BSES Yamuna Power Limited

NOTICE INVITING TENDER (NIT)
FOR
SURVEY, DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, & COMMISSIONING OF NEW 66KV & 33KV CONTROL & RELAY PANELS ALONG WITH ALLIED EQUIPMENTS, ACCESSORIES, DISMANTLING OF EXISTING EQUIPMENTS AND WORKS ON TURNKEY BASIS AT SHASTRI PARK (EAST) GRID, DELHI

NIT NO: CMC/BY/22-23/RS/MD/27

Due Date for Submission: 18.07.2022, 15:00 HRS

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

BSES Yamuna Power Limited

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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 No.	Items	Estimate Cost Value In INR	EMD Value In INR
1	SURVEY, DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, & COMMISSIONING OF NEW 66KV & 33KV CONTROL & RELAY PANELS ALONG WITH ALLIED EQUIPMENTS, ACCESSORIES, DISMANTLING OF EXISTING EQUIPMENTS AND WORKS ON TURNKEY BASIS AT SHASTRI PARK (EAST) GRID, DELHI.	6.26 Crore	6.26 Lakh

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 66KV & 33KV CONTROL & RELAY PANELS ALONG WITH ALLIED EQUIPMENTS, ACCESSORIES, DISMANTLING OF EXISTING EQUIPMENTS AND WORKS ON TURNKEY BASIS AT SHASTRI PARK (EAST) GRID, DELHI., NIT NO: CMC/BY/22-23/RS/MD/27, DUE ON 18.07.2022, 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 **18.07.2022, 15:00 Hrs.** at the address given below.
Part A of the Bid shall be opened on **19.07.2022, 15:30 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
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:**

Sr N	Criteria	Documents to be submitted by bidder
1	The bidder should have own manufacturing facility in India for 33KV or higher voltage class Control & relay 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 Control & relay 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 15 nos 33KV or higher voltage class Control & relay panels per month.	Installed Capacity Certificate
4	The bidder should have successfully designed, supplied, installed & commissioned a minimum 50 Nos of 33KV or higher grade control & relay panels during the last 3 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 1 years satisfactory performance of projects of 33KV or higher voltage class Control & relay panels,executed during the last 3 years from at least two utilities/ SEB/ PSUs / reputed firm wherein the end user shall be Utility/SEB's/PSU's. In case bidder has previous association with BYPL/BRPL for similar product and service,the performance feedback from BYPL/BRPL shall only be considered irrespective of performance certificates issued by any third party organization.	Performance certificate
6	The Bidder must posses valid ISO 9001:2015 certification	Valid ISO 9001:2015 certificate

2.02 **Commercial Criteria:**

Sr N	Criteria	Documents to be submitted by bidder
1	Bidder should have Average Annual Sales Turnover of Rs 200 Crores or more during last three (3) Financial Years (i.e., FY 2018-19, 2019-20 & 2020-21).	Audited balance Sheet/Duly certified CA certificate with UDIN no.
2	The Bidder shall submit an undertaking that "No Litigation" is pending with BYPL or its Group/Associate Companies.	Self Undertaking
3	An undertaking that the bidder has not been blacklisted/debarred by any central/state government institution/Electricity utilities as on the date of bid submission	Self Undertaking
4	The bidder must have valid PAN No., GST Registration Number, in addition to other statutory compliance. The bidder must submit the copies of registrations and submit an undertaking that the bidder shall comply all the statuary compliance 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 authority 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 commencement of the work.	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.

BSES Yamuna Power Limited

3.01 BID SUBMISSION

Please mention our NIT Number: -"CMC/BY/22-23/RS/MD/27, DUE ON 18.07.2022, 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.

BSES Yamuna Power Limited

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.

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	13.07.2022, 17:00HRS
2	Last Date of queries, if any	01.07.2022, 17:00HRS
3	Pre-Bid meeting :- Pre-Bid Meeting will be done via Zoom Meeting - https://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	04.07.2022, 14:00HRS
4	Posting of consolidated replies to all Pre-Bid queries as received.	07.07.2022, 17:00HRS
4	Last Date of Receipt of Bid Documents	18.07.2022, 15:00HRS
5	Date & Time of Opening of PART A - Technical and Commercial Bid	19.07.2022, 15:30HRS

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.

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 supplier is found unsatisfactory during the delivery process, the award will be cancelled and BYPL reserves the right to award to other suppliers 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

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

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**

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

(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.

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.

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**

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

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

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

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

(a) Delivery Schedule

(b) Conformance to Qualifying Criteria

(c) Deviations from Bidding Documents

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

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

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

F. AWARD OF CONTRACT

24.0 CONTACTING THE PURCHASER

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

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

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

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

26.0 AWARD OF CONTRACT

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

other bidders in the tender, provided it is required for timely execution of project & provided he agrees to come to the lowest rate. Purchaser reserves the right to distribute the entire tender quantity at its own discretion without citing any reasons thereof.

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

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

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

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

29.0 **CONTRACT PERFORMANCE BANK GAURANTEE**

Within 15 days of the receipt of Notification of Award/ Letter of Intent/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.

30.0 **CORRUPT OR FRADULENT PRACTICES**

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

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

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

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

(b) Will reject a proposal for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question;

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

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

BSES Yamuna Power Limited

31.00 COMPLETION PERIOD

05 Months from the date of LOA/PO

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.

BSES Yamuna Power Limited

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) .....

BSES Yamuna Power Limited

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

BSES Yamuna Power Limited

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

BSES Yamuna Power Limited

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.**	Required	

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

BSES Yamuna Power Limited

VENDOR CODE OF CONDUCT

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

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

I. Labour and Human Rights

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

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

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

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

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

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

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

. Working Hours - Studies of good manufacturing practices clearly link worker strain to reduced productivity, increased turnover and increased injury and illness. Work weeks are not to exceed

maximum set by local law. Further, a work week should not be more than 60 hours per week, including overtime, except in emergency or unusual situations. Workers should be allowed at least one day off per seven-day week.

. Freedom of Association - Open communication and direct engagement between workers and management are the most effective ways to resolve workplace and compensation issues. Vendors are to respect the rights of workers to associate freely and to communicate openly with management regarding working conditions without fear of reprisal, intimidation or harassment. Workers' rights to join labour unions seek representation and or join worker's councils in accordance with local laws should be acknowledged.

II. Health and Safety

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

The health and safety standards are:

. Occupational Injury and Illness - Procedures and systems are to be in place to prevent, manage, track and report occupational injury and illness, including provisions to: a) encourage worker reporting; b) classify and record injury and illness cases; c) provide necessary medical treatment; d) investigate cases and implement corrective actions to eliminate their causes; and e) facilitate return of workers to work.

. Emergency Preparedness - Emergency situations and events are to be identified and assessed, and their impact minimized by implementing emergency plans and response procedures, including: emergency reporting, employee notification and evacuation procedures, worker training and drills, appropriate fire detection and suppression equipment, adequate exit facilities and recovery plans.

. Occupational Safety - Worker exposure to potential safety hazards (e.g., electrical and other energy sources, fire, vehicles, and fall hazards) are to be controlled through proper design engineering and administrative controls, preventative maintenance and safe work procedures (including lockout/ragout), and ongoing safety training. Where hazards cannot be adequately controlled by these means, workers are to be provided with appropriate, well-maintained, personal protective equipment. Workers shall not be disciplined for raising safety concerns.

. Machine Safeguarding - Production and other machinery is to be evaluated for safety hazards. Physical guards, interlocks and barriers are to be provided and properly maintained where machinery presents an injury hazard to workers.

. Industrial Hygiene - Worker exposure to chemical, biological and physical agents is to be identified, evaluated, and controlled. Engineering or administrative controls must be used to control overexposures. When hazards cannot be adequately controlled by such means, worker health is to be protected by appropriate personal protective equipment programs.

. Sanitation, Food, and Housing - Workers are to be provided with ready access to clean toilet, facilities potable water and sanitary food preparation, storage, and eating facilities. Worker dormitories provided by the Participant or a labour agent are to be maintained clean and safe, and provided by the Participant or a labour egress, hot water for bathing and showering, and adequate heat and ventilation and reasonable personal space along with reasonable entry and exit privileges.

. Physically Demanding Work - Worker exposure to the hazards of physically demanding tasks, including manual material handling and heavy or repetitive lifting, prolonged standing and highly repetitive or forceful assembly tasks is to be identified, evaluated and controlled.

III. Environmental

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

The environmental standards are:

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

IV. Ethics

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

V. Management System

Vendors shall adopt or establish a management system whose scope is related to the content of this Code. The management system shall be designed to ensure (a) compliance with applicable laws, regulations and customer requirements related to the Vendors' operations and products; (b)

conformance with this Code; and (c) identification and mitigation of operational risks related to this Code. It should also facilitate continual improvement.

The management system should contain the following elements:

. Company Commitment - Corporate social and environmental responsibility statements affirming Vendor's commitment to compliance and continual improvement.

. Management Accountability and Responsibility - Clearly identified company representative[s]responsible for ensuring implementation and periodic review of the status of the management systems.

. 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

BSES Yamuna Power Limited

GENERAL CONDITIONS OF CONTRACT (GCC-SUPPLY)

BSES Yamuna Power Limited

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.

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

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

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.

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. 70% prorata of supply value 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 receipted by BYPL Stores & Original certificate issued by BYPL confirming receipt of the subject material at Stores/Site and acceptance of the same as per the provisions of the contract.
f) Two (02) copies Packing List / Detailed Packing List
g) Approved Test certificates / Quality certificates, if applicable
h) Certificate of Origin, if applicable
i) Material Dispatch Clearance Certificate (MDCC)
j) Insurance Policy / Certificate, if applicable
k) Warranty / Guarantee Certificate, if applicable
l) Check list for bill submission.

B. 20% prorata of supply value shall be payable after installation/erection of material duly certified by BYPL Project-in- charge.

C. 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 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 :

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.

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.

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.

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

(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

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 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.

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) Under any other provisions of the Contract which expressly impose a greater liability,
(b) In cases of fraud, willful misconduct or illegal or unlawful acts, or
(c) 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.

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 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

BSES Yamuna Power Limited

GENERAL CONDITIONS OF CONTRACT
(GCC-ETC)

BSES Yamuna Power Limited

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.

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.

D. 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 31.00 - Completion period.

10. CLEANLINESS & PRECAUTIONS INSTRUCTIONS:

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

10.1 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.

10.2 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.
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.

10.3 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.

10.4 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.

11. COMMISSIONING & ACCEPTANCE TEST:

11.1 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.

11.2 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.

12. WORK COMPLETION CERTIFICATION, HANDING OVER:

12.1 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 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.

13. PENALTY AND LIQUIDATED DAMAGES:

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

13.2 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.

13.3 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.

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

14. SAFETY CODE:

14.1 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.

14.2 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.

14.3 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.

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

14.5 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.

15. STATUTORY OBLIGATIONS:

15.1 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 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.)

15.2 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}.

15.3 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.

16. WORKMAN COMPENSATION:

16.1 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.

16.2 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 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.

16.3 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.

17. 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.

18. THIRD PARTY INSURANCE:

18.1 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 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.

19. ENVIRONMENTAL, HEALTH & SAFETY PLAN:

19.1 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.

20. TEST CERTIFICATE & QUALITY ASSURANCE:

20.1 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.

21. SUB-CONTRACTING / SUBLETTING:

21.1 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.

21.2 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.

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

22. INDEMNITY:

22.1 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.

22.2 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.

23. EVENTS OF DEFAULTS:

23.1 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.

23.2 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.

24. RISK & COST:

24.1 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.

25. ARBITRATION:

25.1 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.

26. FORCE MAJEURE:

26.1 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

26.2 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.

26.3 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:

(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.

26.4 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.

26.5 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.

26.6 Terminations for certain events of force majeure:

26.7 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.

27. SECRECY CLAUSE:

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

27.2 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.

28. TERMINATION:

28.1 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.

29. QUALITY:

29.1 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.

29.1 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.

30. INSURANCE POLICY FOR LIFE COVER:

30.1 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.

30.2 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.

31. ACCEPTANCE:

31.1 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.

31.2 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.

31.3 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.

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.

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 31.00 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	Quantity	Supply Price Landed	ETC price Landed	Total Cost (C=A+B)	Total Cost (D=C*Q)
	(Q)	(A)	(B)		
SURVEY, DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, & COMMISSIONING OF NEW 66KV & 33KV CONTROL & RELAY PANELS ALONG WITH ALLIED EQUIPMENTS, ACCESSORIES, DISMANTLING OF EXISTING EQUIPMENTS AND WORKS ON TURNKEY BASIS AT SHASTRI PARK (EAST) GRID, DELHI	1 Lot				

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 (A) (Kindly refer detail SCOPE OF SUPPLY attached as Volume III for Indicative Description of Goods/BOM, BOQ)

ALL PRICES IN INR (Rs)

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	**66 kV & 33 kV Control and Relay Panel**							
1.1	66kV Line Feeder	Nos	4					
1.2	66kV Transformer	Nos	4					
1.3	66kV Bus coupler	Nos	1					
1.4	33kV Line Feeder	Nos	8					
1.5	33kV Transformer	Nos	2					
1.6	33kV Bus coupler	Nos	1					
2	Bay Marshalling Box	Nos	20					
3	ACDB	Nos	1					
4	End Termination Kit	Lot	1					
5	LT Power Cable	Lot	1					
6	Control Cables and Auxiliary Power Cables with proper ferruling and tagging along with glands and lugs	Lot	1					
7	Cable Tray including bends etc with 50% spare capacity in each	Lot	1					
8	Cable Support Structure along with Clamping Arrangement	Lot	1					
9	Fire Resistant Coating	Lot	1					
10	Earthing	Lot	1					
11	Angle Channel Arrangement	Lot	1					
12	Illumination and lighting system	Lot	1					
13	Exhaust and Ventilation system	Lot	1					
14	Fire Protection System	Lot	1					
15	Conduits	Lot	1					
16	Insulated Floor Coating	Lot	1					

BSES Yamuna Power Limited

17	SCADA Works	Lot	1					
18	Painting of Feeder names (SCADA code, Asset Code, etc)	Lot	1					
19	Licensed programming software	No	1					
20	Communication Cord	No	2					
21	Recommended & Mandatory Spares	Lot	1					
22	Accessories	Lot	1					
23	SLD of Grid	No	1					
24	Emergency Exit Floor Marking	Lot	1					
25	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 (B) (Kindly refer detail SCOPE OF WORK attached as Volume III for Indicative Description of Services/BOM, BOQ)

ALL PRICES IN INR (Rs)

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	**66 kV & 33 kV Control and Relay Panel**							
1.1	66kV Line Feeder	Nos	4					
1.2	66kV Transformer	Nos	4					
1.3	66kV Bus coupler	Nos	1					
1.4	33kV Line Feeder	Nos	8					
1.5	33kV Transformer	Nos	2					
1.6	33kV Bus coupler	Nos	1					
2	Bay Marshalling Box	Nos	20					
3	ACDB	Nos	1					
4	End Termination Kit	Lot	1					
5	LT Power Cable	Lot	1					
6	Control Cables and Auxiliary Power Cables with proper ferruling and tagging along with glands and lugs	Lot	1					
7	Cable Tray including bends etc with 50% spare capacity in each	Lot	1					
8	Cable Support Structure along with Clamping Arrangement	Lot	1					
9	Fire Resistant Coating	Lot	1					
10	Earthing	Lot	1					
11	Angle Channel Arrangement	Lot	1					
12	Illumination and lighting system	Lot	1					
13	Exhaust and Ventilation system	Lot	1					
14	Fire Protection System	Lot	1					
15	Conduits	Lot	1					
16	Insulated Floor Coating	Lot	1					
17	SCADA Works	Lot	1					
18	Painting of Feeder names (SCADA code, Asset Code, etc)	Lot	1					
19	Emergency Exit Floor Marking	Lot	1					
20	Shifting of Equipment	Lot	1					
21	Dismantling of Equipment	Lot	1					
22	Training on application, programming, testing and commissioning of Numerical Relays	Days	2					

BSES Yamuna Power Limited

23	Training on IEC 61850	Days	2					
24	**Civil Works**							
24.1	Digging and Refilling of Ground wherever required	Lot	1					
24.2	Foundation Works	No	1					
24.3	New Trench	Lot	1					
24.4	Motorized De-Watering system	Lot	1					
24.5	Finishing of Proposed CRP Room	Nos	1					
24.6	Levelling of Proposed CRP Room	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

VOLUME – III

TECHNICAL SPECIFICATIONS FOR SURVEY, DESIGN, ENGINEERING, SUPPLY, ERECTION, TESTING, & COMMISSIONING OF NEW 66KV & 33KV CONTROL & RELAY PANELS ALONG WITH ALLIED EQUIPMENTS, ACCESSORIES, DISMANTLING OF EXISTING EQUIPMENTS AND WORKS ON TURNKEY BASIS AT SHASTRI PARK (EAST) GRID, DELHI

SCOPE OF TURNKEY EXECUTION

FOR

REPLACEMENT OF 66 kV & 33 kV CONTROL AND RELAY PANELS

AT

SHASTRI PARK EAST GRID SUBSTATION

Revision			0
Date			07.06.2022
Prepared by	Abhishek Harsh	**CES**	Abhishek Harsh 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 of Shashtri Park East Grid Substation.

b. This document shall be read in conjunction with all technical documents enclosed in tender. In event of any contradiction between tender documents, the most stringent one shall govern.

2 SITE DETAILS

a. Shastri Park East Grid Substation is situated near Jag Pravesh Chandra Hospital Delhi 110053

b. Latitude and Longitude of the same is 28°40'37.5"N 77°15'30.0"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.

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

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

3.1.3 SYSTEM PARAMETERS

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

3.2 SCOPE OF SUPPLY

S. No	Items	UOM	Qty	Remarks
3.2.1	66 kV & 33 kV Control and Relay Panel			
3.2.1.1	66kV Line Feeder	Nos	4	
3.2.1.2	66kV Transformer	Nos	4	
3.2.1.3	66kV Bus coupler	Nos	1	
3.2.1.4	33kV Line Feeder	Nos	8	
3.2.1.5	33kV Transformer	Nos	2	Note that Transformer Differential Relay (Relay-1) is not required in these CRPs
3.2.1.6	33kV Bus coupler	Nos	1	
3.2.2	Bay Marshalling Box	Nos	20	
3.2.3	ACDB	Nos	1	Type -1 as per specification
3.2.4	End Termination Kit	Lot	1	a) For items specified in “Scope of Supply” and for Items to be Shifted b) It includes End termination

				kit for Station Transformer and ACDB for cable connection
3.2.5	LT Power Cable	Lot	1	For items specified in "Scope of Supply" and for Items to be Shifted
3.2.6	Control Cables and Auxiliary Power Cables with proper ferruling and tagging along with glands and lugs	Lot	1	c) Cabling shall be considered from C&R panel to Transformer Marshalling Box & Bay Marshalling Box d) Bay Marshalling Box to CT, PT, CB, Isolator, Earth switch etc. e) For items specified in "Scope of Supply" and for Items to be Shifted
3.2.7	Cable Tray including bends etc with 50% spare capacity in each	Lot	1	a) For items specified in "Scope of Supply" and for Items to be Shifted b) 50% spare capacity in each is tray is required
3.2.8	Cable Support Structure along with Clamping Arrangement	Lot	1	For items specified in "Scope of Supply" and for Items to be Shifted
3.2.9	Fire Resistant Coating	Lot	1	a) On all cable specified in "Scope of Supply" and for Items to be Shifted b) Fire rating-2 hours
3.2.10	Earthing	Lot	1	a) Earthing for Items specified in "Scope of Supply" and for items to be shifted with 50x6 GI flat b) Two earthing per equipment shall be considered c) Connection of GI Flat with existing earth mesh shall be in vendors scope
3.2.11	Angle Channel Arrangement	Lot	1	For items specified in "Scope of Supply" and for Items to be Shifted
3.2.12	Illumination and lighting system	Lot	1	For items specified in "Scope of Supply" and for Items to be Shifted
3.2.13	Exhaust and Ventilation system	Lot	1	For items specified in "Scope of Supply" and for Items to be Shifted
3.2.14	Fire Protection System	Lot	1	For items specified in "Scope of Supply" and for Items to be Shifted

3.2.15	Conduits	Lot	1	For items specified in “Scope of Supply” and for Items to be Shifted
3.2.16	Insulated Floor Coating	Lot	1	For items specified in “Scope of Supply” and for Items to be Shifted
3.2.17	SCADA Works	Lot	1	As per Specification
3.2.18	Painting of Feeder names (SCADA code, Asset Code, etc)	Lot	1	As per Engineer Incharge Guidance
3.2.19	Licensed programming software	No	1	
3.2.20	Communication Cord	No	2	
3.2.21	Recommended & Mandatory Spares	Lot	1	For Items specified in "Scope of Supply"
3.2.22	Accessories	Lot	1	For Items specified in "Scope of Supply"
3.2.23	SLD of Grid	No	1	Covered in Acrylic Sheet
3.2.24	Emergency Exit Floor Marking	Lot	1	For items specified in “Scope of Supply” and for Items to be Shifted
3.2.25	Civil	Lot	1	a) All Material Required for civil works b) Kindly refer "Scope of Work"

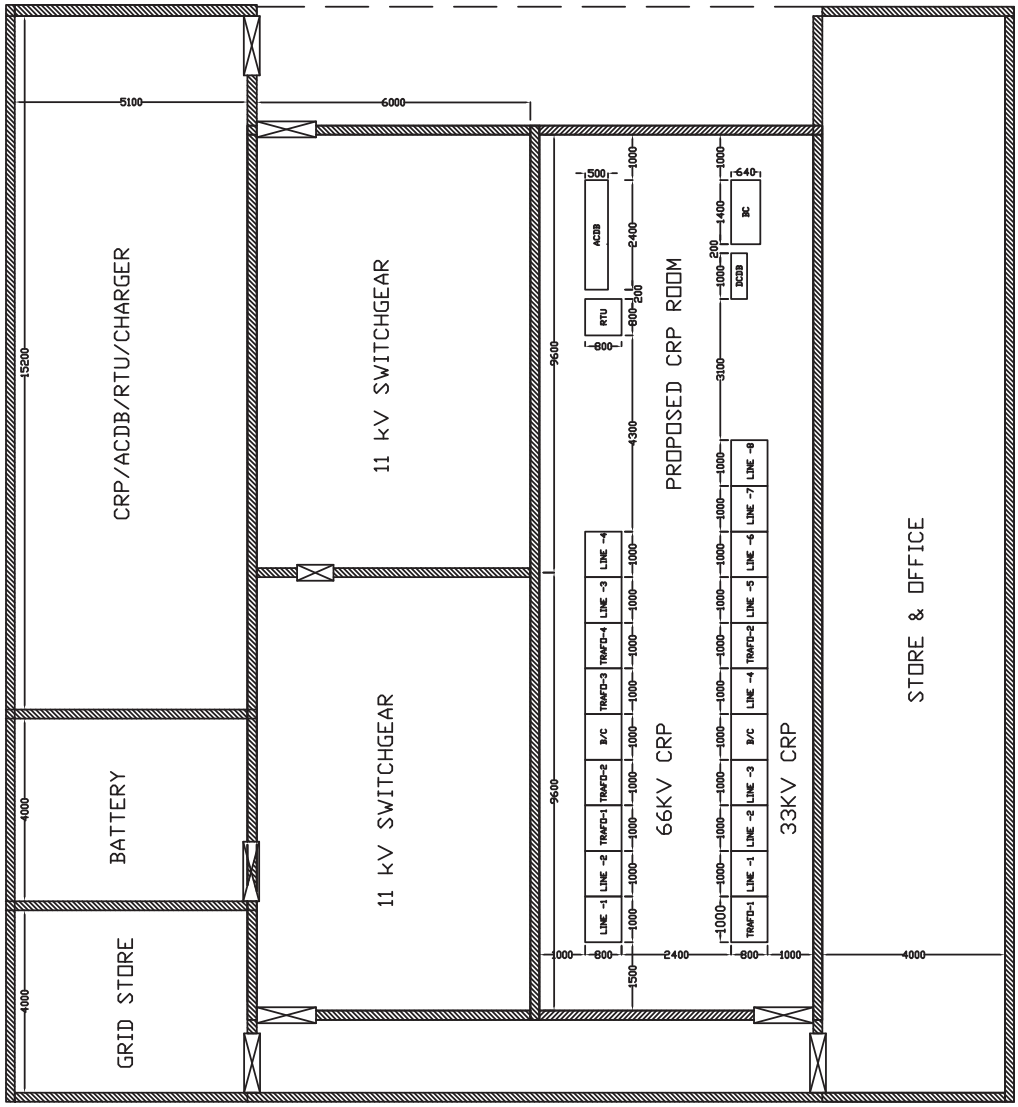
3.3 SCOPE OF WORK

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

S. No	Items	Unit	Qty	Remarks
3.3.1	Erection, Testing and Commissioning of all items specified in “Scope of Supply”	Lot	1	
3.3.2	Shifting of Equipment	Lot	1	DCDB, Battery Charger, IT Panel and with its associated items
3.3.3	Dismantling of Equipment	Lot	1	Existing Bay Marshalling Box, RTU and CRPs with its associated items
3.3.4	Training on application, programming, testing and commissioning of Numerical Relays	Days	2	One-day classroom training at BYPL Training Centre and one-day onsite training. Training shall be provided by Domain experts only
3.3.5	Training on IEC 61850	Days	2	Classroom Training
3.3.6	Civil Works			Kindly refer “Technical Specification for Civil Works” for relevant Civil Works
3.3.6.1	Design and Engineering	Lot	1	
3.3.6.2	Digging and Refilling of Ground wherever required	Lot	1	For items specified in “Scope of Supply” and for Items to be Shifted

3.3.6.3	Foundation Works	No	1	For items specified in "Scope of Supply" and for Items to be Shifted
3.3.6.4	Fire protection system	Lot	1	For items specified in "Scope of Supply" and for Items to be Shifted
3.3.6.5	New Trench	Lot	1	a) For items specified in "Scope of Supply" and for Items to be Shifted b) Cable trench shall be of RCC type c) It Includes Trench Cover d) Box Culvert (For 100 Ton Load) shall be provided where ever required for trench crossing through carriage way e) 50% spare capacity in each trench for future use
3.3.6.6	Motorized De-Watering system	Lot	1	For Trenches
3.3.6.7	Finishing of Proposed CRP Room	Nos	1	
3.3.6.8	Levelling of Proposed CRP Room	Nos	1	

3.4 REFERENCE LAYOUT



DRAWN	R.K
CHECKED	S/G
APPD.	G.S
DATE	06.06.22
SCALE	NTS

TITLE:–

SHASTRI PARK EAST
BUILDING GRID LAYOUT

BSES Yamuna Power Limited

3.5 SCOPE DEMARCATION

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

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3.5.18	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.
3.5.19	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
3.5.20	Temporary store at work premises	✘	✓	
3.5.21	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
3.5.22	Any damages done to the existing system, shall be repaired/ rectified/ replaced	✘	✓	
3.5.23	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.
3.5.24	External Agency Clearance	✘	✓	Statutory fee shall be borne by BYPL
3.5.25	Various compliances pertaining to Job	✘	✓	IE rules, CEA Regulation 2010

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3.6 DOCUMENTATION

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

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

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

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

4 APPROVED MAKE LIST

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

S. No	Equipment	MAKE
4.1.1	CRPs	ABB/Siemens/Schneider/GE
4.1.2	Control cable	Universal/KEI/GEMSCAB/Polycab/ Cords Cable
4.1.3	Numerical relays	Siemens (Siprotec series) and Schneider / Alstom (Micom Series)
4.1.4	Ethernet Switch	Ruggedcom, Hirschman
4.1.5	Fire retardant coating for cables	3M/Demech/Stanvac
4.1.6	Floor coating	3M/Demech/Stanvac
4.1.7	Earth Electrodes	JMV/Pragati
4.1.8	Earth Enhancing Material	JMV/Pragati/Marconite

BSES

Technical Specification

Of

66/33 kV Control and Relay Panel

Specification no – BSES-TS-86-CRP-R0

Rev:		0
Date:		03 Jun 2022
Prepared by	Abhishek Harsh	
	Alok Mandal	
Reviewed by	Srinivas Gopu	
	Abhinav Srivastava	
Approved by	Gaurav Sharma	
	Gopal Nariya	

Contents

1.0 SCOPE

- This specification covers design, manufacture, testing at manufacturer's works, packing and delivery of control and relay panel (CRP) for 66kV and 33kV substations.
- The control and relay panel shall be complete with all components and accessories, which are necessary or usual for their efficient performance and trouble free operation under the various operating and atmospheric conditions. Such parts that may have not been specifically included, but otherwise form part of the CRP as per standard trade and/or professional practice and/or are necessary for proper operation of control and relay panel, will be deemed to be included in this specification.
- Scope also Includes-Licensed programming software and communication cord for offered numerical relays, one set of special tools and tackles (if any) required for maintenance of CRP and its components, Spares as per Annexure C, All relevant drawings, data and instruction manuals.

2.0 CODES AND STANDARDS

Control and Relay panel should be designed and manufactured in accordance with the following standards.

2.1	IS-1248, Part 1- 1993	Direct acting indicating analogue electrical measuring instruments and their accessories.
2.2	IS-3231, Part 1- 1986 Part 2 &3 -1987	Electrical relays for power system protection
2.3	IS-9000 Part 1 -1988	Basic environmental testing procedures for electronics & electrical items
2.4	IS-13703 1993	Low voltage fuses for Voltages not exceeding 1000V AC or 1500 V DC
2.5	IS-13947 Part 1 - 1993	Low voltage switchgear & control gear
2.6	IEC-60255 - 1989	Specification for electrical relays
2.7	IEC 60688 1997	Electrical measuring transducers

3.0 PANEL CONSTRUCTION

3.1	Panel Type	Simplex panels with Width - 1000mm/1250 mm and Depth – 800 to 1000mm. Equipment shall be mounted on the front of the panel and doors for wiring access shall be at the back of panels.

3.2	Enclosure type	Completely metal enclosed and dust, moisture and vermin proof. Degree of protection not less than IP4X in accordance with IS 13947
3.3	Enclosure material	Pre-galvanized, cold-rolled sheet steel of thickness not less than 2.0 mm. Stiffeners shall be provided wherever necessary.
3.4	Doors	Double leaf doors shall be provided at the rear. Doors shall have handles with built-in locking facility. Locks of the door shall be lever type.
3.5	Gland Plate	At least two separate gland plates of removable type with gasket shall be provided for each panel. They shall be of sheet steel of thickness not less than 3.0 mm.
3.6	Cable Entry	Shall be from the bottom
3.7	Cable clamping	Cable glands shall not be used to support control cables. Vendor must provide clamping arrangement of control cable.
3.8	Gaskets	All doors, removable covers and panels shall be Gasketed all around with neoprene gaskets.
3.9	Ventilating louvers	Ventilating louvers, if required, shall have screens and filters. The screens shall be made of either brass or GI wires mesh.
3.10	Foundation	The panels shall be fixed on the embedded foundation channels with intervening layers anti vibration strips made of shock absorbing materials.
3.11	Base Frame	Base frames shall be supplied along with panels. 100mm channel painted black.
3.12	Mounting	Equipment on front of panel shall be flush mounted. No equipment shall be mounted on the doors.
3.13	Working level	The center lines of switches, push buttons and indicating lamps shall not be less than 750mm and higher than 1600mm from panel base. Height of relays, meters and recorders shall not be less than 450 mm from the bottom of the panel.
3.14	Appearance	The center lines of switches, push buttons and indicating lamps shall be matched to give a neat and uniform appearance. Likewise the top lines of all meters, relays and recorders etc, shall be matched.
3.15	Make	To be provided by Vendor

4.0 WIRING

4.1	Internal wiring	1100V grade, FRLS type, single core, stranded copper conductor wires with PVC insulation.
4.2	Size	2.5 sqmm for CT circuits, 2.5 sqmm for PT and control circuits.
4.3	Color Code	
4.3.1	CT & PT	R Ph – Red Y Ph – Yellow B Ph – Blue Neutral – Black
4.3.2	Others	DC– grey, AC-black, Earth – green
4.4	Ferrules	Ferrules marked to correspond with panel wiring diagram shall be fitted at both ends of each wire. Ferrules shall fit tightly on the wire. Wires directly connected to trip circuit shall be distinguished by the addition of red colored unlettered ferrule.
4.5	Termination	Fork type, pin type and ring type (as applicable) tinned copper lugs to be used. Only ring type lugs should be used in CT circuits. Insulated sleeves shall be provided at all the wire terminations.
4.6	Wiring Enclosure	Plastic channels to be used as enclosures. PVC sleeves to be used for interpanel wiring.
4.7	Spare Contacts	Spare contacts of relays and contactors etc. should be wired up to the terminal block.
4.8	Inter-panel wiring	When panels are arranged to be located adjacent to each other inter panel wiring of common bus wires between the panels should be supplied with one end terminated and the other end bunched and coiled. Inter panel wiring shall be clearly indicated in the wiring tables.
4.9	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.

5.0 TERMINAL BLOCKS

5.1	Rating and Type	1100 V grade, molded piece, stud type screw driver operated terminals complete with insulated barriers, washers, nuts and lock nuts.
5.2	Suitability	Unless otherwise specified, terminal blocks shall be suitable for connecting the following conductors of cable on each side- a. All circuits including current / voltage transformer circuits: 6mm^2 flexible copper. b. AC / DC power supply circuits: one no of 10 mm^2 Al./ 6 mm^2 flexible Cu.
5.3	Marking and covers	White fibre markings strip with clear plastic, slip-on / clip-on terminal covers to be provided.
5.4	Disconnecting Facility	To be provided in CT and PT terminals
5.5	Shorting & Earthing Facility	To be provided in CT Terminals
5.6	Spare Terminals	20% in each TB row
5.7	Segregation	TBs shall be segregated by application i.e separate terminal blocks shall be provided for each application as follows (a) CT (b) PT (c) Circuit Breaker (d) Bus Isolator (e) Line Isolator-1 (f) Line Isolator-2 (g) Earth Switch-1 (h) Earth Switch-2 (i) Interpanel Bus wiring etc.
5.8	Vertical clearance with gland plate	Minimum 250mm
5.9	Clearance between two rows of TBs	Minimum 150mm
5.10	Test Terminal Blocks	Screw driver operated stud type for metering circuits.
5.11	Arrangement	Arrangement of the terminal block assemblies and the wiring channel within the enclosure shall be such that a row of terminal block runs in parallel and close proximity to each side of the wiring duct. The side of the terminal block opposite the wiring duct shall be reserved for the external cable connection.

5.12	Categorization	For ease of external connections, terminal blocks shall be categorized based on their usage i.e all terminals for wiring of particular equipment like circuit breaker should form one terminal block.

6.0 PAINT

6.1	Paint Type	Powder coated. Pure Polyester base grade-A, structure finish.
6.2	Paint Shade	RAL7032 'Siemens Grey'
6.3	Paint Thickness	Minimum 50 microns

7.0 MIMIC DIAGRAM

7.1	System Representation	Colored mimic diagram and symbols showing the exact representation of the system shall be provided in the front of control panels
7.2	Material	Mimic diagram shall be made preferably of painted aluminum or plastic (approved material), which shall be screwed on to the panel and can be easily cleaned. Painted overlaid mimic is also acceptable. The mimic bus shall be 2-3 mm thick. The width of the mimic bus shall be 12mm for bus bars and 10 mm for other connections.
7.3	Mimic Indications	LED indications are to be used for breaker and isolator position and semaphore indicators shall be used for earth switch position.

8.0 NAMEPLATES AND MARKINGS

8.1	Nameplates	To be provided as per the following description
8.1.1	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.
8.1.2	Feeder Nameplates	(a) Large and bold name plate carrying the feeder identification numbers shall be provided for circuit / feeder designation on the top of each panel on front as well as rear side. (b) Rear bottom of each panel shall have a nameplate

		clearly indicating the following: (i) Customer Name (ii) BSES, PO No. & date (iii) Drawing Reference No (iv) Year of Manufacture (v) Control Voltage (vi) Customer care No
8.1.3	Material	Non-rusting metal or 3 ply lamicoid. Nameplates shall be black with white engraving lettering. Stickers are not allowed.
8.1.4	Fixing	All nameplates/rating plates shall be riveted to the panels at all four corners. Bolting/screwing is not acceptable.
8.2	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.

9.0 EARTHING

9.1	Panel Earthing	All panels shall be equipped with an earth bus securely fixed.
9.2	Location of earthing earthing bus	Earthing bus shall be at rear side of CRP(Door Side)
9.3	Material	The material and the sizes of the bus bar shall be 25 x 6 mm copper flat unless specified otherwise.
9.4	Earth Bus joints	All bolted joints in the bus should be effected by connection of two bolts.
9.5	Hinged Doors	Earthed through flexible copper braid.
9.6	Instrument and Relay Earthing	All metallic cases of relays, instruments and other panel mounted equipment including gland plate, shall be connected to the earth bus by copper wires of size not less than 2.5 mm^2. The color code of earthing wires shall be green.
9.7	CT and PT circuit earthing	PT and CT secondary neutral shall be earthed at one place only at the terminal blocks through links.

10.0 INSTRUMENTS

10.1	Mounting	Flush mounted

10.2	Voltmeter	Digital type with programmable ratio
10.2.1	Size	96x96 mm
10.2.2	Panels where to be provided	Incomer and Buscoupler
10.2.3	Voltmeter selector switch	Required
10.2.4	Accuracy Class	1.0
10.2.5	Auxiliary Supply	48 – 240VDC and AC i.e universal type.
10.2.6	Make	To be Provided by Vendor
10.2.7	Type/Model	To be Provided by Vendor
10.2.8	VA Burden	To be Provided by Vendor
10.3	Multifunction Meter	Digital type with programmable ratio
10.3.1	Model	Rish Delta Energy,
10.3.2	Make	Rishabh
10.3.3	SCADA Interfacing	RS485 rear port suitable for integration on Modbus Protocol
10.3.4	Size	96x96 mm
10.3.5	Panels where to be provided	All panels
10.3.6	Accuracy Class	1.0
10.3.7	Auxiliary Supply	48 – 240VDC and AC i.e universal type.
10.4	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 shall be 350 mm (H)x200 mm (W)

11.0 RELAYS

11.1	General features of Protection Relays	
11.1.1	Technology and Functionality	Numerical, microprocessor based with provision for multifunction protection, control, metering and monitoring
11.1.2	Mounting	Flush Mounting, IP5X
11.1.3	Architecture	Hardware and software architecture shall be modular and dis-connectable to adapt the protection and control unit to the required level of complexity as per the application.
11.1.4	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.
11.1.5	SCADA Interface port	(a) RS485 for IEC 103 communication. (b) LC Type Dual fibre optic port for interfacing with SCADA on IEC 61850 with PRP compatibility. Through this port relays shall be connected to Ethernet switches.
11.1.6	Communication Protocol	IEC103(Data Type 9) and Dual fibre optic port for interfacing with SCADA on IEC 61850 with PRP compatibility. Through these ports relays shall be connected to switches. Communication protocol shall be selectable at site.
11.1.7	Processing Indications	SCADA functions in monitoring direction 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.
11.1.8	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.
11.1.9	PC Interface port	Front port (preferably serial) for configuration/data download using PC.
11.1.10	GOOSE messaging	Relays shall communicate all status signals, commands and events on GOOSE messaging. Interlocks if any shall also be on GOOSE Messaging and wiring for that shall be in vendor’s scope.
11.1.11	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.
11.1.12	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 minimum of two setting groups.
11.1.13	Event and Fault records	(c) 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. (d) Relay shall store records for last 100 events (minimum) (e) Relay shall store records for last 10 faults (minimum). (f) It should be possible to download records locally to PC and to remote SCADA.
11.1.14	Measurement	Relays 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 SCADA Integration Relays shall communicate all measured and monitored parameters like current, voltage, power, event record, fault record, DIs , DOs etc to SCADA
11.1.15	Self-diagnosis	Relay shall be able to detect internal failures and same shall be transmitted to SCADA as a soft signal. A watchdog relay with changeover contact shall provide information about the failure for annunciation.
11.1.16	Time synchronization	All relays shall be capable of being synchronized with the system clock through SCADA, PC and GPS.
11.1.17	Operation Indicators	(a) LEDs with push button for resetting. (b) Resetting of LEDs shall be possible from SCADA
11.1.18	Test Facility	Inbuilt
11.1.19	Coating	Conformal Type
11.2	Protection Relay Requirement for Line CRP (66kV/33kV)	
11.2.1	Relay 1	Combined Line differential (Dual channel, ST Port Compatible for Single Mode Fibre having wavelength 1310 nm) and distance protection
		Power Swing Blocking
		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.
11.2.2	Relay 2	Bay Control unit having MIMIC with 3-phase Directional Overcurrent and Earth fault protection with IDMT, Definite time and instantaneous characteristics.
		Under and Over voltage
		Sync check function
		Trip Circuit Supervision- 1&2
		Reverse Blocking Function
		Under Frequency, Over Frequency and Rate of change of frequency
		PT supervision
		Circuit Breaker failure protection (CBFP)
11.2.3	User Configurable DIs and DOs	(a) Relay-1 should have DIs and DOs as per scheme requirement. Same shall be finalized during detailed engineering. 2 DIs and 2 DO shall be spare for future use. (b) Relay-2 should have minimum of 32 DIs and 16 DOs Exclusively for SCADA interfacing. DIs and DOs for tripping and interlocking shall be additional as per scheme

		requirement. If DIs and DOs for tripping and interlocking are integrated with DIs and DOs meant for SCADA (may be done to optimize DI/DO configuration), atleast 4 DIs and 4 DOs should be available as spare in each panel for future use.
11.2.4	Note	Combining functions of Relay-1 and Relay-2 in single relay is not acceptable.
11.2.5	SLD	Refer annexure D1 and D5 for SLD of 66kV and 33kV line bays respectively
11.3	Protection Relay Requirement for Transformer CRP (66kV/33kV)	
11.3.1	Relay-1	Biased Differential Protection
		High Impedance REF protection
		Software based ratio and vector correction feature (without ICT)
		H2 and H5 harmonic restraint
11.3.2	Relay-2	Bay Control unit having MIMIC with 3-phase Directional Overcurrent and Earth fault protection with IDMT, Definite time and instantaneous characteristics.
		Under and Over voltage
		Sync check function
		Trip Circuit Supervision- 1&2
		Reverse Blocking Function
		Under Frequency, Over Frequency and Rate of change of frequency
		PT supervision
		Circuit Breaker failure protection (CBFP)
11.3.3	User Configurable DIs and DOs	(a) Relay-1 should have DIs and DOs as per scheme requirement. Same shall be finalized during detailed engineering. 2 DIs and 2 DO shall be spare for future use. (b) Relay-2 should have minimum of 32 DIs and 16 DOs Exclusively for SCADA interfacing. DIs and DOs for tripping and interlocking shall be additional as per scheme requirement. If DIs and DOs for tripping and interlocking are integrated with DIs and DOs meant for SCADA (may be done to optimize DI/DO configuration), atleast 4 DIs and 4 DOs should be available as spare in each panel for future use.
11.3.4	Note	Combining the functions of Relay-1 and Relay-2 in a single relay is not acceptable.
11.3.5	SLD	Refer annexure D2 and D6 for SLD of 66kV and 33kV transformer bays respectively

11.4	Protection Relay Requirement for Bus Coupler CRP (66kV/33kV)	
11.4.1	Relay-1	Bay Control unit having MIMIC with 3-phase Directional Overcurrent and Earth fault protection with IDMT, Definite time and instantaneous characteristics.
		Under and Over voltage
		Sync check function
		Trip Circuit Supervision- 1&2
		Reverse Blocking Function
		Under Frequency, Over Frequency and Rate of change of frequency
		PT supervision for Bus PT-1 and Bus PT-2
		Circuit Breaker failure protection (CBFP)
11.4.2	Relay-2	PT supervision (fuse failure monitoring) for Bus PT-2 if not provided as part of relay-1
		Reverse Blocking Function
11.4.3	User Configurable DIs and DOs	(a) Relay-1 should have DIs and DOs as per scheme requirement. Same shall be finalized during detailed engineering. 2 DIs and 2 DO shall be spare for future use. (b) Relay-2 should have minimum of 32 DIs and 16 DOs Exclusively for SCADA interfacing. DIs and DOs for tripping and interlocking shall be additional as per scheme requirement. If DIs and DOs for tripping and interlocking are integrated with DIs and DOs meant for SCADA (may be done to optimize DI/DO configuration), atleast 4 DIs and 4 DOs should be available as spare in each panel for future use.
11.4.4	SLD	Refer annexure D3 and D7 for SLD of 66kV and 33kV bus coupler bays respectively
11.5	Protection Relay Requirement for Capacitor CRP (66kV/33kV)	
11.5.1	Relay-1	Neutral unbalance relay (current based)
		Timer for ON time delay (600 seconds minimum)
11.5.2	Relay-2	Bay Control unit having MIMIC with 3-phase Directional Overcurrent and Earth fault protection with IDMT, Definite time and instantaneous characteristics.
		Overvoltage and Under voltage protection
		Sync check function
		Trip Circuit Supervision- 1&2

		Reverse Blocking Function
		Under Frequency, Over Frequency and Rate of change of frequency
		PT supervision
		Circuit Breaker failure protection (CBFP)
11.5.3	User Configurable DIs and DOs	(a) Relay-1 should have DIs and DOs as per scheme requirement. Same shall be finalized during detailed engineering. 2 DIs and 2 DO shall be spare for future use. (b) Relay-2 should have minimum of 32 DIs and 16 DOs Exclusively for SCADA interfacing. DIs and DOs for tripping and interlocking shall be additional as per scheme requirement. If DIs and DOs for tripping and interlocking are integrated with DIs and DOs meant for SCADA (may be done to optimize DI/DO configuration), atleast 4 DIs and 4 DOs should be available as spare in each panel for future use.
11.5.4	Note	Combining the functions of Relay-1 and Relay-2 in a single relay is not acceptable
11.5.5	SLD	Refer annexure D4 and D8 for SLD of 66kV and 33kV capacitor bays respectively
11.6	SCADA Interfacing of Protection Relays	
11.6.1	Configuration and wiring of DIs of protection relays for routing status signals to SCADA	DI-1 – CB Open DI-2 – CB Close DI-3 – Earth switch 1 close DI-4 – Earth switch 2 close DI-5 – Line Isolator Open (For Bus Coupler Panel - Earth switch 3 close) DI-6 – Line Isolator Close (For Bus coupler panel - Earth switch 4 close) DI-7 – Bus 1 Isolator Open DI-8 – Bus 1 Isolator Close DI-9 – Bus 2 Isolator Open DI-10 – Bus 2 Isolator Close DI-11 – TC Healthy DI-12 – CB Spring Charged DI-13 – SF6 Low/ SF6 Lockout DI-14 – Local/Remote switch in Remote DI-15 – CB Autotrip DI-16 – Protection/Trip relay faulty DI-17 – DC fail/DC MCB trip from adjacent panel (DC -1/2 fail for bus coupler panel) DI-18 – PT MCB trip (wherever relevant) Sequence of DIs should be strictly as mentioned above. Change in sequence of DIs will not be acceptable.
11.6.2	Configuration and	DO-1 – CB Open

	wiring of DOs of protection relays for executing SCADA commands through SCADA interface port (refer clause 12.1.5).	DO-2 – CB Close DO-3 – Line Isolator Open DO-4 – Line Isolator Close DO-5 – Bus 1 Isolator Open DO-6 – Bus 1 Isolator Close DO-7 – Bus 2 Isolator Open DO-8 – Bus 2 Isolator Close Sequence of DOs should be strictly as mentioned above. Change in sequence of DOs will not be acceptable.
11.6.3	Looping	All relays should be looped to form a common bus for interfacing with SCADA.
11.7	Transformer Monitoring Cum AVR Relay	
11.7.1	Functions	As per annexure –A
11.7.2	Requirement	To be provided in Transformer CRP (Take off price to be mentioned in price bid)
11.8	General Features of Auxiliary Relays	
11.8.1	Type	Static or electromechanical.
11.8.2	Reset Characteristic	Self reset contacts except for lockout relays.
11.8.3	Operation Indicators	(a) Hand reset operation indicators or LEDs with pushbutton for resetting. (b) Resetting of LEDs shall be possible from SCADA
11.8.4	Lockout relay	Manual and Electrical reset type
11.8.5	Operational Data	Bidder shall provide the reference list of the type of relays offered
11.8.6	Spare Contacts	Minimum 1NO and 1NC. To be wired upto the terminal block.
11.9	Auxiliary relays – Panel wise requirement	
11.9.1	Lockout relay	To be provided in all panels
11.9.2	DC fail relay	
11.9.3	AC fail relay	
11.9.4	Trip circuit supervision relay	To be provided in all panels for supervision of two trip coils.
11.9.5	Bistable Relays	To be provided in all panels for multiplication of auxiliary contact of breakers, isolators and earth switches. Multiplied contacts to be used for interlocks, indications and numerical relay input. 2NO + 2NC contacts shall be spare after multiplication in each case.
11.9.6	PT selection relays	To be provided in all panels as per scheme requirement.
11.9.7	Contact Multiplication relay	a. To be provided in all panels b. SCADA Close and Open Command shall be wired

		up through CMR to Closing and Tripping circuit
11.9.8	Transformer Trouble Relays	Auxiliary relays with indicating flags (contactors will not be accepted) should be provided in transformer panel 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) OLTC PRV Trip (h) Buchholz Alarm (i) Low oil level alarm (j) OTI Alarm (k) WTI Alarm.
11.9.9	Transformer Trouble Relay Contact Multiplication	(a) Contact multiplication of Transformer trouble relays shall be provided with 2 NO and 2 NC contact as spare. (b) 1 NO contact of Buchholz, Differential, OSR, PRV, SPR, REF contact multiplication relay for NIFPS (Nitrogen Injection fire protection system) shall be provided.
11.9.10	SF6 low and SF6 lockout relay	To be provided in all 66kV control and relay panels
11.9.11	DC selection scheme	Fed by two DC incoming sources in Bus coupler panel with auto changeover facility
11.10	General Requirements for all relays/contactors	
11.10.1	Auxiliary supply	(a) 48-250 VDC. All relays/contactors shall be suitable for continuous operation at 15% overvoltage and 15% under voltage. (b) No external resistor shall be provided in relays /contactor to achieve desired voltage.
11.10.2	Spare contacts	Shall be wired upto the terminal block
11.10.3	Signal Integration	All signal integration shall only be through NO Contact

12.0 SYNCH CHECK PHILOSPHY

12.1	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.
12.2	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.
12.3	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.
12.4	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.
12.5	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.

13.0 MANAGED ETHERNET SWITCH

13.1	Ethernet Switch	
13.1.1	Numbers	Two at each site
13.1.2	FO Port	Minimum 16 Nos
13.1.3	RJ 45 Port	4 Nos
13.1.4	Communication Protocol	IEC 61850
13.1.5	Network Protocol	PRP
13.1.6	Downlink Rate	100 MBPS

13.1.7	Uplink Rate	1 GBPS
13.1.8	Coating	Conformal
13.1.9	Power Supply Voltage	220 / 50 VDC as per site condition
13.1.10	Grade	Industrial
13.1.11	Certification required	KEMA,CE & FCC for IEC 61850 compliance
13.1.12	Operating Temperature	
13.1.13	Mounting	In Switchgear Panel
13.1.14	Blinking LED Indicators	On each RJ45 ports
13.1.15	Separate Maintenance/console Part	Required
13.1.16	Latency	Less than or equal to 10 ms
13.1.17	Fibre Optic Compatibility	Multimode, 1310 nm
13.1.18	Placement	Din Rail Arrangement Inside Switchgear
13.2	Fibre Optics (Patch Cord) and Ethernet cable	
13.2.1	Connection	From Relays, Meters to Ethernet Switch
13.2.2	Mode of Fibre Optics	Multimode
13.2.3	Wavelength	1310 nm
13.2.4	Ethernet Cable Type	CAT VI
13.2.5	Associated Connectors and Accessories	Required

14.0 ANNUNCIATION

14.1	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.
14.2	Mounting	Flush mounted
14.3	Fascia	16 window
14.4	Signals to provided on Fascia	Window 1 – Main Protection Operated (Distance /Differential) Window 2 – Backup O/C & E/F Protection Operated Window 3 – CBFP operated Window 4 – CB Autotrip Window 5 – SF6 Low/SF6 Lockout (For 66kV CRP only) Window 6 – Trip Circuit Unhealthy Window 7 – DC Fail Window 8 – AC Fail Window 9 – VT Fuse Fail Window 10 – Protection Relay/Trip relay Faulty Window 11 – Tarfo Trouble trip (For trafo panel only)

		Window 12 – Trafo Trouble alarm (For trafo panel only)
14.5	Push Buttons	For test, accept and reset
14.6	Potential Free Contacts	To be provided for event logger
14.7	Alarm	For all signals wired to the annunciator
14.8	Overall Dimension of Group	To be Provided by Vendor

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

15.0 INDICATIONS

15.1	Indicating Lamps	Flush mounted Clustered LED type with rear terminal connections. Lamp Cover to be screwed type an moulded from heat resistant material
15.1.1	Breaker On	Red
15.1.2	Breaker Off	Green
15.1.3	Isolator Close	Red
15.1.4	Isolator Open	Green
15.1.5	Spring Charged	Blue
15.1.6	DC control supply healthy	Amber
15.1.7	Heater circuit healthy	Yellow
15.1.8	Trip circuit healthy	White
15.1.9	PT supply	R, Y, B
15.1.10	Voltage	220VDC/50 VDC
15.1.11	Rating	To be Provided by Vendor
15.1.12	Wattage	To be Provided by Vendor

15.1.13	Series Resistance	To be Provided by Vendor
15.1.14	10% extra Lamp Furnished?	To be Provided by Vendor
15.1.15	Size of lens	To be Provided by Vendor
15.1.16	Make	To be Provided by Vendor
15.1.17	Type	To be Provided by Vendor
15.2	Semaphores	To be provided for all earth switches.
15.2.1	Make	To be Provided by Vendor
15.2.2	Type	To be Provided by Vendor
15.2.3	Diameter of the Disc	To be Provided by Vendor
15.2.4	Operating voltage	220VDC/50 VDC
15.2.5	Burden (Watt DC)	To be Provided by Vendor
15.2.6	Whether latch in type or supply Failure type	To be Provided by Vendor

16.0 SELECTOR SWITCHES AND PUSH BUTTONS

16.1	Switches	Flush Mounted with shrouded terminals
16.1.1	TNC Switch	Lockable Pistol Grip type with spring return to normal position
16.1.2	Local/SCADA selector switch	2 pole
16.1.3	Rotary On/Off Switches	For heater/illumination circuit
16.1.4	Rating of switches	16 A
16.2	Push buttons	Flush Mounted with shrouded terminals
16.2.1	Accept Push Button	Black Color- Trip alarm/DC fail alarm
16.2.2	Reset Push Button	Yellow Color- Trip alarm/DC fail alarm
16.2.3	Test Push Button	Blue Color
16.2.4	Rating	10A

17.0 ACCESSORIES

17.1	Space heaters	Thermostat controlled with switch for isolation
17.1.1	Voltage	240 V AC

17.1.2	Wattage	To be provided by Vendor
17.1.3	Thermostat Range	To be provided by Vendor
17.1.4	Provided with Individual fuse unit	To be provided by Vendor
17.2	Socket and switch	240V, 5/15A universal type socket to be provided in each panel with on-off switch
17.3	MCBs and Fuses	Provision for receiving, distribution, isolation and fusing of DC and AC supplies to various control circuits should be made using MCBs and Fuses of appropriate ratings
17.4	Panel illumination	240V AC illumination lamp controlled by panel door switch to be provided in each panel

18.0 APPROVED MAKES OF COMPONENTS

18.1	Numerical Relays	(a) R Series of ABB (b) Siprotec series of Siemens (c) Micom series(PX40) of Schneider (d) Micom Series of GE (e) All numerical relays in a panel should be of same make. Use of two different makes of relays in a panel is not acceptable.
18.2	Trafo Monitoring Cum AVR relay	A-Eberle/Easun MR
18.3	Auxiliary Relays & Contact Multiplication Relays	Alstom/Schneider/ABB/Siemens/ER
18.4	Miniature Relays	ABB/ OMRAN
18.5	Contactors	ABB/Siemens/Schneider
18.6	MCBs	Siemens/Schneider/Legrand/ABB
18.7	Control switches	Switron/Kaycee
18.8	Annunciator	Minilec/Alan
18.9	Test terminal block	IMP/DAV
18.10	Terminal blocks	Elmex/Connectwell
18.11	Indicating lamps	Siemens/ Teknic/ Binay
18.12	Meters	Rishabh/Conzerv
18.13	Multi Function Meter	Rishabh (Rish Delta Energy)
18.14	Managed Ethernet Switch	Ruggedcom/ Hirschman/ GarrettCom

19.0 QUALITY ASSURANCE, INSPECTION & TESTING

19.1	Vendor quality plan	To be submitted for purchaser approval
19.2	Type tests	Product must be type tested as per Indian Standards or IEC
19.3	Type test report validity	Last five years from the date of bid submission
19.4	Acceptance and Routine tests	As per specifications and relevant standards. Charges of these tests shall be deemed to be included in the equipment price. Purchaser reserves the right to witness all the tests.
19.5	Notice to Purchaser for conducting tests	Atleast three weeks in advance
19.6	Test reports of acceptance and routine test before dispatch	Six copies to be submitted.

20.0 DEVIATIONS

Deviation from this specification shall be stated in writing with the tender by reference to the specification clause/ GTP/ Drawing and description of alternative offer. In absence of such a statement, it shall be assumed by the buyer that the seller complies fully with this specification.

21.0 DRAWINGS AND DATA SUBMISSION MATRIX

- Document checklist for each stage is given in table below. (Refer equipment specification for details)
- Document check sheet compliance shall be the first sheet for each submission stage i.e. Technical bid, Drawing Approval, Pre Dispatch, Pre closure.
- No submission is acceptable without check list compliance.
- Deficient/ improper document/ drawing submission shall be liable for rejection.
- Order of documents shall be strictly as per the check list with in Soft copy with separate folder in proper nomenclature.
- Any drawing not included in the below table but necessary for detailed engineering shall be deemed to be included in bidder's scope.

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
21.1	Contact Person Name, Email ID and Mobile Number	Required			
21.2	Consolidated Deviation Sheet	Required	Required		
21.3	GTP	Required	Required		
21.4	Relevant Type Test as per IS/IEC	Required			
21.5	Manufacturer's quality assurance plan and certification for quality standards		Required		
21.6	Sizing Calculation of Associated Equipment		Required		
21.7	Recommended Spares Apart from spares stated in Spec(for five years of operation)		Required		
21.8	Schematic		Required		
21.9	CRP				
21.9.1	General Arrangement	Required	Required		
21.9.2	Sectional Layout		Required		
21.9.3	Door Layout		Required		
21.9.4	Panel wise BOQ		Required		
21.9.5	Index Sheet		Required		
21.9.6	Symbols		Required		
21.9.7	SLD	Required	Required		
21.9.8	Trip Logic		Required		
21.9.9	AC Distribution Circuit		Required		
21.9.10	DC Distribution Circuit		Required		
21.9.11	CT Distribution Circuit		Required		
21.9.12	VT Distribution Circuit		Required		
21.9.13	Voltage Selection Circuit		Required		
21.9.14	Metering Circuit		Required		
21.9.15	Indication Circuit		Required		

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
21.9.16	Isolator Control Circuit		Required		
21.9.17	Protection Circuit		Required		
21.9.18	Relay Circuit with DI and DOs		Required		
21.9.19	DI and DO Sheet of each relay		Required		
21.9.20	Schematic Circuit diagram and Scheme of Each type of Panel		Required		
21.9.21	Logic Operation Diagram		Required		
21.9.22	Communication Architecture		Required		
21.9.23	Trafo Monitoring Relay Circuit in case of Transformer Panel		Required		
21.9.24	CB Closing interlock circuit		Required		
21.9.25	Tripping Circuit		Required		
21.9.26	CB status & CB trouble cont. mult. circuit		Required		
21.9.27	Isolator , E/S and trafo trouble contact multiplication circuit		Required		
21.9.28	Annunciation circuit		Required		
21.9.29	TB Reference page		Required		
21.9.30	Synch Logic Diagram		Required		
21.9.31	QAP		Required		
21.10	Inspection Reports			Required	
21.11	As manufacturing Drawings			Required	
21.12	Operation and Maintenance Manual			Required	Required
21.13	Trouble shooting manual			Required	Required
21.14	As built Drawings				Required
21.15	Test Report				Required
21.16	Soft Copy				
21.16.1	In Pen drive	Required			

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
21.16.2	Through Mail		Required	Required	Required

22.0 PACKING

22.1	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.
22.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection & identification Label
22.3	Packing Identification Label to be provided on each packing case with the following details	
22.3.1	Individual serial number	
22.3.2	Purchaser's name	
22.3.3	PO number (along with SAP item code, if any) & date	
22.3.4	Equipment Tag no. (if any)	
22.3.5	Destination	
22.3.6	Project Details	
22.3.7	Manufacturer / Supplier's name	
22.3.8	Address of Manufacturer / Supplier / it's agent	
22.3.9	Description and Quantity	
22.3.10	Country of origin	
22.3.11	Month & year of Manufacturing	
22.3.12	Case measurements	
22.3.13	Gross and net weights in kilograms	
22.3.14	All necessary slinging and stacking instructions	

23.0 SHIPPING

23.1	**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.

24.0 HANDLING AND STORAGE

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

25.0 ANNEXURE – A – TRANSFORMER MONITORING CUM AVR RELAY

25.1	**General features**	
25.1.1	Technology and Functionality	Microprocessor based with provision for multifunction control and monitoring.
25.1.2	Mounting	Rack Mounting

25.1.3	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.
25.1.4	Programming and configuration	AVR shall utilize a user friendly setting and operating multi-lingual software in windows environment with menus and icons for fast access to the data required.
25.1.5	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.
25.1.6	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.
25.1.7	SCADA Interface port	LC Type Dual fibre optic port for interfacing with SCADA on PRP protocol. Through this port relays shall be connected to Ethernet switches.
25.1.8	Communication protocol	Relays shall be compatible for interfacing with SCADA on both IEC61850 and IEC103 (Data Type-9) protocol. Communication protocol shall be selectable at site. Relay shall be capable of transmitting all parameters including measured values, DI, DO, AI, Events and fault records to SCADA.
25.1.9	Self diagnosis	Relay shall be able to detect internal failures and same shall be transmitted to SCADA as a soft signal. A watchdog relay with changeover contact shall provide information about the failure.
25.1.10	Cable Termination	Termination of cable shall be at rear side.
25.1.11	Time Synchronization	Relay shall be capable of being synchronized with the system clock through SCADA , PC and GPS.
25.1.12	Auxiliary supply	220VDC or 48VDC
25.2	**Inputs and Outputs**	
25.2.1	CT Input	1/5A selectable through programming
25.2.2	PT Input	110VAC
25.2.3	Binary Inputs	Sixteen programmable binary inputs should be provided
25.2.4	Analog Inputs (4-20mA)	One input to be provided
25.2.5	PT-100 direct input	One input to be provided
25.2.6	Direct Resistance Input	For tap position indication (18 steps)

25.2.7	Binary Outputs	Ten programmable binary outputs should be provided
25.3	**Control**	
25.3.1	Control Tasks	Ability to implement control functions through programmable logics
25.3.2	Voltage setting	Programmable Voltage set point
25.3.3	Voltage Regulation	Raise/Lower tap position to maintain the preset value of voltage.
25.3.4	Voltage Regulation modes	Automatic and Manual
25.3.5	Operation Modes	Local and Remote
25.3.6	Fan and Pump control	To be provided
25.3.7	Transformer Paralleling	Capability to parallel transformers whose AVRs are interconnected via a communication network.
25.4	**SCADA Interfacing**	
25.4.1	Configuration of DIs for routing alarm/trip signals to SCADA.	DI-1 – Buchholz trip DI-2 – OSR Trip DI-3 – PRV trip DI-4 – SPR trip DI-5 – OTI trip DI-6 – WTI trip DI-7 – Buchholz alarm DI-8 – Oil Level low larm (MOG alarm) DI-9 – WTI alarm DI-10 – OTI alarm DI-11 – Tap changer trouble/stuck/out of step DI-12 – Tap changer motor supply fail DI-13 – Tap changer in local control All signals from DI-1 to DI-10 are to be wired up from transformer trouble auxiliary relays.
25.4.2	Configuration of DOs for executing commands from SCADA through interface port/CRP	DO-1 – Tap raise DO-2 – Tap lower DO-3 – Fan group 1 control DO-4 – Fan group 2 control
25.4.3	Analog Inputs	All analog inputs shall be SCADA Compatible
25.5	**Measurement, Event Recording and Monitoring**	
25.5.1	Measured Quantities (optional)	Voltage, Current, Active Power, Reactive Power, Apparent Power, Power factor, frequency
25.5.2	Event Recording	Facility for recording parameters during various events such as tap change, change in binary input status etc.

25.5.3	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.

26.0 ANNEXURE- B – GUARANTEED TECHNICAL PARTICULARS

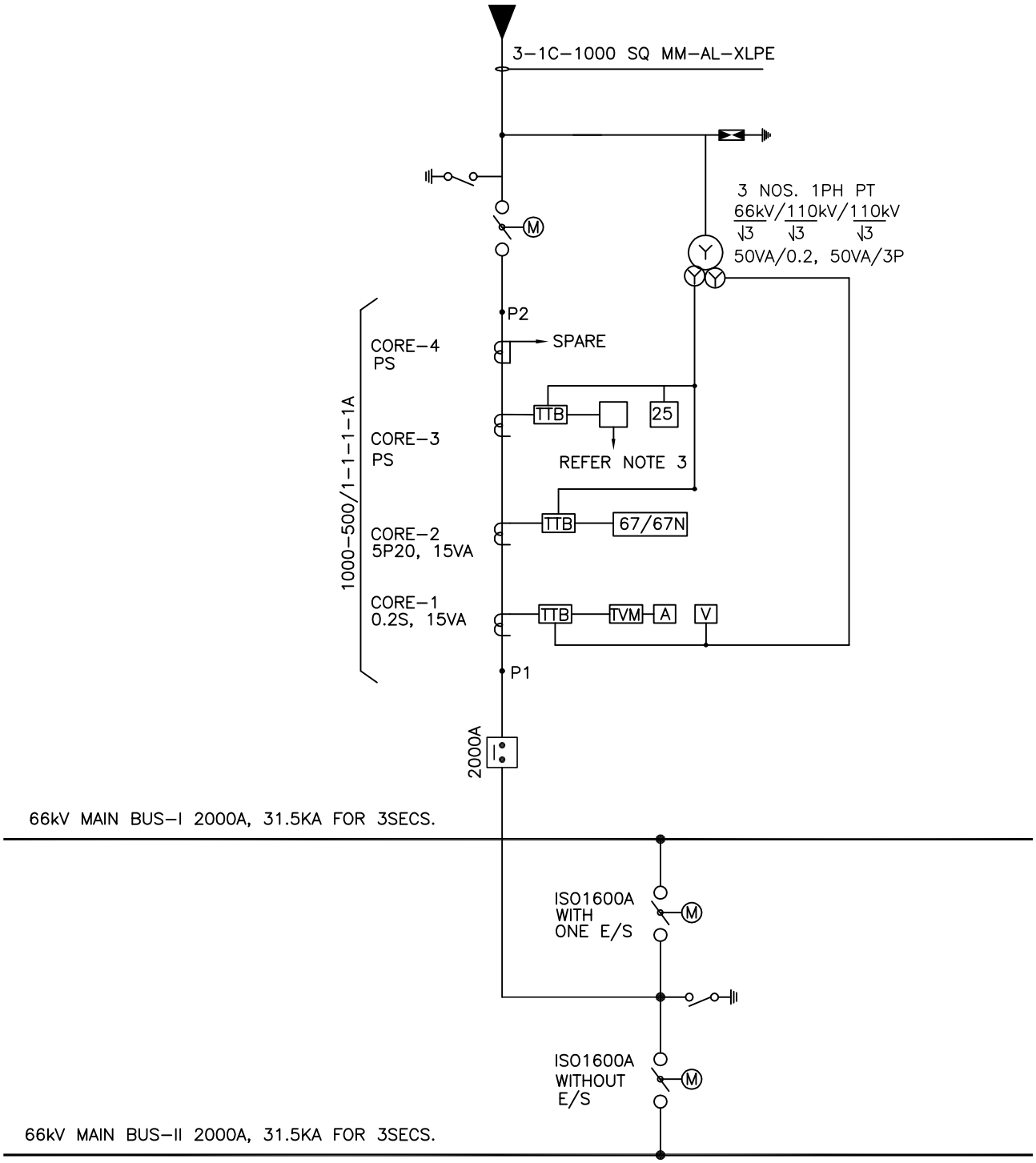
Vendor must submit clause wise compliance against specification at the time of drawing approval clearly highlighting the deviations from specification against each clause.

27.0 ANNEXURE- C – SPARES REQUIREMENT

S No.	Description	Unit Rate
27.1	Numerical relay of each type	1 nos.
27.2	Auxiliary relay of each type	1 nos.
27.3	Contact multiplication relays (Bistable type for CB, isolator and earth switch auxiliary contact multiplication)	6 nos.
27.4	Contactor of each rating	2 nos.
27.5	Voltmeter	1 nos.
27.6	Local/Remote Selector switch	1 nos.
27.7	TNC switch for CB	2 nos.
27.8	TNC switch for Isolators	3 nos.
27.9	Semaphore indicators	4 nos.
27.10	MCB of each rating	1 nos.

28.0 ANNEXURE-D-SLDs

ANNEXURE–D1



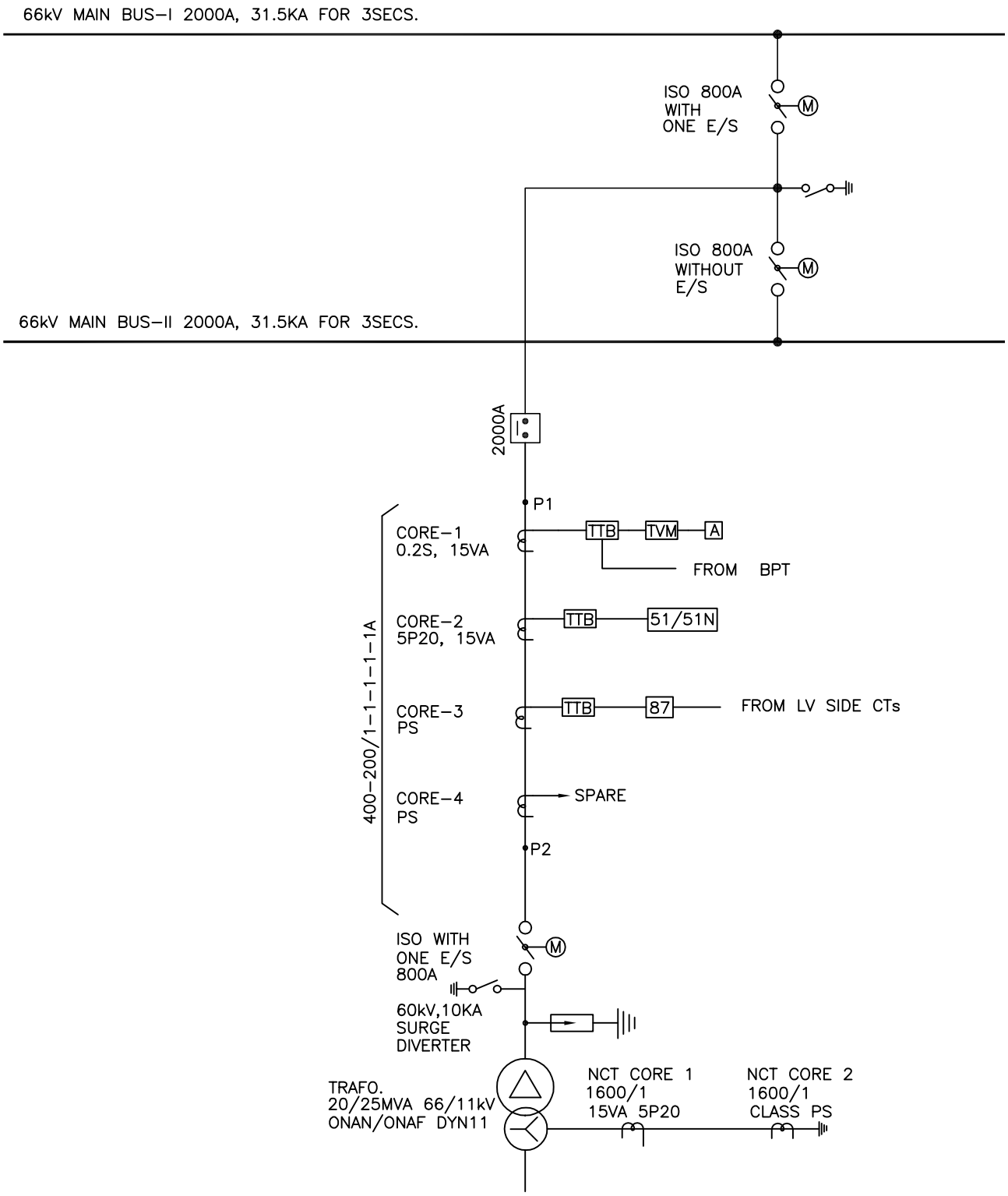
LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	MOTORISED ISOLATOR WITH ONE E/S	TTB	TEST TERMINAL BLOCK
	MOTORISED ISOLATOR WITH DOUBLE E/S	51/51N	O/C & E/F RELAY
	SURGE DIVERTER	21	DISTANCE RELAY
	CURRENT TRANSFORMER	27/59	U/V & O/V RELAY
	POTENTIAL TRANSFORMER	67/67N	DIRECTTIONAL O/C & E/F RELAY
	CIRCUIT BREAKER	87	DIFFRENTIAL RELAY
V	VOLTMETER	46	NEUTRAL UNBALANCE RELAY
A	AMMETER	25	SYNC CHECK
TVM	TRIVECTOR METER		

NOTE; 1. REFER SPECIFICATION CLAUSE 11.0 FOR FUNCTIONAL DETAILS OF PROTECTION RELAYS.
2. TVM IS NOT IN SUPPLIER'S SCOPE.
3. LINE DIFFERENTIAL OR DISTANCE RELAY AS PER CLAUSE 11.2.1 OF SPECIFICATION

DRAWN	AH/AM	TITLE:– TYPICAL 66KV LINE SLD	BSES
CHECKED	SG/AS		
APPD.	GS/GN		SPEC No – BSES–TS–86–CRP–RO
DATE	03.06.22		
SCALE	NTS		DWG No.:– SLD–CRP–66KV–01

ANNEXURE–D2



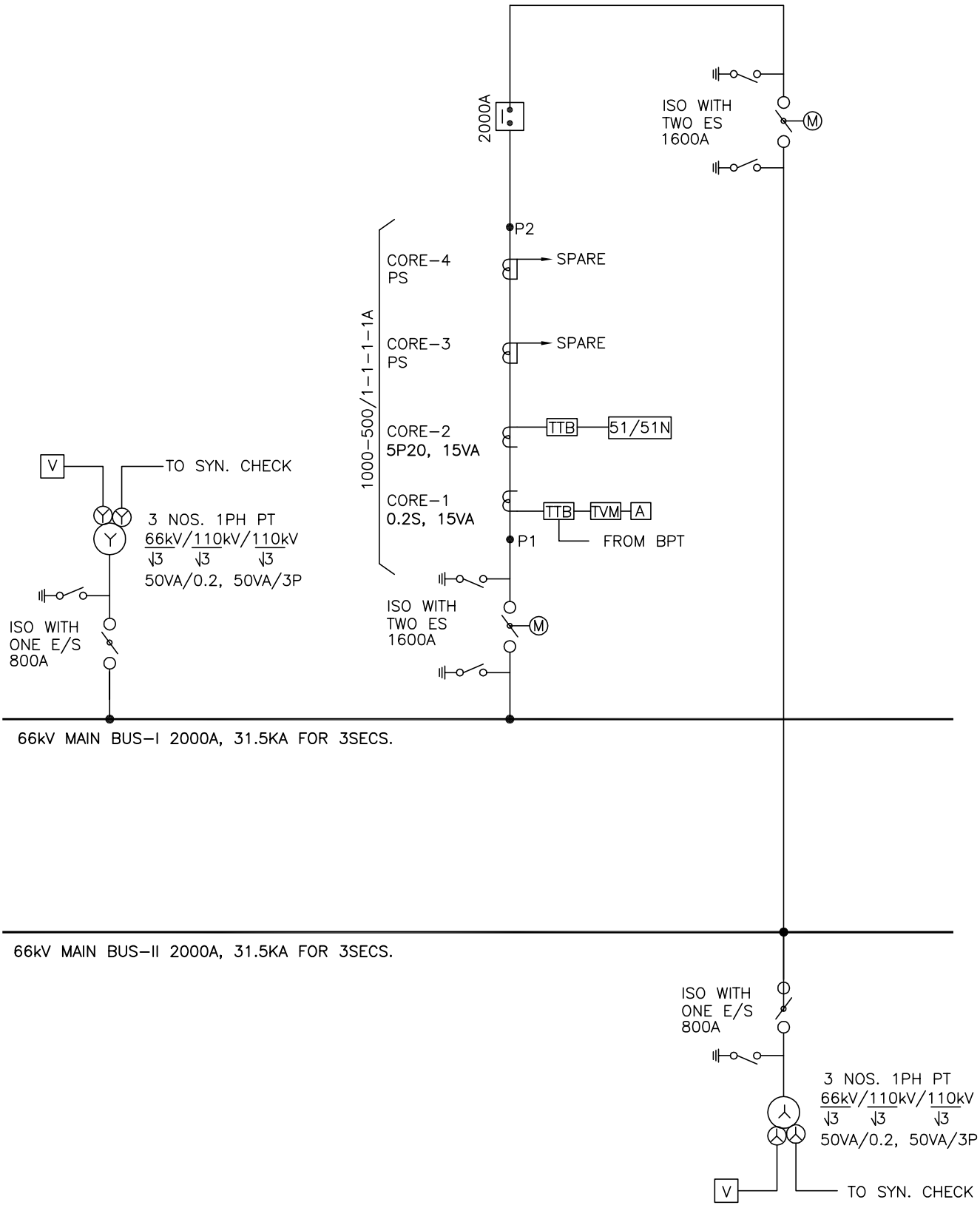
LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	MOTORISED ISOLATOR WITH ONE E/S	TTB	TEST TERMINAL BLOCK
	MOTORISED ISOLATOR WITH DOUBLE E/S	51/51N	O/C & E/F RELAY
	SURGE DIVERTER	21	DISTANCE RELAY
	CURRENT TRANSFORMER	27/59	U/V & O/V RELAY
	POTENTIAL TRANSFORMER	67/67N	DIRECTIONAL O/C & E/F RELAY
	CIRCUIT BREAKER	87	DIFFRENTIAL RELAY
V	VOLTMETER	46	NEUTRAL UNBALANCE RELAY
A	AMMETER	25	SYNC CHECK
TVM	TRIVECTOR METER		

NOTE; 1. REFER SPECIFICATION CLAUSE 11.0 FOR FUNCTIONAL DETAILS OF PROTECTION RELAYS.
2. TVM IS NOT IN SUPPLIER'S SCOPE.

DRAWN	AH/AM	TITLE:– TYPICAL 66/11KV TRANSFORMER FEEDER SLD	BSES
CHECKED	SG/AS		
APPD.	GS/GN		SPEC No – BSES–TS–86–CRP–RO
DATE	03.06.22		DWG No.:– SLD–CRP–66KV–02
SCALE	NTS		

ANNEXURE–D3



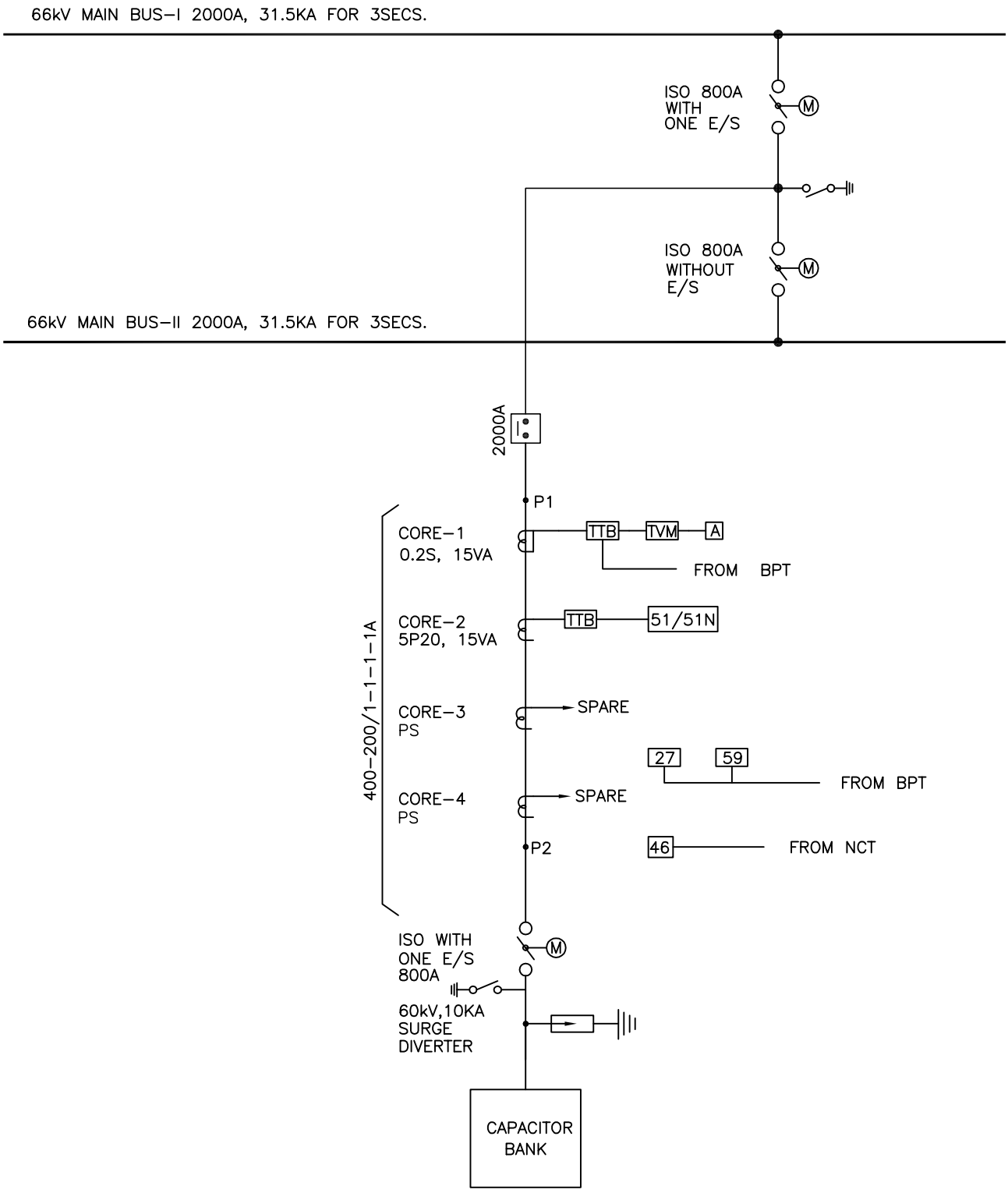
LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	MOTORISED ISOLATOR WITH ONE E/S	TTB	TEST TERMINAL BLOCK
	MOTORISED ISOLATOR WITH DOUBLE E/S	51/51N	O/C & E/F RELAY
	SURGE DIVERTER	21	DISTANCE RELAY
	CURRENT TRANSFORMER	27/59	U/V & O/V RELAY
	POTENTIAL TRANSFORMER	67/67N	DIRECTTIONAL O/C & E/F RELAY
	CIRCUIT BREAKER	87	DIFFRENTIAL RELAY
V	VOLTMETER	46	NEUTRAL UNBALANCE RELAY
A	AMMETER	25	SYNC CHECK
TVM	TRIVECTOR METER		

NOTE; 1. REFER SPECIFICATION CLAUSE 11.0 FOR FUNCTIONAL DETAILS OF PROTECTION RELAYS.
2. TVM IS NOT IN SUPPLIER'S SCOPE.

DRAWN	AH/AM	TITLE:– TYPICAL 66KV BUSCOUPLER SLD	BSES
CHECKED	SG/AS		
APPD.	GS/GN		SPEC No – BSES–TS–86–CRP–RO
DATE	03.06.22		DWG No.:– SLD–CRP–66KV–03
SCALE	NTS		

ANNEXURE–D4



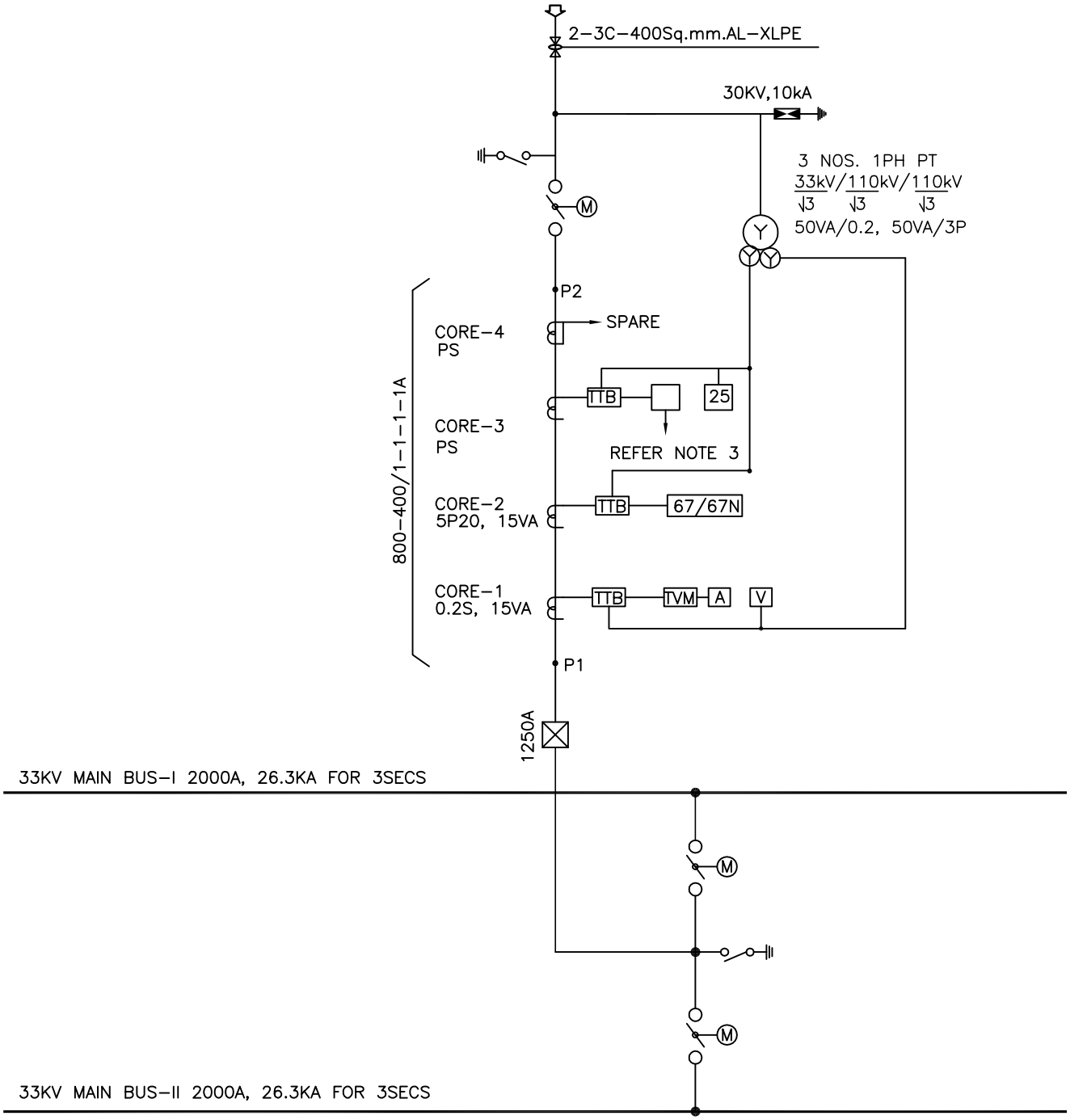
LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	MOTORISED ISOLATOR WITH ONE E/S	TTB	TEST TERMINAL BLOCK
	MOTORISED ISOLATOR WITH DOUBLE E/S	51/51N	O/C & E/F RELAY
	SURGE DIVERTER	21	DISTANCE RELAY
	CURRENT TRANSFORMER	27/59	U/V & O/V RELAY
	POTENTIAL TRANSFORMER	67/67N	DIRECTTIONAL O/C & E/F RELAY
	CIRCUIT BREAKER	87	DIFFRENTIAL RELAY
V	VOLTMETER	46	NEUTRAL UNBALANCE RELAY
A	AMMETER	25	SYNC CHECK
TVM	TRIVECTOR METER		

NOTE; 1. REFER SPECIFICATION CLAUSE 11.0 FOR FUNCTIONAL DETAILSOF PROTECTION RELAYS.
2. TVM IS NOT IN SUPPLIER'S SCOPE.

DRAWN	AH/AM	TITLE:– TYPICAL 66KV CAPACITOR BANK FEEDER SLD	BSES
CHECKED	SG/AS		
APPD.	GS/GN		SPEC No – BSES–TS–86–CRP–RO
DATE	03.06.22		DWG No.:–SLD–CRP–66KV–04
SCALE	NTS		

ANNEXURE–D5



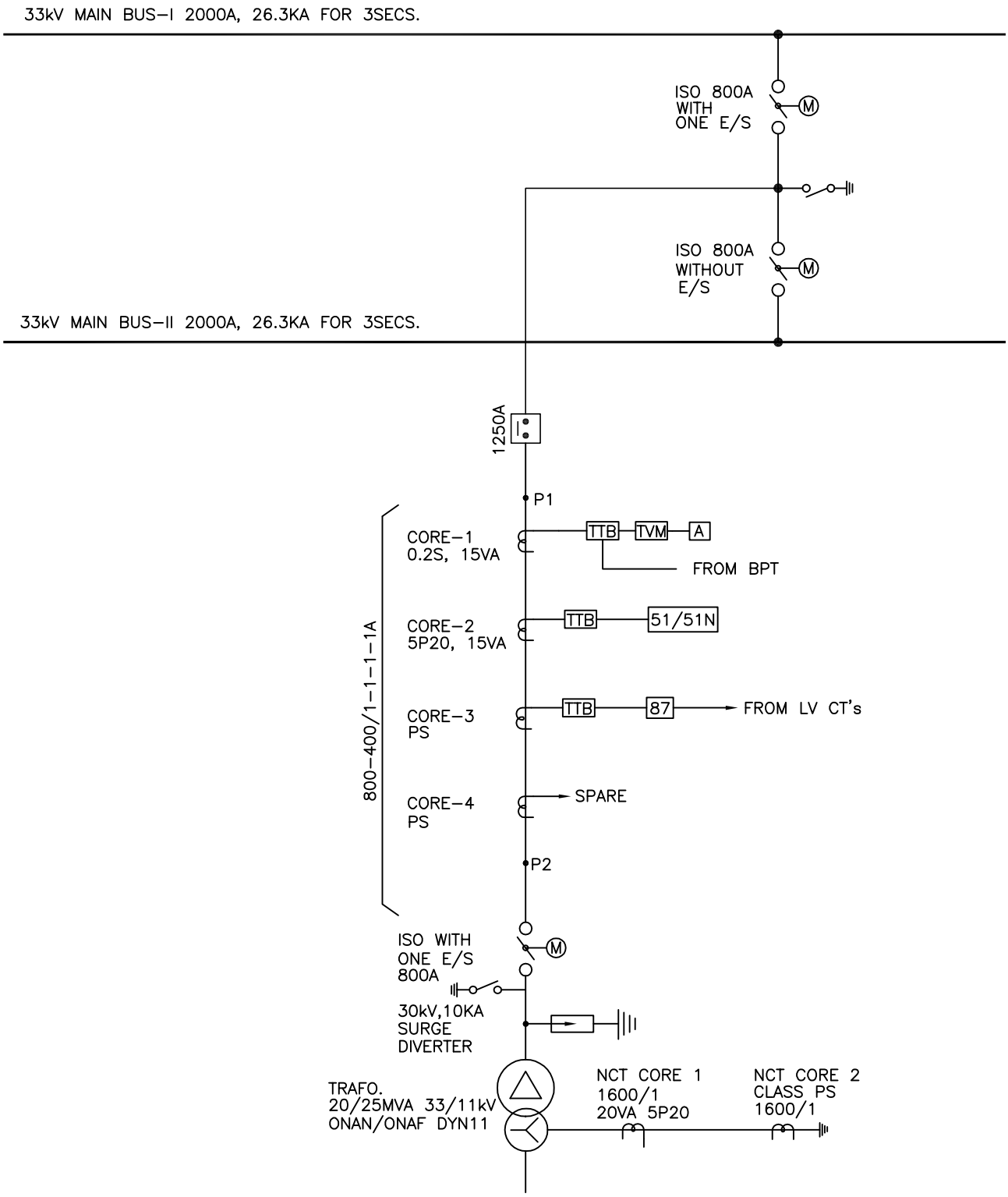
LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	MOTORISED ISOLATOR WITH ONE E/S	TTB	TEST TERMINAL BLOCK
	MOTORISED ISOLATOR WITH DOUBLE E/S	51/51N	O/C & E/F RELAY
	SURGE DIVERTER	21	DISTANCE RELAY
	CURRENT TRANSFORMER	27/59	U/V & O/V RELAY
	POTENTIAL TRANSFORMER	67/67N	DIRECTIONAL O/C & E/F RELAY
	CIRCUIT BREAKER	87	DIFFRENTIAL RELAY
V	VOLTMETER	46	NEUTRAL UNBALANCE RELAY
A	AMMETER	25	SYNC CHECK
TVM	TRIVECTOR METER		

NOTE; 1. REFER SPECIFICATION CLAUSE 11.0 FOR FUNCTIONAL DETAILS OF PROTECTION RELAYS.
2. TVM IS NOT IN SUPPLIER'S SCOPE.
3. LINE DIFFERENTIAL OR DISTANCE RELAY AS PER CLAUSE 11.2.1 OF SPECIFICATION.

DRAWN	AH/AM	TITLE:– TYPICAL SLD FOR 33KV INCOMER/OUTGOING	BSES
CHECKED	SG/AS		
APPD.	GS/GN		SPEC No – BSES–TS–86–CRP–RO
DATE	03.06.22		DWG No.:–SLD–CRP–33KV–01
SCALE	NTS		

ANNEXURE–D6



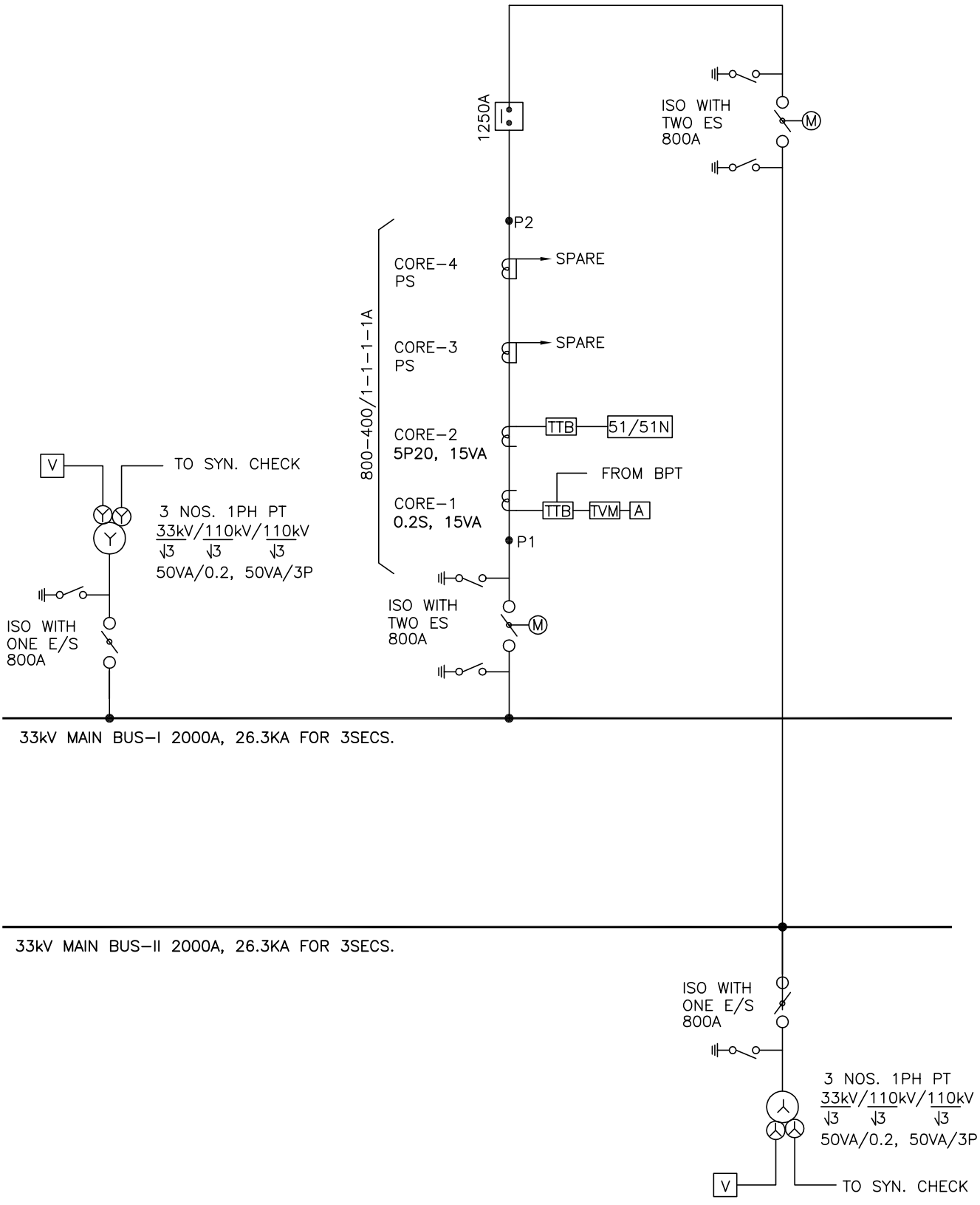
LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	MOTORISED ISOLATOR WITH ONE E/S	TTB	TEST TERMINAL BLOCK
	MOTORISED ISOLATOR WITH DOUBLE E/S	51/51N	O/C & E/F RELAY
	SURGE DIVERTER	21	DISTANCE RELAY
	CURRENT TRANSFORMER	27/59	U/V & O/V RELAY
	POTENTIAL TRANSFORMER	67/67N	DIRECTIONAL O/C & E/F RELAY
	CIRCUIT BREAKER	87	DIFFRENTIAL RELAY
V	VOLTMETER	46	NEUTRAL UNBALANCE RELAY
A	AMMETER	25	SYNC CHECK
TVM	TRIVECTOR METER		

NOTE; 1. REFER SPECIFICATION CLAUSE 11.0 FOR FUNCTIONAL DETAILS OF PROTECTION RELAYS.
2. TVM IS NOT IN SUPPLIER'S SCOPE.

DRAWN	AH/AM	TITLE:– TYPICAL 33/11KV TRANSFORMER FEEDER SLD	BSES
CHECKED	SG/AS		
APPD.	GS/GN		SPEC No – BSES–TS–86–CRP–RO
DATE	03.06.22		DWG No.:–SLD–CRP–33KV–02
SCALE	NTS		

ANNEXURE–D7



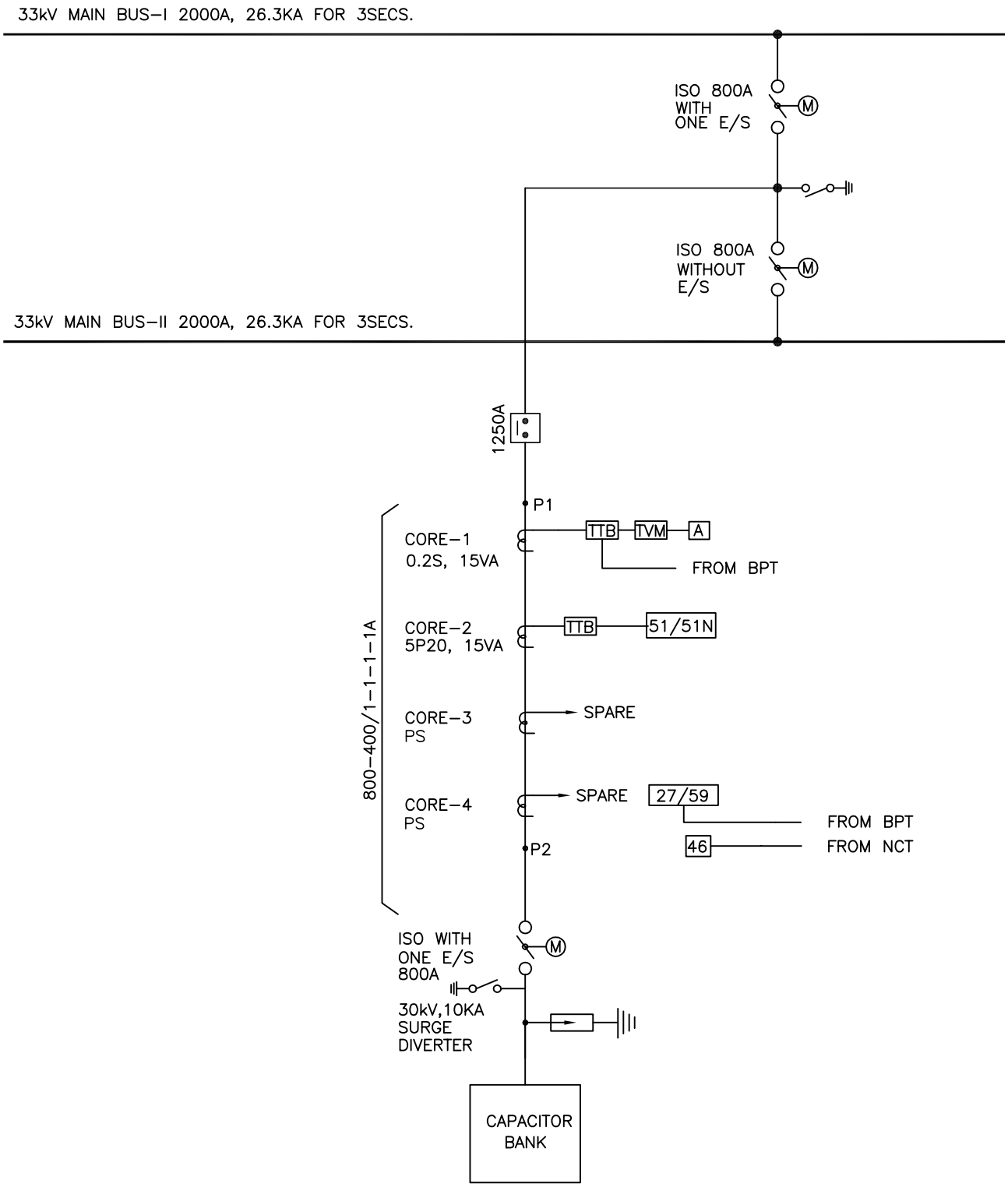
LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	MOTORISED ISOLATOR WITH ONE E/S	TTB	TEST TERMINAL BLOCK
	MOTORISED ISOLATOR WITH DOUBLE E/S	51/51N	O/C & E/F RELAY
	SURGE DIVERTER	21	DISTANCE RELAY
	CURRENT TRANSFORMER	27/59	U/V & O/V RELAY
	POTENTIAL TRANSFORMER	67/67N	DIRECTTIONAL O/C & E/F RELAY
	CIRCUIT BREAKER	87	DIFFRENTIAL RELAY
V	VOLTMETER	46	NEUTRAL UNBALANCE RELAY
A	AMMETER	25	SYNC CHECK
TVM	TRIVECTOR METER		

NOTE; 1. REFER SPECIFICATION CLAUSE 11.0 FOR FUNCTIONAL DETAILS OF PROTECTION RELAYS.
2. TVM IS NOT IN SUPPLIER'S SCOPE.

DRAWN	AH/AM	TITLE:– TYPICAL 33KV BUSCOUPLER SLD	BSES
CHECKED	SG/AS		
APPD.	GS/GN		SPEC No – BSES–TS–86–CRP–R0
DATE	03.06.22		DWG No.:– SLD–CRP–33KV–03
SCALE	NTS		

ANNEXURE–D8



LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	MOTORISED ISOLATOR WITH ONE E/S	TTB	TEST TERMINAL BLOCK
	MOTORISED ISOLATOR WITH DOUBLE E/S	51/51N	O/C & E/F RELAY
	SURGE DIVERTER	21	DISTANCE RELAY
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A	AMMETER	25	SYNC CHECK
TVM	TRIVECTOR METER		

NOTE; 1. REFER SPECIFICATION CLAUSE 11.0 FOR FUNCTIONAL DETAILS OF PROTECTION RELAYS.
2. TVM IS NOT IN SUPPLIER'S SCOPE.

DRAWN	AH/AM	TITLE:–	BSES
CHECKED	SG/AS	TYPICAL 33/11KV CAPACITOR BANK FEEDER SLD	SPEC No – BSES–TS–86–CRP–R0
APPD.	GS/GN		DWG No.:–SLD–CRP–33KV–04
DATE	03.06.22		
SCALE	NTS		

BSES

TECHNICAL SPECIFICATION OF BAY MARSHALLING KIOSK

Specification no – BSES-TS-42-BMK-R0

Rev:		0
Date:		22 Apr 2022
Pages		13
Prepared by	Jeena Borana	
	Alok Mandal	
Reviewed by	Srinivas Gopu	
	Abhinav Srivastava	
Approved by	Gaurav Sharma	
	Gopal Nariya	

INDEX

1.0 SCOPE OF SUPPLY

Design, manufacture, assembly, testing at stages of manufacture, final testing at manufacturer works on completely assembled bay marshalling Kiosk before dispatch, packing, delivery and submission of all documentation for the bay marshalling Kiosk.

2.0 CODES & STANDARDS

Materials, equipment and methods used in the manufacture of Bay Marshalling Kiosk shall conform to the latest edition of following standards:

IS 12063	Classification of degrees of protection provided by enclosure of electricalequipment
IS 5039	Distribution pillars for voltage not exceeding 1000V AC and 1200V DC
IS 2147	Degree of Protection provided by enclosures for low voltage switchgearand controlgear.
IS 5133 Part I	Boxes for enclosure of the electrical accessories: Steel and Cast ironboxes
IS 8828	Circuit breaker for overcurrent protection for household & similarinstallations.
IS 6005	Code of practice for phosphating iron and steel.
IS3202	Code of practice for climate proofing.
IS 2551	Danger Notice Plates
IS 4237	General requirement for switchgear & controlgear for voltage notexceeding 1000V AC & 1200V DC.
IS 8623	Low voltage switchgear & controlgear assemblies
	Indian Electricity Rules
	Indian Electricity Act

3.0 SERVICE CONDITIONS

3.1	Average grade atmosphere:	Heavily polluted, dry
3.2	Maximum altitude above sea level	1000 M
3.3	Ambient Air temperature	Highest 50 deg C, Average 40 deg C
3.4	Minimum ambient air temperature	0 Deg C
3.5	Relative Humidity	100 % Max
3.6	Thermal Resistivity of Soil	150 Deg.C cm/W
3.7	Seismic Zone	4 as per IS 1893
3.8	Rainfall	750 mm concentrated in four months
3.9	Wind Pressure	195Kg/m2 up to 30M elevation as per IS 875-1975

4.0 DESIGN PARAMETERS

4.1	Type	Bay marshalling Kiosk shall be made out of sheet metal, suitable for Outdoor application, vertical self standing enclosure.
4.2	Enclosure	a) Made out of GI sheet (min 120 gsm) of not less than 2 mm thick at the side and Top. b) Degree of protection- IP 55
4.3	Design	BMK Shall be dust and vermin proof, suitable for humid, dusty and tropical atmosphere. Lifting lugs shall be provided to the top. It shall have doomed or sloping roof. Hinged type door shall be provided in front of enclosure. Door shall have handle and provision of padlocking arrangement.
4.4	Internals of marshalling Kiosk	
4.4.1	Terminal block	BMK shall have three distinct sets of Terminal block in vertical formation required for a) AC & DC Distribution up to 415V for AC and 220V for DC. b) For CT & PT connections c) For other potential free contacts.
4.4.2	Type of Terminal	a) AC and DC distribution terminals shall be non-disconnecting stud type. Refer figure-1 for terminal sizes. b) CT & PT terminals shall be disconnecting Stud type suitable for 6mm^2 copper cable. c) For other potential free contacts terminals shall be stud type suitable for 6 mm^2 copper cable.
4.4.3	Design	The terminal blocks shall be made of non-inflammable, molded resin / polyamide with integrally molded barriers, brass inserts & removable transparent covers. Each terminal shall be clearly marked with identification number or letters Each terminal shall have provision for insertion of banana plugs for testing. Marshalling Kiosk shall have followings: a) To receive 415V AC 3phase 4wire and distribution as per scheme in figure -1. b) To receive DC supply and distribution as per scheme in figure-1.

4.4.4	Distribution MCB	The MCB for AC and DC power supply shall be mounted in horizontal configuration at the bottom. For AC circuit MCB shall be 4Pole and 2Pole. For DC it shall be 2 Pole. Partition barrier shall be provided for identification of AC and DC
4.4.5	Wiring	Copper flexible 1.1Kv grade PVC insulated, FRLS grade. The wiring shall be neatly bunched, supported and should be readily accessible, PVC troughs shall be provided.
4.5	Cable Entry	Removable cable gland plate shall be provided at the bottom made out of not less than 2.5mm thick sheet. Proper PVC conduit shall be provided for dressing of wires up to the terminals.
4.6	Panel Illumination	A lamp with Door limit switch shall be provided for illumination of panel. A 5/15 power socket shall also be provided.
4.7	Heater	A heater with thermostat and Fuses shall be provided inside the panel.
4.8	Earthing	Two no's earthing terminals shall be provided at both side for earthing.
4.9	Painting	
4.9.1	Painting surface preparation	Powder coating with min thickness 85 microns and anti-corrosion coating at welded joints.
4.9.2	Painting external finish	692 as per IS 5 on external side and Glossy white inside enclosure.

5.0 FITTINGS AND ACCESSORIES

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
5.2	Name plate details	a) Equipment Name b) Company Name c) PO no. and date d) Sr. No. e) Year of manufacturing-mm/yy f) Guarantee Period

6.0 APPROVED MAKE OF COMPONENTS

6.1	Connectors	Connectwell, Elmex, Phoenix
6.2	Flexible wire	Finolex, Lapp Kabel
6.3	MCB	Schneider, L&T, Siemens, Legrand
6.4	Space heater with thermostat	Elcon, Girish

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

7.0 QUALITY ASSURANCE

7.1	Vendor quality plan	To be submitted for purchaser approval.
7.2	Inspection point	To be mutually identified and agreed inquality plan

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 monthcontaining 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 DRAWING, DATA & MANUALS

9.1	To be submitted along with bid	Seller has to submit: a) Tentative GA / cross sectional drawing of product showing all the views / sections b) Detailed reference list of customers already using the offered product during the last 5 years with particular emphasis on units of similar design and rating c) Completely filled GTP d) Deviations from this specification. Only deviations approved in writing before award of contract shall be accepted e) Details of manufacturer's quality assurance standards and programme and ISO 9000 series or equivalent national certification f) Type test reports shall be submitted for the type, size & rating of product / equipment offered along with bid. In case the type test report for identical product is not available then type test report of nearby size /rating shall be submitted for review. They shall be considered valid for 5 years from date of test performed on product /equipment. g) Complete product catalogue and Manual along with the bid.
9.2	After award of contract, seller has to submit mentioned drawings for buyer's Approval (A) / Reference (R)	a) Programme for production and testing (A) b) Guaranteed Technical Particulars (A) c) Calculations to substantiate choice of electrical, structural, mechanical component size / ratings (A) d) Detailed dimensional drawing for all components, general arrangement drawing showing detailed component layout and detailed schematic and wiring drawings for all components. e) Terminal arrangement details etc (as applicable) (A) f) Drawing of major components (A) g) Rating and diagram plate (A) Detailed loading drawing to enable the buyer to design and construct foundations (as applicable) (R) h) Transport / Shipping dimensions with weights. etc (As applicable) (R) i) List of makes of all components (A) j) Detailed installation and commissioning instructions (R) k) Quality plan

9.3	Submittals required prior to dispatch	a) Inspection and test reports, carried out in manufacturer's works (R) b) Test certificates of all bought out items c) Operation and maintenance Instruction as wellas trouble shooting charts/ manuals
9.4	No of drgs./Documents required at different stages	As per Annexure A Scope of Supply

10.0 INSPECTION & TESTING

10.1	Inspection and Testing during manufacturing	
10.2	Sheet metal Box / Panel	a) Checking of dimensions as per approved drawing. b) Checking for thickness of sheet metal. c) Thickness of Paint as applicable
10.3	Connectors/MCB/Wire	Check for routine electrical test.
10.4	Routine tests	Following routine test shall be conducted on each BMK : a) Dimensional Checks b) Degree of protection for enclosure (paperinsertion test) c) Test for paint thickness. d) HV/IR tests e) Functional tests.
10.5	Type Tests	a) On cubicle of each rating and type b) IP Protection test.
		In case the product is never type tested earlier, seller has to conduct the type tests from CPRI/ERDA/ NABL accredited test labs at their own cost, before commencement of supply.
10.6	Acceptance test	Following routine test shall be conducted on each BMK a) Dimensional Checks b) Degree of protection for enclosure (paperinsertion test) c) Test for paint thickness. d) HV/IR tests e) Functional tests.

11.0 PACKING , SHIPPING, HANDLING AND STORAGE

11.1	Packing	
11.1.1	Packing protection	Against corrosion, dampness, heavy rains,breakage and vibration
11.1.2	Packing for accessories and spares	Robust wooden non returnable packing case with all the above protection and identification labels.
11.1.3	Packing identification label	In each packing case, following details are required : a) Individual serial number b) Purchaser's name c) PO number(along with SAP item code, ifany) & date d) Equipment Tag no. (if any) e) Destination f) Manufacturer/Supplier's name g) Address of manufacturer/supplier's / itsagent h) Description and quantity i) Country of origin j) Month and year of manufacturing k) Case measurements l) Gross and net weights in kilograms m) All necessary slinging and stackinginstructions.
11.2	Shipping	a) The bidder shall ascertain at an early dateand definitely before the commencement of manufacture, any transport limitations suchas weights, dimensions, road culverts, Overhead lines, free access etc. from the manufacturing plant to the project site; and furnish to the Purchaser confirmation that theproposed packages can be safely transported, as normal or oversize packages, up to theplant site. Any modifications required in theinfrastructure and cost thereof in this connection shall be brought to the notice of the Purchaser. b) The seller shall be responsible for all transitdamage due to improper packing.
11.3	Handling and Storage	Manufacturer instruction shall be followed. Detail handling & storage instruction sheet / manual needs to be furnished before commencement of supply.

12.0 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, it will be assumed by the Buyer that the Seller complies fully with this specification.

Annexure – A - Guaranteed Technical Particulars

Sr No	Description	Data by purchaser	Data by Supplier
1.0	Location of equipment	Project specific to be filled up	
2.0	Name of manufacturer		
2.1	Address & contact details		
3.0	Type		
3.1	Manufacturer Model no		
4.0	Degree of protection of enclosure	IP55	
5.0	Thickness of sheet metal enclosure		
5.1	- Top & side sheet	2.0mm min.	
5.2	- Bottom sheet	2.5mm min.	
6.0	Internal lamp with door switch provided		
7.0	Rating of space heater with thermostat		
8.0	Rating of plug and socket	5/15 Ampere	
9.0	Terminal Blocks		
9.1	Make and type		
9.2	Rating		
9.3	Number of terminals provided	As per Fig 1	
9.4	Suitable for conductor size		
9.5	20% spare terminals provided for scheme furnished		
10.0	Miniature circuit breaker		
10.1	Make and type		
10.2	Rated voltage & frequency		

Sr No	Description	Data by purchaser	Data by Supplier
10.3	No. of poles		
10.4	Current rating		
	- Continuous at 50DEG C		
	- Short time for 1 sec.		
10.5	Breaking capacity		
	- Symmetrical		
	-Asymmetrical		
10.6	Type of blow out device		
10.7	Type of overload device		
10.8	Terminals suitable for cable size		
10.9	Whether provided with 2NO/2NC aux. Contacts		
11.0	Cables and Wire		
11.1	Voltage grade	1.1KV	
11.2	Conductor		
11.3	-Material	Copper	
11.4	-Size	10 & 6mm2	
12.0	Overall dimensions (depth, width & height)		
13.0	Details of earthing studs		

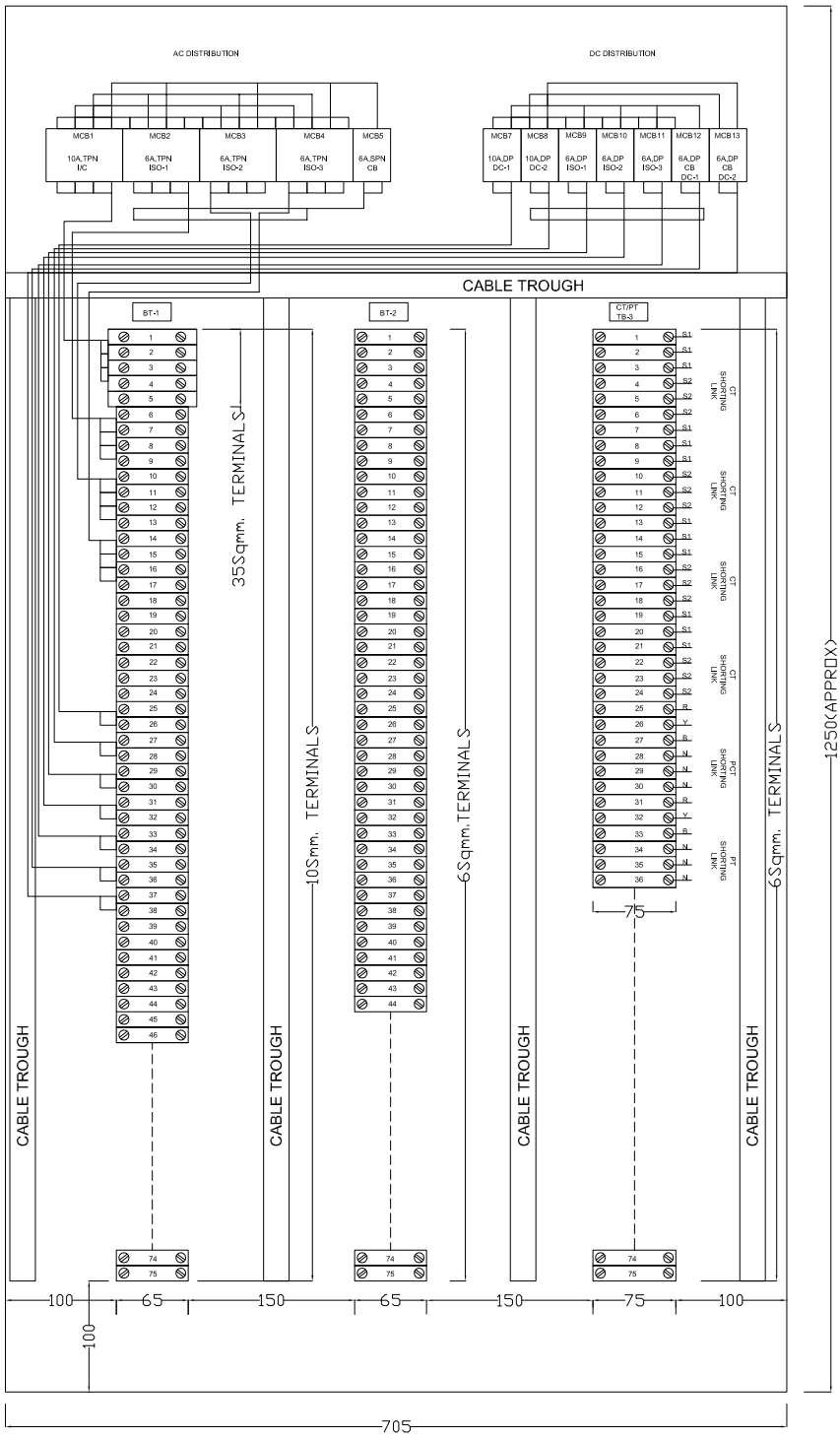
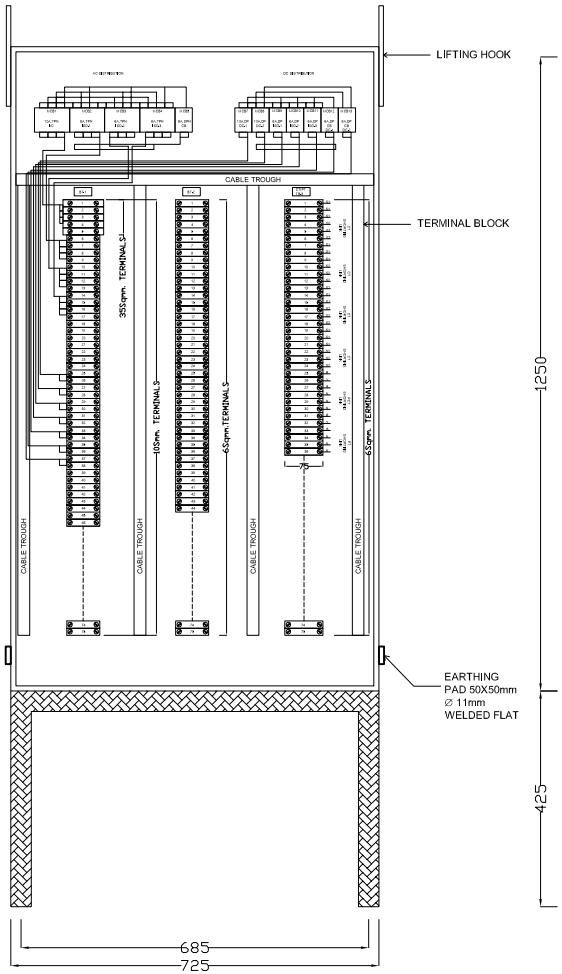


FIGURE-1-SCHEMATIC DIAGRAM

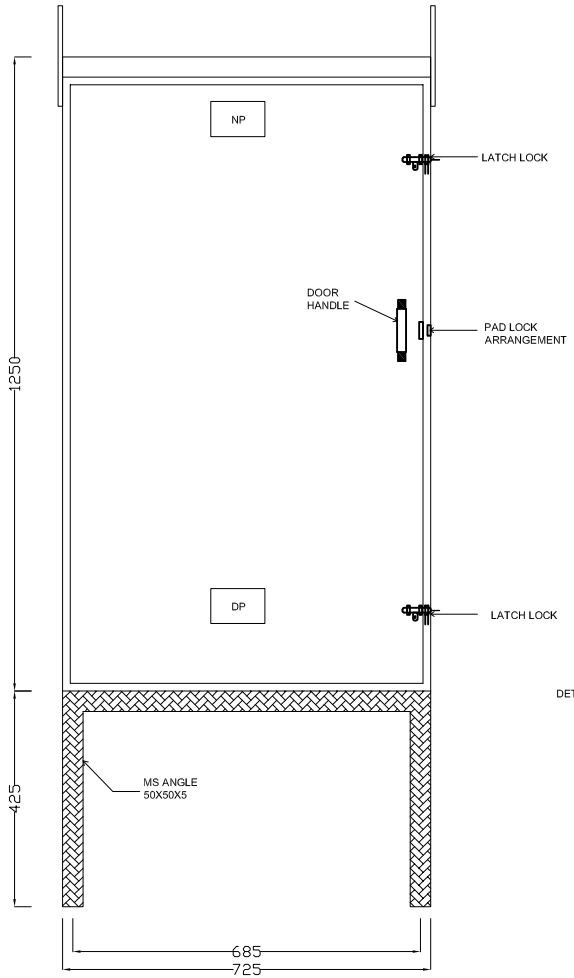
Note-

1. Terminal block TB-1 (75nos) ,TB-2 (75nos) ,shall be non disconnecting stud type.
2. Terminal block TB-3 (75nos) ,shall be disconnecting stud type.
3. Cable Trough shall be provided along the terminal blocks.
4. Busbar type links should be used for CT/PT star point formation . 6nos. spare links to be provided for shorting of spare core of CT.
5. All dimension are in mm.

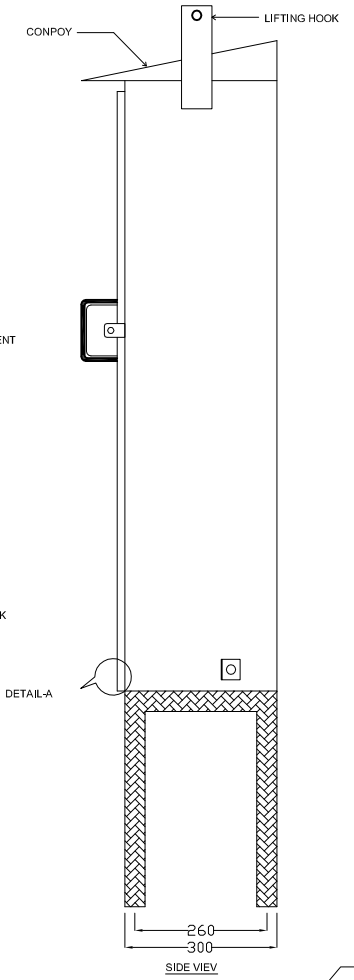
TITLE:-
SCHEMATIC DIAGRAM



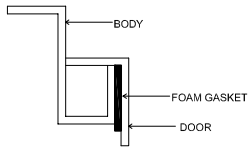
FRONT VIEV WITHOUT OUTER DOOR



FRONT VIEV WITH OUTER DOOR

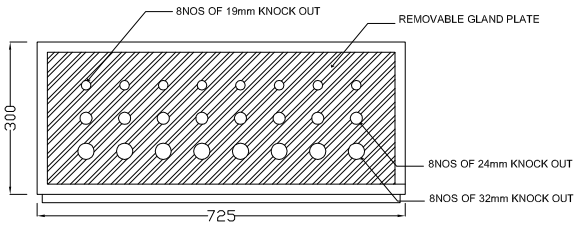


SIDE VIEV



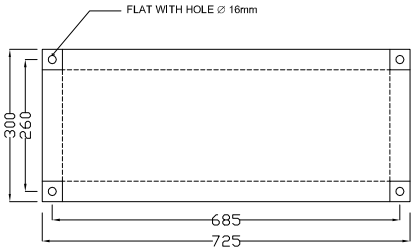
GASKET ARRANGEMENT FOR OUTER DOOR

DETAIL-A



BOTTOM VIEV

1. All dimension are in mm.
2. Degree of Protection IP-55 Outdoor type
3. Cable entry shall be from bottom
4. Fabrlcatlon shall be galvanlzed sheet of 120 GSM (mln) top and slde door 2.0mm and bottom sheet/gland Plate 2.5mm
5. Gasket materlal shall be EPDM/Foam type
6. Paint shade 692 as per IS:5, lnternal paint glossy whlte the thickness of powder coating shall be 85 microns (min.)
7. 1.1kV grade PVC lnsulated frls copper flexlle wlre shall be provlded
8. Earthlng of gasketed jolnts shall be wlth 4sqmm CU wlre
9. Name plate and danger plate shall be made of 1.6mm thick AL plate
10. Busbar type links should be used for CT/PT star point formation. 6No's spare links to be provided for shorting of spare core of CT.



FOUNDATION DETAIL

BSES
TITLE:-
BAY MARSHALLING KIOSK

Technical Specification

For

415 V AC Distribution Board

Specification no – BSES-TS-70-ACDB-R0

Rev		0
Page		1 of 17
Date		05 May 2022
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INDEX

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1 SCOPE

This specification covers the design, engineering, manufacture, assembly and testing at manufacturer's works and supply of 415V AC Distribution board (ACDB)along with all hardware and accessories required for installation and operation.
Specification covers Type 1 and Type 2 ACDB. Type 1 ACDB is for Grid Substations while Type 2 ACDB is for BSES HT Customers.

2 STANDARDS & CODES

2.1	IS:8623	Specification for factory built assemblies of switchgear & control gear for voltages up to and including 1000V AC/1200 V DC.
2.2	IS 60947-1	Specification for Low-voltage Switchgear and Control gear - Part 2 : Circuit Breakers
2.3	IS:10118	Code of practice for selection, installation and maintenance switchgear and controlgear
2.4	IS:2705	Current Transformers
2.5	IS:3231	Electrical relays for power system protection
2.6	IS:1248	Electrical Indicating instruments
2.7	IS:4794	Switches and push buttons
2.8	IS:6005	Code of practice of phosphating iron and steel
2.9	IS:5082	Wrought Aluminum and aluminum alloys for electrical purposes
2.10	IS 3043	Code of practice for Earthing

3 SERVICE CONDITIONS

3.1	System Configuration	3 Phase 4 Wire with neutral solidly grounded
3.2	Supply Voltage	415 volt +/- 10%
3.3	Supply frequency	50Hz
3.4	Location	Indoor
3.5	Average grade atmosphere	Heavily polluted, Dry
3.6	Maximum altitude above sea level	1000M
3.7	Ambient air temperature	Highest 50Deg C Average 40Deg C
3.8	Minimum ambient air temperature	0 Deg C
3.9	Relative Humidity	100%
3.10	Rainfall	750mm concentrated in four months

4 ACB CONFIGURATION

4.1 TYPE 1 ACDB CONFIGURATION

4.1.1	Incomers	a. Two incomers, each having Motorized 630A MCCB. MCCBs shall have microprocessor based over current and earth fault release. b. Auto changeover shall be provided between the two incomers c. Manual castle key interlock required between two incomers d. Castle key for Local /Remote operation
4.1.2	Outgoing feeders	a. The number of outgoing feeders from AC boards shall be such that each substation equipment is fed by separate feeder (refer below). b. Utilization category of MCBs shall be C.

	Application	Type of Switchgear	No of Poles	Rating (A)	Quantity
4.1.3	Transformer Oil filtration	MCB	4	200	2
4.1.4	Welding(Outdoor)	MCB	2	63	4
4.1.5	Power Socket(Indoor)	MCB	4	32	5
4.1.6	Outdoor Lighting	MCB	4	32	2
4.1.7	Indoor Lighting	MCB	4	32	2
4.1.8	Battery Charger	MCB	4	63	2
4.1.9	BMK	MCB	4	32	8
4.1.10	Marshalling Box(PTR)	MCB	4	32	3
4.1.11	AC Supply	MCB	4	32	2
4.1.12	UPS	MCB	2	16	1
4.1.13	11kV Switchgear	MCB	2	32	3
4.1.14	CRP	MCB	2	32	2
4.1.15	RTU/SCADA	MCB	2	16	2
4.1.16	Fire Fighting	MCB	2	16	2
4.1.17	EPAX	MCB	2	16	1

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4.1.18	Power Socket (Outdoor)	MCB	2	16	4

4.2 TYPE 2 ACDB CONFIGURATION

4.2.1	Incomers	a. Two incomers, each having Motorized 400 A MCCB. b. Auto changeover shall be provided between the two incomers c. Manual castle key interlock required between two incomers d. Castle key for Local /Remote operation			
4.2.2	Outgoing feeders	a. The number of outgoing feeders from AC boards shall be such that each substation equipment is fed by separate feeder (refer below). b. Utilization category of MCBs shall be C.			
	Application	**Type of Switchgear**	**No of Poles**	**Rating (A)**	**Quantity**
4.2.3	Welding	MCB	2	63	1
4.2.4	Power Socket	MCB	4	32	3
4.2.5	Outdoor Lighting	MCB	4	16	2
4.2.6	Indoor Lighting	MCB	4	16	2
4.2.7	Battery Charger	MCB	4	32	2
4.2.8	AC Supply	MCB	4	32	2
4.2.9	Switchgear	MCB	2	32	2
4.2.10	RTU/SCADA	MCB	2	16	2
4.2.11	Fire Fighting	MCB	2	16	2

5 CONSTRUCTION

5.1	General construction	a. Board shall be of modular construction with provision for compartmentalization for Incomer and non-compartmentalization for outgoing feeders. b. It shall be free-standing type comprising dust-tight and vermin-proof sheet steel cabinets suitable for indoor installation with IP-54 degree of protection. c. Necessary busbar support insulators, cable glands, cable supports and terminal blocks etc. The board shall be of single front type.

5.2	Material	The Board shall be made out of at least 2.5 mm thick cold rolled steel sheet (CRCA), suitably reinforced to provide flat level surfaces. No welds, rivets, hinges or bolts shall be visible from outside.
5.3	Equipment Mounting	a) All switches provided on the distribution board shall be on front side of the cabinets, operable from outside. b) All MCBs shall be flush mounted operable from front side of ACDB. c) All instruments and control devices shall be mounted on the front of cabinets and fully wired to the terminal blocks.
5.4	Operating Height	$\leq$ 1.6 meter
5.5	Busbar housing	a) The busbars shall be housed in totally enclosed busbar chambers. b) Incoming connections from the busbar to various feeders shall be designed so as not to disturb cable connections. c) Busbar arrangement should ensure safety of the operation/maintenance personnel and facilitate working on any outgoing module without the need for switching off in-feed to the adjacent modules, as far as possible
5.6	Outgoing Cable Termination	For Outgoing cable termination, vertical arrangement of Terminal Blocks shall be provided with ratings in descending order.
5.7	Cable glands	Compression type cable glands shall be provided to hold the cables to avoid any pressure or tension on the terminal block connections.
5.8	Gland Plate	Gland plate shall be 3.0mm thick with metallic knockout punches
5.9	Doors	a) The doors of cable cabinets shall be lockable hinged type b) Doors shall be fitted with double lipped gaskets. c) Bus bar side shall have bolted doors.
5.10	Drawing Pocket	Shall be Provided to keep “As Built Drawings”

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6 BUSBAR

6.1	Material	Busbar shall be of aluminum.
6.2	Size (phase and neutral)	a) Main busbar - 80x10 sqmm for Type 1 ACDB b) Main busbar – 50X10 sqmm for Type 2 ACDB c) Busbar dropper size Incomers - MCCB-80x10 sqmm for Type 1 ACDB d) Busbar dropper size Incomers - MCCB-50x10 sqmm for Type 2 ACDB
6.3	Supports	The busbar shall be supported by means of durable non-hygroscopic, non-combustible and non-tracking polyester fiberglass material or porcelain. Supports shall be capable of withstanding the maximum short circuit stresses
6.4	Sleeves and shrouds	Busbars shall be encased in heat-shrinkable sleeves of insulating material which shall be suitable for the operating temperature of busbars during normal service. The busbar joints shall be provided with removable thermosetting plastic shrouds.

7 MCCB

7.1	MCCB type	4 pole
7.2	MCCB design ambient temperature	50deg C
7.3	MCCB Housing	Thermoplastic material resistant to fire & abnormal heat , non hygroscopic
7.4	MCCB Terminal	Silver coated copper with phase barriers, spreader terminals & shrouds
7.5	De-rating at 50Deg ambient temperature	No derarting (0%)
7.6	MCCB rated 3 phase short circuit breaking capacity Ics = Icu	36kA minimum at 415v and 50Hz
7.7	MCCB rated 3 phase short circuit withstand capacity, Icw	8kA for 1sec
7.8	MCCB SC making current capacity	75kA peak
7.9	MCCB rated insulation level	1000V
7.10	MCCB mechanical & electrical endurance	As per IS 13947 / IEC
7.11	MCCB utilization category	B as per IS / IEC 947
7.12	MCCB indications	ON, OFF & TRIP
7.13	MCCB protection	MCCBs shall have microprocessor based over current and earth fault release.

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7.14	Tripping characteristic required	
7.14.1	Overload setting	Range 60-100%In (Set on 95%)
7.14.2	Short Circuit setting	Range 200-1200%In (Set on 300%)
7.14.3	Earth fault setting	To be provided
7.15	MCCB Clearances in air	As per table XIII of IS 13947-1
7.16	MCCB temperature rise limits	As per table 2 & 3 of IS 13947-1
7.17	MCCB Ingress Protection	IP2X Minimum (pollution degree minimum 2)
7.18	MCCB additional features	Sealing/padlocking of operating knob in OFF position Sealing/padlocking of operating knob in OFF position isolation suitable with positive contact

8 CURRENT TRANSFORMER

8.1	Type	Cast-resin type, Class-E insulation, rated for 120% current continuous
8.2	Provision	Shall be provided in incomer for metering. Separate Neutral CT shall be connected in the neutral for detecting earth fault for both the incomer.
8.3	Secondary current	5A
8.4	Metering CT Class	1.0
8.5	Burden	Based on requirement

9 TERMINALS AND WIRING

9.1	Secondary Wiring	
9.1.1	Grade and type	1100 V grade, PVC insulated, FRLS type stranded flexible copper wire.
9.1.2	Ferruling	Each wire shall bear an identifying ferrule or tag at each end or connecting point.
9.1.3	Size	Appropriate size copper based on rated current and application subject to a minimum of 2.5sqmm copper
9.2	Terminals	Terminals of appropriate size shall be provided inside each cabinet for incoming and outgoing cables.
9.2.1	Grade	1100 V grade, molded piece terminals complete with insulated barriers, washers, nuts and lock nuts.
9.2.2	Power Terminals type	Stud type, nut driver operated

9.2.3	Control terminals type	Stud type, screw driver operated suitable for minimum 6sqmm wire.
9.2.4	Spare terminals	20% spare terminals should be provided in each terminal block.
9.2.5	Accessibility	Placement of terminals shall enable proper cable termination. Terminals shall be readily accessible for inspection and maintenance.
9.2.6	Marking	The terminals shall be serially numbered to facilitate installation and maintenance.
9.3	Cable troughs	Shall be provided for wiring of each terminal block with 50% spare capacity

10 METERS, INDICATIONS AND PUSH BUTTONS

10.1	Meters	
10.1.1	Multifunction Meter	For incomer feeders. Meter should have facility to store peak load current in memory.
10.1.2	Type	Digital with inbuilt phase selector
10.1.3	Communication Protocol	RS485 on MODBUS
10.1.4	Accuracy Class	1.0
10.1.5	Auxiliary supply	240VAC with 10% tolerance
10.2	Indicating lamps	Indicating lamps shall be of low wattage cluster LED type.
10.2.1	Incomer/ Outgoing On	Red
10.2.2	Incomer/ Outgoing Off	Green
10.2.3	Incomer/ Outgoing Trip	Amber
10.3	Push buttons	For manual operation of incomer

11 NAME PLATES & MARKINGS

11.1	Panel nameplate	Panel shall have a nameplate clearly indicating the following: a) Manufacturer's Name & Country: b) Panel Serial No.: c) Customer Name: BSES Yamuna / Rajdhani Power Ltd d) PO No. & date: e) Type of Panel: f) Current rating: g) Rated Voltage and Frequency: h) Month and year or Manufacture: MM/YYYY i) Guarantee period:

11.2	Feeder nameplate	Large and bold name plate carrying the feeder identification shall be provided on the top of each module. Blank insert type name plates shall be provided on each outgoing feeder.
11.3	Equipment nameplate	a) All equipment mounted on front side as well as equipment mounted inside the panels shall be provided with individual name plates with equipment designation engraved. b) All front mounted equipment shall also be provided at the rear with individual name plates engraved with tag numbers corresponding to the one shown in the panel internal wiring to facilitate easy tracing of the wiring.
11.4	Danger plate	Panel shall have a danger plate of anodized aluminum clearly indicating the danger logo and voltage details.
11.5	Material	Non-rusting metal or 3 ply lamicoid. Nameplates shall be black with white engraving lettering. Stickers are not allowed.
11.6	Fixing	All nameplates/rating plates shall be riveted to the panels at all four corners. Bolting/screwing is not acceptable.
11.7	Markings	Each switch shall bear clear inscription identifying its function. Similar inscription shall also be provided on each device whose function is not otherwise identified. If any switch or device does not bear this inscription separate nameplate giving its function shall be provided for it. Switch shall also have clear inscription for each position indicating e.g. Trip-Neutral close, ON-OFF etc.

12 FINISHING

12.1	Primer	Two coats
12.2	Finish	Powder Coating
12.3	Colour shade	RAL 7032 (Siemens Grey)
12.4	Paint thickness	70 microns (minimum)

13 APPROVED MAKE OF COMPONENTS

13.1	Switch	Siemens / L&T (Salzer)
13.2	HRC Fuse Links	GE/ Siemens/ L&T
13.3	Meters	Rishabh/Schneider/AE
13.4	AC Contractors	L&T/Siemens/Telemechanique/GE/ABB
13.5	Terminals	Connectwell/Elmex/Wago/Phoenix
13.6	Push buttons / Actuator	L&T/Siemens/Vaishno/Schneider
13.7	MCCB	L&T/Siemens/ ABB/GE/Schneider
13.8	MCB	Datar/Legrand/Hager/Schneider/ABB
13.9	Indicating lamps	Vaishno/Binay/Teknic/Siemens/Mimic/C&S

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14 QUALITY ASSURANCE PLAN, INSPECTION AND TESTING

S No.	Parameters	Technical Requirements
14.1	Quality Assurance Plan	QAP Shall be submitted by vendor for approval. Inspection and testing of the material shall be carried out accordingly.
14.2	Type test	Equipment should be of type tested quality only, type test certificate to be submitted along with offer. Test reports from CPRI/ERDA accredited laboratory only acceptable.
14.3	Routine /Acceptance test	As per relevant Indian standard
14.4	Inspection	a) The buyer reserves the right to inspect equipment at the Seller's works at any time prior dispatch, to verify compliance with the specifications. 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 equipment.
14.5	Test certificates	Test certificates (routine and acceptance) shall be submitted along with the dispatch documents.

15 PACKING, SHIPPING, HANDLING & SITE SUPPORT

15.1	Packing Protection	The packing shall be fit to withstand rough handling during transit and storage at destination. The test set should be properly protected against corrosion, dampness & damage.
15.2	Packing for accessories and spares	Robust non-returnable packing case with all the above protection & identification Label. The bidder should get the packing list approved before dispatching the material.
15.3	Packing Identification Label	On each packing case, following details are required: 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) Manufacturer / Supplier's name g) Address of Manufacturer / Supplier / it's agent h) Description i) Country of origin j) Month & year of Manufacturing

		k) Case measurements l) Gross and net weight m) All necessary slinging and stacking instructions
15.4	Shipping	The seller shall be responsible for all transit damage due to improper packing.
15.5	Handling and Storage	Manufacturer instruction shall be followed.
15.6	Detail handling & storage instruction sheet / manual to be furnished before commencement of supply.	

16 DEVIATIONS

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

17 DOCUMENT SUBMISSION MATRIX

Drawing submission shall be as per the matrix given below.

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

S No.	Documents to be submitted	Bid	Approval	Pre Dispatch
17.1	Guaranteed Technical Particulars (GTP)	Required	Required	
17.2	Deviation Sheet, if any	Required	Required	
17.3	GA drawing, SLD, Wiring Diagram	Required	Required	

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S No.	Documents to be submitted	Bid	Approval	Pre Dispatch
17.4	Type test reports(not more than 5 years old) from CPRI/ERDA	Required	Required	
17.5	Reference List of major customers using the offered product from last 5 years	Required		
17.6	Performance certificates executed in last 5 years			
17.7	Make of Raw Materials	Required	Required	
17.8	Manufacturer's Quality Assurance Plan		Required	
17.9	Complete product catalogue and Manual		Required	Required
17.10	Test certificates of all raw materials			Required
17.11	Inspection and routine test reports, carried out in manufacturer's works			Required

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ANNEXURE A GUARANTEED TECHNICAL PARTICULARS

S. No.	Description	Specification requirement	Vendor Data
1.0	**GENERAL FEATURES**		
1.1	Make		
1.2	Type		
1.3	Reference Standard		
1.4	Rated Operational voltage	415V AC ± 10%	
1.5	Rated Nominal Current	630A	
1.6	Rated frequency	50 Hz (+3%, -5%)	
1.7	Rated Insulation voltage	1100V	
1.8	Rated Impulse withstand voltage	8kV	
1.9	Service supply for heating, lighting and power sockets	240VAC±10%,	
1.10	Mounting	Floor (Free standing)	
1.11	Connections	Cable entry – Bottom	
1.12	Configuration	Single front	
1.13	Enclosure thickness		
1.13.1	Load Bearing Member	>=2.5mm	
1.13.2	Doors and Covers	>=2 mm	
1.14	Enclosure Material	CRCA Sheet/GI	
1.15	Enclosure degree of protection	IP 54	
1.16	Mechanical safety interlocks	As specified in technical specification	
1.17	Incomer Power Cable Termination	2Rx4Cx300sqmm	
	Outgoing Cable Termination	a) 200A MCB- 4Cx150sqmm b) 63A MCB- 4Cx50sqmm c) 32A MCB- 4Cx25 sqmm d) 16A MCB- 2Cx10 sqmm	
	Cable Termination Type	From Bottom of Panel	
	Clearance	150 mm clearance to be maintained from the bottom of the TB and the gland plate	
1.18	Paint shade	RAL 7032 (Siemens Grey)	
1.19	Typical vertical section (Overall dimension (mm) and weight (Kg))	Required	
1.19.1	Incomer		
1.19.2	Outgoings		
1.20	Dimensions of the ACDB Panel	L (mm) X D (mm) X H (mm)	

S. No.	Description	Specification requirement	Vendor Data
1.21	Weights of the ACDB Panel	(in kg.)	
1.22	Marking on the panel	As per the specification	
2.0	**INCOMER MCCB**		
2.1	Make & Model of MCCB	Required	
2.2	Catalogue of MCCB	Required	
2.3	Continuous Current at 40 deg C/ 50 deg C	630A	
2.4	Rated ultimate breaking capacity at rated voltage	50kA	
2.5	Rated service breaking capacity Ics	Ics = 100% Icu at rated voltage	
2.6	Rated making current	Icm = 220% Icu	
2.7	Utilization Category	A	
2.8	Overload setting	50 -100% (Inverse time characteristics)	
2.9	Overcurrent setting	200-1000% (Instantaneous characteristics)	
2.10	Earthfault setting	20-100% (Instantaneous)	
2.11	Dimension(HxWxD)	Required	
2.12	Weight	Required	
3.0	**BUS AND BUS TAPS**		
3.1	Make		
3.2	Material and grade of buses and joints	High conductivity electrolytic grade aluminum	
3.3	Reference standard		
3.4	Continuous Current (at site condition, 50°C ambient) within cubicle	630A	
3.5	Cross sectional Area		
3.6	DC resistance	ohm/m/ph	
3.7	Skin-effect ratio		
3.8	Reactance	ohm/m/ph	
3.9	Losses-middle phase	w/m/ph	
3.10	Minimum clearance of bus bar and joints	Required	
3.10.1	Phase to phase (mm)		
3.10.2	Phase to earth (mm)		
3.11	Bus bar insulation	a. Heat shrinkable sleeves rated for maximum operating voltage b. Cast resin shrouds for joint	

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S. No.	Description	Specification requirement	Vendor Data
3.12	Bus joints	Silver	
3.13	Bus bar support insulator	Required	
3.13.1	Spacing (mm)		
3.13.2	Make		
3.13.3	Type		
3.13.4	Reference standard		
3.13.5	Voltage class (kV)		
3.13.6	Minimum creepage distance (mm)		
3.13.7	Cantilever strength (Kg/sq.cm.)		
4.0	**CURRENT TRANSFORMER**		
4.1	Make		
4.2	Type	Resin Cast	
4.3	Reference standard		
4.4	CT ratios		
4.5	Class of Insulation	Class-E	
4.6	Protection class	5P20	
4.7	Metering class	5	
4.8	VA burden for Relaying CT-Incomer	Based on requirement.	
5.0	**AMMETERS/MULTIFUNCTION METERS AND VOLTMETERS**		
5.1	Make & Model no.		
5.2	Type	Digital with inbuilt phase selector	
5.3	Communication Protocol	RS485 on MODBUS	
5.4	Accuracy class	1	
6.0	**CONTROL & INDICATIONS**		
6.1	Push button		
6.1.1	Make and model no.		
6.1.2	Type	Flush mounted type with touch proof terminals	
6.2	LEDs		
6.2.1	Make & Model no.		
6.2.2	Type	Flush mounted type with touch proof terminals	
7.0	**TERMINAL BLOCKS**		
7.1	Make & Model no.		
7.2	Spare terminals	Equal to 20% of active terminals in each TB	
7.3	Power terminals	Stud type, screw driver operated	

S. No.	Description	Specification requirement	Vendor Data
7.4	Control terminals	Stud type, screw driver operated suitable for minimum 6sqmm wire.	
8.0	**TESTS**		
8.1	Confirmation of routine tests to be performed as per IS 60947	Yes/No	
8.2	IP 55 test shall be carried out during inspection	Yes/No	
8.3	Confirmation of Type tests to be performed (or report submitted) as per IS 60947	Type test report no./date	
8.4	Confirmation of Acceptance tests to be performed during inspectionas per IS 60947	Yes/No	
8.5	Temperature rise test to be carried out at NABL accredited lab.	Yes/No	
9.0	Deviation sheet against each clause of the specification	To be submitted	

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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

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

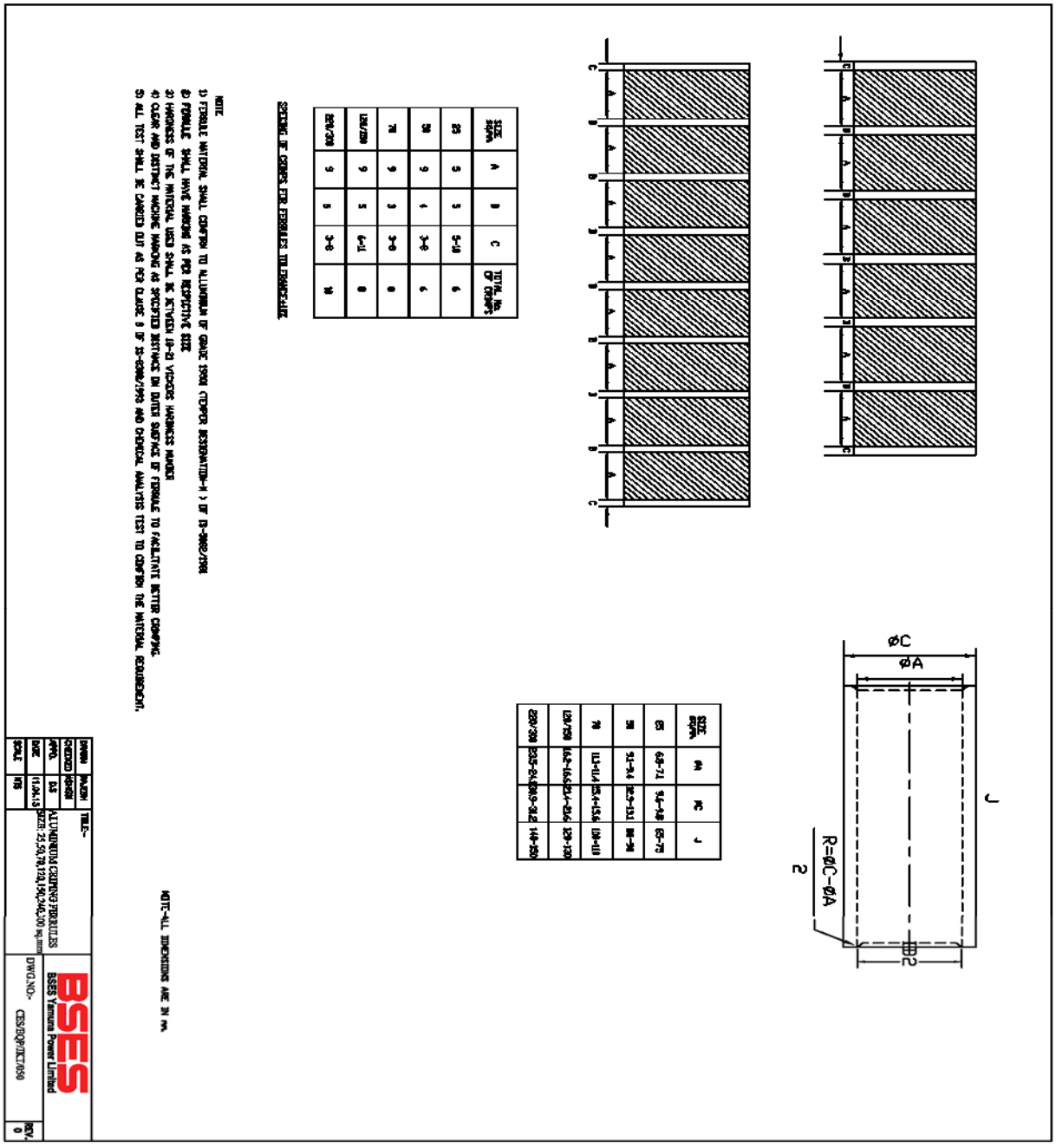
11.0.0 Deviations

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	6	4	7-8	6
70	6	3	8-9	6
95/120	6	5	9-11	8
150/185	6	5	9-11	8
240/300	6	5	9-11	8

SPACING OF CRIMPS FOR FERRULES TOLERANCE±2MM

SIZE (sq.mm)	A	B	J
25	64-71	9.4-9.8	65-75
50	91-94	12.5-13.1	88-96
70	111-114	15.4-15.6	100-110
120/150	164-165	21.4-21.6	120-130
185-240	235-240	30.2-30.6	140-150
300	295-300	38.2-38.6	160-170

NOTE:-ALL DIMENSIONS ARE IN mm.

NOTE

1) FERRULE MATERIAL SHALL CONFORM TO ALUMINIUM OF GRADE 99.6% (COPPER DESIGNATION-H) OF IS-8130/1984
2) FERRULE SHALL HAVE MARKING AS PER RESPECTIVE SIZE
3) HARDNESS OF THE MATERIAL USED SHALL BE BETWEEN 18-23 VICKERS HARDNESS NUMBER
4) CLEAR AND DISTINCT MACHINE MARKING AS SPECIFIED BESIDES ON OUTER SURFACE OF FERRULE TO FACILITATE BETTER CRIMPING.
5) ALL TEST SHALL BE CARRIED OUT AS PER CLAUSE 8 OF IS-8130/1984 AND CHEMICAL ANALYSIS TEST TO CONFIRM THE MATERIAL REQUIREMENT.

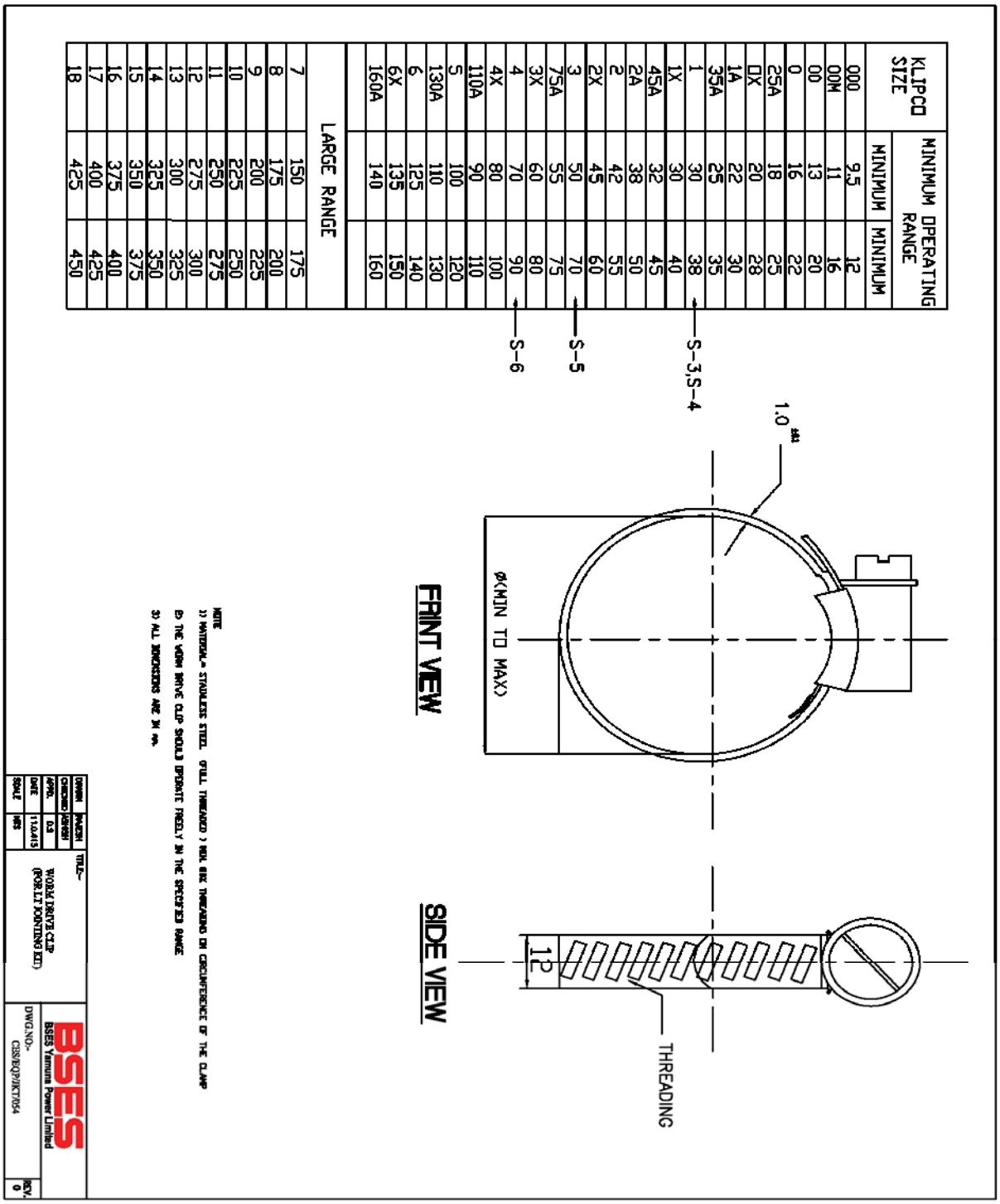
DRAWN	MANISH	TITLE:-	
CHECKED	ASHISH		
APPD.	DGM	ALUMINIUM CRIMPING FERRULES	
DATE	11/04/13	SIZES: 25,50,70,120,150,240,300 sq.mm	
SCALE	NTS		

BSES Yamuna Power Limited

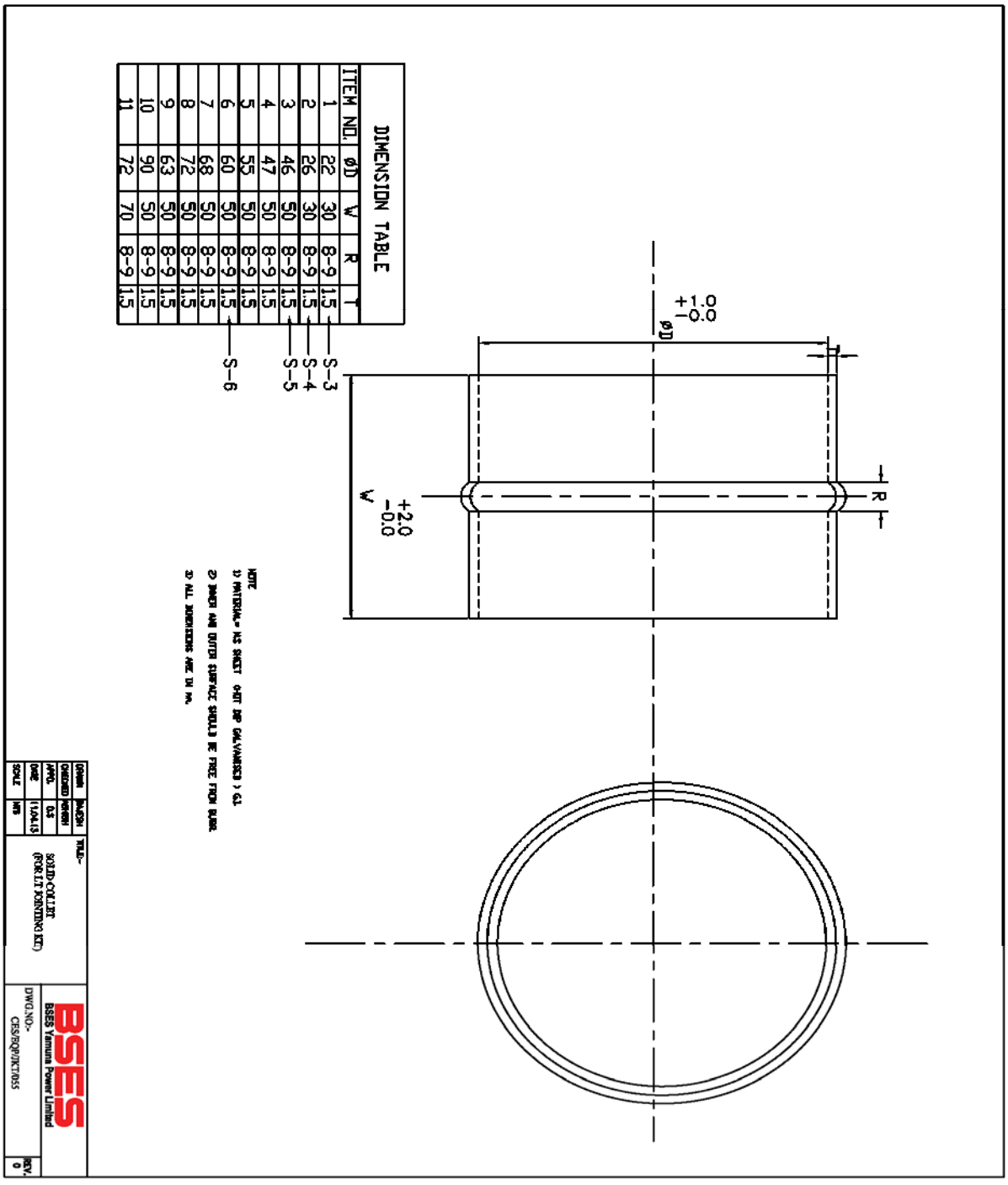
DWG.NO:- CESS/DGM/JKT/050

REV. 0

Annexure B: Drawing of Worm Drive Clip

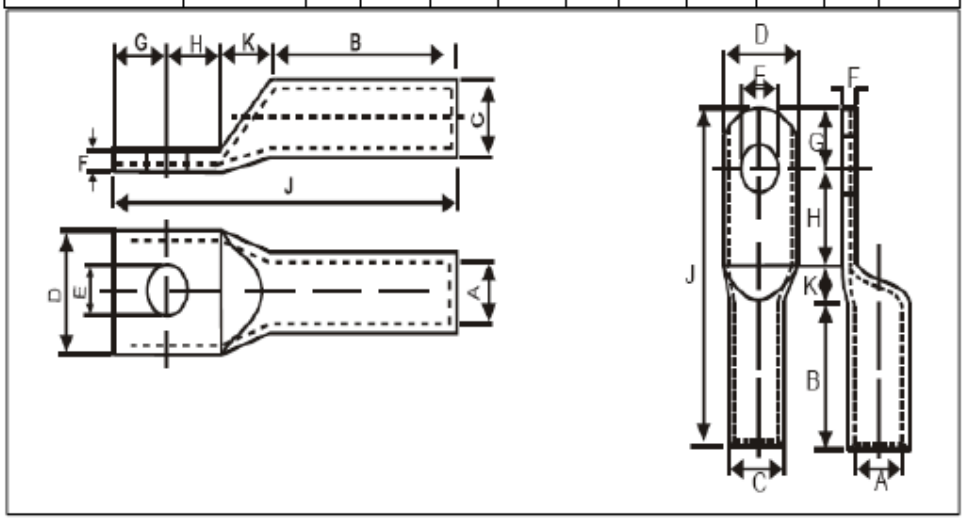


Annexure C: Drawing of Solid Collet



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	

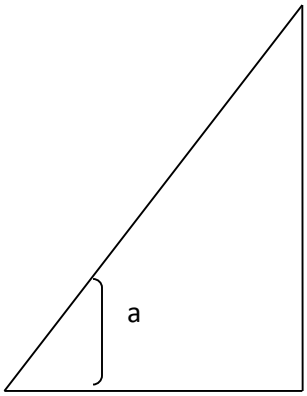
S.No.	Description	Buyer's Requirement	Seller's data
B	Nominal thickness (mm)		
(i)	For 1Cx300 mm^2	1.8 mm	
(ii)	For 1Cx500 mm^2	2.2 mm	
(iii)	For 1Cx630 mm^2	2.4 mm	
iv)	For 1Cx1000 mm^2	2.8 mm	
C	Diameter over Insulation (mm) Approx.	……	
D	Make of insulation compound	Ref: Annexure D	
7	Inner Sheath	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	
Approved by	Gaurav Sharma	
	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

For

Fire Retardant Coating on Cables

Specification no – BSES-TS-88-FRCC-R0

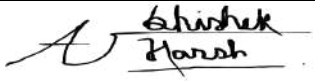
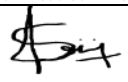
Rev:		0
Page		1 of 8
Date:		06 May 2022
Prepared by	Abhishek Harsh	 3267d7c3-82b5-46cb-b5a6-867ee7820a34
Reviewed by	Srinivas Gopu	 5d32525e-ed3a-4f41-b1c7-b8a5e77d1519
Approved by	Gaurav Sharma	 23dc2de2-95de-4472-99a7-dea873f472b6

TABLE OF CONTENT

DocUUID : cd001bd0-2887-4154-9da5-199811202a68

1.0 SCOPE

- This specification covers the design, manufacture, testing, supply, erection & commissioning of Fire retardant coating on cables and its accessories.

2.0 CODES & STANDARDS

- Material, equipment and methods used in the manufacturing of fire retardant coating on cables shall confirm to the latest edition of following standard

Standard Name / No	Standard's Description
Indian Electricity Act	Latest Edition
CBIP manual	Latest Edition
IEC 60331-11	Tests for electric cables under fire conditions – Circuit integrity – Part 11: Apparatus – Fire alone at a flame temperature of at least 750 degree C
IEEE 383	IEEE Standard for Qualifying Electric Cables and Splices for Nuclear Facilities
IEC 60754-1	Test on gases evolved during combustion of materials from cables
ASTM D2843	Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics
ASTM D2863	Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)

3.0 SERVICE CONDITIONS

3.1	Max Ambient Temperature	50 deg C
3.2	Max Daily average ambient temp	40 deg C
3.3	Min Ambient Temp	0 deg C
3.4	Maximum Humidity	95%
3.5	Minimum Humidity	10%
3.6	Maximum annual rainfall	750 mm
3.7	Average no of rainy days per annum	60
3.8	Rainy months	June to Oct
3.9	Altitude above MSL	300 M
3.10	Seismic Zone	IV

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4.0 GENERAL FEATURES

4.1	Base Type	Water based Intumescent coating
4.2	Color	Off white
4.3	Density	1.3 ± 0.05 g/cc
4.4	Mix ratio by weight	Single component
4.5	Solids by weight	64 ± 2 %
4.6	ph	8
4.7	Toxicity	Non-toxic, asbestos and lead free
4.8	DFT	1.6 mm
4.9	Coverage	3.2kg±0.10 kg/m² @1.6mm DFT
4.10	Drying time	Surface dry in 30 mins
4.11	Functional Cure Time	48 hours
4.12	Application temperature	10-30^{0}C
4.13	Temperature endurance	>1100^{0}C
4.14	Application method	Brushing, Airless spraying
4.15	Fire Rating	2 Hours
4.16	Features	
4.16.1	Solvent free	Required
4.16.2	Eco friendly	Required
4.16.3	Free of any fibers including asbestos	Required
4.16.4	Single component, ready to apply/use	Required
4.16.5	Easy to apply using a paint brush/spray	Required
4.16.6	No de-rating effect on cables	Required
4.16.7	Added fire protection for existing cables	Required
4.16.8	Compatible with different sheathing chemistries of electrical cables	Required
4.17	Test	
4.17.1	Fire Resistance/Circuit Integrity	As per IEC 60331-11
4.17.2	Flame Retardance	As per IEEE 383
4.17.3	Flammability	As per IS 10810 (P-53)
4.17.4	HCL	As per IEC 60754-1
4.17.5	Smoke density	As per ASTM D2843
4.17.6	Limiting oxygen index	As per ASTM D2863
4.18	Make	Stanvac/3M/Demech

- Note- Any make other than specified in table above shall be subject to BSES Approval.

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5.0 DEVIATIONS

Deviation from this specification shall be stated in writing with the tender by reference to the specification clause/ GTP/ Drawing and description of alternative offer. In absence of such a statement, it shall be assumed by the buyer that the seller complies fully with this specification.

6.0 QUALITY, INSPECTION & TESTING

6.1	Vendor quality plan	To be submitted for purchaser approval
6.2	Inspection points	To be mutually identified & agreed in quality plan
6.3	Type test	Equipment shall be type tested from CPRI/ERDA/NABL accreted lab as per IEC/IS/UL standard.
6.4	Routine test	As per relevant standard
6.5	Acceptance test	To be performed in presence of Owner at manufacturer works shall be as per approved QAP

7.0 GTP

Vendor must submit clause wise compliance against specification at the time of drawing approval.

8.0 DRAWING AND DATA SUBMISSION MATRIX

S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
8.1	Contact Person Name, Email ID and Mobile Number	Required	Required		
8.2	Deviation Sheet (as per “Deviations” Clause)	Required			
8.3	GTP	Required	Required		
8.4	Relevant Type Test as per IS/IEC/UL	Required	Required		

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S. No	Head	Bid	Drawing Approval	Pre Dispatch	Pre Closure
8.5	Manufacturer's quality assurance plan and certification for quality standards		Required		
8.6	Sizing Calculation of Associated Equipment		Required		
8.7	Recommended Spares for five years of operation)		Required		
8.8	Drawings	Required	Required		
8.9	QAP		Required		
8.10	BOQ		Required		
8.11	Make of all Component as per specification		Required		
8.12	Installation, erection and commissioning manual		Required		
8.13	Inspection Reports			Required	
8.14	As manufacturing Drawings			Required	
8.15	Operation and Maintenance Manual			Required	
8.16	Trouble shooting manual			Required	
8.17	As built Drawings				Required

9.0 PACKING

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

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9.3	Packing Identification Label to be provided on each packing case with the following details
9.3.1	Individual serial number
9.3.2	Purchaser's name
9.3.3	PO number (along with SAP item code, if any) & date
9.3.4	Equipment Tag no. (if any)
9.3.5	Destination
9.3.6	Project Details
9.3.7	Manufacturer / Supplier's name
9.3.8	Address of Manufacturer / Supplier / it's agent
9.3.9	Description and Quantity
9.3.10	Country of origin
9.3.11	Month & year of Manufacturing
9.3.12	Case measurements
9.3.13	Gross and net weights in kilograms
9.3.14	All necessary slinging and stacking instructions

10.0 SHIPPING

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

11.0 HANDLING AND STORAGE

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

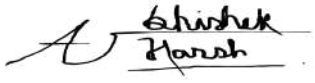
DocUUID : cd001bd0-2887-4154-9da5-199811202a68

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
Reviewed by	Srinivas Gopu	 5d22525e-ed3a-4f41-b1c7-b8a5e77d1519
Approved by	Gaurav Sharma	 23dc2de2-95de-4472-99a7-dea873f472b6

NDEX

DocUUID : 0dc069dd-c771-4bdb-a40c-e5b068994399

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	

DocUUID : 0dc069dd-c771-4bdb-a40c-e5b068994399

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.

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.

		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.

DocUUID : 0dc069dd-c771-4bdb-a40c-e5b068994399

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

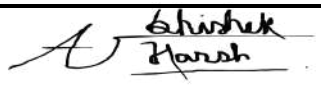
14.1.	Deviation	Deviations from this Specification shall be stated in writing with the tender by reference to the Specification clause/GTP/Drawing and a description of the alternative offer. In absence of such a statement, it will be assumed that the bidder complies fully with this specification. No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

Technical Specification

of

Exhaust and Ventilation System

Specification no – BSES-TS-79-EAV-R0

Rev		0
Page		1 of 4
Date		06 May 2022
Prepared by	Abhishek Harsh	 3267d7c3-82b5-46cb-b5a6-867ee7820a34
Reviewed by	Srinivas Gopu	 5d32525e-ed3a-4f41-b1c7-b8a5e77d1519
Approved by	Gaurav Sharma	 23dc2de2-95de-4472-99a7-dea873f472b6

INDEX

DocUUID : 126a52a5-5e7f-412d-8626-971839cb2393

1. INTENT OF SPECIFICATION

This specification is intended to cover the design, manufacture, assembly, testing at manufacturer's works, supply & delivery, properly packed for transport at site of Air Conditioning system and Ventilation system for substation control room building complete with all materials and accessories for efficient and trouble free operation.

In the event of any discrepancy with the listed documents, the stipulation of this specification shall govern.

2. SCOPE OF SUPPLY

The following equipment shall be furnished with all accessories: -

2.1. Exhaust and supply air fans for ventilation
2.2. 5 star rated split air-conditioner for control room only
2.3. All necessary components for operation of the above equipment.
2.4. All wiring & accessories to complete the installation.
2.5. All relevant drawings, data & instruction manuals.

3. GENERAL REQUIREMENT

3.1. All equipment and material shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards except where modified and/or supplemented by this specification.

3.2. Equipment and materials conforming to any other standard, which ensures equal or greater quality, may be accepted. In such case copies of the English version of the standard adopted shall be submitted along with the bid.

4. DESIGN CRITERIA

4.1. Exhaust system

Industrial type Axial Exhaust fan of propeller type / axial type shall be provided for rooms with suitable drive motor, DOL starter, rain protection cowl with screen, grouting bolts etc. Fan for battery room shall be bifurcated type spark proof construction. The quantity shall be based on calculation. Minimum requirement is given in the subsequent sections.

4.2. Exhaust fan shall be supplied in:

a. Switchgear room – 3 no's heavy duty with sweep of 600mm
b. Battery Room – 2 no's with sweep of 600mm
c. Toilet – 1 no (200mm domestic exhaust fan)

DocUUID : 126a52a5-5e7f-412d-8626-971839cb2393

4.3. Industrial type fan shall be provided as follows

a. Battery room – 1 No, air circulator 600mm
b. Control room – 3 No's, domestic 450mm sweep
c. Switchgear Room – 4 No's, air circulator 600mm

4.4. Air Conditioning

5 star Split air conditioners shall be provided in control room building of to maintain the temperature at 25 degrees Celsius. N-1 redundancy shall be provided for air-conditioning system. Make of air conditioners shall be Daikin / Hitachi/ O-General make.

4.5. All equipment, accessories and wiring shall have fungus protection, involving special treatment of insulation and metal against fungus, insects and corrosion.

5. 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.

DocUUID : 126a52a5-5e7f-412d-8626-971839cb2393

TECHNICAL SPECIFICATION

FOR FIRE PROTECTION SYSTEM

For BYPL GRID S/STN.

Prepared by		Reviewed by		Approved by		Rev	00
Name	Sign	Name	Sign	Name	Sign	Date	2 May 2019
GG		JN		RK			

1 Automatic fire detection system

The new panel room / Switch gear room and cable galleries/ cable cellar to be installed with the fully addressable smoke detectors compactable to the existing panel and the smoke aspiration system.

Details of the panel and the detectors are as follows.

SNO	ITEM	SPECIFICATION	MAKE
1	Digital addressable fire alarm panel (PX-16E/32E)	2-32 zone digitally addressable zones with each zone support 20 addressable devices, Network able, PC based graphic software for easy monitoring, support ASES addressable MCP.	ASES
2	PA console	Keypad with feather touch switch for zone selection, gooseneck mike attached for announcement, main, Ac fail, fuse blown LED indication, inbuilt battery charger and battery upto 25AH.	ASES
3	Aspirating smoke detector system (ASD 531)	Alarm sensitivity range of 0.02%/m to 10%/m.	SECURITON
4	Photoelectric smoke detector	Tested and approved to EN54-7:2000, Bi-color LED detector status indicator. The distance between two detectors shall not be more than 6 meters	SYSTEM SENSOR
5	Rate of rise and fixed temperature thermal detector	Tested and approved to EN54-5:2000 class A1R	SYSTEM SENSOR
6	Digital addressable monitor module (PX-DA-MM)	Digital addressable communications, DIP switch for addressing of module,	ASES
7	Digital addressable manual call point	The points shall be so located to ensure that one or other call box is in approach of 22.5 meters.	ASES
8	Conventional Sounder		ASES
9	Talk Back unit	Compatibility with any make conventional two way communication system, integrated alarm test key features.	ASES
10	Sinages	At all exits, fire fighting equipments, evacuation signs, etc. auto glow type	Reputed

2 First Aid Fire Extinguishers

The first aid fire extinguishers are already place in the conspicuous places in the existing installations. The vendor has to provide the following quantity of first aid fire extinguishers of make Ceasefire or Minimax only.

Minimum Quantity of F.E for 33kV grid:

4.5 kg CO2	----	3 nos
22.5 kg CO2	----	4 nos
6 kg ABC (MAP 90)	----	3 nos
75kg ABC (MAP 90)	----	1 nos

Minimum Quantity of F.E for 66kV grid:

4.5 kg CO2	----	3 nos
22.5 kg CO2	----	8 nos
6 kg ABC (MAP 90)	----	3 nos
75kg ABC (MAP 90)	----	2 nos

3 Fire Bucket with Stand

Fire bucket stand having provision to hang 4 fire buckets with dry sand filled and a suitable top cover to avoid the ingression of water during rain. The fire bucket must comply with the IS 2546.

For 33 kv two stand, 8 buckets with dry sand filled.

For 66 kv Three stand, 12 buckets with dry sand filled

4 Fire Hydrant System

For outdoor grid S/Stn. Fire hydrant system to be installed in loop to cover the entire grid area. All the component of hydrant system to be provided in Red colour and rust free material as per relevant Indian standards.

S.NO.	ITEM	SPECIFICATION
1	Hydrant point	Hydrant point to be installed to cover whole area. The distance between two hydrant points shall not be more than 30 meters.
2	Water Storage Tank	Minimum storage capacity of 15000 Ltr.
3	Pump	An electric/diesel pump installed at static water tank to charge the wet-riser systems 280 LPM
4	Pump panel	Panel comprising starting, stopping and indicating devices of fire pump.
5	Hose Box with RRL hose pipe (15meter)	With every hydrant point
6	Pressure Switch	A switch connected on delivery line of fire pump, tank at pre-set pressure level so designed to automatically start the fire pump
7	Pressure Gauge	
8	Signage	

5 10 KG Modular fire extinguishers

Modular fire extinguisher (MAP 90) extinguishers serving an area of 100 sq. meter to be installed above the oil type distribution transformer and in cable cellar room/ cable gallery so as to cover whole area. The Portable modular FE, ABC (Stored Pressure) shall conform IS 13849. The Dry powder used in FE shall conform IS 4308

6 Fire Stops

Fire resistive stops to be provided at the locations where the trenches enter the S/stn., cable penetration as per IS12459.

7 Fire Wall

As per IEC/IS/CBIP/IEEE/CEA Guideline.

8 Nitrogen injection fire protection system / High velocity Spray system

For transformer of 10 MVA and above rating to be provided with Nitrogen injection fire protection system or with automatic high velocity spray system designed and installed as per IS15325

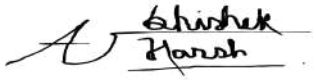
Note: The power supply to fire protection systems like fire pumps, fire alarm system, PA system, exit signage lighting, emergency lighting shall be from normal and emergency power sources with changeover facility (Ref.CEA guideline 2010).

Technical Specification

Of

Insulated Floor Coating

Specification no – BSES-TS-75-INFC-R0

Rev:		0
Pages:		1 of 7
Date:		06 May 2022
Prepared by	Abhishek Harsh	 3267d7c3-82b5-46cb-b5a6-867ee7820a34
Reviewed by	Srinivas Gopu	 5d32525e-ed3a-4f41-b1c7-b8a5e77d1519
Approved by	Gaurav Sharma	 23dc2de2-95de-4472-99a7-dea873f472b6

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

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

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

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.

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

TECHNICAL SPECIFICATION

SCADA RTU/ DCU & NETWORK AUTOMATION SYSTEM FOR 66/33/11kV NEW GRID STATION (IEC 61850 PROTOCOL)

INDEX

INDEX

Sr. No.	Topic	Description
1	**Scope of the Document**	BYPL already has SCADA Control Centre implementation consisting of MCC (Master Control Centre) and (BCC) Business Continuity Centre (commissioned by M/s ABB Ltd. with Network Manager Ver 5.5) through which currently 55 grid stations and approx 400 DMS stations are being controlled and monitored. The present SCADA RTU/ DCU & Network system enable remote monitoring and controlling of all equipment's of the unmanned grid stations. This document states that the new RTU/ DCU & Network automation system supplied will integrate with the existing SCADA infrastructure enabling remote monitoring and controlling of grid equipment's, facilitating unmanned station provision. The scope of this specification covers all the Technical requirements of the RTU/ DCU & Network Automation system including System Architecture design, Manufacturing, Quality, Testing facility at manufacturer's works, packing, forwarding with loading/ unloading at site/ stores. It also states the installation, commissioning and testing of all the equipment's supplied or required for efficient and trouble free SCADA RTU/ DCU & Network Automation system. The scope also covers supply of spares, trainings, configuration tools and documents. This document describes the automation requirement for C&R/ switchgear panels, IEDs, and all other items required for SCADA controlled 66/33/11 kV power system supplied in grid. The specific requirements are covered under technical requirements (Ref. 3)
2.	**Climate conditions for system**	The atmosphere of Delhi/National Capital Region (NCR) is generally laden with mild acid and dust suspended during dry months and subjected to fog in cold months. The design of the equipment's and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.1g • Max. Ambient Temperature (Working): 50°C • Min. Ambient Temperature: 0°C • Max. Humidity: 95% non-condensing • Min. Humidity: 10% • Avg. no. of Thunderstorm days per annum: 50 • Avg. Annual Rainfall: 750mm

		The supplier/ BA is required to submit climate compliance test certificate for supplied SCADA RTU/ DCU & network Automation system.
3	**Technical Requirements**	
3.a	General requirements for Supplier/ Business Associates (BA)	The supplier/ BA should have at least 10 years of experience in design, manufacturing and supply of SCADA RTU/ DCU & Network Automation system integrated with the protection system for controlling and monitoring of the electricity transmission and distribution network. The supplier/ BA needs to submit the proof of completing minimum 5 such projects with other Indian utilities/ concerns as its experience certificate. The supplier/BA should have direct business office at Delhi/NCR. In case of support through business partners details of customers supported by the service partners to be submitted to BYPL. The supplier/ BA should have experience of SCADA RTU/ DCU and Network system integration with numerical relays/ IEDs on standard international protocols (Ref 3.d). The supplier/ BA shall produce a well- structured project plan constituting of timelines for installation, commissioning and testing of the SCADA RTU/ DCU and Network Automation system to which he will have strictly abide. The supplier/ BA can offer an innovative and advanced system and the ways and cost to integrate the same in the existing infrastructure. The offer is subjected to an approval from BYPL after a thorough discussion between the supplier/BA and BYPL. In case, an approval is not awarded to the supplier/BA's offered innovative system, BYPLs existing/ desired infrastructure prevails and the supplier/BA shall provide the system accordingly. The supplier/ BA should optimize on the cost of software products offered to BYPL considering already available licenses with BYPL. The supplier/BA should clearly indicate licensing policy for the software tools offered. The supplier/ BA should be technically capable to provide necessary training to the personnel recommended by BYPL to maintain the system and troubleshooting reports (Ref. 10)
3.b	General System	The SCADA RTU/ DCU & Network Automation system shall be modular

	Design	and suitable for remote operation and monitoring of the complete substation including future expansions. The systems shall be state of the art, suitable for operation under electrical environment present in high voltage substations (66/33/11kV), follow the latest engineering practice, and ensure long-term compatibility requirements and continuity of equipment supply and the safety of the operating staff. The housing of the SCADA RTU/ DCU & Network Automation system hardware should be IP class protected suitable for both indoor and outdoor installations. The offered SCADA RTU/ DCU & Network Automation system shall support remote control and monitoring from existing remote SCADA control centers (MCC/ BCC) via gateways. The system shall be designed such that personnel without any background knowledge in Microprocessor-based technology are able to operate the system. The operator Interface shall be intuitive such that operating personnel shall be able to operate the system easily after having received some basic training. The system shall incorporate the control, monitoring and protection functions specified, self-monitoring, signaling and testing facilities, measuring as well as memory functions, event recording and evaluation of disturbance records. Maintenance, modification, diagnosis or extension of components shall not cause a shutdown of the whole SCADA RTU/ DCU & Network Automation system. Self-monitoring of components, modules and communication shall be incorporated to increase the availability and the reliability of the equipment and minimize maintenance. The SCADA RTU/ DCU and Network Automation system should be processor, co-processor, power supply, rack and media redundant. The SCADA RTU/ DCU & Network Automation system should be web accessible with facility to upload/ download the system configuration files and controlling & monitoring of equipment's. The SCADA RTU/ DCU & Network Automation system should be cyber secured with user based configured password protection.

3.c	System Architecture	The SCADA RTU/ DCU & Network Automation system shall be based on decentralized architecture and on concept of bay-oriented, distributed intelligence. Functions shall be decentralized, object-oriented and located as close as possible to the process. The main process information of the station shall be stored in distributed databases. The typical SCADA RTU/ DCU & Network Automation system architecture shall be structured in two levels, i.e. station and bay level. At bay level, the IEDs shall provide all bay level functions regarding control, monitoring and protection information, inputs for status indications, outputs for commands and measurand/ analog data. The IEDs should be directly connected to the switchgear without any needs for additional interposition or transducers. Each bay control IED shall be independent from each other and its SCADA functioning shall not be affected by any fault occurring in any of the other bay control units of the station. The data exchange between the electronic devices on bay and station level shall take place via the communication infrastructure. Data exchange is to be realized on PRP using IEC 61850 protocol with a redundant managed layer 2 switched Ethernet communication infrastructure. The Ethernet switch must be IEC 61850 compliant and KEMA, CE and FCC certified. The communication shall be made in 1+1 mode (PRP) for IEC 61850 protocol, including the fiber link between the individual bay IEDs to bay switch and Ethernet link between the bay switch to RTU/ DCU, such that failure of one link shall not affect the normal operation of the SCADA RTU/DCU & Network Automation system. However it shall be alarmed in SCADA RTU/ DCU & Network Automation system. Communication shall be on serial link between IEDs like MFMs, DCDBs and the processor with SPD. Clear control priorities shall prevent operation of a single switch at the same time from more than one of the various control levels, i.e. MCC/ BCC, bay level or apparatus level. The priority shall always be on the lowest enabled control level.

<table>
<tr>
<td>3.d</td>
<td>Communication Interface and Protocol</td>
<td>The communication protocol for gateway to control centers must be on IEC 60870-5-104 protocol. While the communication for sub-station IEDs of Bay level and station level must be on IEC 61850 protocol. In addition the RTU/ DCU should have RTU/ DCU serial Modbus RS485 protocol for communication to MFMs and DCDBs. DCDB, NIDS, NIFPS (8 No. DI signals for integration) and APFC should also interfaced with RTU through hard-wiring.

Different protocols to integrate the SCADA RTU/ DCU & Network Automation system are as given in Table 3.d [1]:

<table>
<tr><th colspan="2">Table 3.d [1]</th></tr>
<tr><td>RTU/ DCU to SCADA Control Centers (MCC/ BCC)</td><td>IEC 104</td></tr>
<tr><td>RTU/ DCU to Transformer Monitoring Unit/ NIDS/ APFC</td><td>IEC 61850</td></tr>
<tr><td>RTU/ DCU to Bay Control Units/ Relays</td><td>IEC 61850</td></tr>
<tr><td>RTU/ DCU to MFMs and DCDB</td><td>RTU/ DCU serial Modbus RS485</td></tr>
</table>

NOTE: Converters (protocol/ media/ power supply) of any sort will not be permitted for RTU/ DCU and Network Automation system.</td>
</tr>
<tr>
<td>3.e</td>
<td>IEC 61850 compliant Managed Ethernet switch & network</td>
<td>The IEC 61850 compliant Managed Ethernet switch shall meet the demand of power system automation systems (IEC 61850-3, IEEE 1613 compliance).

• Ethernet switch shall be layer 2 industrial grade.
• Ethernet switch shall be modular with SFP for copper and fiber port.
• Ethernet switch port shall be approve by engineering in charge of SCADA.
• Ethernet switch shall be 19” rack mounted.
• Ethernet switch shall operate at 36 to 72 VDC power supply.
• Operating Temperature: -40°C to +85°C.
• All port shall be user configurable with minimum configuration of 100Mbps.
• Communication type: Fiber Optics media and ST/LC Connector compatible with IEDs supplied with CRP, As Per Site and Ethernet copper CAT6/ above cable. Further approval at the time of final</td>
</tr>
</table>

		engineering approval. • LED indicators on all ports shall be blinking with data transfer. • The switch should have a diagnostic/ error/ warning LED. • It should support remote user setting configuration. • It should own separate maintenance/ console port. • Latency shall be not more than 10ms. • Should be KEMA, CE and FCC Certified. • Switch should be extendable for future expansion. • Minimum 20% spares of utilized hardware and accessories to be provided by the supplier/ BA. • 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. • Shall be suitably mounted in CRP/switchgear panel. • 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. • Power Supply of EFS shall be Dual redundant with pluggable terminal block. • 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 • Shall have Features: Management through Web-based, Telnet, CLI SNMP supported Remote Monitoring Diagnostics with logging and alarms Console ports • 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. to IEEE 802.3ad-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

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<td>
acc. to IEEE 802.1Q-2005 (formerly IEEE 802.1s) MSTP Yes
acc. to IEEE 802.1w-RRST Yes
acc. to IEEE 802.1x-port based Network Access Control

• Shall have Mode Store and Forward
• Shall have Protection class IP4X,Conformal Coating,IPV6
• Shall have Authorized Repair center of original Ethernet switch manufacture in India.
• Shall have Uplink Rate 1 GBPS and Downlink Rate 100 MBPS

<table>
<tr><th colspan="2">Table 3.e [1] BYPL approved Makes</th></tr>
<tr><th>S.No.</th><th>Make</th></tr>
<tr><td>1</td><td>Ruggedcom</td></tr>
<tr><td>2</td><td>Hirschmann</td></tr>
</table>

The specified makes are to be strictly adhered to and no change will be considered hereto.
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<tr>
<td>3.f</td>
<td>RTU/ DCU Enclosure</td>
<td>
RTU/ DCU enclosure should be suitably sized minimum 800mm to accommodate all RTU/ DCU and network accessories, self-standing, fabricated 14 gauge, CRC sheet, duly powder coated paint (RAL 7032 Siemens Grey Structure Shade) with black color plinth and IP class IP5X protected suitable for both indoor and outdoor installations.

Enclosure Details:

• Panel should have a front toughened glass door behind which the RTU/ DCU racks should be mounted on a swing door frame. Doors should have Ergoform- S lock system with key.
• The whole RTU/ DCU hardware should be housed in an energy-efficient Air Conditioned cabinet with temperature and humidity controller.
• Enclosure should have GI mounting plate fitted on its rear wall. Rear wall shall be fixed.
• It should have gland plates suitably sized, fabricated with 3mm CRC sheet, duly powder coated paint (RAL 7032 Siemens Grey Structure Shade).
• Enclosure should have sufficient illumination system with door interlocks, crankcase heaters, Rat/ Rodents repellent system, drawing pocket etc.
• It should have a roof mounted exhaust fan with a removable screwed
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<td>covering, to be used as an alternative in case of AC failure.
• Copper earth strip of suitable size to be provided for both power and electronics, separately.
• A minimum 30% free space should be provided for spares for future expansion.

Table 3.f [1] BYPL approved Makes
<table><tr><th>S.No.</th><th>Make</th></tr><tr><td>1</td><td>Rittal</td></tr></table>
The specified makes are to be strictly adhered to and no change will be considered hereto.</td>
</tr>
<tr>
<td>3.g</td>
<td>RTU/ DCU System</td>
<td>In general the RTU/ DCU system design should aim to minimize power consumption and heat generation. The RTU/ DCU shall be modular type, housed in a 19” rack consisting of processor, co-processor, Digital Input/ Output and Analog Input/ Output modules, power supply and communication interface module, Ethernet switches etc. The auxiliary supply of RTU/ DCU and network system should be 48VDC nominal range: 36-72 VDC with copper wire of suitable size.

RTU/ DCU system should be completely wired up with all the required accessories like MCB, heavy duty CMRs (miniature contactors), rack mounted DC-DC converters, contactors, screw terminals, PVC duct, galvanized GI mounting channels etc. and should be enclosed in an air-conditioned self- standing enclosure.

RTU/ DCU system:

• RTU/ DCU should be modular and expandable
• RTU/ DCU system should have redundant processor, co-processor, power supply, rack, Ethernet switch, bay and station network level.
• It should have a under voltage and earth leakage detection system.
• RTU/ DCU processor should communicate to MCC and BCC on IEC 60870-5-104 protocol on a single IP address.
• Processor and co-processor should be capable to communicate with IEDs (Protection Relays, Digital RTCC relay, bay controller etc.) on IEC 61850 protocol and MFMs, DCDBs to communicate on RS485 RTU/ DCU Modbus slave. DCDB, NIDS and APFC should also interface with RTU through hard-wiring.</td>
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RTU/ DCU system should have programmable logic capabilities supported by easy to use editing facilities. These capabilities shall enable the RTU/ DCU to perform functions using ladder, FBD and statement language as per IEC standard.
Internal battery backup to hold data in SOE buffer memory & also Maintain the time & date.
RTU shall have Integrated HMI/Web based HMI feature.
RTU shall have security log and event archive feature.
All digital and analog input-output modules should be housed in a separate rack.
Digital input and output modules should be 16 channels, 48VDC and potential free contact respectively.
Analog input should be 8/ 16 channel, 16-bit resolution, and universal type, configurable for all ranges between ±10VDC and ±20mA.
RTU/ DCU system should have minimum 20% spares of utilized RTU/DCU & Network hardware and accessories, completely wired up to the last terminal.

<table>
<tr><th colspan="3">Table 3.g [1] BYPL approved Makes with Type</th></tr>
<tr><th>S.No.</th><th>Make</th><th>Type</th></tr>
<tr><td>1</td><td>ABB Ltd.</td><td>RTU560</td></tr>
<tr><td>2</td><td>Schneider</td><td>Saitel DP</td></tr>
<tr><td>4</td><td>Siemens</td><td>A8000</td></tr>
</table>
The specified makes are to be strictly adhered to and no change will be considered hereto.
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<tr>
<td>3.h</td>
<td>Control Wiring, Name Plate and Marking System</td>
<td>
Panel Control Wiring

Suitable size and color control and power wiring to be used for the connection of RTU/ DCU equipment and accessories along with proper and suitable lugs and ferrules. Control wire used inside the panels should be as per international color standards, approved by BYPL.
Field Control Wiring

All control and power cables used in the RTU/ DCU and Network Automation system should be multi-core, FRLS, armored with copper multi-strand.
All communication cables used in the RTU/ DCU and Network Automation system should be tinned copper high density shielded

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or armored with PVC FRLS.
All Optical Fiber Cables (OFC) used in the RTU/ DCU and Network Automation system should be of proper size, armored and suitable for multi/ single mode operations.

- Laying of control and communication cable from field to RTU/ DCU should be in separate cable trays and armored conduit/ duct of suitable size.

- The field wiring material and laying plan is to be submitted by the supplier/ BA and should be duly approved by the engineering staff of SCADA, BYPL before the commencement of work.

- During execution if any replacement/ changes (due to site constraint) are required in the material/ field wiring and laying that shall be duly made by the supplier/ BA without any additional costs within the committed time (maximum one (1) week).
- All field wiring make and model should be approve by SCADA engineering in-charge at the time of detail engineering.

Table 3.h [2] Field Control Wiring

Description	**Approved Make**
RS485 Wire	Belden or equivalent
Ethernet	D-link, Belden or equivalent
Fiber optic cord	Preston or equivalent

Equipment Name Plate

- All equipment's either in RTU/ DCU panel or field should have proper name plate.
- The name plate material, size, and text font and size are to be submitted by the supplier/ BA and should be duly approved by the engineering staff of SCADA, BYPL before the commencement of work.
- Sample name plates are to submit for approval before field installations, any changes suggested by BYPL shall be duly incorporated.
- During the execution any change in name plate size, text font or size suggested by BYPL shall be duly incorporated without any additional costs within the committed time (maximum one (1) week).

		Marking System • The panel and field control wiring Marking System should be proper for the system. The name plates should be properly engraved and all wires should have proper size ferrule nos. and printing life for both should be of minimum 10 years.
3.i	RTU/ DCU Commissioning	• The supplier/ BA will install all network, control and RTU system as per BYPL approved network system architecture • The supplier/ BA will configure, validate and submit the network as per system requirement which will be verified and approved by SCADA engineering in-charge. • The supplier/ BA will be responsible for commissioning of RTU/ DCU with all IEDs as per Annexure 12.b provided. • RTU/ DCU network commissioning engineer (supplier/ BA) will be responsible for IEC 61850 protocol files. • During the local testing, only and only if the punch points are thorough then only final testing will be done. • Final point-to-point testing from SCADA Center is to be necessarily cleared before SAT.
3.j	Time synchronization and SOE	A dedicated GPS signal from the SCADA MCC & BCC (FEP) will be provided for the synchronization of the entire system. This GPS signal would be available to the RTU/ DCU at regular specified intervals and the RTU/ DCU in turn should synchronize all devices via the inter bay bus using SNTP protocol as defined in IEC 61850 standard. To analyze the chronology or sequence of events occurring in the power system, time tagging of data is required which shall be achieved through SOE feature of RTU. The RTU shall have an internal clock with the stability of 10ppm or better. The RTU time shall be set from time synchronization messages received from master station using IEC 60870-5- 104 protocol. In addition, the message can be transmitted using NTP/SNTP. SOE time resolution shall be 1ms or better. The RTU shall maintain a clock and shall time-stamp the digital status data. Any digital status input data point in the RTU shall be assignable as an SOE point. Each time a SOE status indication point changes the state, the RTU shall time-tag the change and store in SOE buffer within the RTU. A

<table>
<tr><td></td><td></td><td>minimum of 10000 events shall be stored in the SOE buffer. SOE shall be transferred to Master Station as per IEC 60870-5-104 protocol. SOE buffer & time shall be maintained by RTU on power supply interruption.</td></tr>
<tr><td>3.k</td><td>Response Times and I/O Capacities</td><td>The total I/O count in a major substation will become large and it must be ensured that the hardware and communication links have sufficient performance to ensure prompt processing of data, Ref. Tables 3.k [1] and 3.k [2].

As I/O at the bay level, both digital and analog will typically be handled by intelligent relays or specialized IEDs, it is therefore important to ensure that these devices have sufficient I/O capacity and dual communication ports for PRP protocol.

<table>
<tr><th colspan="2">Table 3.k [1] Minimum system response times for a substation</th></tr>
<tr><td>Digital Input</td><td>1s</td></tr>
<tr><td>Analog Input</td><td>1s</td></tr>
<tr><td>Digital Output</td><td>0.75s</td></tr>
<tr><td>Disturbance Record File</td><td>3s</td></tr>
</table>

<table>
<tr><th colspan="2">Table 3.k [2] Typical I/O capacities for a substation</th></tr>
<tr><td>Digital Input</td><td>8192</td></tr>
<tr><td>Digital Output</td><td>2048</td></tr>
<tr><td>Analog Input</td><td>2048</td></tr>
<tr><td>Analog Output</td><td>512</td></tr>
</table>

The above are the minimum capacity which may change during detailed engineering of RTU/ DCU. The RTU/ DCU should have the capability of I/Os expansion.</td></tr>
<tr><td>3.l</td><td>Multi Function Meters (MFM)</td><td>A single network loop of MFMs should not have more than eight (8) MFMs. MFM communication network on RTU/ DCU serial Modbus RS485 should be protected against surges and electrical leakages therefore, it is necessary to install Surge Protection Devices placed in between the RTU/ DCU & MFM serial network loop.

The inter-looping of MFMs to be made by 22 guage Belden 8761 non-screened cable while the extension of the communication network from</td></tr>
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<td>MFM to RTU/ DCU to be made by 22 guage Belden 8761 Belden screened cable. The typical diagram for this connection is mentioned in the System Architecture diagram, Annexure 12.a.

Minimum two (2) spare links from CRP to RTU/DCU to be provided by supplier/ BA for future extension.

All hardware of the RTU/ DCU and Network Automation system and CT & PT wirings to MFMs and its configurations fall in supplier/ BAs scope.

The integration of MFM to be done as per the technical document and parameter configuration as per Annexure 12.b.
<table>
<tr><th colspan="2">Table 3.i [1] Field Control Wiring</th></tr>
<tr><th>Description</th><th>Approved Make</th></tr>
<tr><td>MFM</td><td>Delta energy</td></tr>
<tr><td>SPD</td><td>San-tele quip, Phoenix</td></tr>
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<tr>
<td>3.m</td>
<td>Transformer Monitoring cum Automatic Voltage Regulator (AVR) Unit</td>
<td>A digital transformer monitoring cum automatic voltage regulator unit is to be provided as per the tender document for each transformer and it should fulfill the following requirements for SCADA integration and configuration:

• As the name suggests, it should have the functionality of automatic voltage control.
• A digital transformer monitoring cum automatic voltage regulator unit should have the facility to measure CT, PT, Oil temperature, winding temperature and tap position etc. further these parameters shall be telemetered to SCADA RTU/ DCU on IEC 61850 protocol.
• It should have facility to control tap position, fan control etc. further these parameters shall be telemetered to SCADA RTU/ DCU on IEC 61850 protocol for monitoring and controlling.
• It shall have Microprocessor based Numerical relay having LCD display along with the software to make the parameters settings of the device and it shall be possible to do the parameter setting through keyboard unit.
• It should have the feature to set the parameters related to voltage regulation and fan control from MCC & BCC.
• The unit shall have suitable interface to communicate with higher level SCADA system as per the protocol proposed in the integrated package solution.</td>
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		• The unit should be capable of taking tap position, oil temperature inputs directly without any transducers. • The parameters configuration should be as per Annexure 12.b.
3.n	Maintenance, Diagnostics and Reliability	**Maintenance:** It is a requirement that all RTU/ DCUs require no routine or planned maintenance. Therefore, no fans or moving parts shall be used in the RTU/ DCU to avoid any need for maintenance. To ensure this, the RTU/ DCU should be constructed to resist the entry of dust. A single technician shall be able to remove and replace for repair purposes, without special tools and test equipment's involved in the operation of RTU/ DCU. Restoration of equipment to full operational use shall be possible within 15 minutes (nominally) of repairs being completed. It should not be necessary to dismantle (remove multiple pieces of) the RTU/ DCU in order to replace a module. **Diagnostics:** The vendor should provide remote maintenance and monitoring diagnostic and configuration tools (Laptop) which should be able to access the RTU/ DCU and all other IEDs using BYPLs TCP/ IP WAN network. The station should use RTU/ DCUs pass through access capability to monitor the station devices and carry out parameterization of the IEDs, Protection Relays and network devices in the station. • The supplier is required to provide diagnostic and licensed configuration software to run in the supplied tools and access the RTU/ DCU. This software tool shall allow building of new configuration file, modification and configuration of RTU/ DCU configuration file along with the below listed facilities: ▪ Monitoring of all inputs, control of all outputs and testing of calculation logic. Monitoring of all inputs and logic at card level, logic level and protocol level. ▪ Display of communication statistics and eavesdropping of communications channels, including Ethernet, IP, IEC103, IEC 104, IEC 61850 and Modbus. ▪ Download & upload of RTU/ DCU software, database configuration and calculations, upload the complete configuration from RTU/ DCU to modify and then download to RTU/ DCU. ▪ On-line help.

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Display time, date, current firmware, software and configuration running in the RTU/ DCU.
Configuration and diagnostic software must run on latest Microsoft Windows version.

The diagnostic and configuration utility software shall be provided on a pen drive which is compatible with laptop/ PC. The current version number of such software shall be provided.

Reliability:

The RTU/ DCU and Network Automation system will normally remain in continuous service, 24X7, to provide SCADA facilities. A high level of reliability is required as failure can result in the interruption of the operation and monitoring of the Power System Control.

Predicted availability of equipment supplied should exceed the following:

<table>
<tr><th colspan="2">Table 3.n [1]</th></tr>
<tr><th>System Function</th><th>System Availability</th></tr>
<tr><td>Control and monitoring of any one breaker/ equipment</td><td>99.99%</td></tr>
<tr><td>Monitoring of any one status & measurand data indication</td><td>99.99%</td></tr>
<tr><td>Monitoring of any one status/ measurand/analog input</td><td>99.99%</td></tr>
</table>
</td>
</tr>
<tr>
<td>3.o</td>
<td>Interchangeability & Future Extendibility</td>
<td colspan="2">
Interchangeability:

RTU/ DCU parts like processors, co-processors and interface modules and network hardware shall be interchangeable individually, and as a whole RTU/ DCU without the need of re-configuration with pre-programmed flash memory. Any such change or replacement shall not reduce the capability of the equipment to conform to requirements of this specification.

Each module and switch links of the RTU/ DCU and Network Automation system should have Hot Swap feature i.e., at the time of removal/ insertion of modules and switch links, the system should not become faulty and automatically recognize the new module and switch link without any need of system reboot.
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		Future Extendibility: Offered SCADA RTU/ DCU & Network Automation system shall be suitable for extension in future for additional bays. During such requirements, all the drawings and configurations, alarms/ events list etc displayed shall be designed in such a manner that its extension shall be easily performed by the BYPL user. During such event, normal operation of the existing substation shall be unaffected and system shall not require a shutdown. The BA shall provide all the necessary software tools along with the source codes to perform addition of bays in future and complete integration with RTU/ DCU & Network Automation system by the user. These software tools shall be able to configure IEDs, add additional analog variables, alarm list, event list, modify interlocking logics etc. for additional bays/ equipment which shall be added in future. Offered RTU/ DCU & Network Automation System including switches shall have minimum 20% spare of utilized RTU/DCU & Network Automation system hardware and accessories, completely wired up to the last terminal.
3.p	Service life, Warranty and Replacement Support	**Service Life:** BYPL prefers that the major equipment's of RTU/ DCU and Network Automation system shall be capable of complying with this standard, including performing its intended purpose, for a minimum of 10 years from the date of supply. The supplier/BA shall provide a service support letter containing: • The date at which the product was released for sale. • The anticipated date at which the product will be withdrawn from sale, but support will continue to be supplied. • The anticipated date of when the product support will be withdrawn i.e. spares will no longer be available and technical support will no longer be provided. **Warranty and Replacement Support:** During the guaranteed availability period, the spare parts supplied by the supplier/ BA shall be made available to the supplier/ BA for usage subject to replenishment within the committed time (maximum eight (8) weeks). Thus, after the system is revived the inventory of spares with BYPL shall be fully replenished by the supplier/ BA. However, any additional spares required to meet the availability of the system (which is not a part of the above spares supplied by the supplier/ BA) would have to be supplied

		immediately by the supplier/ BA free of cost to BYPL. • RTU/ DCU and Network Automation System Hardware: Minimum 5 years • RTU/ DCU and Network Automation System Accessories: 2 years • Managed Ethernet Switch: 5 years At the time of failure or non-availability of the system, during the warranty period, the supplier/ BA is required to visit the site on BYPLs call within 24hrs, free of cost to revive the system. The supplier/ BA should submit a liability warranty support certificate to BYPL.
3.q	RTU/ DCU & Network Earthing System	Two types of earthing should be provided by the supplier/ BA: power and electronics. Both should be of copper, isolated and suitably sized (as per BYPLs approval). Power earthing should be connected to the RTU/ DCU Enclosure, light, fan, AC while the electronic earthing will be connected to the inside modules of the RTU/ DCU. Color of earthing wire: Green and Yellow/ Green In the receiving station, grid earthing will be used for RTU earthing.
3.r	DR Download	The proposed SCADA network should be configured for remote downloading of DR over WAN from any one (1) location falling under BYPL jurisdiction. All the required configuration settings of the supplied network are to be made by the supplier/ BA.
3.s	RTU Auxiliary Power supply system	Power for the RTU/ DCU & Network Automation system shall be derived from substation 48/ 220V DC system. The power supply system will have a wide range, 48 VDC nominal : 36- 72 V. The supplier/ BA may use DC- DC converter to convert grid control voltage 220VDC to 48VDC with wide operating range. The power supply system should be redundant and distributed through MCB of suitable ratings. Power supply should also be equipped with surge protection device.

Table 3.s [1] Field Control Wiring

Description	**Approved Make**
DC DC converter	Meanwell or equivalent

3.t	Cyber security	Offered system shall have advance cyber security feature which comply below mentioned standards and certificate shall be provided during detail engineering IEC 62443-4-2 IEC 62443-3-3 IEEE 1686 IEC 62351-3 IEC TS-62351-5 IEC 60870-5-7 security extension
4	**SCADA Commands, Indications & Measurands Data**	As per Annexure 12.b.
5	**Quality Control and Checklist**	The supplier/ BA is required to submit a plan of different stages of manufacturing and testing based on which subsequent reports and certificates shall be submitted. If during this period the manufacturing and quality is found unsatisfactory as to workmanship or material, the same is liable for rejection and the supplier/ BA will be obliged to provide standardized equipment as per BYPLs specifications. **Checklist:** 1. Space required for future expansion 2. Component layout 3. Wiring termination details 4. Equipment/ component make used in the panel with their specifications
6	**Pre- Dispatch Inspection (FAT) & Minimum Testing Facility**	**Pre-Dispatch Inspection (FAT):** After submitting and on BYPLs acceptance of the Test certificate and Quality Report, the supplier/ BA is required to call BYPL for Pre-Dispatch Inspection. The supplier/ BA should ensure the completion of manufacturing and set-up for Pre-Dispatch Inspection. Pre-Dispatch Inspection will be treated as FAT, which will only be carried on if the minimum testing facility has been arranged by the supplier/ BA. In case FAT is waived off, all the below mentioned points will be tested during SAT. The following tests are to be carried out under FAT:

		1) Visual inspection of dimensions, workmanship, quality and specifications of the equipments as per the approved drawing and tender document. 2) Test certificate and Quality Report verification as submitted 3) Simulation of RTU/ DCU & SCADA Network connectivity, data acquisition from IEDs/ MFMs and functionalities like: • Indications, Commands and Measurands data • Time synchronization • Sequence of Events • Redundancy, diagnostic feature • Interchangeability • Hot Swapping • Any other functionality as per the tender document 4) During the Pre-dispatch inspection period if the vendor fails to simulate any of the functionality mentioned above and as per the tender document then BYPL has the rights to scrap the inspection and another FAT will be arranged for which the supplier/ BA will bear the travel expenses including both side airfares, cab rent, food and lodging. **Minimum Testing Facility:** The minimum testing facility should include: 1) Minimum number of each type of relays being supplied by the supplier/ BA for SCADA RTU/ DCU and Network Automation system. 2) Complete SCADA RTU/ DCU and Network Automation system with redundancy connecting to each type of IED, at least two (2), being supplied by the supplier/ BA for the aforementioned system.
7	**Packing & Forwarding**	The supplier/ BA shall ensure that all equipment covered by this specification shall be prepared for rail/ road transport (local equipment) and be packed in such a manner so as to protect it from damage in transit. All equipment/ material are to be transported with proper packing and markings. Any damage to the equipment(s) during the transit will be borne by the supplier/ BA and the replaced damaged equipment(s) will be made available to BYPL within the committed time (maximum eight (8) weeks).

8 System Spares, Tools & Software Tools with Licenses

The bidder is required to list the spares, which may be required for ensuring the availability during the guaranteed availability period. The final list of spares shall form part of scope and accordingly the price thereof shall be quoted by the bidder and shall be considered in the evaluation of the bids.

The list shall include the following:

- Item identification
- Recommended spares quantities (minimum 20% of utilized Hardware of SCADA/ DCU and Network Automation System)
- Base price of proposed spares
- Procurement lead time probability of returning the replaced/ repaired spare parts
- Procurement lead time probability of the spare material BYPL may need to procure apart from this Tender
- Quantity of item held in local office by supplier/ BA as emergency spare parts.

All spare parts shall be fully tested, however BYPL has the right to return the tested spare part on being found faulty for which the BA/ supplier shall provide with replacement within the committed time (maximum eight (8) weeks).

Table 8 [1] Mandatory Spares

S.No.	Item	Qty	UOM
1.	RTU/ DCU & Network Hardware		
1.1	Rack redundant	1	No. each type
1.2	Rack I/O	1	No. each type
1.3	DI module with cable	1	No. each type
1.4	DO module with cable	1	No. each type
1.5	AI module with cable	1	No. each type
1.6	Managed Ethernet switch	1	No. each type
1.7	OFC patch cord	5	No. each type
1.8	Power Supply SMPS	2	No. each type
1.9	MCB	2	No. each type
1.10	Main Processor	1	No. each type
1.11	Co-processor connecting IEC 61850 protocol devices	1	No. each type
1.12	Co-processor connecting serial devices	1	No. each type
1.13	Power supply for RTU rack	1	No. each type
2.	RTU/ DCU Panel	Minimum	No. each type

			Accessories (Converters, Power Supplies etc.)	20% of Utilized Hardware of SCADA/ DCU and Network Automation System	
		3.	Communication Cable- RS485, LAN		
		4.	Control Cable		

Table 8 [2] Software Configuration Tools

S.No.	Item	Qty
1	RTU/ DCU configuration tools with licensed software and cables	2 Nos.
2	Network configuration tools with licensed software and cables	1 Nos.

9	**Drawings & Documents, Configuration Backup and Certificates**	**Drawings & Documents:** Following drawings and documents shall be prepared on BYPLs specifications and statutory requirements and shall be submitted before the starting of manufacturing: 1. Completely filled in Technical Particulars 2. General description of the equipment and all components including brochures 3. Bill of material 4. Type test certificates 5. System Design Architecture Drawing 6. Layout drawings of Control cable, communication cable and cable tray linking RTU/ DCU panel, communication panels/ hardware 7. Hardware Specification 8. Sizing Calculations of various components 9. Response Time Calculations 10. Functional Design Document 11. Power Distribution Schematic Diagrams for each RTU 12. Standard documentation per IED, according to IEC 61850 13. MICS document (Model Implementation Conformance Statement) 14. PICS document (Protocol Implementation Conformance Statement) 15. Conformance Test certificate 16. ICD File (IED Capability Description file) 17. SCD file (Substation Configuration Description)

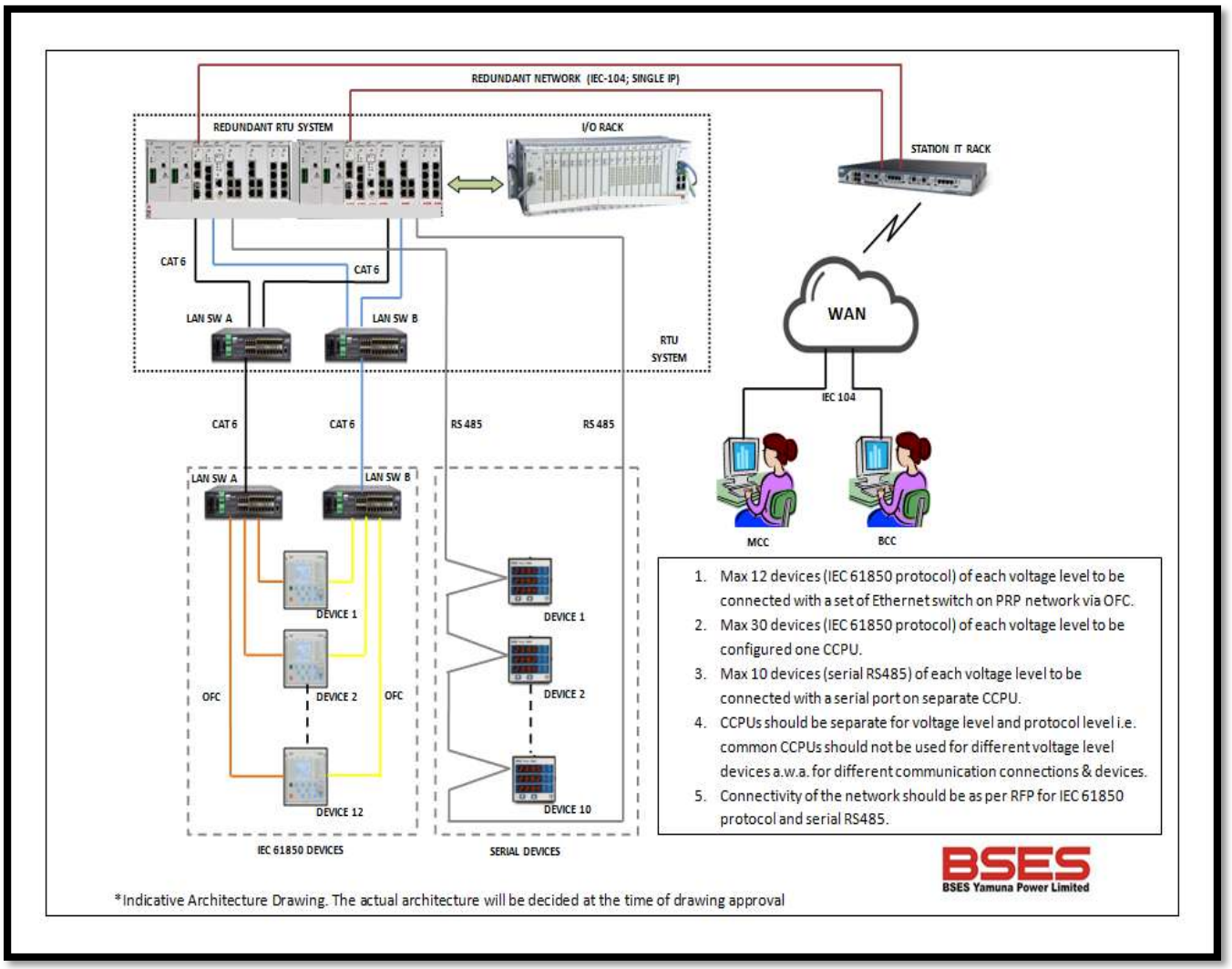
		After the award of the contract four (4) copies of drawings, drawn to scale, describing the equipments in detail shall be forwarded for approval and the supplier/ BA shall subsequently provide four (4) complete sets of final drawings, one of which shall be auto-positive suitable for reproduction, before the dispatch of the equipments. Soft copy (Pen drive) of the drawings, GTP, Test certificates shall be submitted after the final approval of the same to BYPL. All the documents and drawings shall be in English language. After execution any minor/ major change(s) made at the site to be incorporated in the documents and drawings and duly submitted to BYPL in the form of hard and soft copy. **Instruction Manuals:** Bidder shall furnish two (2) soft copies (Pendrive) and four (4)hard copies of nicely bound manuals (in English language) covering erection and maintenance instructions and all relevant information and drawings pertaining to the main equipments as well as the auxiliary devices. **Configuration Backup:** All Configuration files for RTU/ DCU and network automation system should be provided to BYPL. **Certificates:** 1. Test certificates of all the tests required and conducted by the supplier/ BA. 2. System and equipments warranty certificates 3. Maintenance and Service Agreement Certificates The supplier/ BA shall ensure that all the certificates mentioned in this document along with SAT document are submitted to BYPL at the time of SAT.
10	**Trainings and Hands-on**	The supplier/ BA personnel who are experienced instructors and who speak understandable English shall conduct training. The supplier/ BA shall arrange on its own cost all hardware training platform required for successful training and understanding at BYPLs works. The supplier/BA

		shall provide all necessary training material. Each trainee shall receive individual copies of all technical manuals and all other documents used for training. These materials shall be sent to BYPL at least two (2) months before the scheduled commencement of the particular training course. Class materials, including the documents sent before the training courses as well as class handouts, shall become the property of BYPL. BYPL reserves the right to copy such materials, but for in-house training and use only. Hands-on training shall utilize equipment identical to that being supplied to BYPL. The schedule, location, and detailed contents of each course will be finalized during BYPL and supplier/ BAs discussions. If the supplier/ BA have utilized 3rd party equipment or outsourced work to a 3rd party then experienced instructors of the 3rd party are required to be part of the training sessions. **System Hardware Course** A computer system hardware course shall be offered, but at the system level. The training course shall be designed to give BYPL hardware personnel sufficient knowledge of the overall design and operation of the system, so that they can correct obvious problems, configure the hardware, perform preventive maintenance, run diagnostic programs, and communicate with contract maintenance personnel. The following shall be covered: • System hardware design architecture overview: Configuration of the system hardware. • Equipment Maintenance: Basic theory of operation, maintenance techniques and diagnostic procedures for each element of the computer system, e.g., processors, auxiliary memories, Ethernet, routers and printers. Configuration of all the hardware equipment. • System Expansion: Techniques and procedures to expand and add equipment such as loggers, monitors and communication channels. • System Maintenance: Theory of operation, maintenance techniques and practices, diagnostic procedures and (where applicable) expansion techniques and procedures. Classes shall include hands-on training for the specific subsystems that are part of BYPLs equipment or part of similarly designed and configured subsystems. All interfaces to the computing equipment shall be taught in detail. • Operational Training: Practical training on preventive and corrective maintenance of all equipment, including use of special tools and instruments. This training shall be provided on BYPLs equipment or on similarly configured systems.

		System Software Course The contractor shall provide a computer system software course that covers the following subjects: • System Programming: Including all applicable programming languages and all stand-alone service and utility packages provided with the system. An introduction to software architecture, effect of tuning parameters (OS software, Network software, database software etc.) on the performance of the system. • Operating System: Including the user aspects of the operating system, such as program loading and integrating procedures, scheduling, management, service and utility functions and system expansion techniques and procedures. • System Initialization and Failover: Including design, theory of operation and practice • Diagnostics: Including the execution of diagnostic procedure and the interpretation of diagnostic outputs. • Software Documentation: Orientation in the organization and use of system software documentation. • Hands-on Training: One week, with allocated computer time for trainee performance of unstructured exercises and with the course instructor available for assistance as necessary. **Application Software Course** The supplier/ BA shall provide comprehensive application software courses covering all applications including the database and display building course. The training shall include: • Overview: Block diagrams of the application software and data flows. Programming standards and program Interface conventions. • Application Functions: Functional capabilities, design and major algorithm. Associated maintenance and expansion techniques. • Software Development: Techniques and conventions to be used for the preparation and integration of new software functions. • Software Generation: Generation of application software from source code and associated software configuration control procedures. • Software Documentation: Orientation in the organization and use of functional and detailed design documentation and of

		programmer and user manuals. • Hands-on Training: One week, with allocated computer time for trainee performance of unstructured exercises and with the course instructor available for assistance as necessary. **Requirement of Training** The supplier/ BA shall provide training for a batch (maximum of 10 people) for five (5) days in two slots (Time of which will be decided by BYPL and supplier/ BA) on the following courses. Name of Course: • System Hardware • System Software • Application Software
11.	**SAT**	This document exclusively covers the SAT for SCADA RTU/ DCU and Network Automation system. After the successful commissioning and testing of the SCADA RTU/ DCU & Network Automation system and liquidation of all punch points, the system will be put on continuous running mode for a cycle of minimum thirty (30) days after clearance on punch-points. During this period, if the RTU/ DCUs performance due to configuration and/ or hardware does not meet the criteria as per points 3.k and 3.n, the cycle will be reset. During the cycle, availability and operational efficacy of the system will be checked and after successful validation SAT will be concluded. SAT will include the validation of the following: 1. Communication Network 2. SCADA RTU/ DCU and Network redundancy 3. Validation of SOE 4. All approved Indication, Command and Measurand data. BYPL reserves the right to financially penalize the supplier/ BA on failure of SAT as per the technical and tender document.

Annexure 12.a (RTU/ DCU System Architecture Drawing)



Annexure 12.b (Signal List- 11/33/66kV)

A. 11kV Outgoing feeders- IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker ON	✓		DPI
2.	Breaker OFF			SPI
3.	Trip Ckt Healthy 1	✓		SPI
4.	Trip Ckt Healthy 2	✓		SPI
5.	Spring Charge	✓		SPI
6.	Breaker in Service	✓		SPI
7.	Breaker in Test	✓		SPI
8.	Auto Trip (86) Operated	✓		SPI
9.	Panel DC Fail	✓		SPI
10.	Panel AC Fail	✓		SPI
11.	L/R switch in SCADA	✓		SPI
12.	Relay Int Fault	✓		SPI
13.	Over Current Operated(ALL STAGES)	✓		SPI
14.	Earth Fault Operated(ALL STAGES)	✓		SPI
15.	BKR Close COMMAND		✓	DCO
16.	BKR Open COMMAND			
17.	Auto Trip (86) relay reset from Remote		✓	SCO
18.	3Phase R, Y, B- Current & Voltage, Active Power, Reactive Power, Power factor, Max. Demand, Neu. Current	✓		AI/ MV
19.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbalance (O/C & E/F Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose	✓		AI/MV

Note:
1.Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel.
2.Final signals list will be approved with CRP/Switchgear panel drawing.

B. 11kV Incomers: IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		DPI
2.	Breaker OFF			
3.	Trip Ckt Healthy 1	✓		SPI
4.	Trip Ckt Healthy 2	✓		SPI
5.	Panel AC Fail	✓		SPI
6.	Spring Charge	✓		SPI
7.	Breaker in Service	✓		SPI
8.	Breaker in Test	✓		SPI
9.	Auto trip (86) Operated	✓		SPI
10.	VT fuse Blown- Metering	✓		SPI
11.	VT fuse Blown- Protection	✓		SPI
12.	Panel DC Fail			SPI
13.	L/R Switch in SCADA	✓		SPI
14.	Relay Int Fault	✓		SPI
15.	Over Current Operated (All Stages)	✓		SPI
16.	Earth Fault Operated (All Stages)	✓		SPI
17.	Under Voltage Prot. Operated	✓		SPI
18.	Over Voltage Prot. Operated	✓		
19.	REF Operated	✓		SPI
20.	BKR Close COMMAND		✓	DCO
21.	BKR Open COMMAND			
22.	Auto trip (86) relay reset from Remote		✓	SCO
23.	3Phase R, Y, B- Current & Voltage, Active Power, Reactive Power, Power factor, Max. Demand, Neu. Current	✓		AI/ MV
24.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbalance (O/C & E/F	✓		AI/MV

	Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose			

Note:
1. Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel
2. Final signals list will be approved with CRP/Switchgear panel drawing.

C. 11kV Bus Coupler: IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		**DPI**
2.	Breaker OFF			
3.	Trip Ckt Healthy 1	✓		**SPI**
4.	Trip Ckt Healthy 2	✓		SPI
5.	Panel AC Fail	✓		SPI
6.	Spring Charge	✓		**SPI**
7.	Breaker in Service	✓		**SPI**
8.	Breaker in Test			**SPI**
9.	Auto trip (86) Operated	✓		**SPI**
10.	Panel DC Fail	✓		**SPI**
11.	L/R Switch in SCADA	✓		**SPI**
12.	Relay Int. Fault	✓		**SPI**
13.	PT MCB- Metering operated	✓		**SPI**
14.	PT MCB- Protection operated	✓		**SPI**
15.	Over Current Operated	✓		**SPI**
16.	Earth Fault Operated	✓		**SPI**
17.	BKR Close COMMAND		✓	**DCO**
18.	BKR Open COMMAND			
19.	Auto trip (86) relay reset from Remote		✓	SCO
20.	3Phase R, Y, B- Current & Voltage, Active Power, Reactive Power, Power factor, Max. Demand, Neu. Current	✓		AI/ MV

21.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbalance (O/C & E/F Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose	✓		**AI/MV**

Note:
1. Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel
2. Final signals list will be approved with CRP/Switchgear panel drawing.

D. 11Kv Capacitors: IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		**DPI**
2.	Breaker OFF			
3.	Bank ISO ON	✓		**DPI**
4.	Bank ISO OFF			
5.	Trip Ckt Healthy 1	✓		**SPI**
6.	Trip Ckt Healthy 2	✓		SPI
7.	Panel AC Fail	✓		SPI
8.	Spring Charge	✓		**SPI**
9.	Breaker in Service	✓		**SPI**
10.	Breaker in Test	✓		**SPI**
11.	Master Trip (86) Operated	✓		**SPI**
12.	Bus PT fuse Blown-Metering	✓		**SPI**
13.	Bus PT fuse Blown-Protection	✓		**SPI**
14.	Panel DC Fail	✓		**SPI**
15.	L/R Switch in SCADA	✓		**SPI**
16.	Over Current Operated	✓		**SPI**
17.	Earth Fault Operated	✓		**SPI**
18.	Under Volt. Prot. Operated	✓		**SPI**
19.	Over Volt. Prot. Operated	✓		**SPI**
20.	Neg. Phase sequence	✓		**SPI**

	Operated			
21.	Timer Relay operated/ Normal	✓		**DPI**
22.	Relay Int. Fault	✓		**SPI**
23.	BKR Close COMMAND		✓	**DCO**
24.	BKR Open COMMAND			
25.	BANK ISO OPN		✓	**DCO**
26.	BANK ISO CLS			
27.	Master trip (86) reset from remote		✓	**SCO**
28.	3phase R, Y, B- Curr & Volt, React. Pow, Neu. Curr	✓		**AI/ MV**
29.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbalance (O/C & E/F Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose	✓		**AI/MV**

Note:
1. Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel
2. Final signals list will be approved with CRP/Switchgear panel drawing.

E. 33 & 66 kV Incomers/ Outgoing- IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		**DPI**
2.	Breaker OFF			
3.	Bus ISO (89A) ISO ON	✓		**DPI**
4.	Bus ISO (89A) ISO OFF			
5.	Bus ISO (89B) ISO ON	✓		**DPI**
6.	Bus ISO (89B) ISO OFF			
7.	LINE ISO (89L) ON	✓		**DPI**
8.	LINE ISO (89L) OFF			
9.	EARTH SWITCH (89LE)	✓		**SPI**

	CLOSE			
11.	EARTH SWITCH (89AE) CLOSE	✓		**SPI**
13.	Breaker in Service (In-case of I/D BKR)	✓		**SPI**
14.	Breaker in Test (In-case of I/D BKR)	✓		**SPI**
15.	Trip Ckt Healthy	✓		**SPI**
16.	Spring Charge	✓		**SPI**
17.	Master Trip (86) Operated	✓		**SPI**
18.	SF6 Pressure Low & SF6 Lock Out	✓		**SPI**
19.	VT fuse Fail	✓		
20.	L/R Switch in Remote	✓		**SPI**
21.	LBB Operated	✓		**SPI**
22.	Panel DC Fail	✓		**SPI**
23.	Relay Int. Fault	✓		**SPI**
24.	Over Current Operated (All Stages)	✓		**SPI**
25.	Earth Fault Operated (All Stages)	✓		**SPI**
26.	DIFF. Prot Operated	✓		**SPI**
27.	DIST. Prot Operated	✓		**SPI**
28.	BKR Close COMMAND		✓	**DCO**
29.	BKR Open COMMAND			
30.	Bus ISO (89A) ISO ON CMD		✓	**DCO**
31.	Bus ISO (89A) ISO OFF CMD			
32.	Bus ISO (89B) ISO ON CMD		✓	**DCO**
33.	Bus ISO (89B) ISO OFF CMD			
34.	LINE ISO (89L) ON CMD		✓	**DCO**
35.	LINE ISO (89L) OFF CMD			
36.	Master trip (86) relay reset from remote		✓	**SCO**
37.	3phase R, Y, B- Curr & Volt,Active & React. Pow, Pow Factor, Max Demand, Neu. Curr etc.	✓		**AI/ MV**
38.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbalance (O/C & E/F Relay), Disturbance Records, Fault	✓		**AI/MV**

	Graphs for Remote diagnosis purpose			

Note:
1. Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel
2. Final signals list will be approved with CRP/Switchgear panel drawing.

F. 33 & 66 kV Transformer- IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		**DPI**
2.	Breaker OFF			
3.	Bus ISO (89A) ISO ON	✓		**DPI**
4.	Bus ISO (89A) ISO OFF			
5.	Bus ISO (89B) ISO ON	✓		**DPI**
6.	Bus ISO (89B) ISO OFF			
7.	LINE ISO (89T) ON	✓		**DPI**
8.	LINE ISO (89T) OFF			
9.	EARTH SWITCH (89TE) CLOSE	✓		**SPI**
10.	EARTH SWITCH (89AE) CLOSE	✓		**SPI**
13.	Breaker in Service (In-case of I/D BKR)	✓		**SPI**
14.	Breaker in Test (In-case of I/D BKR)	✓		**SPI**
15.	Trip Ckt Healthy- 1	✓		**SPI**
16.	Trip Ckt Healthy- 2	✓		**SPI**
17.	Panel AC Fail	✓		**SPI**
18.	Spring Charge	✓		**SPI**
19.	Auto Trip (86) Operated	✓		**SPI**
20.	Differential Operated	✓		**SPI**
21.	LBB Operated	✓		**SPI**
22.	REF/SEF Prot Operated	✓		**SPI**
23.	SF6 Pressure Low & SF6 Lock Out	✓		**SPI**
24.	Panel DC Fail	✓		**SPI**

25.	L/R Switch in Remote	✓		**SPI**
26.	LBB Operated	✓		**SPI**
27.	Relay Int. Fault	✓		**SPI**
28.	Over Current Operated	✓		**SPI**
29.	Earth Fault Operated	✓		**SPI**
30.	BKR CLS COMMAND		✓	**DCO**
31.	BKR OPN COMMAND			
32.	Bus ISO (89A) ISO ON CMD		✓	**DCO**
33.	Bus ISO (89A) ISO OFF CMD			
34.	Bus ISO (89B) ISO ON CMD		✓	**DCO**
35.	Bus ISO (89B) ISO OFF CMD			
36.	LINE ISO (89T) ON CMD		✓	**DCO**
37.	LINE ISO (89T) OFF CMD			
38.	Master trip (86) relay reset from remote		✓	**SCO**
39.	3phase R, Y, B- Curr & Volt,Active & React. Pow, Pow Factor, Max Demand, Neu. Curr etc.	✓		**AI/ MV**
40.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbalance (O/C & E/F Relay). Fault voltage and phase indication of faulty phase viz. R,Y,B (Voltage Protection Relay). Fault Differential and Bias current in Line and T/F Differential Relay, Fault distance (in distance relay), Disturbance Records, Fault graphs for remote diagnosis purpose.	✓		**AI/MV**

Note:

1. Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel

2. Final signals list will be approved with CRP/Switchgear panel drawing.

G. Signals Related with CRP

Sr. No.	Signal Detail	Type of Signal on IEC61850
1	**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
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
	Digital Output Signals	
1	General trip	Single Command Output
2	Line Diff. Operated	Single Command 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
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

H. Transformer- TM cum AVR relay Signals- IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through TM cum AVR	DO soft through TM cum AVR	Signal Type
1.	DC Fail	✓		**SPI**
2.	Oil Temp Alarm	✓		**SPI**
	Relay Int Fault	✓		**SPI**
3.	Oil Temp Trip	✓		**SPI**
4.	Winding Temp Alarm	✓		**SPI**
5.	Winding Temp Trip	✓		**SPI**
6.	Buchholz Alarm	✓		**SPI**
7.	Buchholz Trip	✓		**SPI**
8.	PRV Trip	✓		**SPI**
9.	OLTC OSR	✓		**SPI**
10.	MOG/LOW Oil Level Alarm	✓		**SPI**
11.	SPR Trip	✓		**SPI**
12.	OSR Main Tank	✓		**SPI**
13.	L/R Switch in Local	✓		**DPI**
14.	L/R Switch in Remote	✓		
15.	Auto Mode	✓		**DPI**
16.	Manual Mode	✓		
17.	Fan Fail	✓		**SPI**
18.	Tap Changer Fail	✓		**SPI**
19.	OLTC Out of Step/ Stuck up/ Motor trip	✓		**SPI**
20.	Tap Rise/ Low Command		✓	**RCO**
21.	Oil Temp	✓		**AI**
22.	Winding Temp	✓		**AI**
23.	Tap Position	✓		**AI**

Note:
1. Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel
2. Final signals list will be approved with CRP/Switchgear panel drawing.

I. 33 & 66kV Bus Coupler- IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		DPI
2.	Breaker OFF			
3.	Bus ISO (89A) ISO ON	✓		DPI
4.	Bus ISO (89A) ISO OFF			
5.	Bus ISO (89B) ISO ON	✓		DPI
6.	Bus ISO (89B) ISO OFF			
7.	EARTH SWITCH (89AE) CLOSE	✓		SPI
8.	EARTH SWITCH (89BE) CLOSE	✓		SPI
9.	Breaker in Service (In-case of I/D BKR)	✓		SPI
10.	Breaker in Test (In-case of I/D BKR)	✓		SPI
11.	Trip Ckt Healthy- 1	✓		SPI
12.	Trip Ckt Healthy- 2	✓		SPI
13.	Panel AC Fail	✓		SPI
18.	Spring Charge	✓		SPI
19.	Auto Trip (86) Operated	✓		SPI
20.	SF6 Pressure Low	✓		SPI
21.	SF6 Lock Out	✓		SPI
22.	VT fuse-1 Blown	✓		SPI
23.	VT fuse-2 Blown	✓		SPI
24.	Panel DC Fail	✓		SPI
25.	L/R Switch in Remote	✓		SPI
26.	LBB Operated	✓		SPI
27.	Relay Int. Fault	✓		SPI
28.	Over Current Operated (All Stages)	✓		SPI
29.	Earth Fault Operated (All Stages)	✓		SPI
30.	BKR Close COMMAND		✓	DCO
31.	BKR Open COMMAND			

32.	BUS (89A) ISO OPN COMMAND		✓	**DCO**
33.	Bus (89A) ISO CLS COMMAND			
34.	Bus (89B) ISO OPN COMMAND		✓	**DCO**
35.	Bus (89B) ISO CLS COMMAND			
36.	Auto trip (86) relay reset from remote		✓	**SCO**
37.	3phase R, Y, B- Curr, BUS PT-01 & BUS PT-02 3 phase voltages	✓		**AI/ MV**
38.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbaethernetce (O/C & E/F Relay). Fault voltage and phase indication of faulty phase viz. R,Y,B (Voltage Protection Realy). Fault Differential and Bias current in line and T/F Diff Relay, Fault distance (in Distance Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose	✓		**AI/ MV**

Note:
1. Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel
2. Final signals list will be approved with CRP/Switchgear panel drawing.

J. 33 & 66kV CAP Bank- IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	Breaker On	✓		**DPI**
2.	Breaker OFF			
3.	Bus ISO (89A) ISO ON	✓		**DPI**

4.	Bus ISO (89A) ISO OFF			
5.	Bus ISO (89B) ISO ON	✓		**DPI**
6.	Bus ISO (89B) ISO OFF			
7.	LINE ISO (89C) ON	✓		**DPI**
8.	LINE ISO (89C) OFF			
9.	EARTH SWITCH (89CE) CLOSE	✓		**SPI**
10.	EARTH SWITCH (89AE) CLOSE	✓		**SPI**
11.	Trip coil Ckt Healthy- 1	✓		**SPI**
12.	Trip coil Ckt Healthy- 2	✓		**SPI**
13.	Panel AC Fail	✓		**SPI**
12.	Spring Charge	✓		**SPI**
13.	Auto Trip (86) Operated	✓		**SPI**
14.	SF6 Pressure Low & SF6 Lock Out	✓		**SPI**
15.	VT fuse Blown	✓		**SPI**
16.	Cap Discharge Time	✓		**SPI**
17.	Neutral Displacement	✓		**SPI**
18.	Panel DC Fail	✓		**SPI**
19.	L/R Switch in Remote	✓		**SPI**
20.	LBB Operated	✓		**SPI**
21.	Relay Int. Fault	✓		**SPI**
22.	Over Current Operated	✓		**SPI**
23.	Earth Fault Operated	✓		**SPI**
24.	Under Voltage Prot. Operated	✓		**SPI**
25.	Over Voltage Prot. Operated	✓		**SPI**
26.	BKR Close COMMAND		✓	**DCO**
27.	BKR Open COMMAND			
28.	Bus (89A) ISO OPN COMMAND		✓	**DCO**
29.	Bus (89A) ISO CLS COMMAND			
30.	Bus (89B) ISO OPN COMMAND		✓	**DCO**
31.	Bus (89B) ISO CLS COMMAND			
32.	CAP Bank ISO OPN Command		✓	**DCO**
33.	CAP Bank ISO CLS			

	Command			
34.	3phase R, Y, B- Curr & voltage, Reactive Pow, Neu Curr	✓		**AI/ MV**
35.	Fault current and phase indication of faulty phase viz. R, Y, B, Earth, Unbaethernetce (O/C & E/F Relay). Fault voltage and phase indication of faulty phase viz. R,Y,B (Voltage Protection Realy). Fault Differential and Bias current in line and T/F Diff Relay, Fault distance (in Distance Relay), Disturbance Records, Fault Graphs for Remote diagnosis purpose	✓		**AI**

Note:
1. Signals like Panel DC Fail and Relay Int Fault to be taken from adjacent panel
2. Final signals list will be approved with CRP/Switchgear panel drawing.

K. BUS PT-1 & 2- IEC 61850 Protocol

S.No.	Signal List	DI/ AI soft through N.Relay/ BCU	DO soft through N.Relay/ BCU	Signal Type
1.	BUS A (89A) ON	✓		**DPI**
2.	BUS A (89A) OFF			
3.	BUS B (89B) ON	✓		**DPI**
4.	BUS B (89B) ON			
5.	Earth Switch (89LE)-1 ON	✓		**DPI**
6.	Earth Switch (89LE)-1 OFF			
7.	Earth Switch (89LE)-2 ON	✓		**DPI**
8.	Earth Switch (89LE)-2 OFF			
9.	BUS-A ISO OPN COMMAND		✓	**DCO**
10.	BUS-A ISO CLS COMMAND			
11.	BUS-B ISO OPN		✓	**DCO**

	COMMAND			
12.	BUS-B ISO CLS COMMAND		✓	**DCO**

L. Smoke Detector- ALL sensors, Manual Call Points- Modbus Protocol

S.No.	Signal List	Soft Signals	Signal Type
1.	All Sensors Alarm operated Signalsll Sensors Alarm operated Signals (10 to 20 Sensors)	✓	**SPI**
2.	All Manual Call Points- MCP- 1, MCP- 2, etc.	✓	

M. Battery Charger- Modbus Protocol

S.No.	Signal List	DI/ AI soft through RTU	Signal Type
1.	Battery CHG Mains AC Fail	✓	**SPI**
2.	Charger A AC MCCB Trip	✓	**SPI**
3.	Charger A DC MCCB Trip	✓	**SPI**
4.	Charger B AC MCCB Trip	✓	**SPI**
5.	Charger B DC MCCB Trip	✓	**SPI**
6.	Charger A/B in boost	✓	**SPI**
7.	Charger A/B rectifier Capacitor Fuse Blown	✓	**SPI**
8.	Battery MCCB Trip	✓	**SPI**
9.	DC system Earth	✓	**SPI**
10.	Insulation Fault	✓	**SPI**
11.	Charger A Current	✓	**AI**
12.	Charger A Voltage	✓	**AI**
13.	Charger B Current	✓	**AI**
14.	Charger B Voltage	✓	**AI**
15.	Battery Current	✓	**AI**
16.	Battery Voltage	✓	**AI**

N. LT Board

S.No.	Signal List	DI Hard Wire to RTU	Signal Type
1.	LT AC Fail	✓	SPI
2.	R,Y,B Phase Current		AI/ MV/ MFI

O. Fire Fighting (All T/Fs)

S.No.	Signal List	DI Hard Wire to RTU	Signal Type
1.	SYSTEM OPERATED	✓	SPI
2.	SYSTEM OUT OF SERVICE	✓	SPI
3.	TCIV CLOSED	✓	SPI
4.	FIRE DETECTOR TRIP	✓	SPI
5.	N2 CYLINDER PRESSURE LOW	✓	SPI
6.	FIRE SYSTEM ALARM	✓	SPI
7.	DC SUPPLY FAIL	✓	SPI

P. MFM- BUS PT- 1, 2 Signals (Front & Rear Bus)- Modbus Protocol

S.No.	Signal List	Data Type
1.	R-Ph Current	MV/ MFI
2.	Y-Ph Current	MV/ MFI
3.	B-Ph Current	MV/ MFI
4.	Neutral Current	MV/ MFI
5.	R-Y Ph Voltage	MV/ MFI
6.	Y-B Ph Voltage	MV/ MFI
7.	B-R Ph Voltage	MV/ MFI

Q. MFM- Signals- All Feeders (Including Bus Section/ Coupler)- Modbus Protocol

S.No.	Signal List	Data Type
1.	R-Ph Current	MV/ MFI

2.	Y-Ph Current	MV/ MFI
3.	B-Ph Current	MV/ MFI
4.	Neutral Current	MV/ MFI
5.	R-Y Ph Voltage	MV/ MFI
6.	Y-B Ph Voltage	MV/ MFI
7.	B-R Ph Voltage	MV/ MFI
8.	Active Power	MV/ MFI
9.	Active Energy	MV/ MFI
10.	Reactive Power	MV/ MFI
11.	Power Factor	MV/ MFI
12.	Max Demand	MV/ MFI
13.	Phase angle 1	MV/ MFI
14.	Phase angle 2	MV/ MFI
15.	Phase angle 3	MV/ MFI
16.	THD Mean Current	MV/ MFI
17.	THD Mean Voltage	MV/ MFI

Annexure 12.c (List of Abbreviations)

1. SCADA: Supervisory Control and Data Acquisition
2. RTU: Remote Terminal Unit
3. DCU: Data Concentrator Unit
4. C&R: Control and Relay
5. BA: Business Associates
6. I/O: Input/ Output
7. MFM: Multi Function Meter
8. TM: Transformer Monitoring
9. BYPL: BSES Yamuna Power Ltd.
10. MCC: Master Control Center
11. BCC: Business Continuity Center
12. IED: Intelligent Electronic Devices
13. NCR: National Capital Region
14. IEC: International Electrotechnical Commisssion
15. KEMA: Keuring van Elektrotechnische Materialen te Arnhem
16. CE: Conformité Européene
17. FCC: Federal Communications Commission
18. PRP: Parallel Redundancy Protocol
19. LAN: Local Area Network
20. NIDS: Network Intrusion Detection System
21. NIFPS: Nitrogen Injection Fire Protection System
22. DCDB: DC Distribution Board
23. APFC: Automatic Power factor Controller
24. HMI: Human Machine Interface
25. TCP/ IP: Transmission Control Protocol/ Internet Protocol
26. GPS: Global Positioning System
27. FEP: Front-End processor
28. SNTP: Simple Network Time Protocol
29. CRC: Cold Rolled Close
30. MCB: Miniature Circuit Breakers
31. CMR: Contact Multiplying Relay
32. PVC: Polyvinyl Chloride
33. GI: Galvanized Iron
34. RTCC: Remote Tap Changer Control
35. CT: Current Transformer
36. PT: Potential Transformer
37. WAN: Wide Area Network
38. DI: Digital Input
39. DO: Digital Output
40. AI: Analog Input
41. FRLS: Fire Retardant Low Smoke

42. OFC: Optical Fiber Cable
43. GTP: Guaranteed Technical Particulars
44. DCO: Double Command Input
45. DPI: Double Point Indication
46. MV: Measured Value
47. SCO: Single Command Input
48. SPI: Single Point Indication
49. BCU: Bay Control Unit
50. SAT: Site Acceptance Test
51. AVR: Automatic Voltage Regulator
52. SPD: Surge Protection Device

TECHNICAL SPECIFICATION

FOR

CIVIL WORKS

Revision		1
Date		30.05.2022
Pages		Page 1 of 16
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1 SCOPE

Specification covers design, engineering, material supply and civil works for new grid substations. All civil works shall satisfy the general technical requirements specified in other Sections of this Specification and as detailed below. They shall be designed to the required service condition / loads as specified elsewhere in this Specification or implied as per National and International Standards. Items/components of site not explicitly covered in the specification but required for completion of the project shall be deemed to be included in the scope.

2 CODES & STANDARDS

The following Indian Codes and Standards shall generally be used for design of civil and structural works. In all cases, the latest revisions with amendments, if any, shall be followed.

a. National Building Code of India

b. SP: 6 ISI handbooks for structural engineers.

c. IS: 2062 Specification for Structural Steel (Standard quality).

d. IS: 456 Code of practice for plain and reinforced concrete.

e. IS: 800 Code of practice for general construction in steel.

f. IS: 806 Code of practice for use of steel tubes in general building construction

g. IS: 808 Rolled steel beam, channel & angle sections

h. IS: 813 Scheme of symbols for welding.

i. IS: 816 Code of practice for use of metal arc welding for general construction in mild steel.

j. IS: 1080 Code of practice for design and construction of shallow foundations in soils (other than raft, ring and shell).

k. IS: 875 Code of practice for design loads (other than earthquake) for buildings and structures.

l. IS: 1893 Criteria for earthquake resistant design of structure

m. IS: 1904 Code of practice for foundations in soil:-General requirements

n. IS: 1905 Code of practice for structural safety of buildings

o. IS: 2074 Ready mixed paint, air drying, red oxide chrome, priming

p. IS: 2212 Code of practice for brick work

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q. IS: 2911 Code of practice for design & construction of pile foundation

r. IS: 2950 Code of Practice for design and construction of raft foundations

s. IS: 2974 Code of Practice for design and construction of machine foundations

t. IS: 4326 Code of Practice for earthquake resistant design and construction of Buildings

u. IS: 8009 Code of Practice for calculation of settlement of foundations: (parts 1& 2)

v. IS: 1829 Code practice for protection of iron and steel (Part I to III) structures for atmosphere corrosion

w. IS: 13920 Code practice for ductile detailing of reinforced concrete structure subjected to seismic force

3 GENERAL GUIDELINES

a. Building Design shall be in accordance with National Building code of India and other relevant Indian Standards.
b. All civil works shall be carried out as per applicable Indian Laws, Standards and Codes. All materials shall be of best quality conforming to this specification, relevant Indian Standards and Codes.
c. The specifications are intended for general description of work, quality and workmanship. The Specifications are not however exhaustive to cover minute details and the work shall be executed according to relevant latest Indian Standards/IRC specifications/CPWD specifications. In the absence of the above, the work shall be executed according to the best prevailing practices in the trade, recommendations of relevant American or British Standards or to the instructions of BSES Project Manager. The IS standards/IRC specifications/CPWD specifications to be followed are mentioned in the technical specifications attached hereto. They shall be latest edition/version of the same issued 15 days prior to the date of opening of this tender. The Contractor is expected to get himself clarified on any doubts about the specifications, etc. before bidding and the discussions recorded in writing with BYPL in respect of interpretation of any portion of this document.
d. The Contractor shall furnish all design, drawings, labor, tools, equipment, materials, temporary works, constructional plant and machinery, fuel supply, transportation and all other incidental items not shown or specified but as may be required for complete performance of the Works in accordance with approved drawings, specifications and direction of BYPL
e. The work shall be carried out according to the design/drawings to be developed by the bidder and approved by BYPL. Bidder shall develop design/repair work keeping in view the functional requirement of the substation facilities and providing enough space and access for operation, use and maintenance based on the input provided by BYPL. Certain minimum requirements are indicated in this specification for guidance purposes only.
f. BYPL shall provide the land on as is basis; the bidder shall visit the substation site to ascertain the quantum of work, present condition of the land before submitting the offer. No request for commercial changes will be entertained post award of work due to any

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claim related to site condition / plot condition. The layout and levels of all structure etc shall be made by the bidder at his own cost from the general grids of the plot and benchmarks set by the bidder and approved by BYPL in presence of engineer in charge.

g. The bidder shall provide all instruments, materials and personnel to BYPL for checking the detailed layout and shall be solely responsible for the correctness of the layout and levels. The contractor shall make his own arrangements for water and electricity.

h. The work shall be carried out according to the design / drawings to be developed by the Contractor and approved by BYPL. For all buildings, structures, foundations etc. necessary layout and details shall be developed by the Contractor keeping in view the functional requirement of the Sub-Station facilities and providing enough space and access for operation, use and maintenance based on the input provided by BYPL. Certain minimum requirements are indicated in this specification for guidance purposes only. However, the Contractor shall quote according to the complete requirements.

i. The Contractor shall take all necessary precautions to protect all the existing equipment's, structures, facilities & buildings, etc. from damage. In case any damage occurs due to the activities of the Contractor on account of negligence, ignorance, accidental or any other reason whatsoever, the damage shall be made good by the Contractor at his own cost to the satisfaction of the Engineer. The Contractor shall also take all necessary safety measures, at his own cost, to avoid any harm / injury to his workers and staff from the equipment & facilities of the power station.

j. During the progress of work, the Engineer will exercise supervision of the work to ensure that the technical provisions of the contract are being followed and the work is being executed accurately and properly. However, such supervision shall in no way relieve the Contractor of the responsibility for executing the work in accordance with the specifications.

k. Before submitting the bid, the Contractor shall inspect and examine the site and its surroundings and shall satisfy himself as to the nature of the ground and subsoil, the availability of materials necessary for completion of the work, means of access to site and in general shall himself obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect his offer. No extra claim consequent on any misunderstanding or otherwise shall be allowed.

4 SCOPE OF SUPPLY AND WORK

All material required for civil work mentioned in this specification is included in scope of supply of the bidder. For Major Works, kindly refer Scope of Supply and Scope of Work of tender document.

5 DESIGN AND EXECUTION CRITERIA

5.1 Design Criteria

a. The minimum grade of concrete shall be M-25 & Grade of Steel FY-415.

b. Limit state method of design shall be adopted unless specified otherwise in the specification.

c. For detailing of reinforcement IS: 2502 and SP: 16 shall be followed. Cold twisted deformed bars conforming to IS: 1786 shall be used as reinforcement. However, in specific areas mild steel (Grade I) conforming to IS:432 can also be used. Two layers of reinforcement (on inner and outer face) shall be provided for wall & slab sections having thickness of 150 mm and above. Clear cover to reinforcement towards the earth face shall be minimum 40 mm.

d. The procedure used for the design of the foundations shall be the most critical loading combination of the steel structure and or equipment and/or superstructure and other conditions, which produces the maximum stresses in the foundation or the foundation component and as per the relevant IS Codes of foundation design. Detailed design calculations shall be submitted by the bidder showing complete details of work proposed to be used.

e. Design shall consider any sub-soil water pressure that may be encountered following relevant standard strictly.

f. Necessary protection to the foundation work. If required shall be provided to take care of any special requirements for aggressive alkaline soil. Black cotton soil or any other type of soil, which is detrimental / harmful to the concrete foundations.

g. Foundation system adopted by Bidder shall ensure that relative settlement.

5.2 Design Loads for Equipment

Design criteria shall comprise the codes and standards used. Applicable climatic data including wind loads, earthquake factors maximum and minimum temperatures applicable to the building locations, assumptions of dead and live loads, including equipment loads, impact factors, Safety factors and other relevant information.

a. Loads of equipment shall be considered as per manufacturer's certified drawings.

b. The foundation shall be designed considering the net allowable bearing pressure of 200KN/m^2 at the depth of 2.0m from ground level.

c. Foundations shall be analyzed for all possible load combinations as per the relevant IS codes.

d. Minimum reinforcement shall be governed by IS: 2974 and IS: 456.

5.3 Cement

a. Unless otherwise specified or called for by Engineer, the fresh ordinary Portland cement conforming to IS-8112 of 1976 (latest revision) i.e. 43 grade shall be used for the works.

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b. The record of cement shall be maintained in M.A.S register by the contractor and verified by engineer of the BYPL.

c. Cement shall be stored in a perfectly water-tight and well ventilated site store capable of accommodating cement to ensure continuity of the work and having a raised and perfect dry floor. Each parcel or consignment of cement shall be stacked separately therein to permit easy access for inspection and a record shall be kept so that each parcel or consignment may be identified. Cement which has become stale or otherwise unsuitable and any bags or the like containing hardened lumps or cakes of cement, consequent to storage at Contractor's site stores will be rejected and shall be removed from the site and disposed of as directed by the Engineer. The cost of such rejected quantities shall be borne by the Contractor.

5.4 Concrete

a. Design Mix of M-25 grades of concrete as per provisions of IS: 456 and other applicable codes shall generally be used for civil work. RMC must be of ACC/Ultratech/Shree cement.

b. The curing period shall commence immediately after the concrete is finally screened and continued a period of 21 days all civil works. The top and side surfaces of concrete shall be kept moist and be protected from the direct rays of the sun during the period. The Contractor shall submit to the Engineer's proposals for ensuring continuous protection of the concrete during the curing period.

5.5 Steel

The reinforcing bars shall be Fe-415 generally conform to various requirements of IS: 1786 (for High Strength deformed steel bars and wires for concrete reinforcement).

5.6 Aggregates

a. Aggregates shall consist of natural sand, crushed stone and gravel and shall be chemically inert, strong, hard, clean, durable against weathering of limited porosity, free from deleterious materials and shall conform to the applicable standards. If so desired by the Engineer, they shall be washed and screened.

b. Sampling and testing shall be as per the applicable standards and shall be carried out under the supervision of Engineer. The cost of all test, sampling, etc. shall be borne by the Contractor.

c. All coarse and fine aggregates shall be stacked separately and shall avoid contamination with foreign materials. Segregates aggregates shall be rejected.

d. The necessary arrangements for field test shall be done at site. The material testing register and weighing material register shall be maintained for field and lab mandatory test by the contractor's authorized site engineer, having degree in Civil Engineering or

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minimum three year experience with diploma in civil egg. The copy of all the certificates shall be submitted to BSES officials.

5.7 Water

a. Water used for both mixing and curing shall be as per applicable standards.

b. Potable waters are generally satisfactory. Where water can be shown to contain an excess acid, alkali, sugar or salt, Engineer may refuse to permit its use.

c. Water test certificate provide by the vendor.

5.8 Bricks

a. Bricks having minimum 75kg/cm^2 compressive strength can only be used for masonry work. Contractor shall ascertain himself at site regarding the availability of bricks of minimum 75 kg/cm^2 compressive strength before submitting his offer.

b. Ensure that the bricks are free from cracks, war page and of uniform colour.

c. Manufacturer's test report & Material Test reports for all the materials shall be submitted for approval prior to the utilization for work.

d. Contractor shall make his own arrangements for the storage of adequate quantity of material.

5.9 Levelling, Excavation, Backfill & Compaction

a. Area shall be properly leveled before construction. If fill material is required, the fill material shall be suitable as per the requirement & level. The fill shall be such a material and the site so designed as to prevent the erosion by wind and water of material from its final compacted position or the in-situ position of undisturbed soil. Backfill material around foundations or other works shall be suitable for the purpose for which it is used and compacted to the density described under Compaction. If rocky strata available at site then bidder have to do all the necessary arrangements for rock cutting & its disposal.

b. The thickness of fill material under the foundations shall be such that the maximum pressure from the footing, transferred through the fill material and distributed onto the original undisturbed soil will not exceed the allowable soil bearing pressure of the original undisturbed soil. For expansive soils the fill materials and other protections etc. to be used under the foundation is to be got approved by BYPL. All the area excavated in due course of construction must be filled by vendor. The area of future bay must be filled by vendor up to the proper level of yard.

c. Whenever water table is met during the excavation, it shall be dewatered and water table shall be maintained below the bottom of the excavation level during excavation, concreting and backfilling.

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d. Material unsuitable for founding of foundations shall be removed and replaced by suitable fill material and to be approved by BYPL. Excavated material not suitable or not required for backfill shall be disposed off in areas as directed by BYPL. Excavation and backfill for foundations shall be in accordance with the relevant IS code.

e. The density to which fill materials shall be compacted shall be as per, relevant IS and as per direction of BYPL. All compacted sand filling shall be confined as far as practicable. Backfilled earth shall be compacted to minimum 95% of the Standard Proctor's density at OMC. The sub grade for the roads and embankment filling shall be compacted to minimum 95% of the Standard Proctor's density at OMC. Cohesion less material sub grade shall be compacted to 70% relative density (minimum).

f. Anti termite chemical treatment shall be given to foundations of Enclosure, filling below the Enclosure floor etc. as per IS: 6313 and other relevant Indian Standards.

5.10 General Requirement Site Surfacing/Stone Filling

The material required for site surfacing/stone filling shall be free from all types of organic materials and shall be of standard quality, and as approved by BYPL. The material to be used for stone filling/site surfacing shall be uncrushed/crushed/broken stone of 20 mm nominal size (ungraded single size) conforming to Table 2 of IS:383 - 1970. Hardness, Flakiness shall be as required for wearing courses are given below:

a. Sieve Analysis limits (Gradation)
(IS: 383 - Table - 2)

Sieve Size	% passing by weight
40mm	100
20mm	85 – 100
10mm	0 – 20
	0 – 5

'One Test' shall be conducted for every 500 Cu.m.

b. Hardness

Abrasion value (IS: 2386 Part-IV) - not more than 40%
Impact value (IS: 2386 Part-IV) - not *more* than 30% and frequency shall be one test per 500 cum with a minimum of one test per source

c. Flakiness Index

One test shall be conducted per *500* cum of aggregate as per IS:2386 Part-I and maximum value is 25%

5.11 Admixtures & Additives

a. Only approved admixtures shall be used in the concrete for the Works. When more than one admixture is to be used, each admixture shall be batched in its own batch and added to the mixing water separately before discharging into the mixer. Admixtures shall be delivered in suitably labeled containers to enable identification.

b. Admixtures in concrete shall conform to IS: 9103. The waterproofing cement additives shall conform to IS: 2645. BYPL shall approve concrete Admixtures/ Additives.

c. The contractor shall use water-reducing set-retarding admixture in some of the concrete. The use of such an admixture will not be approved to overcome problems associated with inadequate concrete plant capacity or improperly planned placing operations and shall only be approved as an aid to overcoming unusual circumstances and placing conditions.

d. The water-reducing set-retarding admixture shall be an approved brand of Ligno-sulphonate type admixture.

5.12 Anti weed Treatment, Stone Spreading & PCC

a. The Contractor shall furnish all labour, equipment and materials required for complete performance of the work in accordance with the drawings specification and as per the direction of BYPL.

b. The contractor shall prepare the specified area before stone spreading. PCC must be carried out in two layers. First layer of 75 mm thickness nominal of grade 1:4:8 concreting and second layer of 75 mm thickness of grade 1:2:4 cement concrete.

c. Along with PCC Stone spreading of 100cm thickness shall be done.

d. Before taking up stone filling, anti weed treatment shall be applied in the specified area wherever gravel filling is to be done, and the area shall be thoroughly de-weeded including removal of roots. The recommendation of local agriculture or horticulture department shall be sought wherever feasible while choosing the type of chemical to be used. Nevertheless the effectiveness of the chemical shall be demonstrated by the contractor and monitored over a period of two to three weeks by the Engineer-in-Charge. The final approval shall be given. by Engineer-in-Charge and final approval given based in the results.

e. The anti weed chemical shall be procured from reputed manufacturers. The dosage and application of chemical shall be strictly followed as per manufacturer's recommendation. The contractor shall be required to maintain the area free of weeds for a period of 1 year from the date of application of 1st dose of anti weed chemicals.

f. In yard area red sand stone of 50 mm thickness must be laid above nominal PCC. Above sand stone gavel spreading of specified size must be laid.

5.13 Trench

a. Trench shall be of RCC type.

b. All the material wherever required for trenches shall be supplied by bidder.

c. Power Cable trench and Control cable trench shall be separate

d. The precast removable RCC covers (with lifting arrangement) as per the layout drawing shall be provided. The precast covers shall be constructed using RCC of M35 grade. Trench cover must be of pre-cast concrete of grade not less than M-35 of appropriate load bearing capacity.

e. Cable trench RCC covers shall be designed for self weight of top slab + UDL of 2000 Kg/m2 + concentrated load of 200 kg at centre of span on each panel.

f. Paved portion of cable trenches shall be repaired to withstand class AA Loading of IRC/relevant IS Code

g. The top of trenches shall be kept at least 100 mm above the finished ground level. The top of cable trench shall be such that the surface rain water do not enter the trench.

h. All metal parts inside the trench shall be connected to the earthing system at regular intervals.

i. Wherever required, all the construction joints of cable trenches i.e. between base slab to base slab and the junction of vertical wall to base slab as well as from vertical wall to wall and all the expansion, joints shall be provided with approved quality PVC water stops of approx. 230 x 5 mm size for those sections where the ground water table is expected to rise above the junction of base slab and vertical wall of cable trenches.

j. The repaired Cable trenches shall be blocked at the ends if required with brick masonry in cement sand mortar 1:6 and plaster with 15mm thick 1:6 cement and mortar.

k. Angles 50x50x6 mm (minimum) with lugs shall be provided for edge protection all round edges of repaired RCC cable/pipe trenches supporting covers.

l. Sealing of repaired cable trench must be made in such a manner that no rain water can accumulate in it.

m. If trench passes through road/load bearing path then Box Culvert of Appropriate load bearing shall be used.

n. All the floor openings in building shall be covered with 6mm thick Checkered plates

o. Trench in existing control room may be used for control cable/LT Power Cable laying but repairing and modification of the same shall be in vendor's scope. If new trench is required in control room then the same shall also be in vendor's scope.

5.14 Substation Building

a. Building Shall comply fire safety norms as per relevant IS.

b. Ground floor of the building shall be made for cable cellar

c. First floor of the building shall accommodate 11 kV and 33 kV Switchgear.

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d. Second floor of the building, if applicable, shall accommodate auxiliary equipment as per scope of work of tender document.

e. Height of 3.5 meter is recommended for cable cellar. However, height of cable cellar room shall be finalized during detailed engineering based on functional requirements of switchgear. Operation and maintenance considerations shall also be taken into account.

f. Height of 4.5 meter is recommended for other floors, however it will be finalized during detailed engineering based on functional requirements of switchgear. Operation and maintenance considerations shall also be taken into account.

g. Clear space of 1m at the rear and 2.5 m in front is mandatory for all equipment to ensure ease of operation and maintenance. However, clearances shall be optimized subject to functional requirements of equipment during detailed engineering.

h. The minimum height of substation room/HV switch room/MV switch room shall be arrived at considering 1200 mm clearance requirement from top of the equipment to the below of the soffit of the beam.

i. There shall be two entries and two exits for each floor and room.

j. Motorized shutter shall be provided for entry and exit of switchgears.

k. Doors and windows shall be provided in Building wherever required.

l. Two staircases shall be provided in substation building with granite finish and SS Railing of 304 grade.

m. Kota stone shall be provided in cable cellar and switchgear room for flooring purpose.

n. 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.

o. Plaster work, putty and painting all around the building and common area with plastic paint

p. Epoxy flooring after installation of equipment on kota stone shall be provided in Switchgear room.

q. Level of cable cellar room shall be above 1200 mm from FGL.

r. Provision for Cable Entry and Exit in Switchgear room, Cable Cellar Room and capacitor bank room.

s. Provision of Lighting, Exhaust Fan, Ceiling Fan, Power Points For Cable Cellar and Switchgear Room shall be provided.

t. Water proofing in three layers shall be done in roof slab and ground floor trench. Proofing shall be done by using Dr Fixit chemical

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u. In case the building height requires the fire safety norms to be followed then properly designed firefighting system must be installed as per the norms of Delhi fire Service Department. All necessary clearance and certificate required from Delhi fire department must be in the scope of bidder.

v. Green Building concept must be implemented in Substation Building design for maximum day lighting and ventilation.

5.15 Substation Road

a. Inside substation roads to be provided for access along with car parking for three cars and two Wheeler parking for three vehicles. Building and parking are in the scope of bidder. Layout of the roads shall be based on layout drawing for the substation. Parking areas shall be provided for Site personnel and visitors as per layout drawing. Adequate turning space for vehicles shall be provided and bend radius shall be set accordingly. It has to be connected suitably with roads.
b. All substation roads shall be constructed so as to permit transportation of all heavy equipment up to 60MT. The main approach roads upto Control Room Building and other relevant roads will be RCC/Cement Concrete Roads. The other connecting roads and pathways shall be of Paver blocks/ CC Road as per site requirement. The pavers blocks used for the roads shall be minimum 80mm thick with compressive strength not less than 450Kg/cm2.
c. Road construction shall be as per IRC standard.
d. Adequate provision shall be made for road drainage.
e. All the culverts and its allied structure (required for road/rail, drain, trench crossings, etc.) shall be designed for class AA loading as per IRC standard/IS code. All trenches inside the substation shall cross the road through culverts.

6 INTERFACING

The proper coordination & execution of all interfacing civil works activities shall plan in advance and execute in such a manner that interfacing activities do not become bottlenecks and dismantling, breakage etc. is reduced to minimum.

7 INSPECTION, TESTING & QUALITY CONTROL

a. Detailed field quality plan shall be submitted for approval.
b. Construction Quality shall be properly controlled by the bidder. Bidder shall work as per the Field Quality Plan provided by BYPL. All the Tests specified in the Field Quality Plan shall be done by bidder.

c. Weekly construction status will be updated by the bidder to BYPL to assure the work progress & the construction quality.

d. A Civil Engineer shall be deployed by the bidder for construction quality control. Civil Engineer has to review ongoing construction work, check materials and workmanship.

e. Necessary arrangements for field tests shall be done at site. Bidder has to do the following tests from NABL accredited labs:
   - Raw material test : For Cement, sand , aggregates, water, brick, Steel

- Cube Test for compressive strength of concrete

8 STATUTORY RULES

a. Contractor shall comply with all the applicable statutory rules pertaining to factories act (as applicable far the State). Fire Safety Rules of Tariff Advisory Committee. Water Act for pollution control and coordinate with forest department for necessary approval prior to tree cutting.
b. Plastering on structural members (in fire prone areas) etc. shall be made according to the recommendations of Tariff Advisory Committee.
c. Statutory clearance and norms of State Pollution Control Board shall be followed as per Water Act for effluent quality from plant.
d. Use of C&D waste material as per Order DPCC/EC/9311/WMC-11/2014-15/3044-3068 dt. 14.01.2020

9 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, it will be assumed that the bidder complies fully with this specification. No deviation will be acceptable post order.

10 DOCUMENTATION

a. Drawing submission shall be as per the matrix given below. All documents/ drawing shall be provided in Soft & Hard on A3/ A4 sheet in box file with separators for each section. Language of the documents shall be English only. Deficient/ improper document/ drawing submission may liable for rejection

b. This list is not exhaustive but indicative of minimum requirement only. Final list of drawings shall be prepared by successful bidder during detailed engineering.

S. No	Detail of Document	Bid	Drawing Approval	Pre construction	Post construction
1	Design calculation, general arrangement drawings, foundation drawing & detailed erection / Construction drawings including R/F drawings for Sub-Station Control Room Building		Required		Required
2	Field quality plan		Required	Required	
3	Foundation design & drawing of all equipment foundations		Required		Required
4	Structural steel fabrication drawings for equipment support structure		Required		Required

S. No	Detail of Document	Bid	Drawing Approval	Pre construction	Post construction
5	Foundation design & drawing of Power Transformer		Required		Required
6	Design & drawing of transformer grating, firewall & burnt oil tank		Required		Required
7	Foundation design & drawing for lighting pole		Required		Required
8	Foundation design & drawing for Capacitor Bank, Auxiliary Transformer and design of fencing For both.		Required		Required
9	Complete fencing along with gate for the Sub-Station yard		Required		Required
10	Details of Indoor and Outdoor Cable Trenches with cable tray supports and trench covers		Required		Required
11	Design & drawing of Rainwater Harvesting System, sewerage system including septic tank, Water supply arrangement, landscaping, etc		Required		Required
12	Design & drawing of roads and complete drainage system (with final connection to Rain Water Harvesting recharge pit) within Sub-Station including crossings		Required	Required	Required
13	Design & drawing Security room		Required	Required	Required
14	Design & drawing NIFPS system & underground water tank		Required	Required	Required

11 APPROVED MAKES

S No	Item Detail	Approved make	Remarks
1	Exhaust fan	Crompton/Havells/Bajaj	
2	Lighting fixture	Havells/Crompton/Philips	
3	Air conditioning System	Voltas/carrier/Hitachi	
4	Structural Steel Built up Section	Tata/SAIL/Jindal	

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S No	Item Detail	Approved make	Remarks
5	Ceramic tiles	Kajaria	Size not less than 600mm X 300 mm
6	Toilets fittings	Jaquar/Hindware make	
7	Toilet door	Green ply	Both Side laminated
8	Toilet Flooring	Kajaria	Anti skid tiles of Size 600 mm X 600 mm
9	Grid building floor	Kota Stone	
10	Glass door fittings	Ozone make	As per approved Drawings
11	Mortise Lock and Door closer	Dorset make	
12	Doors and Windows	Hindalco/Jindal	Aluminium powder coated
13	Electrical cable	Havells/Polycab/Finolex/KEI	
14	Electrical conduit	Setia	Heavy Duty
15	Switch socket	Anchor/Havells/Legrand	
16	Cement	ACC/Ultratech/J K Laxmi	
17	TMT Bar	Tata/Jindal/SAIL	
18	Plastic Paint	Asian/Nerolack/Berger	Three or more coat.
19	Sanitary pipes	Astral/Skipper/Ashirwad	Ring fitted
20	Almirah	Godrej/Tata	

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