BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS GROUP
ENGINEERING MANAGEMENT, NOIDA, SECTOR-142

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Title: 420 kV HCB DISCONNECTOR		Date	30.04.15	08.05.15	08.05.15
		Group	TBEM		

CUSTOMER: TELANGANA STATE POWER GENERATION CORPORATION LTD.

PROJECT: 1x800 MW KOTHAGUDEM TPS – 400 kV SWITCHYARD & 4x270 MW BHADRADRI TPS – 400 kV SWITCHYARD

LOI NO: CEE/111/KTPS-VII(1X800MW)/D.No. 150/14, Dated: 27/12/2014
CEE/SE-IV/BHADRADRI TPS (4X270MW)/D.No.72/15, Dated:21/03/2015

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SECTION 1

SCOPE, SPECIFIC TECHNICAL REQUIREMENTS AND QUANTITIES

1.0 SCOPE

This technical specification covers the requirements of design, manufacture, testing at works, packing and dispatch of disconnect switch complete with accessories as listed under this specification.

This section covers the specific technical requirements of disconnect switch. This constitutes minimum technical parameters for the above item as specified by the customer (TSGENCO). The offered equipment shall also comply with the General Technical Requirements for the project as detailed under section-3 of this specification.

The specification comprise of following sections:

Section-1: Scope, Specific Technical Requirements & Quantities
Section-2: Equipment Specification
Section-3: General Technical Requirements
Section-4: Guaranteed Technical Particulars

In case of any conflict between various sections, order of precedence shall be in the same order as listed above.

1.1 THE EQUIPMENT IS REQUIRED FOR THE FOLLOWING PROJECT

Name of customer : Telangana State Power Generation Corp. Ltd.

Name of the project 1 : 400 kV Switchyard at Kothagudem TPS-VII
Name of the project 2 : 400 kV Switchyard at Bhadradri TPS.

Refer Section - 3 for Project Details and General Specifications.

1.2 SPECIFIC TECHNICAL REQUIREMENTS

Technical Particulars

Technical parameters	**Units**	**400 kV**
Installation		Outdoor
Nominal Voltage	kV	400
Highest Voltage	kV	420
Rated Current at 50°C ambient temperature	A	3150
Short time current for 3 sec.	kA	50
Peak withstand current	kAp	125
Short circuit making current for earthswitch	kAp	125
Rated Frequency	Hz	50
Type		Horizontal Center break
Operating mechanism of isolator		A.C. motor operated and manual (Both local & remote) (Emergency Manual)
Operating mechanism of Earthswitch		A.C. motor operated and manual with mechanical as well as electrical interlock.
Mounting arrangement		Lattice Structure mounted.

Technical parameters	**Units**	**400 kV**
Phase to phase spacing	mm	7000
Center-line of bus bar for equipment connection from the base of support structure (plinth level)	mm	8250
Minimum height of lowest part of support insulator of equipment from plinth	mm	2550
Rated Impulse withstand voltage (Dry & Wet)		
- To earth	kV_p	± 1425
- Across open Isolator	kV_p	± 1425 impulse on one terminal and 240kV_p Power frequency voltage of opposite polarity on other terminal(across isolating distance)
Switching surge withstand voltage (Dry & Wet) to earth	kV_p	±1050
Switching surge withstand voltage (Dry & Wet) across open terminals of Isolator	kV_p	± 900 impulse on one terminal and 345 kV_p p. f. voltage of opposite polarity on other terminal(across isolating distance)
Switching surge withstand voltage between phases	kV_p	±1575
One minute power frequency withstand voltage	kV_{rms}	
- To earth		520
- Across open terminals of Isolator		610
Min. Corona extinction voltage	kV_{rms}	320
Rated mechanical terminal load		Ad pet Table III of IEC 129 or calculated value whichever is higher
Blade Material		Electrolytic copper tube
Main contact		Silver plated copper alloy
Minimum Silver coating on Main Contacts		25 microns
Rated magnetizing current/ capacitive current make and break capacity	A	0.5
Max. Radio Interference Voltage for frequency between 0.5 & 2 MHz (both for open and closed condition):	μV	1000 at 266 kV rms
Total operating time of isolators	sec	Not more than 12 sec
No. of Auxiliary Contacts		14 NO + 14NC + 2MBB for main switch 14 NO + 14 NC for E/S wired to TB in addition to those required for Equipment scheme.
Rated current of aux. Contacts	A	10 at 220 V DC
Breaking capacity of aux. Contacts	A	2 A DC with circuit time constant of not less than 20 ms. At 220 V DC
No. of terminals in control cabinet		All contacts and control circuits are to be wired upto control cabinet plus 24 spare terminals.

Technical parameters	Units	400 kV
Electrical Interlocking contactor for Isolator and Earth switch		Required
Spare way for "Local Mode" and "Remote Mode" of Local/ Remote switch for its use in SAS (Sub Automation System) wired till TBs		Required
Type of TBs (*For terminating Aux Power, Aux contacts etc*)		Stud Type
Seismic acceleration		0.3 g
PROPOSED INSULATOR (Not in vendor scope of supply)		
Type		Solid core
Standard		IEC 168 or Equivalent
Total minimum creepage	mm	10500
Cantilever strength of Insulator	kN	8
Height of insulator	mm	3650
Top PCD		127
No. of holes on top		4xM16
Bottom PCD		300
No. of holes on bottom :		8x Dia18
AUXILIARY SUPPLY		
AC supply for motors		415V ± 10%, 3-ϕ, 50Hz ± 5%, 4 wire
AC supply for heaters		240V,1-ϕ,50Hz,2 wire
DC supply for interlocking		220V DC (85%-110%), 2 wire
Weight of zinc coating for galvanized items except Hardware	g/m^2	610
Degree of protection for operating Mechanism box		IP55
Material of sheet for mechanism box		Painted sheet steel
Min. thickness of aluminum sheet	mm	2

Note: Disconnecting Switches with Single Earth switch shall be so constructed that Earth Switch can be installed on either side of the disconnector switch at site.

1.3 QUANTITIES

A) MAIN QUANTITY

Sl. No.	Description	Quantity (Nos.)	
		Kothagudem	Bhadradri
1.	420 kV, 3150A, 50 kA for 3 sec, 3-Pole Horizontal Center Break (motor & manually operated) mechanically ganged Isolator with one Earth Switch (motor & manually operated) mechanically ganged operation along with operating mechanism including all accessories and complete in all respects, but without Post Insulators, terminal connectors and structures.	29	48
2.	420 kV, 3150A, 50 kA for 3 sec, 3-Pole Horizontal Center Break (motor & manually operated) mechanically ganged Isolator with two Earth Switch (motor & manually operated) mechanically ganged operation along with	02	02

	operating mechanism including all accessories and complete in all respects, but without Post Insulators, terminal connectors and structures.		
3.	Supervision of erection, testing and commissioning of 420 kV 3-pole HCB isolator.	01	01

Note:1 Bidder shall quote lump-sum price for Erection, Commissioning and Testing of one no. of isolator. However if there are persistent problems of alignment of the subsequent switches, the bidder's assistance shall be deemed to be included in the offer for the subsequent erection also until full satisfaction of the Owner without any extra charge.

Note:2 ACCESSORIES REQUIRED

Support Insulators	:	No
HV Power Connectors	:	No
Mounting structure for isolators	:	No
Hardware (Nuts, Bolts & Nuts) for fixing the isolator and accessories to the structure	:	Yes
Double compression brass cable glands	:	No

B) MANDATORY SPARE

i) Kothagudem

Sl. No.	420kV Disconnect Switch	Unit	Quantity
1	Complete pole of centre break disconnecting switch with operating mechanism and two earth switches	Nos.	4
2	Fixed main & arcing contact assembly for Horizontal break Isolator	Nos.	6
3	Support Bearing	Set	3
4	Hinge pin	Nos.	6
5	Terminal pad	Nos.	6
6	Auxiliary switch assembly for Main blade (6 NO + 6 NC)	Set	3
7	Auxiliary switch assembly for Main blade (4 NO + 4 NC)	Set	2
8	Limit switches for one operating mechanism complete	Set	3
9	Operating mechanism Box	Nos.	3
10	Drive motor with gear box	Set	2
11	Operating mechanism Box for earth switch	Nos.	2

ii) Bhadradri

Sl. No.	420kV Disconnect Switch	Unit	Quantity
1	One complete pole with earth switch including motor operating mechanism (MOM) with box but excluding structure	Nos.	1
2	Copper contact fingers for male & female contacts	Sets	2

3	Open/Close contactor assembly, timers, key interlock push button switch & auxilliary switches	Set	1
4	Limit Switch	Set	2
5	Terminal Pads	Nos.	3
6	Corona shield rings	Nos.	3

1.4 PRE QUALIFICATION REQUIREMENT

Disconnecting switches being offered should be from manufacturer who has manufactured and supplied minimum thirty (30) nos. of Disconnecting switch of offered voltage class or higher, suitable for air insulated substation/ switchyard and which must have been in successful operation for a minimum period of two (2) years as on date of Techno-Commercial bid opening.

1.5 TYPE TESTS

Bidder shall submit valid type test and additional type tests reports (as per relevant IEC/IS standard) for the tests carried out within last five years from the date of LOA. The tests should have been conducted on identical or similar equipment/components to those offered. In case type test reports are more than 5 years old (from the date of LOA) or the reports of type tests are found to be technically unacceptable, the type test shall be conducted by the vendor without cost and delivery implication to BHEL.

1.6 INSPECTION & TESTING

Before being fitted on the equipment, all components shall be subjected to routine tests at the Contractors factory, provided by the relevant IEC/IS standards. A detailed test report proving the successful passing of such tests shall be provided.

Prior to dispatch, the routine & acceptance tests shall be carried out on each item in accordance with the applicable IEC/IS and the material shall be offered for final inspection by BHEL and TSGENCO in accordance with agreed quality plan with 3 weeks advance information. The charges for these shall be deemed to be included in the equipment price.

1.7 QUALITY PLAN

The contractor shall carry out contract works in accordance with sound quality management principles which shall include such as controls which are necessary to ensure full compliance to all requirements of the specification & applicable international standards. These quality management requirement shall apply to all activities during design, procurement, manufacturing, inspection, testing, packaging, shipping, inland transportation, storage, site erection & commissioning. Contractor shall submit detailed Quality Plan for BHEL / customer's approval.

1.8 TITLE BLOCK

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

A) Kothagudem TPS

a) Project Name : 400 kV Switchyard at Kothagudem TPS-VII
b) Customer Name : Telangana State Power Generation Corp. Ltd.
c) Consultant Name : DCPL
d) Contractor : BHEL
e) Customer LOA no.: CEE/111/KTPS-VII(1X800MW)/D.No. 150/14, Dated: 27/12/2014

B) Bhadradri TPS

a) Project Name : 400 kV Switchyard at Bhadradri TPS
b) Customer Name : Telangana State Power Generation Corp. Ltd.
c) Consultant Name : DESIN
d) Contractor : BHEL
e) Customer LOA no.: CEE/SE-IV/BHADRADRI TPS (4X270MW)/D.No.72/15, Dated: 21/03/2015

1.9 Drawings / Documents

In addition to no. of sets of documents to be submitted to customer (refer section 3), two sets of all documents submitted for approval / information and five sets of all approved documents shall be provided for BHEL use.

Soft copies in CD-R of documents shall comprise

i) Scanned images of all approved documents, including drawings.
ii) Editable versions (AUTO CAD 2000 or High) of all drawings viz. drawings, GTP, Manufacturing and field quality plan, type test reports, O & M instructions / manuals.

SECTION - 2

EQUIPMENT SPECIFICATION

1.0 400kV Disconnecting Switch

The equipment will be used in the switchyard, having characteristics as listed in the Annexures.

Each disconnect switch shall be furnished with fittings and accessories as listed in the Annexures.

Disconnect switches shall be suitable for connection to string conductor / tube bus of required no. & size.

1.1 Type and Duty

a) The disconnect switch shall carry rated current continuously and short-time current for 3 second.

b) In addition, the disconnecting switch shall be capable of making and breaking -

i. Magnetizing current of the voltage transformer.

ii. Capacitive current of the buses and short connections.

1.2 Constructional Features

The 3-pole disconnect switch shall be gang operated, single break type so that all the poles make and break simultaneously. 1-pole disconnect switch shall have individual pole drive.

The disconnect switch shall be designed for upright mounting on steel structure unless otherwise indicated.

The disconnect switch and its earthing switches including operating mechanism shall be so constructed that they can not come out of their open or closed position by gravity, wind pressure, vibration, shocks or accidental touching of connecting rods of the operating mechanism.

The mechanical linkages shall be such that the deflection is negligible. Facility of adjustment of the interpole operating rods and locking arrangement shall be provided.

The disconnect switch shall have padlocking arrangement in both `Open' and 'Closed' positions.

All current carrying parts shall be of non-ferrous metal or alloy. All live parts shall be designed to avoid sharp points and edges.

All metals parts shall be of such material and treated in such a way as to avoid rust, corrosion and deterioration due to atmospheric condition. Ferrous

parts shall be hot-dip galvanised.

Bolts, nuts, pins, etc. shall be provided with appropriate locking arrangement such as locknuts, spring washers, key etc.

Bearing housing shall be weather- proof with provision for lubrication. The design, however, shall be such as not to require frequent lubrication. The requirement of lubrication shall be after 1000 operations or after 5 years whichever is earlier.

All bearings in the current path shall be shorted by flexible copper conductor of adequate size.

1.3 Main Contacts

i) The main contacts shall be of silver-plated copper alloy and controlled by powerful springs designed for floating and pressure point contact. The thickness of the silver plate shall not be more than 25 micron.

ii) The contacts shall have sufficient area and pressure to prevent excessive heating liable to bring about pitting or welding.

iii) Contacts shall be adjustable to allow for wear, shall be easily replaceable and shall have minimum movable parts and adjustments.

iv) The blade shall be made of electrolytic copper tube of liberal section. Rotating feature of the blade at the end of travel for contact wiping shall be provided. The high-pressure type contacts of horizontal break isolators shall wipe the contact surfaces while opening and closing. The contacts shall be so designed that wiping action shall not cause scouring or abrasion on the contact surfaces.

v) Arcing horns shall be provided to divert the arc from main contacts to the separating horns after the main contacts have opened. Arcing horns shall be renewable type.

vi) Arcing contacts shall close first and open last so that no damage due to arcing whatsoever shall be caused to the main contacts.

1.4 Auxiliary Contacts

i) Each disconnect switch shall be provided with minimum ten (10) normally closed and ten (10) normally open electrically separated spare contacts, in addition to the auxiliary contacts required for its operation and indication.

ii) The contacts shall be convertible type so that normally open contact may be converted to normally closed contact and vice-versa at site.

iii) The auxiliary contacts shall be rated 10A at 240V A.C. and 5A at 220V D.C.

iv) The auxiliary contacts shall be adjustable type to suit the following requirement:

a) Signalling of 'Closed Position' shall not take place unless the main power contacts have reached a position so that rated normal and short time current can be carried safely.

b) Signalling of 'Open Position' shall not take place unless the main power contacts are at a safe isolating distance.

1.5 Interlocks

i) All electrical and mechanical interlocks necessary for safe and satisfactory operation of the disconnect switch and its earthing switch and associated circuit breaker shall be furnished.

ii) In addition to the provision of electrical interlocks, earthing switches shall be mechanically interlocked with main isolator.

iii) The disconnecting switch shall be suitable for sequential interlocking with associated equipment, for closing and opening.

iv) Interlocks are required to be provided :

a) To prevent isolators open on load.

b) To prevent closing of earthing switch when isolator is closed.

c) To prevent closing of the line isolator when earthing switch is closed.

v) Operating of earth blade shall not take place when corresponding main isolator is in operation stroke and vice-versa.

1.6 Insulators (Not applicable)

i) Insulators shall be post type and composed of stacked units. Insulators of identical rating shall be interchangeable.

ii) Insulator shall be of wet-process porcelain, brown glazed and free from all blemishes. Metal parts and hardware shall be hot-dip galvanized.

iii) Insulator shall have adequate mechanical strength and rigidity to withstand the duty involved.

iv) When operated at maximum system voltage there shall be no electrical discharge. Shielding rings, if necessary, shall be provided.

v) Insulation shall be co-ordinate with basic impulse level of the system. The creepage distance shall be as indicated in the annexure.

vi) The insulators shall have the minimum cantilever strength of 6000 KNm.

vii) The insulators shall be so arranged that leakage current will pass to earth and not between terminals of the same pole or between phases.

viii) Each rotating insulator shall be supported on double-roller or ball bearings.

1.7 Blades

i) All metal parts shall be of non-rusting and non-corroding metal. All castings except current carrying parts shall be made of malleable cast iron or cast

steel.

ii) The live parts shall be designed to eliminate sharp joints. The isolators shall be so designed that the switch blade will not move to closed position if the operating shaft gets disconnected.

1.8 Operating Mechanism

i) The operating mechanism of the disconnect switch shall be motor operated type, with electrical control from remote as well as local position.

ii) The mechanism shall also have provision for manual operation with detachable handle. The arrangement shall be such that one operator may be able to operate without undue efforts.

iii) Interlock shall be provided such that electrical power to the motor is cut off on insertion of manual operating handle.

iv) The mechanism of disconnect switch shall be so designed that its blade(s) are in positive continuous control throughout the cycle of operation.

v) Visible indication of switch position and means to prevent false indication if the mechanism fails to complete the operation shall be provided.

vi) Starters, relays, limit switches shall be provided as required for operation, indication and interlocks. Electromagnetic brakes and/or adjustable mechanical stop shall be provided to limit over-travel.

vii) The motor operated mechanism shall be suitable for operation from 415V, 3 phase, 50 Hz supply. The drive mechanism shall be such that during manual operation the motor drive shall be automatically de-coupled. Suitable reduction gearing shall be provided between the motor and the drive shaft of the disconnect switch. A quick electro-mechanical break shall be fitted on the higher speed shaft.

1.9 Mechanism Box

i) The mechanism box shall house the operating mechanism, electrical, controls, monitoring devices and all other accessories.

ii) The box shall be IP-55, of gasketted weatherproof construction, fabricated from sheet steel minimum 2 mm thick. They shall be dust, water and vermin proof.

iii) The box shall have front access door with lock and key, and removable gland plate at bottom for cable entry.

iv) The box shall be suitable for mounting on disconnect switch support structure. The mounting height shall be such as to permit easy manual/electrical operation standing at grade level.

v) Thermostat controlled space heater, internal illumination lamp and 3 pin 5A socket with individual ON/OFF switches shall be provided in the box.

vi) For local operation following shall be provided :

a) Local-remote selector switch.

b) Open/Close/Stop Push Button.

vii) Cable entries shall be from the bottom, suitable removable cable gland plate shall be provided on the cabinet for the purpose.

1.10 Wiring

i) Wiring shall be complete in all respects to ensure proper functioning of the control, protection, monitoring and interlocking schemes.

ii) Wiring shall be done with flexible 1100V grade, PVC insulated switchboard wires with stranded copper conductor of 2.5 sqmm. The operating coils and small wirings shall be tested as assembled for a power frequency voltage of 2 KV for one minute.

iii) Each wire shall be identified at both ends with permanent markers bearing wire numbers as per contractor's wiring diagram.

iv) Wire terminations shall be done with crimping type connectors with insulating sleeves. Wires shall not be spliced between terminals.

v) All spare contacts of push buttons, auxiliary switches etc. shall be wired upto the terminal blocks in the mechanism box.

1.11 Terminal Blocks

vi) Terminal blocks shall be 1100V grade, enclosed clamp type with engraved numbers suitable for termination of at least two numbers of 2.5 mm^2 stranded copper conductor.

vii) Not more than two wires shall be connected to any terminal. Spare terminals equal in number of 20% active terminals shall be furnished.

viii) Terminal blocks shall be located to allow easy access. Wiring shall be so arranged that individual wires of external cables can be connected to consecutive terminals.

1.12 Earthing Switch

i) Earthing switch for 3-pole disconnect switch shall be triple-pole, gang operated type, with provision for padlocking in both open and close positions.

Earthing switch for 1-pole disconnect switch shall be single-pole, with provision for padlocking in both open and close positions.

ii) Earth switch shall have both electrical and manual operating mechanism unless otherwise indicated in the annexure. The manual operating mechanism shall be located such that it can be easily operated from standing height at grade level.

If electrical operating mechanism of earthing switch is desired in the annexure, it shall be motor operated type, with electrical control from local position. The various features of the operating mechanism and its mechanism box, wiring requirement etc are similar to those stipulated for the main disconnect switch.

iii) Mechanical and electrical safety interlocks shall be provided to prevent closing of earthing switch when the main disconnect switch is closed and vice-versa.

iv) Earthing switch shall be provided with minimum 4 NO + 4 NC spare contacts in addition to the auxiliary contacts required for its interlock and indication or elsewhere in the system for protection, interlock and indication .

All auxiliary switches & interlocking coils shall be wired up to terminal blocks in mechanism box through G.I. Conduits.

v) The earthing blades shall be required to carry peak current and rated short time current as the main blades of the isolator and shall withstand dynamic stresses.

Each earth switch shall be provided with flexible copper braids for connection to the ground mat. These braids shall have same short time current carrying capacity as the earth blades.

1.13 Assembly

i) The disconnect switch along with its base frame and operating mechanism shall be completely assembled and checked for correct alignment and operation at manufacturer's works prior to despatch.

ii) All parts and accessories shall have appropriate benchmarks and part numbers for identifications at site.

1.14 Grounding

iii) Each equipment shall be provided with two ground pads for connection to station ground.

iv) The ground pad shall comprise buffed metal surface with two tapped holes, M 10 G.I. bolts and spring washers for connection to 75x10 mm G.I. flat of approved size.

iii) Each disconnect/earth switch operating rod shall be separately grounded at a point above the mechanism box. This is done by flexible copper braid of adequate section but in no case less than 70 mm².

1.15 Painting

i) Base frame, operating rod and all hardwares shall be hot-dip galvanised.

ii) Mechanism box will be finished with two coats of aluminium paints after surface treatment, involving chemical cleaning, phosphating and application

of under coats.

iii) Sufficient quantity of touch-up paints shall be furnished for application at site.

1.16 TESTS

1.16.1 Routine Test

i) During manufacture and on completion, all equipment and accessories shall be subjected to the Routine Tests as laid down in latest revision of IEC/IS.

ii) In addition to above tests specified by IEC/IS, the following tests also have to be carried out for specific equipments :

a) Mechanical operation test (routine test) on EHV disconnect switches (Main switch and earth switch).

1.16.2 Special Tests

Special tests listed under shall be carried out in presence of Owner's representative.

a) Test on galvanised components [as per IS:2633].

b) Stalled torque test on motor operating mechanism [at 110% of supply voltage].

ANNEXURE

FITTINGS & ACCESSORIES

Disconnecting switch

Each disconnecting switch shall be furnished complete with fittings and accessories as listed below :

1. Ground pads for 75x10 mm flat.
2. Base frame with anchor bolts, nuts and washers.
3. Operating mechanism with all accessories including operating rod of required length, for disconnect switch and for earth switch
4. Starters, relays and auxiliary switches.
5. Local / Remote selector switch.
6. Open / Stop / Close push buttons.
7. Spare auxiliary switches 6 NO + 6 NC.
8. Mechanical ON-OFF indicator
9. Weather-proof mechanism box with lock and key for disconnect switch and for earth switch, where indicated.
10. Set of fuse switches for A.C. and D.C. supply.
11. Space heater with thermostat and ON-OFF switch.
12. Internal illumination lamp with ON-OFF switch.
13. 3 pin 5A socket outlet with ON-OFF switch.
14. Terminal blocks and wiring - lot.
15. Earthing switch, if specified, complete with safety interlocks and 4 NO + 4 NC spare auxiliary switches.
16. Flexible copper braid for grounding of operating rod.
17. Other standard accessories, which are not specifically mentioned but are usually provided with disconnecting switch of such type and rating for efficient and trouble-free operation.

SECTION - 3

PROJECT DETAILS AND GENERAL SPECIFICATIONS

GENERAL TECHNICAL REQUIREMENTS

1.0 PROJECT DETAILS

A) Kothagudem TPS

A)

Customer	:	M/s Telangana State Power Generation Corporation Ltd.
Project Title	:	1x800MW Kothagudem Thermal Power Station Stage VII, Unit 12
Project Location	:	Paloncha Village, Khammam District, Telangana
Nearest Railway station	:	Bhadrachalam Road railway station.
Nearest Road Head	:	Khammam 16 km approx., Nearest Highway NH221 (Vijaywada – Jagdalpur Highway).
Nearest Airport	:	Hyderabad (about 200 Km)
Postal Address	:	Chief Engineer (O&M), Kothagudem Thermal Power Station Stage VII, Unit – 12, TSGENCO, Village - Paloncha, Dist. – Khammam, Telangana -507115

B) Bhadradri TPS

Customer	:	M/s Telangana State Power Generation Corporation Ltd.
Project Title	:	4x270MW Bhadradri Thermal Power Station
Project Location	:	Ramanujavaram Village, Khammam District, Telangana
Nearest Railway station	:	Manuguru railway station.
Nearest Road Head	:	Khammam
Nearest Airport	:	Hyderabad (about 345 Km)
Postal Address	:	Chief Engineer (O&M), Bhadradri Thermal Power Station Stage TSGENCO, Village - Ramanujavaram, Dist. – Khammam, 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%

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
I.	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 CLEARENCE (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 pert 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 throughly 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 paintaing 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-galvasized. 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' 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.	For approval	No of Copies
	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.	3

C. <u>As Built Drawings</u>

Hard copies of Drawings	15
CDs	3

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.

SECTION 4
GUARANTEED AND TECHNICAL PARTICULARS

(TO BE FILLED SEPARATELY FOR EACH TYPE AND RATING OF SWITCH)

1.		**GENERAL**	
	a)	Name and country of Manufacturer	
	b)	Manufacturer's Type Designation	
	c)	Standard Applicable	
	d)	Rated Voltage	
	e)	Rated current (A)	
		i) Under Normal Current	
		ii) Under Site Conditions at 50 degree C ambient	
	f)	Rated Frequency (Hz)	
	g)	No. of poles	
	h)	Whether poles are mechanically ganged	
	i)	Pole to pole spacing	
2.		**GUARANTEED RATINGS**	
	a)	Rated short time current (kA rms)	
		i) For 1 sec.	
		ii) For 3 secs.	
		iii) Dynamic current (kA peak)	
		iv) Rated short circuit current which can be made	
		by earthing switches (kA rms)	
	b)	Opening Time of	
		i) Disconnecting Switch (sec)	
		ii) Earth switch (sec)	
	c)	Closing Time of	
		i) Disconnecting Switch (sec)	
		ii) Earth switch (sec)	
	d)	Temperature rise over 50^0 C ambient temperature	
		corresponding to maximum continuous current	
	e)	Maximum capacity for interrupting magnetizing current of transformers	
	f)	Max. capacity for interrupting line charging current	
	h)	Whether Earth Switch capable of discharging	

		trapped charges of 500 km long line	
3.		**DIELECTRIC WITHSTAND CAPACITY OF COMPLETE ASSEMBLED DISCONNECTING SWITCH AND EARTHING SWITCHES**	
	a)	One minute dry power frequency withstand test voltage	
		i) against ground (kV_{rms}) -dry	
		- wet	
		ii) Across open contacts (kV_{rms}) -dry	
		- wet	
	b)	1.2/50 microsecond dry impulse withstand voltage	
		(positive and negative polarity)	
		i) against ground (kV_{rms}) -dry	
		- wet	
		ii) Across open contacts (kV_{rms}) -dry	
		- wet	
	c)	250/2500 micro second switching impulse withstand	
		voltage (+ve & -ve polarity)	
		i) against ground (kV_{rms}) -dry	
		- wet	
		ii) Across open contacts (kV_{rms}) -dry	
		- wet	
	d)	Corona extinction voltage (kV_{rms})	
	e)	Radio Interference Voltage at 1.1 Um/$\sqrt{3}$ in micro	
		volts) for Frequency between 0.5 MHz to 2.0 MHz.	
	f)	Total Creeepage distance to ground (mm)	
4.		**OPERATING MECHANISM**	
	a)	Operating Torque required to	
		i) to operate 3 pole gang-operated Main switch	
		ii) to operate 3-pole gang- operated earthing switch	
	b)	Type and Rating (KW) of motor	
	c)	Rated Voltage of the motor	
	d)	Full load current (A)	
	e)	Starting Current (A)	
4.1		**INTERLOCKING**	
	a)	Whether mechanical / constructional interlock between	

		Disconnecting Switch and earth switch provided	
	b)	Details of Electrical Interlock enclosed for	
		i) Disconnecting Switch	
		ii) Earth switch	
	c)	Arrangement provided to prevent electrical or manual	
		operation unless interlock conditions are satisfied.	
		(Please provide write up separately)	
	d)	Whether interlock coil is continuously rated	
	e)	Whether DC Control Voltage and variation allowed.	
	f)	Power Consumption	
4.2		**CONTROLS**	
	a)	Rated DC control Voltage	
	b)	Limits of Voltage	
	c)	Power Consumption of the Voltage	
5.		**CONSTRUCTIONAL FEATURES**	
	a)	Whether position of earth switch can be interchanged	
		At site to either side of the pole	
	b)	Main Contacts	
		i) Type of Contacts	
		ii) Contact area (sq cm)	
		iii) Material of contact	
		iv) Contact pressure in kg/ sq cm	
		v) Max. Current density under normal current	
		Carrying capacity (amps/sq cm)	
		vi) Thickness of Silver coating	
	c)	Auxiliary Contacts on Disconnecting Switch	
		i) Total Number	
		ii) NO	
		iii) NC	
		iv) Adjustable	
		v) Make before break	
		vi) Rated Voltage (volts)	
		vii) Rated Continuous current (Amps)	
		viii) Rated DC breaking current with 20 ms time	
		constant (A)	
	d)	Auxiliary Contacts on Earthing Switch	
		i) Total Number	
		ii) NO	
		iii) NC	
		iv) Adjustable	

		v) Rated Voltage (volts)	
		vi) Rated Continuous current (Amps)	
		vii) Rated DC breaking current with 20 ms time	
		constant (A)	
	e)	Whether counter balance spring/ weight provided	
		For Disconnecting switch / earth switch	
	f)	Type of bearing	
	g)	Locations of bearings	
	h)	Type of lubricant for bearings	
	i)	Rated mechanical terminal load	
		- Longitudinal load (Kg)	
		- Transverse load (Kg)	
6.		CONTROL CABINET	
		- Material & Thickness	
		- Degree of protection	
7.		**GALVANIZATION:**	
	a)	Applicable standard	
	b)	Method of galvanization	
	c)	Weight of zinc coating	
8.		**WEIGHTS:**	
	a)	Weight of 3-phase isolator	
	b)	Motor Operating Mechanism box	
	c)	Manual operating mechanism box	
	d)	3 pole Earthing Switch	
	e)	Weight of the heaviest package.	
9.		**OVERALL DIMENSIONS:**	
	a)	3 phase isolator	
	b)	Motor Operating Mechanism box	
	c)	Manual operating mechanism box	
	d)	Earthing Switch	
	e)	Largest package	
	f)	No of packages & Shipping dimension of each package	
10.		LITERATURE	
		Whether the following are enclosed	

	a)	Type test Reports	
	b)	OGA drawings of Disconnecting switches with and	
		without Earth Switches	
	c)	Details of constructional interlock	
	d)	Details of Motor operating Mechanism	
	e)	Leaflets and Literature bringing out salient features	
	f)	Operation & Maintenance Manual	

ANNEXURE – A

NO DEVIATION CERTIFICATE

It is confirmed that there is no deviation and the offer is in full compliance with the specification. It is also confirmed that there are no deviations in any other form such as comments, variations and or exceptions. Further it is confirmed that at all drawings/ data sheets/ QP/ type tests reports shall be submitted to BHEL for organizing approval of ultimate customer. Also, furnishing of all relevant information/ repetition of type tests (if required for meeting the specification requirement) shall be carried out by us at no extra cost to BHEL and without affecting delivery requirements.

Signature of the authorized representative of Bidder

Name _____

Designation _____

Place _____

Date _____

Company Seal

SECTION-6

TECHNICAL CHECK LIST FOR ISOLATORS / EARTHING SWITCHES
(INFORMATION TO BE FURNISHED WITH OFFER)

BIDDERS ARE INSTRUCTED TO

- WRITE **'YES'** UNDER CLOUMN '**Confirmation**', IF THE INFORMATION / SCHEDULE IS FURNISHED / ENCLOSED WITH THE OFFER, **OR**
- WRITE **'NO'** UNDER CLOUMN '**Confirmation**', IF THE INFORMATION / SCHEDULE IS NOT FURNISHED / ENCLOSED WITH THE OFFER, **OR**
- WRITE **'NOT APPLICABLE (NA)'** UNDER CLOUMN '**Confirmation**', IF THE INFORMATION / QUERY / SCHEDULE IS NOT RELEVANT TO THEM, **AND**

- **RETURN THIS CHECKLIST AS THE PART OF THE OFFER DULY SIGNED BY THEM.**

SN.	Parameters	Specified Requirement	Confirmation
1	Rated Voltage (KV)	**420kV**	
2	Type of Isolator	HCB(Cu)	
3	Standard applicable for isolators and earthing switches	IEC:62271-102 (2001-12), IS:9921	
4	Rated Current Under site conditions (A) at 50° C ambient-	3150A	
5	Rated short time withstand Current of Isolator and Earth switch	50kA for 3 Sec	
6	Rated dynamic short circuit withstand Current of Isolator and Earth switch	125kAp	
7	Rated frequency (Hz)	50	
8	Number of poles	3	
9	Phase to phase spacing(mm)	7000	
10	Whether all 3 poles are ganged	Mechanically	
11	Opening time of isolator and earth switch (Sec.)	Less than 12	
12	Closing time of isolator (Sec.)	Less than 12	

13	Temperature rise over 50° C ambient temperature corresponding to maximum continuous current (°C)	As per IEC-62271-102 or table-IV of IS: 9921-II	
14	Seismic Acceleration	0.3 g	
15	Dielectric withstand capacity of completely assembled isolator/isolator and earth switch		
15.1	One minute dry power freq. Withstand test voltage(KV rms)		
	i. against ground (KV rms)	520	
	ii. Across isolating distance (KV rms.)	610	
15.2	1.2/50 micro's impulse withstand test voltage		
	i. Against ground (KVP)	±1425	
	ii. Across isolating distance (KVP) -	±1425(240)	
15.3	250/2500 micro sec. switching surge withstand test voltage (dry & wet)		
	i. Against ground (KVP) -	±1050	
	ii. Across isolating distance (KVP)	±900(345)	
16	Corona extinction voltage (KV rms) –	320	
17	Radio interference level at 1.1 Ur/_/3 (in micro volts at 1.0 MHz)	1000	
18	Min creepage distance of support & rotating insulator (mm) – (25 mm/kV)	10500	

19	Operating Mechanism for Isolator	Motor/Manual	
20	Operating Mechanism for Earth Switches	Motor/Manual	
21	Whether constructional interlock between Isolator & Earth switch provided	YES	
22	Whether interlock between Isolator & Earth switch provided	Mechanical & Electrical	
23	Arrangement provided to prevent electrical or manual operation unless interlock conditions are satisfied	YES	
24	Rated Mechanical Terminal Load i) Straight Load(N) ii)Across Load(N)	 1600 530	
25	Whether interlock coil is continuously rated	YES	
26	Rated DC control voltage and variation allowed	220V DC(85%-110%)	
27	Material of contacts	Hard drawn electrolytic copper and the surface shall be silver plated	
28	Thickness of silver plating of contacts	25 micron	
29a)	Number of auxiliary contacts on isolator/pole	14NO + 14 NC + 2MBB	
29b)	Number of auxiliary contacts on earth switch/pole	*14 NO + 14 NC*	

29c)	No. of TBs on Isolator in the terminal strip provided for Master pole (to be used for interpole cabling)	50	
29c)	No. of TBs on Earth Switch in the terminal strip provided for Master pole (to be used for interpole cabling)	40	
30	Rating of Auxiliary contacts	10 A at 220 V DC	
31	Rated DC breaking current of Auxiliary contacts with time constant not less than 20 ms (A)	2A	
32	Material of Current carrying parts	Copper	
	Material of Arm	Hard drawn electrolytic copper & contact surface shall be heavily silver-plated. For 420kV Al is also acceptable with contact surface heavily silver plated.	
	Material of Terminal Pads	Hard Drawn Electrolytic Copper/ Al	
34	Height of the centre line of Terminal Pad above ground level	8250	
35	Min Clearance (mm) i) Phase to earth ii) Phase to phase	 3500 4200	
36	Capability of Isolator for making and breaking the magnetizing/capacitive currents	0.7 A at 0.15 power factor	
37	All valid Type test reports are available	Yes, available	
	CONTROL CABINETS		
38	Application	Outdoor	
39	Material of control cabinet sheet	Painted sheet steel	

40	Thickness of sheet (mm)	Sheet Steel: 2mm	
41	Degree of protection provided	IP55	
42	Standard applicable for control cabinet	As per relevant IS/IEC	
43	Whether Hot Dip Galvanised	YES/No	
44	Colour shade of finish paint of control cabinet as per IS : 5		
45	Size of Conductor used in Control Wiring of control cabinet	2.5 sq.mm	
46	20 % Spare Terminal Blocks provided in control cabinet	YES	
47	Terminal Blocks shall be suitable for 4X25 Sqmm Ar. Alu. Cable	YES	
48	Confirm to follow the BHEL/Customer MQP	Confirmed	
49	***Following accessories not limited to this is included in scope or not:***		
A	***Hardware for Structure (BHEL supply) to Base Channel (vendor supply)***	***YES***	
B	***Hardware for Base Channel (vendor supply) to Bottom of Post Insulator (BHEL supply*)***	***YES***	

C	***Hardware for Top BPI (BHEL supply*) to Male/Female Member***	***YES***	
D	***Hardware for Structure (BHEL supply) to MOM Box***	***YES***	
E	***Hardware for Structure (BHEL supply) to Earth Switch MOM***	***YES***	
F	***Terminal Connectors***	***NO***	
G	***Support Insulators (3 Nos. post insulators if 420kV HDB Isolator is offered.)***	***YES***	
H	***Support Structure***	***NO***	