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DOCUMENT No.	TB-377-316-051	Rev	00		Prepared	Checked	Approved
CUSTOMER Doc. No.				NAME	MVK	MVK	SKS
TYPE OF DOC.	TECHNICAL SPECIFICATION			SIGN			
TITLE CONTROLLED SWITCHING DEVICE FOR EXISTING 420 kV CIRCUIT BREAKER				DATE	12.04.18	12.04.18	12.04.18
				GROUP	TBEM		
				W.O. No	84005		
CUSTOMER	TELANGANA STATE POWER GENERATION CORPORATION LTD						
PROJECT	400 kV Switchyard at 1X800MW Kothagudem TPS, Stage-VII, Unit#12						

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00						First Issue		
Rev.	Date	Altered	Checked	Approved	REVISION DETAILS			
Distribution				CUSTOMER	TBMM	O/C		
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SECTION - 1

1.1 SCOPE

This technical specification covers the requirements of design, manufacture, testing at works, packing & dispatch and supervision of erection, testing & commissioning of Controlled Switching Devices (CSD) for existing 420 kV Circuit Breakers complete with accessories as listed under this specification.

This section covers the scope, specific technical requirements and quantities of CSD's. This constitutes minimum technical parameters for the above item.

In case of any discrepancies between the requirements mentioned under Section-1 and those specified in other Sections of Technical specification, details specified in Section-1 shall be treated as binding requirement.

The equipment is required for the following project:

Name of the Customer : Telangana State Power Generation Corp. Ltd.
Name of the Project : 400 kV Switchyard at 1X800MW Kothagudem TPS, Stage-VII,
Unit#12
Name of the Consultant : Development Consultants Private Limited

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

1.2 SPECIFIC TECHNICAL REQUIREMENTS

Existing Circuit Breaker shall be equipped with controlled switching with consequent optimization of switching behavior, when used in:

- ☐ Switching of transformer.

The controller shall be provided in Main & Tie circuit breakers of Transformers.

The controlling relay shall also record and monitor the switching operations and make adjustments to the switching instants to optimize the switching behavior as necessary. It shall provide self diagnostic facilities, signaling of alarms and enable downloading of data captured from the switching events.

Requirement for Controlled Switching Device for 400kV Circuit Breaker:

The circuit breaker with controlled switching as indicated in single line diagram shall meet the following requirement:

1. The Switching controlled Device shall be used to reduce increased over voltages, re ignition between circuit breaker contacts that may be caused by normal switching of high voltage circuit breakers and hence optimize the stresses on circuit breaker while switching the circuit. The switching controlled device will be called device henceforth.

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2. The device shall be such that only switching commands (for operating purpose) are processed in the device. Open command triggered by protection on fault shall be forwarded directly to the breaker. In these cases switching instance is not controlled.
3. Circuit breaker should be able to be switched while switching controlled device is not in operation e.g. during maintenance work or power supply is not connected, a bypass shall be provided to the device. In these cases the switching commands will then be forwarded directly to the circuit breaker via this Bypass. The switching time will not be controlled with these switching operations.
4. The device shall meet the requirements of IEC-60255-4 Appendix 'E' class III regarding HF disturbance test, and fast transient test shall be as per IEC-61000 – 4 level III and insulation test as per 60255 – 5.
5. The device shall have functions for switching ON & OFF the circuit breakers.
6. The device shall get command to operate the breakers manually or through auto re-close relay at random. The controller shall be able to analyze the current and voltage waves available through the signals from secondaries of CTs & CVTs for the purpose of calculation of optimum moment of the switching the circuit breaker and issue command to circuit breaker to operate.
7. The device shall also have an adaptive control feature to consider the next operating time of the breaker in calculation of optimum time of issuing the switching command and optimize the switching behavior as necessary. In calculation of next operating time of the breaker the controller must consider all factors that may affect the operating time of the breaker.
8. The device should have display facility at the front for the settings and measured values.
9. The device shall have self monitoring facility.
10. The device shall be suitable for operation considering transient and dynamic state values of the current and voltage from the secondary of the CTs and CVTs.
11. The device should be PC compatible for the setting of various parameters. During the switching operations, current and voltage waveforms and other parameters shall be recorded and saved together with calculated values. Recorded waveform shall be downloaded on to PC for evaluation purpose. It shall also enable downloading of data captured from the switching events. Window based software for this purpose shall be supplied by the contractor to be used on owner's PC.
12. It shall have self monitoring facilities. Faults which impair the functioning of the device or peripheral components, failure of trip voltage or sensors shall be displayed visually and shall give alarm.
13. The device shall be designed to operate correctly and satisfactorily with the excursion of auxiliary A/C & DC voltages and frequency as specified elsewhere in the specification.



14. The device shall have time setting resolution of 0.1 ms or better.
15. The device shall have sufficient number of output/input potential free contacts for connecting the monitoring equipment and annunciation system available in the control room. Necessary details shall be worked out during engineering the scheme.
16. Supply of all the necessary accessories required for the successful operation of controlled switching device shall be in the scope of supplier of the device.
17. Modification of existing CB & BCU panel schemes with CSD interface, necessary wiring, mounting of relays, contactors etc for successful operation of CSD is in the scope of bidder.

1.3 BILL OF QUANTITIES

Sl. No	Description	Unit	Total Qty
1.	Supply of Controlled Switching Device (CSD) for existing [#] 400kV CB [CGL Make] along with all accessories like transducers, aux. relays/contactors, diodes, switches etc as required complete in all respect (except special cables)	Set	2
2.	Supply of special cables ^s for CSD [for CGL Make CB] Length = distance from CB to BCU panel	m	125
3.	Supervision of Erection, Testing & Commissioning of supplied CSD at site (includes making of cutout in BCU panel, modification of existing CB & BCU panel schemes with CSD interface, necessary wiring, mounting of relays/contactors, diodes, switches etc) [for CGL Make CB] (1 Lot per CSD)	Lot	2

^s Special cables other than 1100V LT Power & Control Cables required for CSD shall be in bidders scope. Only distance from CB to Relay panel has been provided at Sl no. 2 of BOQ. Total requirement special cable qty. is to be estimated & supplied by bidder based on no. of runs etc.

[#]Details of Controlled Switching Device (CSD) application and make/model of existing 420 kV Circuit Breakers at respective substations is as mentioned below:

Sl No	Substation	SLD Drg No.	Dia.	CB with/without PIR CSD used in switching of -		
				Main Bay CB (404)	Tie Bay CB (405)	Main Bay CB (406)
1	Kothagudem S/s	TB-3-377-510-001	404-405-406 (GT-Tie-Line)	without PIR; Transformer application; CGL Make, Model-400-SFM-50AA	with PIR; Transformer application; CGL Make, Model-400-SFM-50AA	-

NOTE:

- 1) Total qty. in BOQ may vary by $\pm 30\%$.
- 2) CSD will be mounted in existing BCU Panel (BCP#03) installed in S/yard AC Kiosk.
- 3) Supply of relay/contactors, diodes, switches, cables, lugs, ties etc required for connection of CSD in existing BCU panel and interface with existing circuit breakers is deemed to be included in bidders scope.
- 4) CB scheme, Control & Protection scheme shall be provided to successful bidder. Bidder shall modify the relevant sheets of the scheme to show CSD interfaces and submit in .pdf format for review/approval at Contract stage.
- 5) **Enclosures:**

Sl No	Drg No.	Description
1	TB-3-377-510-001 (R6)	Single Line Diagram of 400 kV Switchyard (Kothagudem S/s)
2	TB-0-377-510-002 (R7) (Sh-1)	400kV Switchyard layout Plan (Kothagudem S/s)
3	EH5-4463-01 (Sh-1&4)	GA drawing of 420kV Circuit Breaker (400-SFM-50AA)
4	SKETCH	GA drawing of BCU Panel (BCP#03)

1.4 TYPE TESTING

Bidder shall submit valid type test reports (as per relevant IEC/IS standard) for the tests carried out within last ten years from the date of LOA (i.e. 27.12.2014). The reports should have been conducted on identical or similar equipment/components to those offered. In case type test reports are more than 10 years old (from the date of LOA) or the reports of type tests are found to be technically unacceptable to BHEL/Customer, the type test shall be conducted by the vendor without cost and delivery implication to BHEL.

1.5 SUPERVISION OF ERECTION, TESTING & COMMISSIONING

Bidder shall quote lump-sum price for supervision of installation, testing and commissioning of CSD for each breaker at each site. The required instruments for testing & commissioning shall be brought by the bidder and shall be taken back by the bidder after successful completion of testing and commissioning.

1.6 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. It will be the bidder's responsibility to get its QP approved from the ultimate customer.

1.7 PROJECT TITLE BLOCK

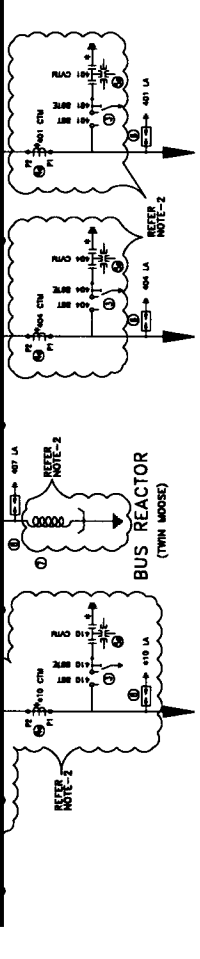
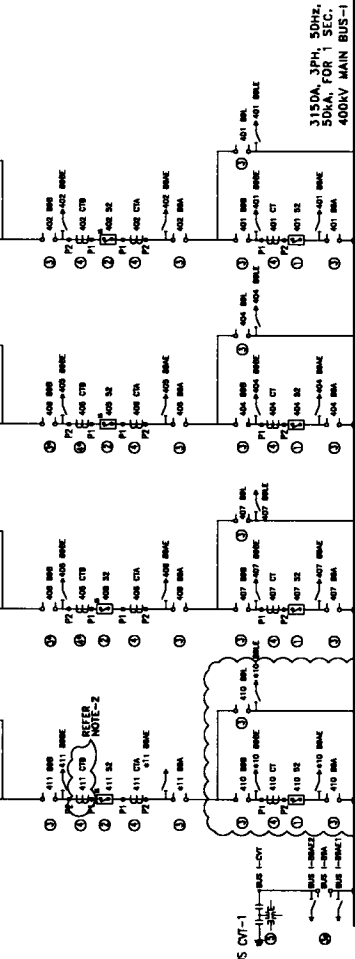
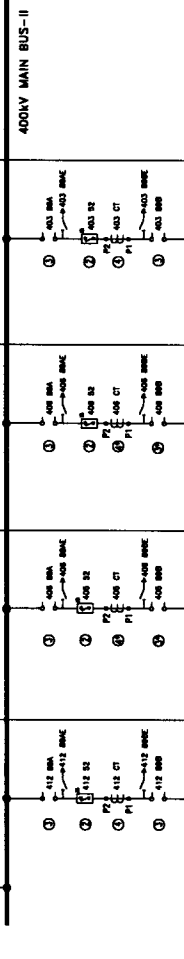
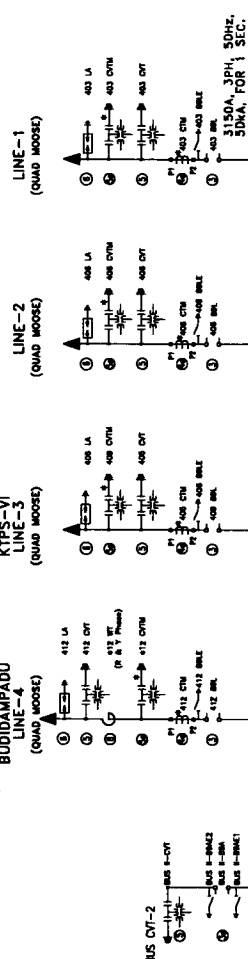
The drawings / documents submitted shall be project and product specific and shall incorporate following details:



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

-- x x --

(ULO OF KTPS-VI - BUDIDAMPADU D/C LINE)
KTPS-VI
LINE-3
(QUAD MOOSE)



TO FGD TRAF.

TO GT-1

TO ST-1

REV.	DATE	ALTD.	CHD.	APPD.	REV.	DATE	ALTD.	CHD.	APPD.
D5	28.08.16	MR	S/-	VR	S/-	AS	S/-	AS	S/-
ORG REISED TO INCORPORATE 125MVA REACTOR SLD REISED TO INCORPORATE FGD TRAF. BAY & METERING CT. CVT (GT&ST BAY) DETAILS AS PER EQUIPMENT & WT IN LINE&A AS PER TS/SCCO REQUIREMENT (ADDITIONAL SCOPE).									

REV.	DATE	ALTD.	CHD.	APPD.	REV.	DATE	ALTD.	CHD.	APPD.
D4	28.03.16	MR	S/-	VR	S/-	AS	S/-	AS	S/-
LOCATION OF SYNCHRONIZING CVT IN GT BAY. SLD REISED IN LINE WITH DCPL COMMENTS AND MOM DATED: 29.04.15, 10.04.15 & 23.02.15.									

REV.	DATE	ALTD.	CHD.	APPD.	REV.	DATE	ALTD.	CHD.	APPD.
D3	23.08.15	MR	S/-	VR	S/-	AS	S/-	AS	S/-
SLD REISED IN LINE WITH MOM WITH TS/SCCO LETTER REF: 13A06/DOH-4/D24(DATED: 19.05.15).									

NAME	SIGN	DATE
PR	S/-	22.01.15
PR/RAJUT	S/-	22.01.15
AS	S/-	22.01.15

DISTRIBUTION OF PRINTS	DEPT.	CODE
APPROVED	TBEM	422



DEPT. CODE

SCHEDULE OF EQUIPMENT

S.NO.	DESCRIPTION	SYMBOL	QTY.	RCR MET. EQPT.	FGD WT. EQPT. PLCC QTY.
1	400KV, 3150A, 50KA FOR 3 SEC. 3PH. SFB CIRCUIT BREAKER WITHOUT PIR	Ⓢ	03	-	01
2	400KV, 3150A, 50KA FOR 3 SEC. 3PH. SFB CIRCUIT BREAKER WITH PIR	Ⓢ	08	-	08
3	400KV 3150A, 50KA FOR 3 SEC. 3PH. ICB ISOLATOR MOTOR AS WELL AS MANUALLY OPERATED, MECHANICALLY GANGED WITH ONE EARTH SWITCH MOTOR OPERATED.	Ⓢ	25	-	04
3*	400KV 3150A, 50KA FOR 3 SEC. 3PH. ICB ISOLATOR MOTOR AS WELL AS MANUALLY OPERATED, MECHANICALLY GANGED WITH ONE EARTH SWITCH MOTOR OPERATED (HIGH LV).	Ⓢ	04	-	04
3*	400KV 3150A, 50KA FOR 3 SEC. 3PH. ICB ISOLATOR MOTOR AS WELL AS MANUALLY OPERATED, MECHANICALLY GANGED WITH TWO EARTH SWITCH MOTOR OPERATED.	Ⓢ	02	-	02
4	400KV 3000A, 5 CORE, 50KA FOR 3 SEC. 1PH. CURRENT TRANSFORMER (HIGH LEVEL)	Ⓢ	30	-	06
4*	400KV 3000A, 2 CORE, 50KA FOR 3 SEC. 1PH. CURRENT TRANSFORMER (METERING)	Ⓢ	12	-	06
5	400KV, 4400PF, 1PH. CAPACITIVE VOLTAGE TRANSFORMER (3 SECONDARY)	Ⓢ	18	-	18
5*	400KV, 4400PF, 1PH. METERING CAPACITIVE VOLTAGE TRANSFORMER (2 SECONDARY)	Ⓢ	12	-	06
6	300KV, 20KA, 1-PH. METAL OXIDE, GAPLESS TYPE, CLASS-W SURGE ARRESTER	Ⓢ	21	-	03
7	400KV, 125 MVAR BUS REACTOR	Ⓢ	-	01	-
8	400KV, 200KA, 10MH WAVE TRAP (1-PH)*	Ⓢ	-	-	02

(*) SUPPLY OF WAVE TRAP, INSULATORS FOR WAVE TRAP AND ASSOCIATED EQPT. SUPPORT STRUCTURE IS IN SCOPE OF TS/SCCO.

SYSTEM PARAMETERS

DESCRIPTION	400KV
HIGHEST SYSTEM VOLTAGE (KV)	420
SYSTEM VOLTAGE (KV)	400-58
FREQUENCY	50 HZ, ±3% TO -5%
NO. OF PHASE	3
SYSTEM FAULT LEVEL (KA FOR 1 SEC)	50
LOCKING IMPULSE WITHSTAND VOLTAGE (KV)	1425
SWITCHING IMPULSE WITHSTAND VOLTAGE (KV)	1050
PI WITHSTAND VOLTAGE (KV)	830
CREPPE DISTANCE (MM)	10500
SYSTEM EARTHING	EFFECTIVELY EARTHED
AMBIENT TEMPERATURE	50 DEG. C.

NOTE:-

1. SYSTEM: 400KV, 3150A, 50Hz, 25mm²/KV, 50 KA FOR 1 SEC. EFFECTIVELY EARTHED.
2. SUPPLY, ETC & CIVIL WORKS OF 125MVA REACTOR & METERING CT, CVT & ASSOCIATED ISOLATOR (GT&ST BAY) IS SUBJECT TO COMMERCIAL SETTLEMENT WITH TS/SCCO (ADDITIONAL SCOPE).

NAME OF CUSTOMER/PROJECT

TELANGANA STATE POWER GENERATION CORPORATION LIMITED.
1XB0D MW KOTHAGUDEM TPS

NAME OF CONSULTANT:
DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA

BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS GROUP

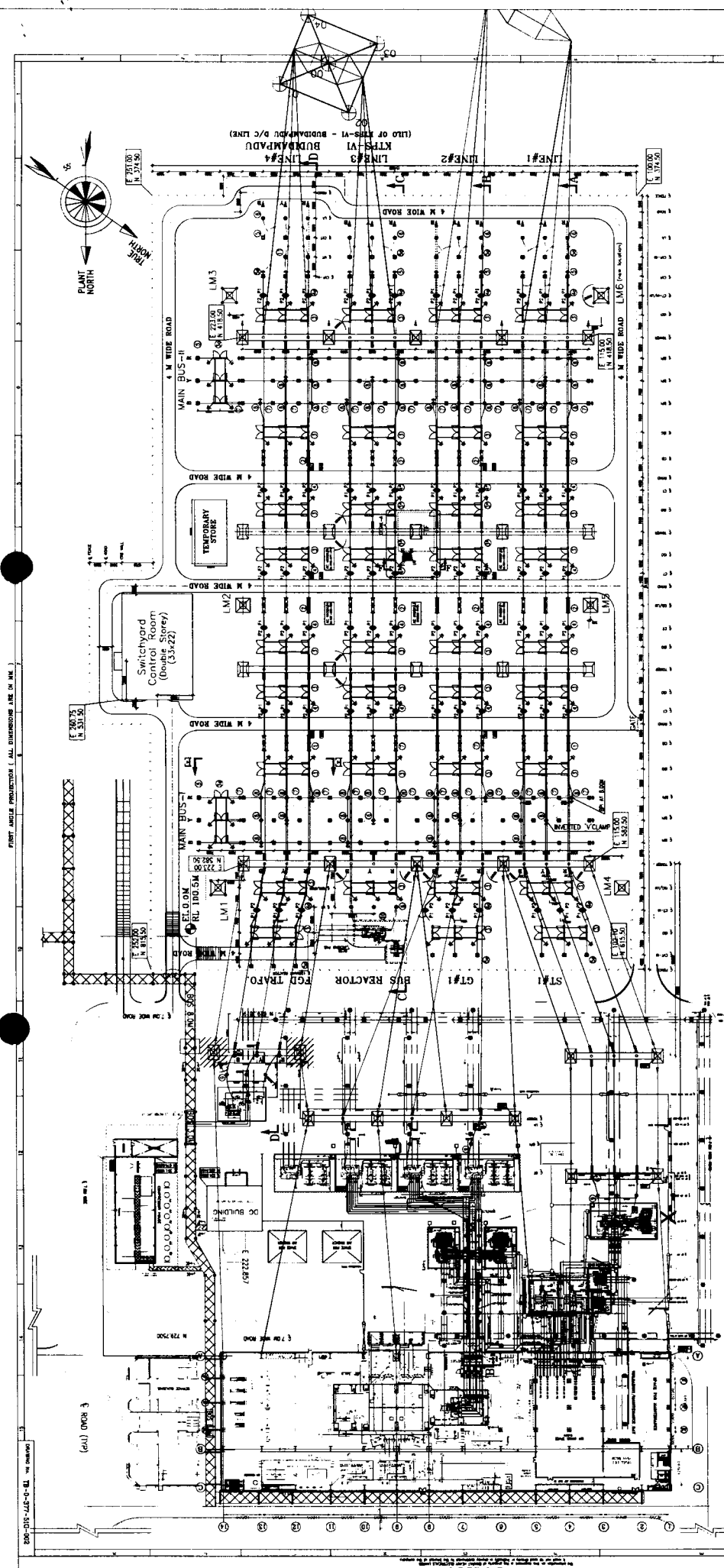
SINGLE LINE DIAGRAM OF 400KV SWITCHYARD

SCALE NTS W.O. No. 84005

DRG. No. TB-3-377-510-001

REV. 01

REV. 06



NOTES:

1. ALL CONNECTIONS SHALL BE MADE IN ACCORDANCE WITH THE 'WIRING REGULATIONS'.
2. THE ELECTRICAL WORK SHALL BE DONE IN ACCORDANCE WITH THE 'ELECTRICAL REGULATIONS'.
3. THE ELECTRICAL WORK SHALL BE DONE IN ACCORDANCE WITH THE 'ELECTRICAL REGULATIONS'.
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9. THE ELECTRICAL WORK SHALL BE DONE IN ACCORDANCE WITH THE 'ELECTRICAL REGULATIONS'.
10. THE ELECTRICAL WORK SHALL BE DONE IN ACCORDANCE WITH THE 'ELECTRICAL REGULATIONS'.

CONDUCTOR SCHEDULE	
SL. NO.	DESCRIPTION
1.	MAIN BUS
2.	TRANSFORMER
3.	SWITCHGEAR
4.	BUS REACTOR
5.	TRANSFORMER
6.	SWITCHGEAR
7.	BUS REACTOR
8.	TRANSFORMER
9.	SWITCHGEAR
10.	BUS REACTOR

SYSTEM PARAMETERS	
PARAMETER	VALUE
SYSTEM VOLTAGE (KV)	400KV
SYSTEM FREQUENCY (HZ)	50
SYSTEM POWER (MW)	1000
SYSTEM REACTIVE POWER (MVAR)	1000
SYSTEM FACTOR (PF)	0.9
SYSTEM LOSS (MW)	100
SYSTEM EFFICIENCY (%)	99
SYSTEM CAPACITY (MW)	1000
SYSTEM RESERVE (MW)	100

CLEARANCE TABLE	
ITEM	VALUE
MINIMUM CLEARANCE (M)	1000
MINIMUM CLEARANCE (M)	1000
MINIMUM CLEARANCE (M)	1000
MINIMUM CLEARANCE (M)	1000
MINIMUM CLEARANCE (M)	1000
MINIMUM CLEARANCE (M)	1000
MINIMUM CLEARANCE (M)	1000
MINIMUM CLEARANCE (M)	1000
MINIMUM CLEARANCE (M)	1000
MINIMUM CLEARANCE (M)	1000

SCHEDULE OF EQUIPMENT	
ITEM	DESCRIPTION
1.	MAIN BUS
2.	TRANSFORMER
3.	SWITCHGEAR
4.	BUS REACTOR
5.	TRANSFORMER
6.	SWITCHGEAR
7.	BUS REACTOR
8.	TRANSFORMER
9.	SWITCHGEAR
10.	BUS REACTOR

LEGEND	
SYMBOL	DESCRIPTION
1.	MAIN BUS
2.	TRANSFORMER
3.	SWITCHGEAR
4.	BUS REACTOR
5.	TRANSFORMER
6.	SWITCHGEAR
7.	BUS REACTOR
8.	TRANSFORMER
9.	SWITCHGEAR
10.	BUS REACTOR

CONDUCTOR SCHEDULE	
SL. NO.	DESCRIPTION
1.	MAIN BUS
2.	TRANSFORMER
3.	SWITCHGEAR
4.	BUS REACTOR
5.	TRANSFORMER
6.	SWITCHGEAR
7.	BUS REACTOR
8.	TRANSFORMER
9.	SWITCHGEAR
10.	BUS REACTOR

SYSTEM PARAMETERS	
PARAMETER	VALUE
SYSTEM VOLTAGE (KV)	400KV
SYSTEM FREQUENCY (HZ)	50
SYSTEM POWER (MW)	1000
SYSTEM REACTIVE POWER (MVAR)	1000
SYSTEM FACTOR (PF)	0.9
SYSTEM LOSS (MW)	100
SYSTEM EFFICIENCY (%)	99
SYSTEM CAPACITY (MW)	1000
SYSTEM RESERVE (MW)	100

CLEARANCE TABLE	
ITEM	VALUE
MINIMUM CLEARANCE (M)	1000
MINIMUM CLEARANCE (M)	1000
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MINIMUM CLEARANCE (M)	1000
MINIMUM CLEARANCE (M)	1000
MINIMUM CLEARANCE (M)	1000

SCHEDULE OF EQUIPMENT	
ITEM	DESCRIPTION
1.	MAIN BUS
2.	TRANSFORMER
3.	SWITCHGEAR
4.	BUS REACTOR
5.	TRANSFORMER
6.	SWITCHGEAR
7.	BUS REACTOR
8.	TRANSFORMER
9.	SWITCHGEAR
10.	BUS REACTOR

REVISIONS	
NO.	DESCRIPTION
1.	ISSUED FOR TENDER
2.	REVISED
3.	REVISED
4.	REVISED
5.	REVISED
6.	REVISED
7.	REVISED
8.	REVISED
9.	REVISED
10.	REVISED

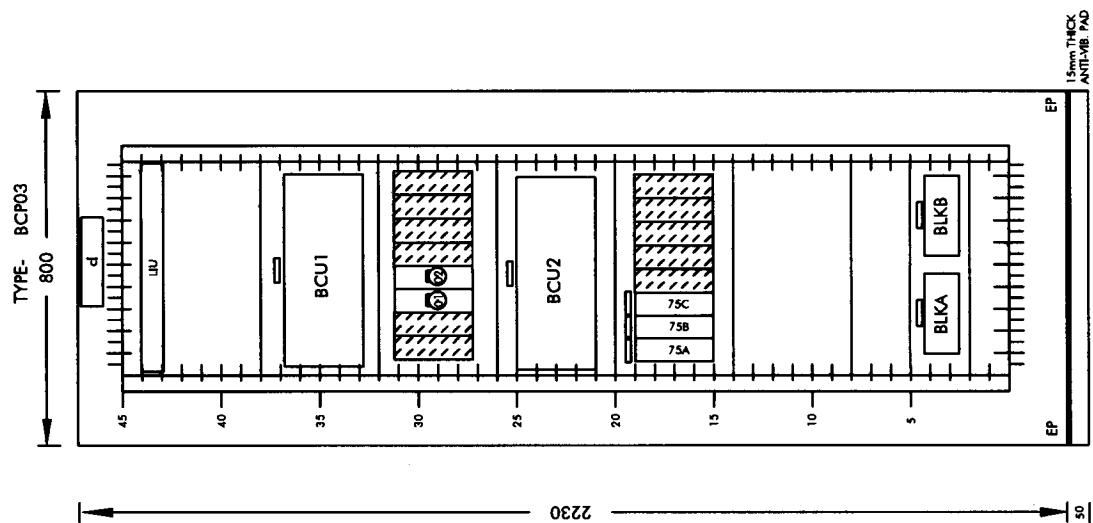
FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

DATE: 10-10-2010

BY: [Signature]

SKETCH

GA Drawing of BCU Panel (BCP#03)



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Project: 1x800 MW KOTHAGUDEM THERMAL POWER STATION STAGE VII, UNIT 12 &
4x270 MW BHADRADRI THERMAL POWER STATION.

Customer: TELANGANA STATE POWER GENERATION CORPORATION LTD

Section-3: Project Details & General Specifications

Rev. No. 00

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)
Chief Engineer (O&M), Kothagudem Thermal Power Station Stage

Postal Address : 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



Project: 1x800 MW KOTHAGUDEM THERMAL POWER STATION STAGE VII, UNIT 12 &
4x270 MW BHADRADRI THERMAL POWER STATION.

Customer: TELANGANA STATE POWER GENERATION CORPORATION LTD

Section-3: Project Details & General Specifications

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

a).	Design wind speed	:	44 m/sec.
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1.1.5 SEISMIC FACTORS

a).	Horizontal Seismic Coefficient	:	As per latest IS : 1893	} Zone - III
b).	Vertical Seismic Coefficient	:	As per latest IS : 1893	

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 %



Project: 1x800 MW KOTHAGUDEM THERMAL POWER STATION STAGE VII, UNIT 12 &
4x270 MW BHADRADRI THERMAL POWER STATION.

Customer: TELANGANA STATE POWER GENERATION CORPORATION LTD

Section-3: Project Details & General Specifications

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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 INSTRUCTIONS 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.



Project: 1x800 MW KOTHAGUDEM THERMAL POWER STATION STAGE VII, UNIT 12 &
4x270 MW BHADRADRI THERMAL POWER STATION.

Customer: TELANGANA STATE POWER GENERATION CORPORATION LTD

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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.



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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.



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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,



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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.



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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.



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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 otherwise 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



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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



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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.



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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.



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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



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Copies of installation, operation & maintenance manual.	5
Copies of drawings on floppies/CDs	1 set

B. After approval and for information / distribution

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. As Built Drawings

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.

ANNEXURE - A
SCHEDULE OF TECHNICAL DEVIATIONS

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

<u>S.No.</u>	<u>Page No.</u>	<u>Clause No.</u>	<u>Deviation</u>	<u>Reason / Justification</u>
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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