



BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION PROJECTS ENGINEERING MANAGEMENT

DOCUMENT No.	TB-387-316-006	Rev. No.	00		Prepared	Checked	Approved
TYPE OF DOC.	TECHNICAL SPECIFICATION			NAME	NK	SKS	AG
TITLE 220V, 1605AH & 48V, 645AH LEAD ACID BATTERY BANK				SIGN	<i>K. K. K.</i>	<i>S. S. S.</i>	<i>37804</i>
				DATE	07.07.20	07.07.20	07.07.20
				GROUP	TBEM		
CUSTOMER	TELANGANA STATE POWER GENERATION CORPORATION LTD						
PROJECTS	400 kV Switchyard at 5X800MW Yadadri TPS						

CONTENTS

Section	Description	No. of Sheet
Section-1.	SCOPE, SPECIFIC TECHNICAL REQUIREMENTS & BILL OF QUANTITIES	05
Section-2.	DETAILED TECHNICAL REQUIREMENTS – EQUIPMENT SPECIFICATION	04
Section-3.	PROJECT DETAILS AND GENERAL SPECIFICATION	13
Section-4.	SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS	5
Section-5.	CHECK LIST	3
	ANNEXTURE – A (Technical Deviation)	1
	ANNEXTURE – B (Technical PQR)	1

Rev No.	Date	Altered	Checked	Approved	REVISION DETAILS			
				Distribution	TBMM	TBQM	TBCM	TBTS
				Copies	2	-	-	-

COPYRIGHT AND CONFIDENTIALITY
The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD.
It must not be used directly or indirectly in anyway detrimental to the interest of the company

SECTION - 1

1.1 SCOPE

This technical specification covers the requirements of design, manufacture, testing at works, packing, dispatch and supervision of installation & commissioning of DC Lead acid vented type batteries (plante). Notwithstanding the details included in this specification, the battery banks shall be supplied complete with spares and accessories like Rack, interconnecting links, cables lug etc at site as may be required for erection, commissioning and trouble free operation of batteries. The battery banks complete with accessories shall be freestanding on floor.

This section covers the scope, quantities & project specific technical requirements as specified by the customer for 220V & 48 V DC Batteries. The Specific Technical Requirements for the above item are given in Section-2. The offered equipment shall also comply with the General Technical Requirements for the project as detailed under section-3 of this specification.

In case of any discrepancies between the requirements mentioned under Section-1, Section-2 and those specified in the Section-3, the specifications given in this section shall prevail and shall be treated as binding requirements.

No deviation from the requirements specified in various clauses of this specification shall be allowed. A certificate to this effect shall have to be furnished along with the offer.

The equipment is required for the following project's:

Name of the Customer : Telangana State Power Generation Corp. Ltd. (TSGENCO)
Name of the Project1 : 400 kV Switchyard at 5X800MW Yadadri TPS
Consultant : TCE Bangalore

The scope of supplies shall be as per commercial terms and conditions enclosed separately with the enquiry.

1.2 SPECIFIC TECHNICAL REQUIREMENTS

Nominal voltage of main DC system shall be 220V. DC batteries shall be designed for continuous float operation with trickle charging, hence all the associated components like batteries, battery chargers, DC motors, relays, contactors, timers etc shall be suitable for continuous operation at the maximum continuous battery float voltage including suitable temperature correction factors.

Parameter	220V DC	48V DC
Nominal Battery Voltage (V)	220	48
Maximum Battery Bank Voltage	242	52.8
Minimum Battery Bank Voltage	187	40.8
Cell Designation	Stationary, Lead Acid Type with plante positive Plates, High Discharge Rate type	
Charging method	As per requirement to meet the technical specification	
No. of Cells per battery	108	24
Nominal Cell Voltage (V)	2	

Nominal float voltage per cell (V)	2.25	
End Cell Voltage	1.8Volt /Cell	
Equalising charge (occasional)	2.33Volt /Cell	
Boost charging/cell (after complete discharge)	2.75Volt /Cell (Max.)	
End Battery Voltage	1.8X108 = 194.4V	1.8X24 = 43.2V
Design Ambient design temperature	50°C	
Min. Electrolyte temp.	7.0°C (as per min. site temp.)	
Battery Charging Requirement	Battery shall be such that it can be charged from fully drained state to fully charged condition within 10 Hrs.	
Battery Room Size	18m x10m, bidder to accommodate battery banks with 1.0 meter clear space from inside wall surface. Refer sketch of Battery Room attached along with this Section.	
Temperature correction factor	As per Battery Manufacturer Data	
Intermediate tapping	As required	
Humidity	85%	
Mounting	FRP Rack	
Terminal connection	Through single core fire survival cables	

- The rating and quantities of battery chargers (for information) is as below:
220V, 240A float & float cum boost chargers: 2 Nos.
48V, 100A float & float cum boost chargers: 2 Nos.
- Size of cable between battery & distribution board shall be intimated during detailed engineering stage. Bidder to provide TB's of appropriate size as per the input.

1.3 BILL OF QUANTITIES

S. No.	Details	Unit	Qty (Nos)
1.3.1	Main Items		
1	220V, 1605AH Lead Acid Plante Battery bank complete in all respects with accessories as per specification	Sets	2
2	48V, 645AH Lead Acid Plante Battery bank complete in all respects with accessories as per specification	Sets	2
1.3.2	Mandatory Spares		
1	Battery Cell (Uncharged, Dry)	Nos	40
2	Inter connecting cell strips	Nos	40
3	Vent plug	Nos	40
4	Teak wood cable clamps with hardware	Nos	20
5	Hydrometer	No	2
6	Rubber gloves	Pair	2
7	Voltmeter for measuring cell voltage (Center zero type)	No	2
8	Insulated socket spanner with handle	No	2
9	Thermometer	No	2
1.3.3	Services		

1	Supervision of erection at site for 220V, Lead Acid Plante Battery bank	Sets	2
2	Supervision of erection at site for 48V, Lead Acid Plante Battery bank	Sets	2
1.3.4	Optional Type Test (Please refer clause 1.5)		
1	<u>Battery Type Test</u> : Discharge performance test at low temperature.	Lot	1
2	<u>Battery Type Test</u> : Ampere-hour test & watt-hour efficiency test.	Lot	1
3	<u>Battery Type Test</u> : Endurance test.	Lot	1
4	<u>Battery Type Test</u> : Container (shall be type tested as per IS:1146)	Lot	1
5	<u>Battery Type Test</u> : Sealing compound (shall be type tested as per IS:3116)	Lot	1
1.3.5	Special Tools & Tackles		
1	Special tools & tackle	Lot	1

Note:

- Each set of battery shall be equipped with fittings and accessories as listed below. As there are 4 sets of batteries as per clause 1.31 & 1.3.2 above, 4 sets of below items shall be supplied.:

1	One battery log book.
2	Two copies of printed instruction sheet.
3	Two nos. cell testing voltmeter (3-0-3 volts) complete with leads.
4	One no. rubber syringe type hydrometer suitable for specific gravity reading.
5	Three nos. pocket thermometer.(Digital type)
6	Two nos. thermometer (0 to 100°) with specific gravity correction scale.
7	One set cell bridging connector.
8	Two nos. each Electrolyte resistant plastic funnels and plastic jugs
9	Battery racks suitable for accommodating the cells coated with paint.
10	Insulator (with 5% extra), rubber pad etc. for rack.
11	Two nos. plastic filling bottle for filling up.
12	One pair of spanners.
13	Requisite quantity of electrolyte with 10% extra in non-returnable containers.
14	Two pairs of rubber hand gloves.
15	Two nos. cell lifting straps.
16	One set of inter cell, inter tie and inter bank connectors as required for complete installation.
17	Self adhesive PVC stickers for cell numberings
18	Goggles.
	NOTE: Any other accessories if required for satisfactory operation of the complete battery system shall also be included in Bidder's offer and to be supplied accordingly.

2) Special Tools & Tackles

A set of special tools & tackle which are necessary or convenient for erection, commissioning, maintenance and overhauling of the equipment shall be supplied.

The tools shall be shipped in separate containers, clearly marked with the name of the equipment for which they are intended.

3) Recommended Spares

The Bidder shall submit a list of recommended spare parts for five (5) years satisfactory and trouble free operation, indicating the itemized price of each item of the spares. The prices of these shall be indicated in separate schedules and these shall not be considered for the purpose of evaluation.

4) Battery rating mentioned at clause 1.3.1 above is minimum rating, if battery bank of mentioned capacity is not available with vendor, the bidder to quote nearest higher rating.

5) If any mandatory spares specified in BOQ are not applicable as per battery design, bidder to supply equivalent spares for the same.

1.4 TYPE TESTING

Bidder shall submit valid type test reports (as per relevant IEC/IS standard) for the tests carried out after 17.10.2012. The reports should have been conducted on identical or similar equipment/components to those offered. In case type test reports are earlier than 17.10.2012 or the reports of type tests are found to be technically unacceptable by TSGENCO, the type test shall be conducted by the vendor without cost and delivery implication to BHEL.

1.5 OPTIONAL TYPE TEST REQUIREMENT

Type test charges will be optional. These charges shall be valid for the entire tenure of the contract. BHEL/TSGENCO reserves the right to delete the optional type tests at time of contract.

The bidder shall successfully carry out the following type tests (but not limited to) on two cells of the battery, even if the Bidder submits type test certificates for Purchaser's review and approval. The bidder shall indicate the charges for each of these type tests separately and the same shall be considered for the evaluation of the bids. The type test charges shall be paid only for the test(s) actually conducted successfully under this contract and upon certification by BHEL/TSGENCO engineer.

- a) Discharge performance test at low temperature.
- b) Ampere-hour test & watt-hour efficiency test.
- c) Endurance test.
- d) Container shall be type tested as per IS:1146
- e) Sealing compound shall be type tested as per IS:3116

The type test shall be carried out in presence of BHEL/TSGENCO representative for which minimum 15 days' notice shall be given by Supplier. The Supplier shall obtain Purchasers approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc for the type test(s) to be carried out.

1.6 QUALITY PLAN

The bidder to follow BHEL/ TSGENCO approved quality plan at contract stage.

1.7 SUPERVISION OF INSTALLATION & COMMISSIONING

Manufacturer of Battery shall supervise the installation and commissioning and perform commissioning tests as recommended in O&M manual / or relevant standards. All necessary instruments, material, tools and tackles required for installation, testing at site and commissioning are to be arranged by Battery manufacturer.

1.8 TITLE BLOCK

The drawings / documents submitted shall be project and product specific and shall incorporate following details:

- a) Project Name : 400 kV Switchyard at 5X800MW Yadadri TPS
- b) Customer Name : Telangana State Power Generation Corp. Ltd.
- c) Consultant Name : TCE, Bangalore
- d) Contractor : BHEL
- e) Customer LOA no. : ED/TPC/SE-III/YADADRI TPS(5X800MW)/D.No. 102/17, Dated: 17/10/2017

1.9 Drawings / Documents

The drawings / documents submitted shall be project and product specific and shall incorporate all project details and title block of the customer as detailed in Section 1, 2 & 3.

The drawings/ documents, as follows shall be used for providing engineering manufacturing clearance of the equipment (220 V & 48V Lead Acid Plante Battery Bank) and furthermore, it shall be used for delay analysis, if any from bidder.

The schedule for submission and resubmission shall be in line with details provided in section-3.

1	OGA, Room layout, BOM, GTP & CKT Diagram/Scheme drawings
2	Type Test Reports
3	Quality Assurance Plan & Inspection Test Schedule

Date of Submission of first lot of drawings/ documents shall be counted only from the date of submission of reasonably correct drawings/ documents.

The successful bidder shall have to extend all possible supports like timely submission/ re-submission of drawings, visit to end customer to facilitate documents approval without any commercial implications to BHEL. Acceptance of bidder's documents shall be subject to end customer approval.

- - X X - -

SECTION – 2

2.1 GENERAL TECHNICAL REQUIREMENTS

APPLICABLE STANDARDS

IS:1651	- Stationary Cells and Batteries, Lead-Acid Type (with Tubular Positive Plates)
IS:1652	- Stationary Cells and Batteries, Lead-Acid Type (with Plante Positive Plates)
IS:1146	- Rubber and Plastic Containers for Lead-Acid Storage Batteries
IS:6071	- Synthetic Separators for Lead-Acid Batteries
IS:266	- Specification for Sulphuric Acid
IS:1069	- Specification for Water for Storage Batteries
IS:3116	- Specification for Sealing Compound for Lead-Acid Batteries
IS:1248	- Indicating Instruments
IS:10918	- Vented type nickel Cadmium Batteries
IEC:60896-21&22	- Lead Acid Batteries Valve Regulated types – Methods of Tests & Requirements
IEC: 60623	- Vented type nickel Cadmium Batteries
IEC:60622	- Secondary Cells & Batteries – Sealed Ni-Cd rechargeable single cell
IEC:60623	- Secondary Cells & Batteries – Vented Ni-Cd rechargeable single cell
IEC:60896-11	- Stationary Lead Acid Batteries – Vented Type – General requirements & method of tests
IEEE-485	- Recommended practices for sizing of Lead Acid Batteries
IEEE-1115	- Sizing of Ni-Cd Batteries
IEEE-1187	- Recommended practices for design & installation of VRLA Batteries
IEEE-1188	- Recommended practices for design & installation of VRLA Batteries
IEEE-1189	- Guide for selection of VRLA Batteries

All equipment and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) and IEC except where modified and/or supplemented by this specification.

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

The electrical installation shall meet the requirements of Indian Electricity Rules as amended upto date and relevant IS Code of Practice. In addition, other rules and regulations applicable to the work shall be followed.

2.2 DESIGN CRITERIA

The voltage at Battery terminals shall not exceed the limits of + 10% and - 15% of the nominal system voltage at any time during the duty cycle.

For continuous operation at specified ratings, temperature rise of the various components of battery & battery charger shall be limited to the permissible values stipulated in the relevant standards and/or this specification.

The equipment will be installed indoor in a clean but hot, humid and tropical atmosphere.

2.3 SPECIFIC REQUIREMENTS

Please refer attached battery room layout. The bidder to accommodate the supplied batteries in the room with sufficient ventilation and clearance space.

- a) Each set of battery shall consist of number of cells assembled together on mounting racks.
- b) The battery shall be flooded cell with Plante Lead acid. In the event of failure of any cell, there shall be no interruption in power supply to load.
- c) The plates shall be designed for maximum durability during all service conditions including high rate of discharge and rapid fluctuation of load.

2.4 Construction

- a) Cell container shall be made of transparent glass, hard rubber, suitable robust, heat resistant, leak proof, non-absorbent, acid resistant, non-bulging type and free from flaws, such as wrinkles, cracks, blisters, pin holes, etc. The cell shall be mechanically sturdy. Container shall be closed/sealed lid type. Lid and sealing compound shall be non-cracking type.
- b) The cell shall be provided with visual electrolyte level checks for ease in of maintenance. Electrolyte level markings shall be for upper and lower limits.
- c) Sufficient sediment space shall be provided so that the cells will not have to be cleaned out during normal life.
- d) Separator between plates shall permit free flow of electrolyte. Proper arrangement to keep end plates in position shall be furnished.
- e) For flooded cell, suitable mechanism and / or Ceramic Vent plug shall be provided to eliminate emission of acid mist during the float operation. The bidder shall also indicate the Gas emission rate of the battery in their offer for necessary design of the ventilation of the Battery Room. Anti-splash type vent plug shall be provided in each cell.
- f) The cells shall be supported on insulators fixed on to the rack with adequate clearance between adjacent cells.
- g) The cell terminals posts shall be provided with connector bolts and nuts, made of copper/ brass effectively coated with lead to prevent corrosion.
- h) Lead coated copper connectors shall be furnished to connect up cells of Battery set.
- i) Positive and Negative terminal posts shall be clearly and indelibly marked for easy identification.
- j) Bent copper plates, tubular copper lugs, teakwood clamp, bolts, nuts, washers, etc. shall be furnished for connection of outgoing single core, stranded Aluminum conductor, XLPE insulated cables to end take-off connections at positive and negative plate. All connectors and lugs shall be capable of continuously carrying the discharge current of the battery for the entire load cycle and let though fault current which the battery can produce and withstand for the period declared.
- k) The battery shall be shipped uncharged for flooded cell with the electrolyte furnished in a separate non-returnable container. 10% extra electrolyte shall be furnished to cover spillage in transit or during erection.
- l) The pole sealing arrangement should be such that no acid particle gets entrapped due to acid creep as a result of capillary action and it should be possible to remove and refix the sealing to carry out the maintenance.

2.5 Battery Racks

Battery racks for supporting battery cells shall be constructed of best quality FRP forming a rigid structure. Racks shall be painted with at least three (3) coats of electrolyte-resistant paint of approved shade. Batteries shall be preferably be located in single tier arrangement. Racks shall be free standing type, mounted on porcelain / electrolyte-resistant high impact plastic insulators. Numbering tags for each cell shall be attached on to the racks.

2.6 TESTS

All equipment and components thereof shall be subject to shop tests as per relevant IS standards. The tests shall included but not limited to:

Following type tests (but not limited to) on two cells of the battery shall be carried out by the bidder, even if the Bidder submits type test certificates for customer review and approval.

- a) Discharge performance test at low temperature.
- b) Ampere-hour test & watt-hour efficiency test.
- c) Endurance test.
- d) Container shall be type tested as per IS:1146
- e) Sealing compound shall be type tested as per IS:3116

All other routine tests shall be carried out on each equipment as per relevant standard.

2.7 DRAWINGS, DATA & MANUALS

Bidder shall submit all relevant drawings and data pertaining to the equipment for the approval of TSGENCO/ TCE Bangalore. The minimum documents required for approval is as follows:

Dimensional Battery room layout drawing.

GA & Internal Details of Battery Cells & GA of Stand.

Cable Termination detail

Typical foundation plan.

Bill of materials indicating complete list of materials, accessories, spares, components, makes of components, quantities and rating Battery cell voltage characteristics and data for different discharge rates.

Quality plan.

Field Quality plan.

Type Test Reports.

Storage and Installation Instruction.

Operation and Maintenance Manual

List of makes of various items / components shall be submitted for Purchaser's approval during contract stage

Leaflets and catalogues of different equipment and accessories including write up on features of different components along with data sheets, curves, tables etc.

All final approved drawings and documents shall be submitted in CD in Auto CAD (approved version) and MS office format as applicable for Purchaser's future reference.

2..8 PACKING AND MARKING

The cells shall be suitably packed as per applicable standards so as to avoid any loss or damage during transit. Loose item such as connectors, copper rods, hardware, insulators and accessories

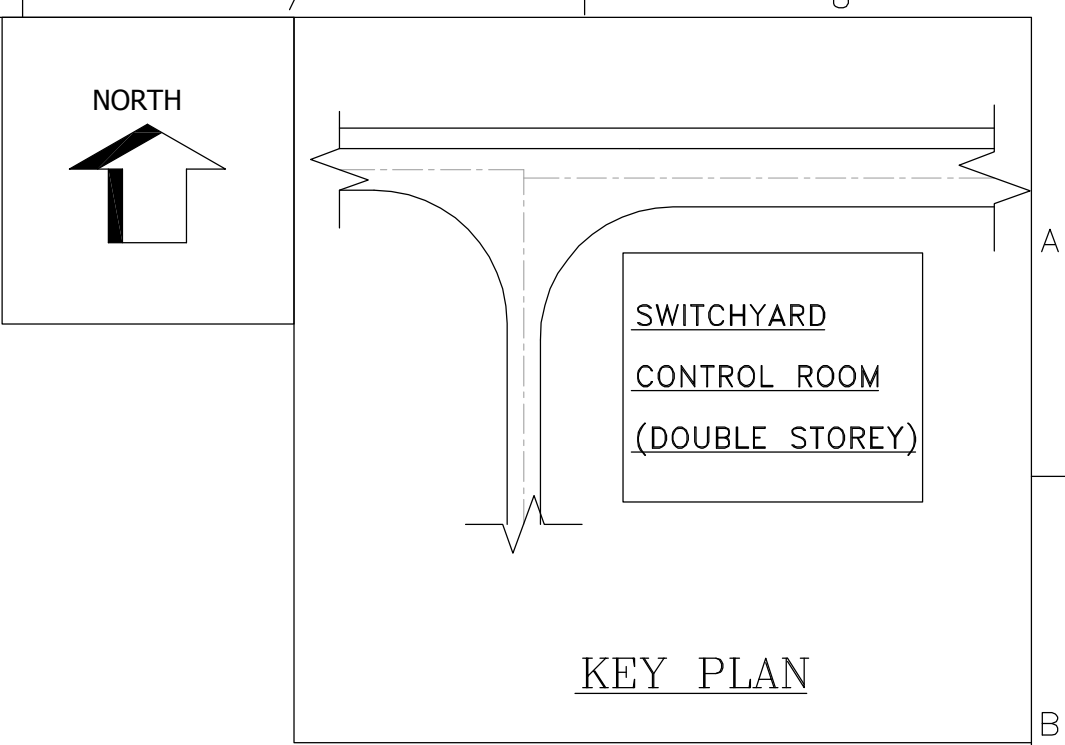
etc. shall also be packed in cases. For details / specific packing requirements for the project refer section-3.

2.9 Markings

Each cell shall be marked with details as below:

- a) Manufacturer's type and trade name
- b) AH capacity at 30 minute rate.
- c) Upper & lower electrolyte level in case of transparent containers.
- d) Month & Year of manufacture
- e) Country of origin
- f) The cells and batteries may also be marked with the ISI certification mark.

- x -



1. ALL DIMENSIONS ARE IN MM. DIMENSIONS SPECIFIED FOR ROOMS ARE IN METRES.
2. -0.50M SHALL BE READ AS FGL OF SWITCHYARD.
3. 400KV SWITCHYARD CONTROL ROOM BUILDING IS A DOUBLE STOREY BUILDING WITH TRENCHES BELOW FLOOR LEVEL FOR CABLE LAYING.
4. CASSETTE TYPE AC WITH FALSE CEILING (AC+FC) SHALL BE PROVIDED IN STAFF ROOM & ELECTRONIC TEST LAB AT GROUND FLOOR AND OFFICE ROOM'S & CONFERENCE ROOM ON FIRST FLOOR. CONTROL ROOM ON THE FIRST FLOOR SHALL BE PACKAGED AIR-CONDITIONED WITH FALSE CEILING. OTHER PARTS OF BUILDING SHALL BE NON AIR-CONDITIONED & WITH NO FALSE CEILING. UNDER DECK INSULATION SHALL BE PROVIDED FOR AC AREAS.
5. DIMENSIONS AND ARRANGEMENT OF PANELS INSIDE CONTROL ROOM BUILDING ARE INDICATIVE AND SHALL BE FINALISED DURING DETAILED ENGINEERING.
6. LT SWITCHGEAR ROOM, BATTERY ROOM, PANTRY, TOILETS AND STORE ROOM SHALL BE PROVIDED WITH EXHAUST AIR FANS.
7. ALL ROOM EXCEPT AHU ROOM SHALL BE PROVIDED WITH WINDOW.
8. ALL THE DIMENSIONS OF THE ROOMS ARE WALL CENTRE TO CENTRE DIMENSIONS.
9. SEPARATE DRAWING SHALL BE SUBMITTED FOR DETAILED ARCHITECTURE AND TRENCH LAYOUT OF CONTROL ROOM BUILDING.
10. PROTECTION/BAY CONTROL PANELS WILL BE LOCATED IN OUTDOOR SWITCHYARD AC KIOSK.
11. ALUMINIUM GLAZED WINDOW SHALL BE PROVIDED IN CONTROL ROOM TO HAVE A CLEAR VIEW OF SWITCHYARD EQUIPMENTS.
12. PROTECTIVE GRILL SHALL BE PROVIDED FOR ALL THE GLASS WINDOWS FACING SWITCHYARD.
13. BATTERY ROOM AND SWITCHGEAR ROOM DOOR SHALL BE FIRE-PROOF TYPE.
14. ACID SPILL PROOF TYPE OF FLOORING SHALL BE PROVIDED IN BATTERY ROOM.

TAXA CONSULTING ENGINEERS LIMITED
VENDOR DOCUMENT REVIEW STATUS

☐ A Drawing/Document approved as submitted. Proceed with fabrication/construction.

☐ B Drawing/Document approved subjected to comments. Proceed with fabrication/construction considering our comments.

☐ C Our comments are noted on this marked up print. _____ Dated: _____

☐ D Our comments are noted in memo attached to the forwarding transmittal letter No. _____

☐ E Correct original of this drawing/document to reflect our comments and resubmit for approval.

☐ F Correct original of this drawing/document to reflect our comments and resubmit for records.

☒ G Drawings/Documents of this category are for information only and not for approval. Information furnished on the drawing/document is noted.

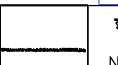
☐ H Drawing/Document reviewed against our previous comments and other revisions highlighted in the last drawing document.

☐ I Drawing/Document returned without review.

☐ J Print not enclosed.

Approval conveyed herein neither relieves the Vendor of his/her contractual obligations and his responsibilities for correctness of dimensions, materials of construction, weights, quantities, design details, assembly fits, performance requirements, etc. conformity of the supplies with the Indian Statutory Laws as may be applicable, nor does it limit the purchaser's rights under the contract.

Reviewed by: **RAJ** Date: _____ **03.7.2020**

		TELANGANA STATE POWER GENERATION CORPORATION LTD. TELANGANA, INDIA																	
NAME OF CUSTOMER		5 x 800 MW YADADRI TPS, NALGONDA																	
OWNER'S CONSULTANT:		TATA CONSULTING ENGINEERS LTD. BANGALORE																	
		भारत हेवी इलेक्ट्रिकल्स लिमिटेड द्राष्टिकान परियोजना विभाग BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION PROJECTS DIVISION																	
COPY RIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electricals Limited, It must not be used directly or indirectly in any way detrimental to the interests of the company.		<table border="1"> <thead> <tr> <th>REV.</th> <th>ISS. NAME</th> <th>DATE</th> <th>BY</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>PK</td> <td>19/02/16</td> <td></td> </tr> <tr> <td>02</td> <td>HK</td> <td>19/02/16</td> <td></td> </tr> <tr> <td>03</td> <td>DM/RS</td> <td>19/02/16</td> <td></td> </tr> </tbody> </table>		REV.	ISS. NAME	DATE	BY	01	PK	19/02/16		02	HK	19/02/16		03	DM/RS	19/02/16	
REV.	ISS. NAME	DATE	BY																
01	PK	19/02/16																	
02	HK	19/02/16																	
03	DM/RS	19/02/16																	
श्रीरक्ष/TITLE		CONCEPTUAL 400 KV SWITCHYARD CONTROL ROOM BUILDING LAYOUT																	
DEPT.		उत्तुपात / SCALE																	
SIGN.		डाईग.क्र./DRAWING NO. TB-3-387-316-008																	
		पृष्ठ #SHEET NO. 01																	
पुनः/REV		उगला पृष्ठ/NEXT SHEET 02																	

REV.	DATE	ALTERED	NK		REV.	DATE	ALTERED	NK		REV.	DATE	ALTERED	NK		REV.	DATE	ALTERED	NK	
05	30.06.20	CHECKED	SKS		04	15.05.20	CHECKED	SKS		03	27.04.20	CHECKED	SKS		02	14.11.18	CHECKED	NK	
		APPROVED	AG				APPROVED	AG				APPROVED	AG				APPROVED	DKM	
ZONE					ZONE					ZONE					ZONE				
	REVISED AS PER TCE/TSGENCO COMMENTS DATED 03.06.2020.					REVISED AS PER TCE/TSGENCO COMMENTS DATED 05.05.2020.					REVISED AS PER MOM DATED 17.12.18.					REVISED AS PER TCE/TSGENCO COMMENTS DATED 26.10.18.			
																REVISED AS PER TCE COMMENTS DATED 26.09.18.			



Project: 5x800 MW YADADRI THERMAL POWER STATION.
Customer: TELANGANA STATE POWER GENERATION CORPORATION LTD

Section-3: Project Details & General Specifications

Rev. No. 01

SECTION - 3

PROJECT DETAILS AND GENERAL SPECIFICATIONS

GENERAL TECHNICAL REQUIREMENTS

1.0 PROJECT DETAILS

Customer	:	M/s Telangana State Power Generation Corporation Ltd.
Project Title	:	5x800MW Yadadri Thermal Power Station
Project Location	:	Veerlapalem Village, Damercherla Mandal, Nalgonda District, Telangana
Nearest Railway station	:	Vishnupuram railway station.
Nearest Road Head	:	NH-9 is at 45km North SH-2 is at 7km South
Nearest Airport	:	Hyderabad (about 120 Km) Chief Engineer (O&M), 5X800MW Yadadri Thermal Power
Postal Address	:	Station, TSGENCO, Village - Veerlapalem, Mandal- Dameracheral, Dist. – Nalgonda, Telangana

1.1 SITE CONDITIONS (FOR DESIGN PURPOSES)

1.1.1 SITE CONDITIONS

a).	Average rainfall per year	:	1124 mm
b).	Maximum hourly rainfall intensity	:	102 mm
c).	Altitude	:	1000 m

1.1.2 DESIGN AMBIENT

a).	Minimum Temperature	:	13.5°C
b).	Maximum Temperature	:	45°C
c).	Design Ambient Temperature	:	50 °C

1.1.3 RELATIVE HUMIDITY

a).	Maximum	::	85%
-----	---------	----	-----



Section-3: Project Details & General Specifications

Rev. No. 01

1.1.4 WIND PRESSURE (AS PER IS:875-1987)

a). Design wind speed : 44 m/sec.

1.1.5 SEISMIC FACTORS

a). Horizontal Seismic Coefficient : As per latest IS : 1893

b). Vertical Seismic Coefficient : As per latest IS : 1893

} **Zone - III**

1.1.6 ELECTRICAL DATA

		400 kV System	415V AC System	240V AC System	220 V DC System	48 V DC System
1.	Nominal Voltage	400 kV	415 V	240 V	220 V	48 V
2.	Highest System Voltage	420 kV	457 V	264 V	242 V	55 V
3.	No. of phases	3	3	1	NA	NA
4.	Frequency	50 Hz	50 Hz	50 Hz	NA	NA
5.	Voltage variation	± 5%	+10 %	+10 %	+10 % to -15%	+10 %
6.	Neutral Earthing	Effectively Earthed	Solidly Earthed	Solidly Earthed	-	-
7.	Fault Level	50 kA for 1 sec.	50 kA for 1 sec.	50 kA for 1 sec.	15 kA for 1 sec.	-

1.1.7 SYSTEM PARAMETERS

Dry and wet one minute power frequency withstand voltage : 630 kVrms
Dry impulse withstand voltage positive and negative : 1425 kVpeak
Minimum Total Creepage : 25 mm/kV

1.1.8 MINIMUM CLEARANCE (AS PER IS: 10118)

Phase to phase (PP) : 4200 mm
Phase to earth (PE) : 3500 mm
Section clearance : 6500 mm
Minimum ground clearance from plinth level (Plinth level : 300 mm) : 8000 mm



Vertical ground clearance to nearest part not at earth
potential of an insulator supporting live conductor/ equipment 2440 mm

1.2 INSTRUCTION TO BIDDERS

The bidders shall submit the technical requirements, data and information as per the technical data sheets, provided in Section-4.

The bidders shall furnish catalogues, engineering data, technical information, design documents, drawings etc fully in conformity with the technical specification. It is recognised that the Manufacturer may have standardised on the use of certain components, materials, processes or procedures different than those specified herein. Alternate proposals offering similar equipment based on the manufacturer's standard practice will also be considered provided such proposals meet the specified designs, standard and performance requirements and are acceptable to the Purchaser. Unless brought out clearly, the Bidder shall be deemed to conform to this specification scrupulously.

1.3 STANDARDS

The works covered by the specification shall be designed, engineered, manufactured, built, tested and commissioned in accordance with the Acts, Rules, Laws and Regulations of India.

The equipment to be furnished under this specification shall conform to latest issue (with all amendments) of specified standards.

In addition to meeting the specific requirement called for in Sections 1 and 2 of the Technical Specification, the equipment shall also conform to the general requirement of the applicable standards, which shall form an integral part of the specification. The Bidder shall note that standards mentioned in the specification are not mutually exclusive or complete in themselves, but intended to complement each other. When the specific requirements stipulated in the specifications exceed or differ from those required by the applicable standards, the stipulation of the specification shall take precedence.

Other internationally accepted standards, which ensure equivalent or better performance than that specified in the standards referred, shall also be accepted. The bidder shall submit copies of such standards.

In case governing standard for the equipment is different from IS or IEC, the salient points of difference shall be clearly brought out in the offer along with English language version of standard or relevant extract of the same. The equipment conforming to standards other than IS/IEC shall be subject to Purchaser's / owner's approval. The bidder shall clearly indicate in his bid the specific standards in accordance with which the works will be carried out.



1.4 TYPE TESTING, INSPECTION, TESTING & INSPECTION CERTIFICATE

All equipment being supplied shall conform to type tests and shall be subject to routine and acceptance tests in accordance with requirements stipulated under respective sections. Purchaser reserves the right to witness any or all the tests. The Manufacturer shall intimate the Purchaser the detailed programme about the tests at least three (3) weeks in advance in case of domestic supplies & six (6) weeks in advance in case of foreign supplies. Purchaser reserves the option for getting any or all the type tests repeated on the equipment. The Manufacturer shall also submit type test procedure for approval of the Purchaser.

In the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design/manufacturing changes (including substitution of components) or due to non-compliance with the requirement stipulated in the technical specification or any/all additional type tests not carried out without any additional cost implication to the Purchaser.

The price of conducting all tests and additional type tests is deemed to be included in Bid price. In case any bidder indicates that he shall not carry out a particular test, his offer shall be considered incomplete and shall be liable to be rejected.

The purchaser intends to repeat the type tests and additional type tests on cables for which test charges shall be payable as per provision of contract.

The Purchaser, his duly authorised representative and/or outside inspection agency acting on behalf of the Purchaser shall have at all reasonable times free access to the Contractors premises or Works and shall have the power, at all reasonable times to inspect and examine the materials and workmanship of the Works during its manufacture or erection if part of the Works is being manufactured or assembled at other premises or works, the Manufacturer shall obtain for the Engineer and for his duly authorized representative permission to inspect as if the works were manufactured or assembled on the Manufacturer's own premises or works. Inspection may be made at any stage of manufacture, dispatch or at site at the option of the Purchaser and the equipment if found unsatisfactory due to bad workmanship or quality, material is liable to be rejected.

The Manufacturer shall give the Purchaser/inspector thirty (30) days written notice of any material being ready for testing. Such tests shall be to the Manufacturer's account except for the expenses of the inspector. Unless witnessing of the tests is virtually waived, the Purchaser/ inspector will attend such tests within thirty (30) days of the date of which the equipment is notified as being ready for test/ inspection, failing which the Manufacturer may proceed with the test which shall be deemed to have been made in the Inspector's presence and the Manufacturer shall forthwith forward duly certified copies of test reports in triplicate to the Inspector.

The Purchaser or Inspector shall, within fifteen (15) days from the date of inspection as defined herein, give notice in writing to the Manufacturer, of any objection to any drawings and all or any equipment and workmanship which in his opinion is not in accordance with the Contract. The



Manufacturer shall give due consideration to such objections and shall either make the modifications that may be necessary to meet the said objections or shall confirm in writing to the Purchaser/ inspector giving reasons therein, that no modifications are necessary to comply with the Contract.

When the factory tests have been completed at the Manufacturer's works, the Purchaser/ inspector shall issue a certificate to this effect within fifteen (15) days after completion of tests but if the tests are not witnessed by the Purchaser/inspector, the certificate shall be issued within fifteen (15) days of receipt of the Manufacturer's Test certificate by the Engineer/ Inspector. Failure of the Purchaser/inspector to issue such a certificate shall not prevent the Manufacturer from proceeding with the Works. The completion of this test or the issue of the certificate shall not bind the Purchaser to accept the equipment should it, on further tests/ after erection, be found not to comply with the Contract. The equipment shall be dispatched to site only after approval of test reports and issuance of MICC by the Purchaser.

In all cases where the Contract provides for tests whether at the premises or at the works of the Manufacturer or of any Sub-Contractor, the Manufacturer except where otherwise specified shall provide free of charge such items as labour, materials, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the Purchaser /Inspector or his authorised representative to carry out effectively such tests of the equipment in accordance with the Contract and shall give facilities to the Purchaser Inspector or to his authorised representative to accomplish testing.

The inspection by Purchaser and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Manufacturer in respect of the agreed quality assurance programme forming a part of the Contract.

The Purchaser will have the right of having at his own expenses any other test(s) of reasonable nature carded out at Manufacturer's premises or at site or in any other place in addition of aforesaid type and routine tests, to satisfy that the material comply with the specification.

The Purchaser reserves the right for getting any field tests not specified in respective sections of the technical specification conducted on the completely assembled equipment at site. The testing equipment for these tests shall be provided by the Purchaser.

1.5 MATERIAL/WORKMANSHIP

1.5.1 GENERAL REQUIREMENT

Where the specification does not contain characteristics with reference to workmanship, equipment, materials and components of the covered Equipment it is understood that the same must be new, of highest grade of the best quality of their kind conforming to best engineering practice and suitable for the purposes for which they are intended.



The design of the Works shall be such that installation, future expansions, replacements and general maintenance may be undertaken with a minimum of time and expenses. Each component shall be designed to be consistent with its duty and suitable factors of safety, subject to mutual agreements and shall be used throughout the design. All joints and fastenings shall be devised, constructed and documented so that the component parts shall be accurately positioned and restrained to fulfil their required function. In general screw threads shall be standard metric threads. The use of other thread forms will only be permitted when prior approval has been obtained from purchaser.

Whenever possible, all similar part of the Works shall be made to gauge and shall also be made interchangeable with similar parts. All spare parts shall be interchangeable with, and shall be made of the same materials and workmanship as the corresponding parts of the Equipment supplied under the Specification. Where feasible, common component units shall be employed in different pieces of equipment in order to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.

All materials and equipment shall be installed in strict accordance with the manufacturer's recommendation(s). Only first-class work in accordance with the best modern practices will be accepted. Installation shall be construed as being the erection of equipment at its permanent location. This, unless otherwise specified, shall include unpacking, cleaning and lifting into position, grouting, levelling, aligning, coupling of or bolting down to previously installed equipment bases/foundations, performing the alignment check and final adjustment prior to initial operation, testing and commissioning in accordance with the manufacturer's tolerances /instructions and the Specification. All factory assembled rotating machinery shall be checked for alignment and adjustments made as necessary to re-establish the manufacture's limits. Suitable guards shall be provided for the protection of personal on all exposed rotating and / or moving machine parts and shall be designed for easy installation and removal for maintenance purpose. The spare equipment(s) shall be installed at designated locations and tested for healthiness.

The Contractor shall apply oil and grease of the proper specification to suit the machinery, as is necessary for the installation of the equipment. Lubricants used for installation purposes shall be drained out and the system flushed through where necessary for applying the lubricant required for operation. The Contractor shall apply all operational lubricants to the equipment installed by him.

All oil, grease and other consumables used in the Works/ Equipment shall be purchased in India unless the Contractor has any special requirement for the specific application of a type of oil or grease not available in India. If such is the case, he shall declare in the proposal where such oil or grease is available. He shall help purchaser in establishing equivalent Indian make and Indian Contractor. The same shall be applicable to other consumables too.

1.5.2 PROVISIONS FOR EXPOSURE TO HOT AND HUMID CLIMATE

Outdoor equipment supplied under the specification shall be suitable for service and storage under tropical conditions of high temperature, high humidity, heavy rainfall and environment favourable to



the growth of fungi and mildew. The indoor equipments located in non-air conditioned areas shall also be of same type.

1.6 COLOUR SCHEME AND CODES FOR PIPE SERVICE

The contractor shall propose a colour scheme for those equipment/Items for which the colour scheme has not been specified in the specification for the approval of purchaser. The decision of purchaser shall be final. The scheme shall include:

Finishing colour of Indoor equipment

Finishing colour of Outdoor equipment.

Finish colour of all cubicles.

Finishing colour of various auxiliary system equipment including piping

Finishing colour of various building items.

All steel structures, plates etc. shall be painted with non-corrosive paint on a suitable primer. It may be noted that normally all electrical equipment in switchyard are painted with shade 631 of IS-5. All The indoor cubicles shall be of same colour scheme and for other miscellaneous items, colour scheme will be approved by the purchaser.

1.7 PAINTING

- a) All sheet steel work shall be phosphated in accordance with the following procedure and in accordance with IS: 6005 "Code of practice for Phosphating Iron and Steel".
- b) Oil, grease, dirt and swerve shall be thoroughly removed from emulsion by cleaning.
- c) Rust and scale shall be removed by pickling with dilute acid followed by washing with running water, rinsing with slightly alkaline hot water and drying.
- d) After phosphating, thorough rinsing shall be carried out with clean water followed by final rinsing with dilute bichromate solution and over drying.
- e) The phosphate coating shall be sealed by the application of two coats of ready mixed, stoving type zinc chromate primer. The first coat may be "Flash dried" while the second coat shall be stoved.
- f) After application of the primer, two coats of finishing epoxy paint shall be applied, each coat followed by stoving. The panel shall have colour conforming to shade 631 of IS-5 for outside and inside of the panel with black colour for base frame.
- g) Each coat of primer and finishing paint shall be of a slightly different shade to enable inspection of the painting.



- h) Finished painted appearance of panel shall present an asthetically pleasing appearance free from dents and uneven surface.
- i) A small quantity of finishing paint shall be supplied for minor touching up required at site after the installation of the panels.

1.8 PROTECTION

- a) All coated surfaces shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portions shall be suitably protected with either a metallic or a non-metallic protecting device. All ends of all valves, pipings and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage.
- b) All equipment accessories and wiring shall have fungus protection, involving special treatment of insulation and metal against fungus, insects and corrosion.
- c) The parts which are likely to get rusted, due to exposure to weather should also be properly treated and protected in a suitable manner.
- d) Screens of corrosion resistant material shall be furnished on all ventilating louvers to prevent entry of insects.

1.9 FUNGISTATIC VARNISH

Besides the space heaters, special moisture and fungus resistant varnish shall be applied on the parts, which may be subjected or predisposed to the formation of fungi due to the presence or deposit of nutrient substances. The varnish shall not be applied to any surface of part where the treatment will interface with the operation or performance of the equipment. Such surfaces or parts shall be protected against the application to the varnish.

1.10 SURFACE FINISH

All interiors and exteriors of tanks, control cubicles and other metal parts shall be thoroughly cleaned to remove all rust, scales, corrosion, greases or other adhering foreign matter. All steel surfaces in contact with insulating oil as far as accessible shall be painted with not less than two coats of heat resistant, oil insoluble, insulating paints.

All metal surfaces exposed to atmosphere shall be given two primer coats of zinc chromate and two coats of epoxy paint with epoxy base thinner. All metal parts not accessible for painting shall be made of corrosion resisting material. All machine finished or bright surfaces shall be coated with a suitable preventive compound and suitably wrapped or other wise protected. All paints shall be carefully selected to withstand tropical heat and extremes of weather within the limit specified. The paint shall not scale off or wrinkle or be removed by abrasion due to normal handling.



1.11 GALVANIZING

All ferrous parts including all sizes of nuts, bolts, Plain and spring washers, support channels, structures, shall be hot dip galvanised conforming to latest version of IS:2629 or any other equivalent authoritative standard. However, hardware less than M12 size shall be electro-galvanized. Minimum weight of zinc coating shall be 610 gm/sq.mm and minimum thickness of coating shall be 85 microns for all items thicker than 6mm. For items lower than 6 mm thickness, requirement of coating shall be as per relevant ASTM.

1.12 AUXILIARY POWER SUPPLY

1.12.1 A.C power supply for auxiliaries will be available at 240 V, 50 C/s 1-phase, 2 wire and 415V, 50 C/s, 3-phase, 4 wire, neutral solidly earthed with variation in frequency of +/-5% and variation in voltage +/-10%

1.12.2 D.C. power supply at 220 V, 2-wire ungrounded will be available 187 V to 242 V.

1.13 INSPECTION AND TESTING

All tests and inspection of the equipment specified shall be performed to the extent and in the manner as stipulated in the relevant standards and in this specification. All type tests/routine tests/acceptance tests as specified shall be conducted in the presence of purchaser. Wherever equipment similar to the one being offered has already been type tested within 5 years from the date of opening the bid. Type tests done in an independent government laboratory or in the presence of representative of State Electricity Board or other reputed public undertakings, the type test reports of the same shall be submitted for scrutiny /approval. If these are found suitable and technically acceptable, conducting of type tests shall be waived off. Otherwise the subcontractor will have to carry out the type tests without any extra cost and without any delivery implications.

1.14 PACKAGING

Aluminium Tube shall be partially packed with Hessians cloths. Similar items shall be grouped and tied with steel wires/strip for convenient handling during transits.

MARKINGS

The following details are to be clearly indicated in the material forwarding documents:

- a) Name and address of the consignee.
- b) Purchase order number.
- c) Name of supplier/s.
- d) Description of equipment / material.



e) Tare weight.

f) Gross weight.

All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. On request of the purchaser, the Contractor shall also submit packing details/associated drawing for any equipment material under his scope of supply, to facilitate the purchaser to repack any equipment/material at a later date, in case the need arises, while packing all the materials, the limitation from the point of view of availability of Railway wagon sizes in India should be taken account of. The Contractor shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. Any demurrage wagons and other such charges claimed by the transporters, railways etc. shall be to the account of the Contractor. Purchaser takes no responsibility of the availability of the wagons.

1.15 HANDLING, STORING AND INSTALLATION

In accordance with the specific installation instructions as shown on manufacturer's drawings or as directed by the purchaser or his representative, the Contractor shall unload, store, erect, install, wire, test and place into commercial use all the equipment included in the contract. Equipment shall be installed in a neat, workmanlike manner so that it is level, plumb, square and properly aligned and oriented. Commercial use of switchyard equipment means completion of all site tests specified and energisation at rated voltage.

Contractor may engage manufacturer's Engineers to supervise the unloading, transportation to site, storing, testing and commissioning of the various equipment being procured by them separately. Contractor shall unload, transport, store, erect, test and commission the equipment as per instructions of the manufacturer's supervisory Engineer(s) and shall extend full cooperation to them.

In case of any doubt/misunderstanding as to the correct interpretation of manufacturer's drawings or instructions, necessary clarifications shall be obtained from the purchaser.

Contractor shall be held responsible for any damage to the equipment consequent to not following manufacturer's drawings/instructions correctly.

Where assemblies are supplied in more than one section, contractor shall make all necessary mechanical and electrical connections between sections including the connection between buses. Contractor shall also do necessary adjustments/alignments necessary for proper operation of circuit breakers, isolators and their operating mechanisms. All components shall be protected against damage during unloading, transportation, storage, installation, testing and commissioning. Any equipment damaged due to negligence or carelessness or otherwise shall be replaced by the contractor at his own expenses.

Contractor shall be responsible for examining all the shipment immediately of any damage, shortage, discrepancy etc. for the purpose of Purchaser's information only. The Contractor shall submit to the



purchaser every week a report detailing all the receipts during the weeks. However, the Contractor shall be solely responsible for any shortages or damages in transit, handling and/or in storage and erection of the equipment at Site. Any demurrage, pilferage and other such charges claimed by the transporters, railways etc. shall be to the Contractor's account.

The Contractor shall be fully responsible, for the equipment/material until the same is handed over to the purchaser in an operating condition after commissioning. Contractor shall be responsible for the maintenance to the equipment/material while in storage as well as after erection until taken over by Purchaser, as well as protection of the same against theft, element of such nature, corrosion, damages etc.

The Contractor shall be responsible for making suitable indoor storage facilities, to store all equipments which require indoor storage.

The words erection and installation used in the specification are synonymous. Exposed live parts shall be placed high enough above ground to meet the requirements of electrical and other statutory safety codes.

The minimum phase to earth, phase to phase and section clearance along-with other technical parameters for the various switchyard voltage levels to be maintained shall be strictly as per the approved drawings.

The design and workmanship shall be in accordance with the best engineering practices to ensure satisfactory performance throughout the service life. If at any stage during the execution of the Contract, it is observed that the erected equipment(s) do not meet the above minimum clearances, the Contractor shall immediately proceed to correct the discrepancy at his risks and costs.

1.16 TOOLS AND TACKLES

The Contractor shall supply with the equipment one complete set of all special tools and tackles for the erection, assembly, dis-assembly and maintenance of the equipment. However, these tools and tackles shall be separately, packed and brought on to Site.

1.14 EQUIPMENT BASES

A cast iron or welded steel base-plate shall be provided for all rotating equipment, which is to be installed on a concrete base unless otherwise agreed to by the Purchaser. Each base-plate shall support the unit and its drive assembly, shall be of a neat design with pads for anchoring the units shall have a raised lip all around, and shall have threaded drain connections.

1.15 QUALITY

BHEL quality plan to be followed subject to TBEM / customer's approval.



1.16 DOCUMENTATION

1.16.1 DRAWINGS

All drawings shall be prepared in AutoCAD and ultimate documentation would include drawings/documents on CDs. All dimensions and data shall be in SI metric units.

All items of the equipment should be clearly identified by proper part nos. in the contract drawings. Such parts, which are to be dispatched to site from works in dispatchable units and are reassembled at site, should be marked by proper identification marks at works and indicated in the drawings and quantified. The shipping list should be sent along with the general arrangement drawings for engineer's approval. All the items of the shipping list should be identified in the drawing.

The drawing submitted by the supplier shall be reviewed by the purchaser as far as practicable within two weeks of receipt of drawings and shall be modified by the sub-contractor if any modifications and/or corrections are required by the purchaser. The sub-contractor shall incorporate such modifications and / or corrections and submit the final drawings for approval. Any delay arising out of failure of the subcontractor to rectify the drawings shall not alter the contract completion date.

Further work by the subcontractor shall be in strict accordance with these drawings and no deviation shall be allowed without the written approval of the purchaser.

All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawings shall be at supplier's risk.

Approval of drawing or work by the purchaser/consultant shall not relieve the subcontractor of any of his responsibilities and liabilities under the contract.

In case of any modifications that may be necessary during erection or commissioning of the equipment, the subcontractor shall carry out modifications in the original drawing & submit 'As Built drawings' and required no. of prints thereof.

1.16.2 INSTRUCTION MANUALS

The supplier shall submit to the purchaser, draft instruction manuals for approval within 30 days of placement of order. The final instruction manuals complete in all respects shall be submitted 60 days before the first shipment of the equipment. The instruction manuals shall contain full details and drawings of all the equipment furnished, the erection procedures, testing, operation & maintenance procedures of the equipment.

If after the commissioning and initial operation of the plant, the instruction manuals require any modification/ addition / changes, the same shall be incorporated and the up- dated final instruction manuals shall be submitted as required.



1.16.3 TITLE BLOCK & DRAWING/ DOCUMENT NUMBERING SCHEME

Title block for drawing / document should be followed as per ANNEXURE-3

1.16.4 DOCUMENTATION SCHEDULE AT CONTRACT STAGE

A.	<u>For approval</u>	<u>No of Copies</u>
	Copies of all drawings with project details, dimension, shipping weights, No. of cases & dimensions, fixing details, tolerance etc.	10
	Copies of type test reports.	5
	Copies of works quality plan & field quality plan.	5
	Copies of installation, operation & maintenance manual.	5
	Copies of drawings on floppies/CDs	1 set
B.	<u>After approval and for information / distribution</u>	
	Copies of all drawings	15
	Copies of installation, operation & maintenance manual including Routine test reports	15
	Sets of RTF of drawings	2
	CDs of Drgs and O & M Manuals	4
C.	<u>As Built Drawings</u>	
	Hard copies of Drawings	15
	CDs	4

NOTE:

1. Any revision of drawings / documents shall be submitted in the same no. of copies submitted first time for approval
2. Final drawings / documents shall be submitted in bound volume with customer and project details etc. written on the top.

SCHEDULE-IXC/12
220 V BATTERY

(Ψ): Additional data requirement after award of contract

A. BATTERY
1.0 GENERAL

- | | | |
|-----|--------------------|---|
| 1.1 | (Ψ) Make | : |
| 1.2 | (Ψ) Cat No. | : |
| 1.3 | Type | : |
| 1.4 | Reference Standard | : |

2.0 RATING

- | | | | |
|-----|---|------|---|
| 2.1 | Rated Voltage | Volt | : |
| 2.2 | (Ψ) 10-hour rating at 27°C to 1.85 Volt per cell | AH | : |
| 2.3 | (Ψ) 1-hour discharge rate to 1.75 Volt per cell | Amp | : |
| 2.4 | (Ψ) 1-Minute discharge rate to 1.75 Volt per cell | Amp | : |

3.0 PERFORMANCE

- | | | | |
|------|---|--------|---|
| 3.01 | (Ψ) Does the battery meet the required duty cycle curve ? | Yes/No | : |
| 3.2 | (Ψ) Cell voltage characteristics during duty cycle furnished? | Yes/No | : |
| 3.3 | Minimum cell voltage during duty cycle | Volt | : |
| 3.4 | (Ψ) AH efficiency at 10-hour discharge rate | % | : |
| 3.5 | Expected life of Battery | Hr. | : |
| 3.6 | 15% margin considered | Yes/No | : |
| 3.7 | 25% ageing compensation factor considered | Yes/No | : |

4.1		(Ψ) Recommended charging rate for Volt/Cell	Amp	:
a)	Float charging			:
b)	Equalising Charge			:
c)	Boost charging in 10 hrs.			:
i)	Start			:
ii)	Finish			:

- For first filling
- At full charge
- At end of 10-hour discharge

a)	Float charge at rated Volt/Cell	KA	:
b)	Boost charge at rated Volt/Cell	KA	:

4.5 (Ψ) Cell voltage characteristics during charging furnished ? :

5.1	(Ψ) Number of cells per battery	:
5.2	Type of the cell	:
5.3	Cell designation as per I.S.	:
5.4	Material of the container	:
5.5	(Ψ) Overall dimension of each cell mm	:
5.6	(Ψ) Weight of complete cell	:
	a) Without acid	Kg :
	b) With acid	Kg :

5.7 (Ψ) Internal resistance of cell Ohm :

6.0 INTERCELL CONNECTOR

6.1 Intercell connector furnished? :

6.2 Type of intercell connector bolted/burned :

6.3 Material of intercell connector :

7.0 PLATES

7.1 (Ψ) Number of positive plates per cell :

7.2 Type of positive plate :

7.3 Type of negative plate :

7.4 Terminal Stand Material

8.0 SEPARATOR

8.1 Type :

8.2 Material :

8.3 (Ψ) Thickness :

9.0 ELECTROLYTE

9.1 (Ψ) Amount of electrolyte for first filling

a) Per cell litre :

b) Per set litre :

9.2 First filling with 10% extra furnished? :

9.3 Electrolyte conforms to :

10.0 RACKS

10.1 (Ψ) Number of racks per battery :

10.2 (Ψ) Number of cells per rack :

- | | | |
|------|---|--------------|
| 10.3 | Type of racks | Rows/tiers : |
| 10.4 | Material of rack | : |
| 10.5 | Racks provided with | |
| | a) Numbering tags for cells | : |
| | b) Teakwood clamps for cables | : |
| 10.6 | Insulator with 5% extra furnished for | |
| | a) Cell | Yes/No : |
| | b) Stand | Yes/No : |
| 10.7 | Inter-row, Inter-tier connectors and end take-off furnished ? | : |
| 10.8 | Connection hardware with 5% extra furnished | : |

11.0 (Ψ) DIMENSION & WEIGHTS

- | | | |
|------|-----------------------------------|------|
| 11.1 | Overall dimension (L x B x H) mm | : |
| 11.2 | Approx. Weight | Kg : |
| 11.3 | Battery layout drawing furnished? | : |

12.0 (Ψ) VENTILATION REQUIREMENTS

- 12.1
- 12.2
- 12.3
- 12.4
- 12.5

13.0 (Ψ) ACCESSORIES FURNISHED WITH EACH BATTERY

13.1

13.2

13.3

13.4

13.5

13.6

13.7

13.8

13.9

13.10

13.11

13.12

SECTION-5

CHECKLIST FOR LEAD ACID BATTERY BANK

Put a tick mark on 'YES' if the specified requirement is met, or put a tick mark on 'NO' if the specified requirement is not met and give comments in the remark column

1. TECHNICAL REQUIREMENTS

Sl. No.	Parameters	Required Value 220V BATTERY	Required Value 48V BATTERY	Bidder's Confirm- ation	Reasons for non compliance
1.	Manufacturer's Identification System			YES/NO	
2.	Battery Type	Lead Acid plante	Lead Acid plante	YES/NO	
3.	Battery Voltage	220V	48V	YES/NO	
4.	Design Ambient Temperature	50deg. C	50deg. C	YES/NO	
5.	Max. Battery Bank Voltage	242V	52.8V	YES/NO	
6.	Min Battery Bank Voltage	194.4V	43.2V	YES/NO	
7.	Nominal voltage per cell	2V	2V	YES/NO	
8.	End Cell Voltage for specified duty cycle	1.8V	1.8V	YES/NO	
9.	No. of Cells per battery bank	108	24	Bidder to specify	
10.	Cell container	As per spec	As per spec	YES/NO	
11.	Type of Stand offered (freestanding on floor complete with necessary hardware)	As per spec	As per spec	YES/NO	
12.	Arrangement for connection for cell tapping provided for continuity during boost charging?	As per spec	As per spec	YES/NO	
13.	Applicable standard	IS-1651 / IS-1652	IS-1651 / IS-1652	YES/NO	
14.	Accessories as per clause 1.3 of section-1 included in the scope of supplies	YES	YES	YES/NO	
15.	Mandatory spares quoted in line with clause 1.3 of section-1	YES	YES	YES/NO	
16.	Supply of electrolyte for first filling plus 10% extra with the battery bank	YES	YES	YES/NO	
17.	All routine & acceptance tests to be conducted	YES	YES	YES/NO	
18.	Qualifying requirement - Documentary proof against the Qualifying requirement	Attached & Confirmed	Attached & Confirmed	YES/NO	

	mentioned in technical PQR has been attached along with offer. Note: Bidder to ensure completeness of offer in this regard. No further communication regarding Qualifying requirement documentary proof is envisaged during tender evaluation.				
19.	The design of the equipment will be such that during the period both trickle charger unit and boost charger units are working independently, the tap connection from various taps of the battery cell to the load circuit should not involve any circulating current.	YES	YES	YES/NO	
20.	Intermediate tapping arrangement provided	YES	YES	YES/NO	
21.	Special tools & tackles as per clause 1.3 of section-1 included in the scope of supplies	YES	YES	YES/NO	

2. TYPE TESTS

1. Whether the offered equipment has been type tested after 17.10.2012 and valid reports are available.

YES /NO

2. If case, the reports are not found complete / valid at contract stage, such type tests shall be carried out without any cost / delivery implication.

YES/NO

-- X X --

ANNEXURE - A
SCHEDULE OF TECHNICAL DEVIATIONS

Bidder shall list below all technical deviation clause wise w.r.t. tender specifications:

S.No.	Page No.	Clause No.	Deviation	Reason / Justification
-------	----------	------------	-----------	------------------------

Any deviation not specifically brought out in this section shall not be admissible for any commercial implication at later stage. Except to the technical deviations listed in this schedule, bidder's offer shall be considered in full compliance to the tender specifications irrespective of any such deviation indicated / taken elsewhere in the submitted offer.

Date:

Tenderer's Stamp & Signature

ANNEXURE – B

Technical Pre-Qualifying Requirements

The Bidder should have manufactured and supplied at least two (2) numbers of highest offered rating or above of high discharge type Plante positive plate type battery at least one (1) each at two (2) different industrial installations, which should be in successful operation for at least two (2) years as on date of zero date of Yadadri (17.10.2017).