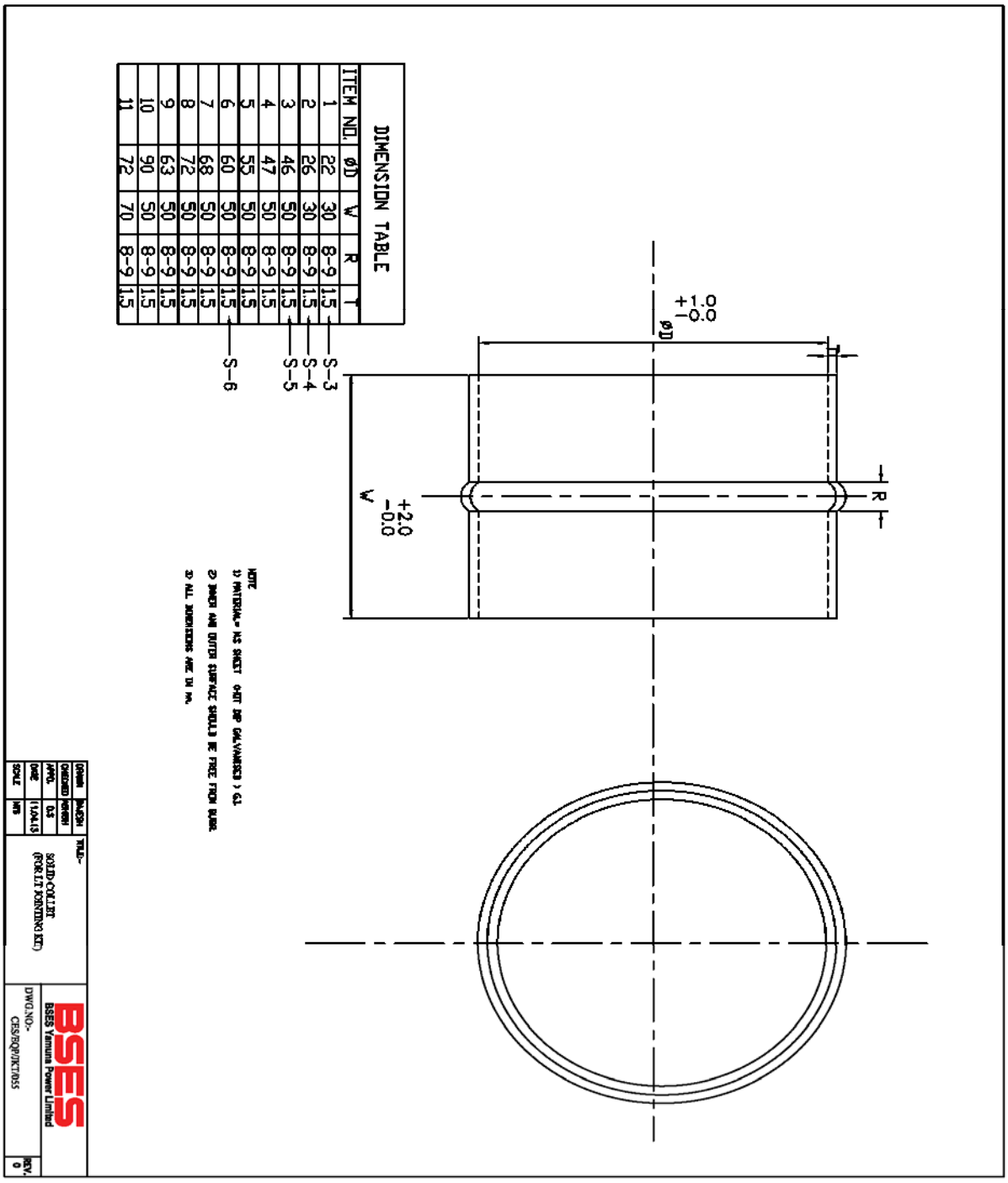
NOTE-ALL DIMENSIONS ARE IN mm.

DRAWN	RAJESH	TITLE- ALUMINIUM CRIMING FERRULES SIZE: 25,50,70,120,150,240,300 sq.mm	BSES Yamuna Power Limited
CHECKED	ASHISH		
APPD.	D.S		DWG.NO:- CES/EQP/JKT/050 REV. 0
DATE	11.04.13		
SCALE	NTS		

Annexure B: Drawing of Worm Drive Clip

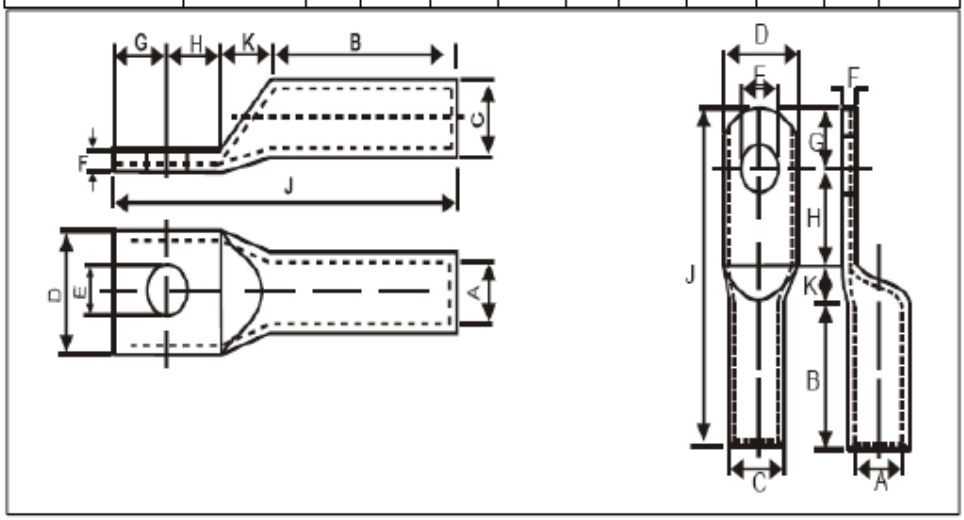


Annexure C: Drawing of Solid Collet



Annexure D: Drawing of Aluminum Lug

Cable Size											
Cable details	Conductor shape	E	A	C	D	F	B	K	H	G	J
CABLE ARM XLPE 1.1KV 4C 300MM2 AL	SECTOR SHAPE	17	23.5 - 24.1	30.9 - 31.2	44.2 - 45.2	7 - 7.5	89	14	27	27	157
CABLE ARM XLPE 1.1KV 4C 150MM2 AL	SECTOR SHAPE	13	16.2 – 16.6	21.4 - 21.6	30.6 - 31.2	4.7 - 5.3	83	11	17	17	128



NOTE: ALL DIMENSIONS ARE IN MM

BSES

Technical Specification of

LT Power Cable(Single & Multi-Core)

Specification no – BSES-TS-01-LTPC-R0

Rev:		0
Date:		31 Mar 2022
Prepared by	Abhishek Vashistha	
	Rohit Patil	
Reviewed by	Puneet Duggal	
	Amit Tomar	31/03/2022
Approved by	Gaurav Sharma	
	K. Sheshadri	31/3/22

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Contents

1.0 SCOPE OF SUPPLY

The specification covers design, manufacture, shop testing, packing and delivery of 1100 Volts grade, Aluminium conductor XLPE insulated power cables.

2.0 CODES & STANDARDS

The cables shall be designed, manufactured and tested in Accordance with the following Indian & IEC standards.

2.1	IS- 7098 (Part-1)	Cross linked polyethylene insulated PVC sheathed cables for working voltages upto and including 1100V.
2.2	IS- 6474	Polyethylene insulation & sheath of electric cables.
2.3	IS- 5831	PVC insulation and sheath of electrical cables.
2.4	IS : 10810	Methods of tests for cables.
2.5	IS : 8130	Conductors for insulated electrical cables and flexible cords.
2.6	IS : 3975	Low carbon galvanized steel wires, formed wires and tapes for armouring of cables.
2.7	IS- 4026	Aluminum ingots, billets and wire bars (EC grade)
2.8	IS-5484	EC Grade aluminium rod produced by continuous casting and rolling
2.9	IS : 10418	Specification for drums for electric cables.
2.10	IS : 3961	Recommended current ratings for cables.
2.11	IS:1255	Installation and Maintenance of power cables upto and including 33 kV rating.
2.12	IS:4826	Specification for hot-dipped galvanized coatings on round steel wires
2.13	IS:1717	Metallic Materials – Wire – Simple torsion test
2.14	IEC 60228	Conductors of insulated cables. Guide to the dimensional limits of circular conductors.
2.15	IEC 60331	Fire resisting characteristics of electric cables.
2.16	IEC 60332 – 3	Tests on electric cables under fire conditions. Part 3: Tests on bunched wires or cables.
2.17	IEC 60502	Extruded solid dielectric insulated power cables for rated voltages from 1kV to 30 kV.
2.18	IEC 60754 – 1	Test on gases evolved during combustion of materials from cables. Part 1: Determination of the amount of halogen acid gas evolved during combustion of polymeric material taken from cables.
2.19	IEC 60811	Common test methods for insulating and sheathing materials of electric cables
2.20	IEC 60885	Electric test methods for electric cables
2.21	IEC 60304	Standard colours for insulation for low frequency cables and wires.
2.22	IEC 60227	PVC insulated cables of rated voltages up to and including 460/760 V.

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

<table>
<tr><td>3.1</td><td>Conductor</td><td>a) Electrolytic Grade Stranded Aluminium Conductor
b) Grade: H2 as per IS: 8130/1984
c) Class 2
d) Chemical Composition as per IS 4026
e) Shape& Size:
<table>
<tr><th>S. no.</th><th>Shape</th><th>Single core (sq.mm)</th><th>Multi core (sq.mm)</th></tr>
<tr><td>1</td><td>Compacted Circular</td><td>• 1cx25
• 1cx95
• 1cx300
• 1cx630
• 1cx1000</td><td>• 2cx10</td></tr>
<tr><td>2</td><td>Sector</td><td>---</td><td>• 2cx25
• 4cx25
• 4cx50
• 4Cx150
• 4Cx300
• 4Cx400</td></tr>
</table></td></tr>
<tr><td>3.2</td><td>Insulation</td><td>Extruded XLPE insulation as per IS : 7098 part-1</td></tr>
<tr><td>3.3</td><td>Core Identification</td><td>a) Single Core Cable – Natural
b) Two Core Cable – Red & Black
c) Four Core Cable – Red, Yellow, Blue and Black</td></tr>
<tr><td>3.4</td><td>Inner Sheath</td><td>a) For Single Core Cable – Inner Sheath Not Required
b) For 2 Core cable- Pressurized Extruded, Black PVC type ST-2 (IS 5831-1984)
c) For 4 core cable –Extruded Black PVC type ST-2 (IS 5831-1984)</td></tr>
<tr><td>3.5</td><td>Armour</td><td>a) For 2C X 10 mm^2 – Galvanized Steel round wire.
b) For all sizes above 10 mm^2-Galvanized Steel Strip
c) Armour not required for single core cables
d) Minimum area of coverage of armouring shall be 90%</td></tr>
</table>

		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

		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

4.1	Reference Standard	Cable drum shall comply with IS: 10418.
4.2	Type of Drum	Wooden drums with anti termite treatment. (The drums shall be provided with M.S spindle plate and nut-bolts arrangement as per IS : 10418)
4.3	Drum Length & Tolerance	• For 2C X 10 mm^2 Cable - 1000+/-5% Mtr • For all Other cable sizes - 500 +/-5% Mtr
4.4	Overall Tolerance	-2 % for the total cable length for the entire order.
4.5	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
4.6	Preventive Measure for cable Drum	a) The surface of the drum and outer most cable layer shall be 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.
4.7	Drum Identification Labels	a) Drum identification number 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

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

5.0 PACKING, SHIPPING, HANDLING & STORAGE

5.1	Shipping information Plan	The seller shall be give complete shipping information concerning the weight ,size of each package
5.2	Transit Damage	The seller shall be held responsible for all transit damage due to improper packing/inside cable damaged found in store/site
5.3	Cable Drum Handling	The drum shall be with M.S spindle plate(with nut –bolts) of adequate size to suit the spindle rod , normally required for handling the drums , according to expected weight of the cable drums as per IS:10418

6.0 QUALITY ASSURANCE, TESTING& INSPECTION

All the tests shall be carried out in accordance with IEC / IS standards.

6.1	Quality Assurance Plan	In event of order manufacturer has to submit the signed copy of QAP.
6.2	Inspection hold points	AS per approved QAP (QAP shall be approved at the time of GTP approval)
6.3	Routine Test	a) Measurement of Electrical Resistance b) HV test with power frequency AC voltage
6.4	Type Test	**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 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

		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 mm^2 – one sample for chemical composition and purity test of aluminium shall be conducted per300km of ordered quantity and multiple thereof. b) For cable sizes 50mm^2 – 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 mm^2 – 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

d. No submission is acceptable without check list compliance.
e. Deficient/ improper or incomplete document/ drawing submission shall be liable for rejection.
f. Order of documents shall be strictly as per the check list.
g. Any document not included in the below table but necessary for detailed engineering shall be deemed to be included in bidder's scope

S No.	Detail of Document	Bid	Approval	Pre Dispatch
1	Guaranteed Technical Particulars (GTP)	Required	Required	
2	Deviation Sheet, if any	Required	Required	
3	Detailed cross sectional drawing of cable	Required	Required	
4	Dimensional drawing of cable drum	Required	Required	
4	Type test reports of offered type and rating of cable	Required	Required	
5	BIS certificate	Required		
6	Complete cable catalogue	Required		
7	Make of Raw Materials	Required	Required	
8	Cable de-rating factors	Required	Required	
9	Armour coverage calculation		Required	
10	Inspection test reports and Routine Test Certificates carried out in manufacturer's works			Required
12	Test certificates of all raw materials			Required
13	Calibration test reports of instruments			Required

8.0 PROGRESS REPORTING

8.1	Outline Document	To be submitted for purchaser approval for outline of Production-inspection, testing-inspection, packing, dispatch, documentation programme.
8.2	Detailed Progress Report	To be submitted to purchaser once a month containing a) Progress on material procurement b) Progress on fabrication (As applicable) c) Progress on assembly (As applicable) d) Progress on internal stage inspection e) Reason for any delay in total programme f) Details of test failures if any in manufacturing stages. g) Progress on final box up constraints/forward path.

9.0 DEVIATION

a) Deviations from this specification shall be listed separately by bidder clause wise (format given below) along with optional offer and has to submit the list along with bid/quotation. BSES will review the deviations and if BSES is agreed with the deviation, seller has to take written confirmation from BSES on deviation during tender evaluation.

b) In the absence of any separate list of deviations from the bidders with bid as well as written confirmation from BSES on deviations, it will be assumed by the Buyer that the Seller complies with the Specification fully.

c) Any deviations mentioned in any other submitted bid documents (i.e.in filled GTP, Catalog, BSES old approval, buyer's/seller's standards etc) by seller without separate deviation sheets will not consider as a deviation from this tech spec at any stage of contract.

Deviation sheet format

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

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)		
A	For 2CX10Sqmm	A2XWY	
B	For Sizes above 10 mm^2	A2XFY	
3	Voltage Grade (kV)	1.1	
4	Maximum Conductor temperature		
A	Continuous	90°C	
B	Short time	250°C	
5	Conductor		
A	Material and Grade	As per Cl.3.1	
B	Make of Al	Ref Annexure D	
C	Size (mm^2)	…… mm^2	
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)	……	
H	Maximum Conductor resistance at 20 ° C(Ohm/Km)	As per Table 2 of IS 8130	
6	Insulation		
A	Insulation Material	As per Cl. 3.2	
B	Nominal thickness (mm)	As per Table 3 of IS 7098 Part-1	
C	Diameter over Insulation (mm) Approx.	……	
D	Make of insulation compound	Ref: Annexure D	
7	Inner Sheath		
A	Material and Type	As per Cl. 3.4	
B	Minimum thickness	As per Table 5 of IS 7098 Part-1	
C	Approx. dia. Over sheath (mm)	……	
8	Galvanized Steel Armour	as per purchaser's site - specific condition	
A	Material		
a)	For 2CX10 mm^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	
B	Area covered by Armour	Min 90% and calculations shall be strictly as per Annexure-D	
C	Dia. over Armour – Approx.(mm)	……	

Sr. No.	Description	Buyer's Requirement	Seller's data
9	Outer Sheath (FRLS)		
A	Material and Type	As per Cl. 3.6	
B	Minimum Thickness	As per Table 8 of IS 7098 Part-1	
C	Colour	Orange	
D	Embossing Details	As per Cl.3.6 (e)	
10	Approx. overall dia. (mm)	……	
11	Overall order tolerance	- 2 % for the total cable length for the entire order	
12	Cable Drum		
A	Type of Drum	Wooden	
B	Drum Length & tolerance	As per Spec. Cl. 4.3 & 4.4	
C	Marking on Drum	As per Spec. Cl. 4.7	
D	Drums provide with MS Spindle plate & nut bolts arrangement (as per IS:10418)	Required	
13	End Cap	Required	
14	Weights	……	
a)	Net Weight of cable (Kg/Km.) – Approx		
b)	Weight of empty drum	Kg	
c)	Weight of cable with drum	Kg	
15	Continuous current rating for standard I.S condition laid direct		
a)	In ground 30° C	Amps	
b)	In duct 30° C	Amps	
c)	In Air 40° C	Amps	
16	Short circuit current for 1 sec of Conductor (kAmp)	……	
17	Electrical Parameters at Maximum operating temperature:		
A	AC Resistance	Ohm/Km	

Sr. No.	Description	Buyer's Requirement	Seller's data
B	Reactance at 50 C/s	Ohm/Km	
C	Impedance	Ohm/Km	
D	Capacitance	Micro farad / Km	
18	Recommended minimum bending radius	..... x O/D	
19	De-rating factor for following Ambient temperature in	Ground / Air	
a)	At 30° C		
b)	At 35° C		
c)	At 40° C		
d)	At 45° C		
e)	At 50° C		
20	Group factor for following Nos. of cables laid	Touching / Trefoil	
a)	3 Nos.		
b)	4 Nos.		
c)	5 Nos.		
d)	6 Nos.		
21	Process of Cross linking of Polyethylene	Dry/ Sioplas Cure	
22	Type test	Is copy of latest valid TTR for respective Sizes enclosed? Yes /No	
23	FRLS Properties	As per IS 1554, Part-1	
	Oxygen Index	As per IS 1554, Part	
	Temperature Index	As per IS 1554, Part	
	Max Acid Gas Generation	As per IS 1554, Part	
	Light Transmission / Smoke Density	As per IS 1554, Part	

11.0 ANNEXTURE- B

GUARANTEED TECHNICAL PARTICULARS (Single Core)

(Separate GTP needs to be furnished for 25, 95, 300, 500, 630 & 1000 mm^2 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	Type	A2XY (Un-armoured)	
3	Voltage Grade (kV)	1.1kV	
4	Maximum Conductor temperature		
A	Continuous	90°C	
B	Short time	250°C	
5	Conductor		
A	Material and Grade	As per Cl. 3.1	
B	Size (mm^2)	.....mm^2	
C	Min no. of wires in each conductor (Nos.)	As per Manufacturer Standard	
D	Min Dia. of wires in each conductor before compaction (mm)	As per Manufacturer Standard	
E	Shape of conductor	Compacted Circular	
F	Diameter over conductor (mm)	……	
G	Maximum Conductor resistance at 20 ° C(Ohm/Km)	As per Table 2 of IS 8130	
H	Make of Al	Ref Annexure D	
6	Insulation	As per Table 3 of IS7098 Part-1	
A	Insulation Material	As per Cl. 3.2	

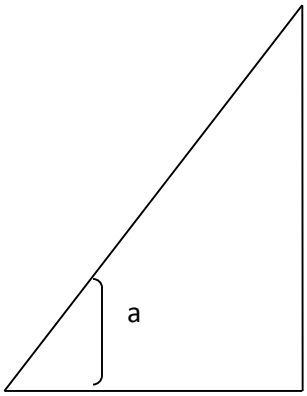
S.No.	Description	Buyer's Requirement	Seller's data
B	Nominal thickness (mm)		
(i)	For 1Cx300 mm^2	1.8 mm	
(ii)	For 1Cx500 mm^2	2.2 mm	
(iii)	For 1Cx630 mm^2	2.4 mm	
iv)	For 1Cx1000 mm^2	2.8 mm	
C	Diameter over Insulation (mm) Approx.	……	
D	Make of insulation compound	Ref: Annexure D	
7	Inner Sheath	Not applicable	
8	Armour	Not applicable	
9	FRLS Outer Sheath		
A	Material and Type	As per Cl. 3.6	
B	Minimum Thickness	As per Table 8 of IS 7098 Part-1	
C	Colour	Orange	
D	Embossing Details	As per Cl.3.6 (e)	
10	Approx. overall dia. (mm)	……	
11	Overall order tolerance	-2 % for the total cable length for the entire order	
12	Cable Drum		
A	Type of Drum	Wooden	
B	Drum Length & tolerance	As per Spec. Cl. 4.3 & 4.4	
C	Marking on Drum	As per Spec. Cl. 4.7	
D	Drums provide with MS Spindle plate & nut bolts arrangement (as per IS:10418)	Required	
13	End Cap	Required	
14	Weights	……	
a)	Net Weight of cable (Kg/Km.) – Approx		
b)	Weight of empty drum	Kg	

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:		
A	AC Resistance	Ohm/Km	
B	Reactance at 50 C/s	Ohm/Km	
C	Impedance	Ohm/Km	
D	Capacitance	Micro farad / Km	
18	Recommended minimum bending radius	……. x O/D	
19	Derating factor for following Ambient temperature in	Ground / Air	
a)	At 30° C		
b)	At 35° C		
c)	At 40° C		
d)	At 45° C		
e)	At 50° C		
20	Group factor for following Nos. of cables laid	Touching / Trefoil	
a)	3 Nos.		
b)	4 Nos.		
c)	5 Nos.		
d)	6 Nos.		
21	Process of Cross linking of Polyethylene	Dry/ Sioplas Cure	
22	Type test	Is copy of latest valid TTR for respective Sizes enclosed?	

S.No.	Description	Buyer's Requirement	Seller's data
		Yes /No	
23	FRLS Properties		
	Oxygen Index	As per IS 1554, Part	
	Temperature Index	As per IS 1554, Part	
	Max Acid Gas Generation	As per IS 1554, Part	
	Light Transmission / Smoke Density	As per IS 1554, Part	

12.0 ANNEXTURE – C

ARMOUR COVERAGE PERCENTAGE



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 = π x D x Cos a,
D = diameter under armour
a = angle between armouring wire / formed wires and axis of cable
tan a = π x D/C, and
C = lay length of armouring wires / formed wires.

Min 90% armour coverage shall be provided both in case of wires and strips.

The gap between armour wires / formed wires shall not exceed one armour wire / Formed wire space and there shall be no cross over / over-riding of armour wire / Formed wire so, the minimum area of coverage of armouring shall be 90%.

13.0 ANNEXTURE – D

LIST OF SUB-VENDORS

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

BSES

TECHNICAL SPECIFICATION

FOR

FRLS CONTROL CABLE

SPECIFICATION NO. – BSES-TS-57-CCAB-R0

Rev:		0
Pages:		11
Date:		20 April 2022
Prepared by	Abhishek Vashistha	
	Rohit Patil	
Reviewed by	Puneet Duggal	
	Amit Tomar	
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	Gopal Nariya	

INDEX

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	Cable construction Features	Size & dimensions of each item mentioned under this clause shall be followed as detailed out in GTP, refer Annexure A
4.2	Conductor	• 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)

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.

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.

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

Annexure – A: Guaranteed Technical Particulars (Data by Supplier)

(Standard Cable sizes are 2Cx2.5, 4Cx2.5, 6C X 2.5, 8Cx2.5, 10Cx2.5, 12C X 2.5 mm^2)

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 (mm^2)	2.5	
b)	No. of wires in each conductor	As per Manufacturer standard	
c)	Dia. of wires in each conductor before compaction (mm)	As per Manufacturer standard	
d)	Shape of Conductor	As per Clause 4.2 of specification	
e)	Diameter over conductor mm	To be specified by vendor	
f)	Maximum Conductor resistance at 20 ° C (Ohm/Km)	As per Table 2 of IS 8130	
6.0	Insulation	As per Table 1 of IS:5831 – 1984	
a)	Nominal thickness (mm)	As per Clause 4.3 of specification & Table 2 of IS 1554(Part-1)	
b)	Minimum thickness (mm)		
c)	Core Identification	As per IS 1554 Part 1	
d)	Approx. dia. over Insulation (mm)	To be specified by	

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	

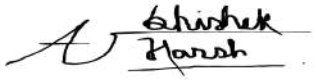
Sr.	Description	Buyer's requirement	Vendor's Data
15.0	Continuous current rating for standard I.S. condition laid Direct		
a)	In ground 30° C Amps	To be specified by vendor	
b)	In duct 30° C Amps	To be specified by vendor	
c)	In Air 40° C Amps	To be specified by vendor	
16.0	Short circuit current for 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

Insulated Floor Coating

Specification no – BSES-TS-75-INFC-R0

Rev:		0
Pages:		1 of 7
Date:		06 May 2022
Prepared by	Abhishek Harsh	 3267d7e3-82b5-46eb-b5a6-867ee7820a34
Reviewed by	Srinivas Gopu	 5d32525e-ed3a-4f41-b1c7-b8a5e77d1519
Approved by	Gaurav Sharma	 23dc2de2-95de-4472-99a7-dea873f472b6

BSES	BSES-TS-75-INFC-R0
TECHNICAL SPECIFICATION OF INSULATED FLOOR COATING	

INDEX

DocUUID : 0741b82a-0e63-45fd-a24f-3f04776609e6

BSES	BSES-TS-75-INFC-R0
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

DocUUID : 0741b82a-0e63-45fd-a24f-3f04776609e6

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

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.

7 INSPECTION AND TESTING

7.1	Type test	Equipment should be of type tested quality only, type test certificate to be submitted along with offer. If the manufacturer's lab is accredited by govt. / authorized body then it shall be acceptable for type testing.
7.2	Acceptance & Routine tests	As per relevant Indian standard

8 PACKING, SHIPPING, HANDLING AND SITE SUPPORT

8.1	Packing Protection	The packing shall be fit to withstand rough handling during transit and storage at destination. The test set should be properly protected against corrosion, dampness & damage.
8.2	Packing for accessories and spares	Robust non-returnable packing case with all the above protection & identification Label. The bidder should get the packing list approved before dispatching the material.
8.3	Packing Identification Label	On each packing case, following details are required:
8.3.1	Individual serial number	
8.3.2	Purchaser's name	
8.3.3	PO number (along with SAP item code, if any) & date	
8.3.4	Equipment Tag no. (if any)	
8.3.5	Destination	
8.3.6	Manufacturer / Supplier's name	
8.3.7	Address of Manufacturer / Supplier / it's agent	
8.3.8	Description	
8.3.9	Country of origin	

DocUUID : 0741b82a-0e63-45fd-a24f-3f04776609e6

8.3.10	Month & year of Manufacturing	
8.3.11	Case measurements	
8.3.12	Gross and net weight	
8.3.13	All necessary slinging and stacking instructions	
8.4	Shipping	The seller shall be responsible for all transit damage due to improper packing.
8.5	Handling and Storage	Manufacturer instruction shall be followed.
8.6	Detail handling & storage instruction sheet / manual to be furnished before commencement of supply.	

9 DEVIATIONS

9.1	Deviation	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed that the bidder complies fully with this specification. No deviation will be acceptable post order.

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		

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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.

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TECHNICAL SPECIFICATION

FOR

SCADA NETWORK & INTEGRATION

INDEX

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. 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: • Management through Web-based, Telnet, CLI • SNMP supported • Remote Monitoring • Diagnostics with logging and alarms • Console ports xxiii. Shall have Product conformity • 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 service Yes • 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. Make- Belden or equivalent
2.3.5	Communication hardware	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	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 Protection relays, Digital RTCC and multifunction meters for SCADA signals as per Annexure 1 : Signals Related with Digital RTCC, Annexure 2: Signals Related with CRP and Annexure 3: Signals Related with MFM and communication for the same in existing RTU 560A Co Processor CMU05/CMR02. ii. For communication configuration and troubleshooting of Relays, Digital RTCC 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 SCADA signal mapping table for signals listed in Annexure 1: Signals Related with Digital RTCC, Annexure 2: Signals Related with CRP and Annexure 3: Signals Related with MFM and communication configuration details for RTU configuration. iv. Simulation of all configured SCADA signals (Listed in Annexure 1: Signals Related with Digital RTCC, Annexure 2: Signals Related with CRP and Annexure 3: 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, Multifunction meters and Digital RTCC 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: Signals Related with Digital RTCC

Sr. No.	Signal Detail	Type of Signal on IEC61850
	Digital Input Signals-	
1	Bucholz Alarm	Single Point Information
2	Bucholz Trip	Single Point Information
3	MOG Alarm	Single Point Information
4	OSR Trip	Single Point Information
5	OTI Alarm	Single Point Information
6	OTI Trip	Single Point Information
7	WTI Alarm	Single Point Information
8	WTI Trip	Single Point Information
9	PRV Trip	Single Point Information
10	SPRV Trip	Single Point Information
11	Digital RTCC Auto/Manual	Single Point Information
12	Digital RTCC Communication Fail	Single Point Information
13	Digital RTCC L/R Switch	Single Point Information
14	Digital RTCC Watchdog Operated	Single Point Information
15	Oil surge Trip	Single Point Information
16	FAN failed	Single Point Information
17	Winding Temp. High alarm	Single Point Information
18	OLTC PRV Trip	Single Point Information
19	OLTC Low Oil Level	Single Point Information
20	Tap Changer Stuck Up	Single Point Information
21	OLTC motor Supply Fail	Single Point Information
22	OLTC supply fail	Single Point Information
23	Tap Max Reach	Single Point Information
24	Tap Min Reach	Single Point Information
25	Under Voltage	Single Point Information
26	Over Voltage	Single Point Information
	Digital Output Signals-	
1	Digital RTCC Relay Auto/Manual	Single Command Output
2	Tap Changer Raise	Single Command Output
3	Tap Changer Lower	Single Command Output
	Measurement Signals-	
1	Oil Temperature	Measured Float
2	Tap Position	Measured Float
3	Tap Count	Measured Float
4	Winding Temperature	Measured Float
5	Voltage BR (of 11kV)	Measured Float
6	Voltage RY (of 11kV)	Measured Float
7	Voltage YB(of 11kV)	Measured Float

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

Annexure 2: Signals Related with CRP

Sr. No.	Signal Detail	Type of Signal on IEC61850
1	**Signals of Differential Relay**	
	Digital Input Signals	
1	Differential Trip Bph	Single Point Information
2	Differential Trip Rph	Single Point Information
3	Differential Trip Yph	Single Point Information
4	Differential Highset Trip	Single Point Information
5	Differential Trip	Single Point Information
6	Inrush detected	Single Point Information
7	REF Trip	Single Point Information
8	Trafo. Differential lockout operated	Single Point Information
9	Trafo. Differential watchdog operated	Single Point Information
10	Trafo. Differential communication fail	Single Point Information
11	Trafo Trouble Trip	Single Point Information
	Measurement Signals	
1	Current Bph	Measured Float
2	Current Rph	Measured Float
3	Current Yph	Measured Float
4	Fault Current Bph	Measured Float
5	Fault Current Rph	Measured Float
6	Fault Current Yph	Measured Float
7	Fault Current Nph	Measured Float
8	Fault locator in some relays	Measured Float
9	Sigma kA square	Measured Float
2	**Signals of Distance Relay**	
	Digital Input Signals	
1	Distance Relay Lockout Operated	Single Point Information
2	Distance Trip	Single Point Information
3	Distance Zone-1 operated	Single Point Information
4	Distance Zone-2 operated	Single Point Information
5	Distance Zone-3 operated	Single Point Information
6	Line Distance Relay Communication Fail	Single Point Information
7	Line Distance Relay watchdog operated	Single Point Information
	Measurement Signals	
1	Active Power	Measured Float
2	Current Bph	Measured Float

3	Current Rph	Measured Float
4	Current Yph	Measured Float
5	Fault Current Bph	Measured Float
6	Fault Current Rph	Measured Float
7	Fault Current Yph	Measured Float
8	Fault Current Nph	Measured Float
9	Fault Locator in some relays	Measured Float
10	Frequency	Measured Float
11	Power Factor	Measured Float
12	Reactive Power	Measured Float
13	Sigma kA square	Measured Float
14	Voltage BR	Measured Float
15	Voltage RY	Measured Float
16	Voltage YB	Measured Float
3	**Signals of Line Differential Relay**	
	Digital Input Signals	
1	Conductor Broken	Single Point Information
2	Differential Trip	Single Point Information
3	Rph Differential Trip	Single Point Information
4	Yph Differential Trip	Single Point Information
5	Bph Differential Trip	Single Point Information
6	Distance Trip	Single Point Information
7	Distance Zone-1 operated	Single Point Information
8	Distance Zone-2 operated	Single Point Information
9	Distance Zone-3 operated	Single Point Information
10	Earth Fault high set trip	Single Point Information
11	Earth Fault IDMT trip	Single Point Information
12	General Trip	Single Point Information
13	Inter-trip	Single Point Information
14	Line differential block	Single Point Information
15	Line differential Channel-1 fail	Single Point Information
16	Line differential Channel-2 fail	Single Point Information
17	Line differential operated	Single Point Information
18	Line differential relay watchdog operated	Single Point Information
19	Phase fault high set trip	Single Point Information
20	Phase fault IDMT trip	Single Point Information
21	PT Fuse Fail	Single Point Information
22	Sync fail	Single Point Information
	Measurement Signals	
1	Active Power	Measured Float
2	Current Bph	Measured Float
3	Current Rph	Measured Float

4	Current Yph	Measured Float
5	Fault Current Bph	Measured Float
6	Fault Current Rph	Measured Float
7	Fault Current Yph	Measured Float
8	Fault Current Nph	Measured Float
9	Fault Locator in some relays	Measured Float
10	Frequency	Measured Float
11	Power Factor	Measured Float
12	Reactive Power	Measured Float
13	Sigma kA square	Measured Float
14	Voltage BR	Measured Float
15	Voltage RY	Measured Float
16	Voltage YB	Measured Float
4	**Signals of Overcurrent Earthfault Relay**	
	Digital Input Signals	
1	50BF/LBB Operated	Single Point Information
2	86 Supervision	Single Point Information
3	Relay Communication fail	Single Point Information
4	Relay watchdog operated	Single Point Information
5	Isolator A status	Double Point Information
6	Isolator B status	Double Point Information
7	Cable door open	Single Point Information
8	CB in Remote	Single Point Information
9	CB Status	Double Point Information
10	Earth Fault General Trip	Single Point Information
11	Earth Fault High set Trip	Single Point Information
12	Earth Fault IDMT Trip	Single Point Information
13	Earth Switch AE status	Double Point Information
14	Earth Switch BE status	Double Point Information
15	Earth Switch LE status	Double Point Information
16	Line Isolator status	Double Point Information
17	Breaker L/R switch	Single Point Information
18	Negative Phase Sequence	Single Point Information
19	Phase Fault General Trip	Single Point Information
20	Phase Fault Highset Trip	Single Point Information
21	Phase Fault IDMT Trip	Single Point Information
22	Phase Fault Overload Trip	Single Point Information
23	PT Fuse Failure	Single Point Information
24	Relay Reset	Single Point Information
25	SF6 Gas Pressure Low	Single Point Information
26	SF6 Lockout Operated	Single Point Information
27	Spring Charged	Single Point Information
28	TCS Alarm-1	Single Point Information

29	TCS Alarm-2	Single Point Information
	Digital Output Signals	
1	CB Command	Double Command Output
2	Relay Reset	Single Command Output
	Spare Output	
	Measurement Signals	
1	Active Power	Measured Float
2	Current Bph	Measured Float
3	Current Rph	Measured Float
4	Current Yph	Measured Float
5	Fault Current Bph	Measured Float
6	Fault Current Rph	Measured Float
7	Fault Current Yph	Measured Float
8	Fault Current Nph	Measured Float
9	Fault Locator in some relays	Measured Float
10	Frequency	Measured Float
11	Power Factor	Measured Float
12	Reactive Power	Measured Float
13	Sigma kA square	Measured Float
14	Voltage BR	Measured Float
15	Voltage RY	Measured Float
16	Voltage YB	Measured Float

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

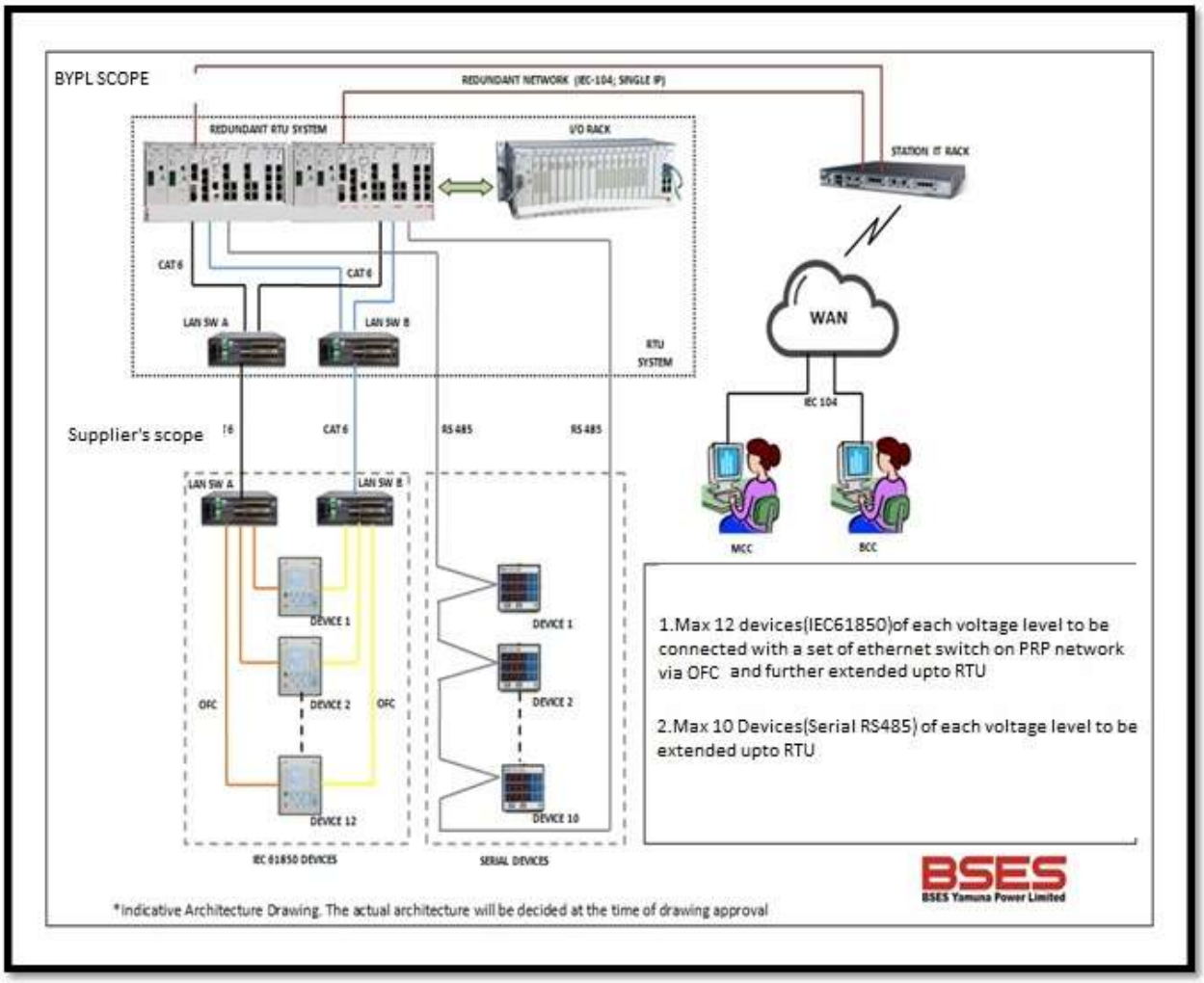
Annexure 3: Signals Related with MFM

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



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. RTCC: Remote Tap Changer Control
20. OFC: Optical Fiber Cable
21. DCO: Double Command Input
22. DPI: Double Point Indication
23. MV: Measured Value
24. SCO: Single Command Input
25. SPI: Single Point Indication
26. SPD: Surge Protection Device

Technical Specification

of

Illumination and Lighting System

Specification no – BSES-TS-98-ILS-R0

Rev		0
Page		1 of 12
Date		06 May 2022
Prepared by	Abhishek Harsh	3267d7c3-82b5-46cb-b5a6-867ee7820a34
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Approved by	Gaurav Sharma	23dc2de2-95de-4472-99a7-dea873f472b6

BSES	BSES-TS-98-ILS-R0
TECHNICAL SPECIFICATION OF ILLUMINATION AND LIGHTING SYSTEM	

NDEX

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1. SCOPE

The specification covers the design, engineering, manufacture, assembly and testing at manufacturer's work, supply and installation of Illumination system for substation including normal distribution pillars, normal lighting board, emergency distribution pillar, emergency lighting board, Junction boxes, Illumination lamps with required lux level.

2. STANDARDS AND CODES

Standard Code	Standard Description
IS 16101 : 2012	General Lighting -LEDs and LED modules – Terms and Definitions
IS16102(Part 1) 2012	Self-Ballasted LED Lamps for General Lighting Services, Part 1 Safety Requirements
IS16102(Part 2) 2012	Self-Ballasted LED Lamps for General Lighting Services, Part 2 Performance Requirements
IS16103(Part 1) 2012	Led Modules for General Lighting, Part 1Safety Requirements
IS16103(Part 2) 2012	Led Modules for General Lighting, Part 2 Performance Requirements
IS15885(Part2/Sec13)	Safety of Lamp Control Gear , Part 2 Particular Requirements , Section 13 dc. or ac. Supplied Electronic Control gear for Led Modules
IS16104 : 2012	d.c. or a.c. Supplied Electronic Control Gear for LED Modules - Performance Requirements
IS16105 : 2012	Method of Measurement of Lumen Maintenance of Solid State Light (LED) Sources
IS16106 : 2012	Method of Electrical and Photometric Measurements of Solid-State Lighting (LED) Products
IS 16107(Part 1)2012	Luminaires Performance ,Part 1 General Requirements
IS 16107(Part 2)2012	Luminaires Performance, Part 2 Particular Requirements ,Section 1 LED Luminaire
IS 16108 : 2012	Photo biological Safety of Lamps and Lamp Systems
IS 10322 : 2012	Luminaires: Part 5 Particular requirements, Section 3 Luminaires for road and street lighting
IS 5	Colours for Ready Mixed Paints and Enamels
IS 613	Copper Rods and Bars for electrical purposes
IS 694	PVC Insulated cables for working voltages up to and including 1100 V
IS 2551	Danger notice plates
IS 5082	Wrought Aluminium and Aluminium alloy bars, rods, tubes and sections for electrical purpose
IS 6665	Code of practice for industrial lighting
IS 13703	LV Fuses for voltage not exceeding 1000V ac or 1500V dc
IS 10118	Code of Practice for Selection, Installation and Maintenance of Switchgear and Controlgear
International Standard	

IEC 62612	Self-ballasted LED lamps for general lighting services for voltage above 50 V — Performance requirements
IEC : 60598-2-3	Particular requirements - Luminaries for road and street lighting
IEC 62471	Photo biological safety of lamps and lamp systems
IEC 62778	Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaries
IEC 61000-4-5	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test
IEC 60439	Low Voltage Switchgear and Controlgear assemblies - Type tested and partially type tested assemblies
IEC 60529	Degrees of protection provided by enclosures (IP Code)
IEC 60947-1	Low Voltage Switchgear and Controlgear - General Rules
IEC 60947-2	Low Voltage Switchgear and Controlgear - Circuit breakers
IEC 61643	Low-voltage surge protective devices

3. ILLUMINATION SYSTEM

3.1.	Lux level requirement	3.1.1. The design of the illumination system shall ensure availability of the average illumination levels as specified below with the maximum possible uniformity in the entire substation. The illumination system shall consist of the normal lighting system and emergency lighting system. The minimum illumination levels shall be as specified below(Reference IS3646(Part II)). 3.1.1.1. Outdoor Substation : 20 lux 3.1.1.2. Roads within substation : 20 lux 3.1.1.3. Boundary wall of the substation : 10 lux 3.1.1.4. Control room : 300 lux 3.1.1.5. Switchgear Room : 200 lux 3.1.1.6. Battery room : 100 lux 3.1.1.7. Stair case : 100 lux 3.1.1.8. Transformers : 100 lux 3.1.2. The illumination level of specific spots such as operating mechanisms of Capacitor bank isolator, oil level and temperature gauges of transformer etc. shall be minimum 50 Lux. Contractor shall design the lighting system with the help of desired software. Owner shall verify the same post commissioning with lux meter to check the levels. In case desired lux levels are not met contractor has to install addition fitting in outdoor and indoor location as per requirement. 3.1.3. Complete design calculation sheets for arriving at the number of luminaires required for the normal and emergency requirements shall be furnished by the bidder. Design calculation sheets for the selection of cables, MCB, HRC fuses, bus bars, etc. are also required to be furnished for Owner's approval.

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3.2.	Illumination circuit	3.2.1.	The illumination system load and welding load in the substation area shall be supplied from 415/230 volt ACDBs to be provided in the substation control room. Requisite numbers of 3-phase, 4-wire, cable circuits for illumination system and welding socket outlets shall be extended from the above board. The laying of cables from the Board to the illumination system/welding socket outlets and their installation are included in the Bidder's scope.
		3.2.2.	Each outgoing cable circuit for illumination loads from the 415 volt switchboard shall terminate in the respective outdoor pillar boxes located in the substation. Outgoing feeders from the illumination shall be taken to the various illumination points in the substation. Necessary fuses shall be provided near light fixtures in the substation.
		3.2.3.	The emergency illumination load shall be supplied from the main emergency illumination board located in the control room. Necessary cable circuits with appropriate fuses shall be provided by the Contractor for the supply system for emergency illumination load of the substation.
		3.2.4.	Emergency DC lighting system shall be provided in the substation wherever required. The emergency lighting shall be adequate for safe movement by the operating personnel in the substation in the event of failure of normal lighting system. Number of lights shall be decided at the time of detailed engineering. A total of minimum 12 no's individually controllable 60 watt lamps shall be provided in the substation.
3.3.	Wiring	3.3.1.	All lighting fixtures and 5A convenience outlets shall be wired with 1.1 KV grade PVC insulated extra flexible, multistranded, copper conductor cables of size not less than 2.5 sq.mm.
		3.3.2.	For 15A heavy-duty outlets copper conductor cables of size not less than 6 sq. mm shall be used.
		3.3.3.	The wiring shall consist of phase, neutral and ground. For grounding the lighting fixtures/convenience outlets etc., GI wire of size not less than 14 SWG shall be used. The phase and neutral conductor shall be suitably colour coded.
		3.3.4.	Supply shall be looped between the lighting fixtures of the same circuit by using junction boxes. For this purpose one (1) 100 mm x 100 mm square junction box shall be provided for each lighting fixture. For recessed lighting fixtures, supply shall be extended from the junction boxes to the fixtures by means of flexible conduits. While for stem-mounted/wall-mounted lighting fixtures the junction box shall be mounted below one of the mounting stems.
		3.3.5.	For lighting branch circuits the nos. of lighting switches shall be decided keeping in mind the ease of control, as well as to limit the current to 2.5A per circuit.
		3.3.6.	For convenience outlets, the bidder shall design the wiring scheme so as to limit 6 nos. of 5A outlets per branch

		circuit and two nos. of 15A outlets per branch circuit. 3.3.7. All wiring materials such as terminals, crimping lugs, ferrules etc. shall also be provided by the Contractor. 3.3.8. No section of the conduit shall be filled with more than 70% of its area. Any consumable material that is required for pulling the wires through conduit shall also be provided by the Contractor. 3.3.9. Lighting fixtures coming in one area shall be evenly distributed between three phases so that tripping of one phase or two phases does not cause total loss of illumination in that area.
3.4.	Required documents to be submitted	Complete manufacturer's literature/catalogues, performance curves, illumination distribution curves, G.A. drawings, specification sheets, etc. as relevant in respect of all materials/equipment to be supplied shall be submitted by the Contractor.
3.5.	Illumination system check after installation	After completion of installation of the illumination system in the substation, the actual illumination level at different locations shall be measured by the Contractor in the presence of Owner's authorised representative. If the average value of the measured illumination levels is found to fall short of the specified levels, the Contractor shall have to provide additional lighting fixtures so as to achieve the specified levels of illumination at no additional cost to the Owner. While measuring the illumination levels due allowance shall be made on account of maintenance factor. The specified lux levels shall be suitably increased to cover maintenance factor of 0.6 for outdoor areas.

4. DISTRIBUTION PILLARS FOR NORMAL ILLUMINATION SYSTEM

4.1.	Construction	4.1.1. Distribution pillars of adequate dimensions shall be constructed from sheet steel having a thickness not less than 2 mm. 4.1.2. The pillars shall be totally enclosed weather-proof, dustproof, vermin-proof, having hinged doors with locking arrangement and shall be capable of being mounted in the substation. 4.1.3. The pillars suitable for cable entry at the bottom shall be designed for easy access of connections to terminals and inspection of equipment mounted therein. 4.1.4. The degree of protection of the board shall be IP55. 4.1.5. The enclosure shall be painted externally with Shade No., 692 of IS:5 and internally with brilliant white of semi-glossy finish of IS:5.
4.2.	Configuration	4.2.1. Each pillar shall accommodate the following: 4.2.2. One incoming, 4-pole (3 phase and neutral) isolating switch with MCB of appropriate current rating. 4.2.3. 3-phase and neutral bus bars of appropriate current rating. 4.2.4. Single-pole earth leakage circuit breakers of suitable current ratings on all outgoing circuits.

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		4.2.5. Neutral links for all outgoing circuits. 4.2.6. Cable lugs, compression type cable glands, name plates, circuit numbers, earthing lugs, etc. to make the pillar complete in all respects. 4.2.7. 20% spare outlets shall be provided for outgoing feeders. 4.2.8. Three (3) indicating lamps with fuses to indicate that supply is 'ON'.

5. LIGHTING DISTRIBUTION BOARDS

5.1.	Construction	5.1.1. Metal-clad enclosure with minimum 2 mm CRCA sheets for load-bearing members and 1.6 mm for non load-bearing members suitably reinforced with structural. 5.1.2. 3-phase, 4-wire bus bar system with high conductivity aluminium busbars mounting on FRP insulators having anti-tractive property with minimum 25 mm phase-to-phase and minimum 19 mm phase-to-earth clearances. The busbars shall be uniform throughout the length of the LDB and busbar joints shall be silver plated and covered with shrouds. 5.1.3. All cables shall enter from the bottom. 5.1.4. The degree of protection for the LDB shall be IP-54. 5.1.5. The enclosure shall be painted externally with Shade No., 692 of IS:5 and internally with brilliant white of semi-glossy finish of IS:5.
5.2.	Configuration	Each LDB shall accommodate the following: 5.2.1. One incoming, 4-pole (3 phase and neutral) isolating switch with MCB of appropriate current rating. 5.2.2. 3-phase and neutral bus bars of appropriate current rating. 5.2.3. 4 Pole outgoing MCBs of appropriate rating 5.2.4. Cable lugs, compression type cable glands, name plates, circuit numbers, earthing lugs, etc. to make the pillar complete in all respects. 5.2.5. 20% spare outlets shall be provided for outgoing feeders. 5.2.6. Three (3) Nos. indication lamps (Red, Yellow, Blue) shall be provided to indicate that the incoming supply is available. Similarly, 3 Nos. indication lamps shall be provided to indicate that the busbar is energised.
5.3.	Busbar	5.3.1. The busbars shall be suitable for short-time current rating of 40KA for 1 Sec. 5.3.2. The busbar temperature rise shall not exceed 35 Deg C over an ambient of 50 Deg C. 5.3.3. The LDBs shall be provided with a continuous busbar of 25 x 6 sq.mm (electrolytic copper) with suitable hardware for connection to the main grounding grid

6. MAIN EMERGENCY LIGHTING BOARD

6.1.	Construction	6.1.1. Metal-clad enclosure with minimum 2 mm CRCA sheets for load-bearing members and 1.6 mm for non load-bearing members suitably reinforced with structural. 6.1.2. All cables shall enter from the bottom. 6.1.3. The degree of protection for the LDB shall be IP-54. 6.1.4. The enclosure shall be painted externally with Shade No., 692 to IS:5 and internally with brilliant white of semi-glossy finish to IS:5.
6.2.	Configuration	6.2.1. Each Board shall accommodate the followings: 6.2.2. Automatic changeover contactor. 6.2.3. Voltage sensing relays. 6.2.4. Time delay relay. 6.2.5. Bus Bars. 6.2.6. Two pole MCBs of adequate ratings for incoming and outgoing feeders. 6.2.7. Test switch, push button type. 6.2.8. Indicating lamps, ac - Green, dc - Red. 6.2.9. Terminals for remote indication 6.2.10. Cable lugs, compression type cable glands, name-plates, circuit numbers, earthing lugs and remote indication wiring upto substation 415V a.c. control board, to make the board complete in all respects.
6.3.	Changeover facility	The main emergency lighting board shall have an automatic changeover switch to energise the dc lighting system in the event of AC power failure. It shall have voltage-sensing relays to perform the changeover automatically when AC voltage of any one phase falls below 60 percent of 240 volts and continues at that low level for more than 10 seconds. These shall changeover from DC to AC again when 70 percent of 240 volt is restored and this continues for 10 seconds.
6.4.	Emergency Lighting Pillar	Local Emergency Lighting Pillar shall be identical in details to Lighting Distribution Pillar specified in clause 4 except that it shall have two pole isolating switch fuse unit on the incoming side and only two busbars and shall be without neutral links.

7. LUMINAIRES

7.1.	Luminaires type	Luminaires for use in normal and emergency illumination systems in the substation shall be suitable for LED lamps. All the luminaires shall be supplied complete with all accessories and lamps. The LED lamps ratings shall be adequate to achieve the required Lux level and calculation for number of luminaires shall be in the bidder's scope. Minimum rating shall be a follows - 7.1.1. Outdoor – 90W minimum 7.1.2. Indoor – 36W minimum

7.2.	Flood lights	The flood light luminaires in the substation shall be fixed at suitable height on the substation structures/ building, so as to provide the specified average illumination in the substation area without causing any glare to the operational/ maintenance staff working in the substation. While fixing the luminaires it shall be ensured that the stipulated electrical clearances are not violated. The Contractor shall supply and install suitable type of non-mettalic street light poles or octagonal galvanished poles required for installing the fittings for illuminating the roads, fence boundary wall etc.
7.3.	Reliability	Substation lighting circuits shall be divided into two or three sections and provided with time switches of suitable ratings.
7.4.	Design features for Outdoor Luminaires	
7.5.	Fixture	7.5.1. The luminaries housing shall be either extruded or pressure die casted aluminium of minimum 1.6 mm thickness. Body must be Corrosion Resistant Powder Coated and UV resistant. 7.5.2. The entire housing shall be dust and waterproof having Ingress protection of housing as IP65 or above as per IEC 60529. 7.5.3. Luminaire should be covered with suitable Glass or diffuser with high Transitivity. All luminaires shall be supplied with either clear toughened glass or clear polycarbonate cover for better IP retention and higher life.
7.6.	LED	7.6.1. The luminous efficacy of LED luminaire shall be atleast 85 lumen/watt. 7.6.2. LED module efficacy shall not be less than 90 percent of the rated LED module Efficacy. 7.6.3. Color Rendering Index (CRI) shall be at least 70 7.6.4. Color Temperature shall be 5500-6500K 7.6.5. Uniformity Emin/Eavg> 0.4, Emin/Emax>0.33
7.7.	LED Driver	LED driver shall have following features: 7.7.1. LED driver shall be applicable for Power supply 240V AC±10%, at 50Hz+3% / -5%. 7.7.2. Output voltage of the driver shall be designed to meet the Power Requirements of the system. 7.7.3. Power factor of complete fitting shall be more than 0.90 at full load. 7.7.4. Total Harmonic Distortion (THD) shall be < 10 %
7.8.	General Requirements	7.8.1. The connecting wires used inside the Luminaire, shall be low smoke halogen free, fire retardant e-beam cable and fuse protection shall be provided in input side. 7.8.2. The lumen maintenance of all the LED fixtures shall not be less than 70% after 50,000 hours. 7.8.3. Built in protection features for Short circuit, Surges (at least upto 5kV), and overvoltage shall be provided.

		7.8.4. High /Low voltage cut-off shall be provided. 7.8.5. The whole luminaire shall be eco-friendly green technology based i.e. mercury free. 7.8.6. No UV and IR radiations shall be produced. 7.8.7. Access of driver for maintenance shall be provided at the top/side of the luminaire fixture. 7.8.8. All fasteners must be of stainless steel.

8. JUNCTION BOXES/WALL BOXES

8.1.	Size	100 mm x 100 mm junction boxes and wall boxes of standard size shall be provided.
8.2.	Construction	Wall boxes and junction boxes shall be made of FRP with a thickness of 2.0mm. Necessary conduit termination fittings such as bushings, locknuts etc. also be provided.

9. AUTOMATIC LIGHTING CONTROLLER

9.1.	Size	Contractor shall provide microprocessor based automatic lighting controller for controlling switching arrangement of indoor and outdoor lighting. The controller shall have provision of setting 52 week ON / OFF time as per astronomical clock or as per user requirement. All abnormal events shall be recorded in the controller. Secure / Genus or equivalent are approved makes.

10. SOCKETS & SWITCHES

10.1.	Indoor	All sockets and switches shall be modular and universal type suitable for 5/15A
10.2.	Outdoor	Two nos transformer oil filtration sockets shall be provided, one at each transformer bay. These sockets shall be three phase industrial type and rated for 100A.

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11. NAMEPLATE & MARKING

11.1.	Name plate details of LED housing	Followings shall be clearly engraved / embossed on the die cast housing of LED: Rated voltage or voltage range (marked 'V' or 'Volt'); 11.1.1. Rated current (marked A' or 'Ampere'); 11.1.2. Rated wattage (marked 'W' or 'Watts'); 11.1.3. Rated frequency (marked in 'Hz') 11.1.4. Rated lumen 11.1.5. Indian/International Standards to which it is manufactured 11.1.6. Month and year manufacture 11.1.7. Customer Name - BSES Yamuna / Rajdhani Power Ltd 11.1.8. Fitting serial number 11.1.9. PO no and date 11.1.10. Guarantee period
11.2.	Panel nameplate and marking details	
11.2.1.	Panel nameplate	Panel shall have a nameplate clearly indicating the following: 11.2.1.1. Panel Serial No.- 11.2.1.2. Customer Name - BSES Yamuna/Rajdhani Power Ltd 11.2.1.3. PO No. & date - 11.2.1.4. Panel Name - 11.2.1.5. Current rating - 11.2.1.6. Guarantee period -
11.2.2.	Feeder nameplate	Large and bold name plate carrying the feeder identification shall be provided on the top of each module.
11.2.3.	Danger plate	Panel shall have a danger plate of anodized Aluminium clearly indicating the danger logo and voltage details.
11.2.4.	Material	Anodized Aluminium 16SWG. Nameplates shall be satin silver in colour with black letters engraved on them. Stickers are not allowed.
11.2.5.	Fixing	All nameplates shall be riveted to the panels at all four corners. Bolting/screwing is not acceptable.

12. APPROVED MAKE OF COMPONENTS

12.1.	Relays	ABB/Jyoti/Omran
12.2.	HRC Fuse Links	GE/ Siemens/ L&T
12.3.	AC Contractors/ DC contactor	L&T/Siemens/Telemechanique/GE/ABB

12.4.	Terminals	Connectwell/Elmex/Wago/Phoenix
12.5.	Push buttons / Actuator	L&T/Siemens/Vaishno/Schneider
12.6.	MCB	Legrand/Hager/Schneider/ABB
12.7.	LED	NICHIA/ OSRAM/ CREE/ PHILIPS//EDISON
12.8.	Luminaire fittings	GE/Philips/Crompton/Bajaj
12.9.	Indicating lamps	Vaishno/Binay/Teknic/Siemens/Mimic/C&S

13. INSPECTION & TESTING

13.1.	Type test	All Equipment should be of type tested quality only, type test certificate to be submitted along with offer. If the manufacturer's lab is accredited by govt. / authorized body then it shall be acceptable for type testing.
13.2.	Acceptance & Routine tests	As per relevant Indian standard

14. DEVIATION

14.1.	Deviation	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed that the bidder complies fully with this specification. No deviation will be acceptable post order.

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