



BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS ENGINEERING MANAGEMENT
NOIDA

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TYPE OF DOC.	TECHNICAL SPECIFICATION	NAME	DKS	SKS	RS
TITLE Clamps & Connectors with Accessories		SIGN			
		DATE	05.10.2017	05.10.2017	05.10.2017
		GROUP	TBEM		
		WO No.	84007		

CUSTOMER	Tamilnadu Generation and Distribution Corporation (TANGEDCO)
CONSULTANT	Desein Private Limited, New Delhi

PROJECT	400kV GIS at 2x660MW Ennore SEZ Supercritical Thermal Power Project at Ash Dyke of NCTPS
NOA Ref.	

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Remarks: Bidder to note that data and details of Guaranteed Technical Particulars shall not be reviewed during Technical Review, hence compliance of Technical Specification shall be bidder's responsibility.

Rev	Date	Altered	Checked	Approved	
Distribution				To	
				Copies	

Section 1: Scope, Technical Requirements and Quantities

1.1 SCOPE

This technical specification covers the requirements of design, manufacture, inspection and testing at manufacture's works, proper packing and delivery to site of **Clamps & Connectors with Accessories** conforming to this specification.

This section covers the specific technical requirements of **Clamps & Connectors with Accessories**. This constitutes minimum technical parameters for the above item as specified by the customer. The offered equipment/ item shall also comply with the Section-3 (Project Details and General technical requirements for all equipment under the Project) of this specification.

The specification comprises of following sections,

Section-1 : Scope, Project specific technical requirements & Bill of Quantities.

Section-2 : Specific technical requirements for the equipment under scope of supplies.

Section-3 : Project Details and General technical requirements for all equipment under the Project.

Section-4 : Annexures (2nos.)

In case of any discrepancies between the requirements mentioned under different Sections, order of precedence shall be in the same order as listed above.

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

The equipment is required for the following project:

Name of the Customer : Tamilnadu Generation and Distribution Corporation (TANGEDCO)

Name of consultant : Desein Private Limited, New Delhi

Name of the Project : 400kV GIS at 2x660MW Ennore SEZ Supercritical Thermal Power Project at Ash Dyke of NCTPS

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

1.2 SPECIFIC TECHNICAL REQUIREMENTS

Specific technical requirements like rated voltage, rated current, conductor details and type of clamps & connectors and accessories etc. are given in enclosed Annexure-I (Bill of Quantities for Clamps & Connectors and Accessories). Other technical requirements for the connectors shall be as follows,

(1)	Material for	400kV
	(a) For connecting to equipment terminals and conductors of Aluminum	Aluminium alloy casting conforming to designation A6 of IS:617 and test shall conform to IS:617
	(b) For connecting equipment terminals made of copper with	Bimetallic connectors made from Aluminium alloy casting, conforming to designation A6

	conductors of Aluminum	of IS:617 with 2mm thick bimetallic liner and all test shall conform to IS:617
	(c) For connecting shield wire	Galvanized mild steel
	(d) Bolts, nuts and plain washers	For sizes below M12, electro galvanized mild steel, For sizes M12 and above, for Hot dip galvanized
	(e) Spring washers for items-(a) to (c)	Electro galvanised mild steel suitable for at least service conditions-3 as per IS:1573
(2)	Minimum thickness of any current carrying part of clamps & connector and accessories	10mm
(3)	Corona extinction voltage	320kV
(4)	Fault current level for 1second	63kA
(5)	Rated peak short circuit current	100kAp
(6)	Rated voltage	400kV
(7)	Highest system voltage	420kV
(8)	Rated lightning (Full wave) impulse withstand voltage (1.2/50 micro sec.) dry & wet	1425kVp
(9)	Rated Switching impulse withstand voltage ((250/2500 micro sec.) dry & wet	1050kVp
(10)	Rated one minute power frequency withstand voltage	650kVrms
(11)	Rated Frequency	50Hz
(12)	Total creepage distance	31mm
(13)	Minimum cantilever strength	800kg

Note: The connector suitable for Aluminum tube shall be such design that projected part of Aluminum tube shall be fully covered to avoid entry of birds inside Aluminum tube.

1.3 BILL OF QUANTITIES

The bill of quantities shall be as per Annexure-I (Bill of Quantities for Clamps & Connectors with Accessories).

Note: The quantity for individual item may vary up to any extent, however total quantity may vary +/- 30% during contract execution stage. It is also to be noted that any item can be completely/ partially deleted during detailed engineering stage.

1.4 TYPE TESTING

The bidder shall submit the type tests reports for the tests conducted on the equipment identical or similar to those to be supplied under this contract and the test(s) should have been conducted at an independent laboratory not earlier than five (5) years prior to supply under this contract. If any type test report is found to be technically unacceptable, such type test(s) shall be conducted by the bidder without any cost and delivery implication to BHEL/TANGEDCO.

Clamps & Connectors with Accessories shall be proven type and type tested design confirming the requirements of section-2, however Clamp Slip Test shall be conducted as mentioned in section-2 and shall be subjected to BHEL/TANGEDCO approval.

1.5 QUALITY PLAN

The successful bidder shall submit the QP for BHEL/ TANGEDCO approval. In case bidder has reference QP agreed with TANGEDCO, same can be submitted for specific project after award of contract for BHEL/ TANGEDCO's approval. There shall be no commercial implication to BHEL on account of QP approval.

All materials shall be procured, manufactured, inspected and tested by vendor/ sub-vendor as per approved quality plan.

The supplier shall perform all tests necessary to ensure that the material and workmanship conform to the relevant standards and comply with the requirements of the specification. Charges for all these tests for all the equipment & components shall be deemed to be included in the bid price.

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 PACKING

The material shall be packed in such a way to ensure protection against damage during transit, storage for prolonged periods and handling.

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Annexure-BILL OF QUANTITIES for Clamps & Connectors with Accessories (Based on Erection Key Diagram)							
400kV GIS at 2x660MW Ennore SEZ Supercritical Thermal Power Project at Ash Dyke of NCTPS							
Sl. No.	EKD ID No.	Discription	Current rating (A)	Main Qty. (Nos.)	Spare Qty. (Nos.)	Total Qty. (Nos.)	Remarks
1	8	420kV, 1-Phase Bus post Insulator					
1.a	8C	Suitable for twin ACSR Moose conductor Rigid through type horizontal approach	2000	27	3	30	
2	9	420kV, 125MVAR Reactor HV Bushing					
2.a	9A	Suitable for twin ACSR Moose conductor horizontal approach	2000	6	1	7	
3	10	420kV, Start up Transformer HV Bushing					
3.a	10A	Suitable for twin ACSR Moose conductor horizontal approach	2000	3	1	4	
4	12	420kV, Generator Transformer HV Bushing					
4.a	12A	Suitable for twin ACSR Moose conductor horizontal approach	2000	6	1	7	
5	13	420kV, Air to SF6 gas Bushing					
5.a	13A	Suitable for twin ACSR Moose conductor horizontal approach	2000	36	3	39	
6		Two way PG Clamps /Tee/Welding sleeves and Spacers					
6.a	17	420kV Tee connector suitable for twin ACSR Moose run and twin ACSR Moose tap	2000	18	3	21	
6.b	18	420kV Tee connector suitable for Quad ACSR Moose run and twin ACSR Moose tap	2000	36	3	39	
6.c	23	420kV Flexible spacers suitable for Twin ACSR Moose conductor	-	132	9	141	
6.d	24	420kV Rigid spacers suitable for Twin ACSR Moose conductor	-	210	12	222	
6.e	28	Tension clamps for 7/9 SWG(10.98mm dia) GI Wire	-	51	3	54	
6.f	29	Two way PG clamps for 7/9 SWG(10.98mm dia) GI Wire	-	34	3	37	
6.g	30	PAD Clamps for connecting 7/9 SWG (10.98mm dia) GI Shield Wire on one side and 75X12 mm GI Flat on other side	-	27	3	30	
6.h	31	Structure clamps for 7/9 SWG (10.98mm dia) GI Shield wire on Lattice type structure	-	840	42	882	
6.i	32	Earth clamps for 7/9 SWG (10.98) GI Shield Wire on Wall/ Structure	-	264	15	279	
	Conductor Size						
	1	ACSR Moose conductor (Overall diameter=31.77mm)					
	2	7/9 SWG GI Shield Wire (Overall diameter=10.98mm)					
	Notes:						
	1	The sub-conductor spacing for 400kV Twin conductor is 450mm.					

Section-2: Specific technical requirements for the equipment under scope of supplies**6.03.00 Technical Particulars**

1.0	RATING	400 kV
1.1	Application	Switchyard / Outdoor
1.2	Quantity	As per requirement
1.3	Voltage class	420 kV
1.4	Frequency	50 Hz
1.5	No. of phases	3 Phase
1.6	Rated current for site conditions	As required
1.7	Short time Current Rating and duration	63 kA for 1.0 sec.
1.8	Rated peak short circuit current	100 kA (Peak)
2.0	Design Requirements	
2.1	Ambient temperature	50 ⁰ C
2.2	Insulation level	1425 kV peak
2.3	Phase spacing	As per IS
2.4	Type of break	Horizontal double break/ tandem type vertical-break
2.5	Type of mounting	Horizontal upright
2.6	Operating device	
	(a) For disconnector	Motor driven (Both local & remote) (Emergency Manual)
	(b) For earth switch	Motor Driven with electrical/ Mechanical interlocks
3.0	Insulation Data	
3.1	1.2 / 50 micro sec. lightning impulse withstand	
	To earth	1425 kV peak
3.2	Total creepage distance	31 mm/ kV
3.3	Minimum cantilever strength	800 kg



- v. ~~Fibre optic Distribution Panels (FODP) for optical fibre terminations be supplied and installed by the contractor. FODP shall be designed to provide Protection for fibre splicing of pre connectorized pigtails and to accommodate connectorized termination and coupling of the fibre cables.~~

10.00.00 MISCELLANEOUS EQUIPMENT

10.01.00 Codes and Standards

ALUMINIUM tubular Conductor	IS:5082 / IEC
ACSR conductor	IS : 398 / IEC
Clamps & connectors	IS : 617, IS : 5561 / IEC
Insulator string	IS : 731 / IEC
Hardware	IS : 2486, IEC : 433
Spacers	IS : 10162 / IEC
Earthing conductor	IS : 2141 / IEC
Cabinets, boxes, kiosks, panel etc.	IS:5039, IS:8623 and IEC:439

10.02.00 ~~Design and Constructional Features~~

10.02.01 ~~Cabinets, boxes, kiosks, panels etc~~

~~(Control cabinets, junctions boxes, marshalling boxes, lighting panels, terminal boxes operating mechanism boxes, etc)~~

- ~~i. The size of enclosure and the layout of equipment inside shall provide generous clearances.~~
- ~~ii. Each cabinet/box/kiosk/panel shall be provided with a 15A, 240V AC, 2 pole, 3 pin industrial grade receptacle with switch.~~



2x660 MW Ennore SEZ Supercritical Thermal Power
Project at Ash Dyke of NCTPS
Spec. No. CE/C/P&E/EE/E/OT. No. 03/2013-14
Vol. IV: Electrical Works:228



- iii. ~~For incoming supply, MCB of suitable rating shall be provided.~~
- iv. ~~Illumination of each compartment shall be with door operated incandescent lamp.~~
- v. ~~All control switches shall be of rotary type.~~
- vi. ~~Shall be of painted sheet steel or ALUMINIUM. However, the junction and switch boxes shall be of hot dip galvanized sheet steel of 1.6mm thickness.~~
- vii. ~~Thickness of sheet steel shall be 2mm cold rolled or 2.5 mm hot rolled. The thickness of ALUMINIUM shall be 3mm and shall provide rigidity.~~
- viii. ~~Top of the boxes shall be sloped towards rear.~~
- ix. ~~The cabinets/ boxes/kiosks/ panels shall be free standing or wall mounting or pedestal mounting type. They shall have hinged doors with padlocking arrangement. All doors, removable covers and plates shall be gasketed all around with neoprene gaskets.~~
- x. ~~The cable entry shall be from bottom for which removable gasketed cable gland plates shall be provided. Suitable 240V, single phase 50Hz AC heaters with thermostats controlled by switch and fuse shall be provided to maintain inside temperature 10 deg. above the ambient.~~
- xi. ~~Each cabinet / box / kiosk / panel shall be provided with two earthing pads to receive 75mmx 12mm GS flat. The connection shall be bolted type with two bolts per pad. The hinged door shall be connected to body using flexible wire.~~
- xii. ~~The cabinets/boxes/kiosks/panels shall also be provided with danger plate, and internal wiring diagram pasted on inside of the door. The front label shall be on a 3 mm thick plastic plate with white letter engraved on black background.~~

10.02.02 Clamps and Connectors

- i. Shall be Aluminium alloy casting conforming to designation A6 of IS: 617 for connecting to equipment terminals and conductors of ALUMINIUM. In case the terminals are of copper, the same clamps/ connectors shall be used with 2 mm thick bimetallic liner.
- ii. Shall be Galvanized mild steel for connecting to shield wire.
- iii. Bolts, nuts and plain washers shall be hot dip galvanized mild steel for sizes M12 and above. For sizes below M12, they shall be electro-galvanized mild steel.
- iv. The spring washers shall be electro-galvanized mild steel.
- v. All castings shall be free from blow holes, surface blisters, cracks and cavities.
- vi. All sharp edges and corners shall be rounded off to meet specified corona and radio interference requirements



- vii. Shall have same current rating as that of the connected equipment with temperature rise limited to 35 deg.C over 50 deg.C.
- viii. All current carrying parts shall be at least 10 mm thick.
- ix. Shall be manufactured to have minimum contact resistance.
- x. Flexible connectors, braids or laminated strips shall be made up of copper/ALUMINIUM.
- xi. Current rating and size of terminal/conductor for which connector is suitable shall be embossed/punched on each component.

10.02.03 Insulator String Hardware

- i. ~~Shall be of bolted type and forged steel except for insulator cap, which can be of malleable cast iron.~~
- ii. ~~Shall also generally meet the requirements of clamps and connectors as specified above.~~
- iii. ~~In one span, Tension string assembly at one end shall be supplied with suitable turn buckle.~~
- iv. ~~Suitable sag compensating spring shall be supplied in case the design calculations show excessive variation of the sag over the temperature range of 0 to 80 deg.C.~~

10.02.04 Aluminium tubular Conductor (If Applicable)

- (i) Size 4 " IPS (EH type).

10.02.05 ACSR Conductor

- (i) Code & standard IS-398
- (ii) Name MOOSE ACSR

10.02.06 Spacers

- (i) Shall be non-magnetic material except nuts and bolts, which shall be of hot dip **galvanized mild steel**.
- (ii) Shall generally meet the requirement of clamps and connectors specified above.



- (iii) Design shall take care of fixing and removing during installation and maintenance.
- (iv) Clamp slip test shall be conducted as follows:
In this test the sample shall be installed on test span of twin/quad bundle string at a tension of 44.2 kN (4500 kg.). One of the clamps when subjected to a longitudinal pull of 2.5 kN (250 kg) parallel to the axis of conductor shall not slip, i.e. permanent displacement between conductor and clamp after the test shall not exceed 1.0 mm.
This test shall be performed on all other clamps of the sample.

10.02.07 Earthing Conductor

- (i) All conductors buried in earth shall be of mild steel.
- (ii) All conductors above the ground level shall be galvanized steel.
- (iii) Shield wire for lightning protection

10.02.08 Bay Marshalling Box (BMB)

- i. Each bay of the switchyard shall be provided with a Bay marshalling Box (BMB) located at a convenient location to receive and distribute cables within the bay.
- ii. It shall receive two incoming three phase AC supplies controlled by MCBs with auto changeover provision and distribute adequate three/single phase ac supplies controlled by MCBS. Of the outgoing feeders, 20% shall be kept spare.
- iii. BMB shall also be provided with 63A, 3 phase 4 pin industrial grade receptacle with rotary switch.
- iv. Adequate terminal blocks (having 20% spare terminal) shall be provided in separate compartment in BMB for implementing interlocking schemes for operation of switchyard equipment (circuit breaker, disconnecting and earth switches etc.).



SECTION – 3

PROJECT INFORMATION AND GENERAL TECHNICAL REQUIREMENTS

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CHAPTER 1

PROJECT SYNOPSIS

1.0 GENERAL BACKGROUND AND SALIENT FEATURES

1.1 Introduction

Tamilnadu Generation and Distribution Corporation owns the proposed green-field 1320 MW (2 units of 660 MW each) Coal Based Thermal Power Station at Katupalli. This is an expansion of North Chennai Thermal Power Station (NCTPS) and located on some portion of the ashdyke of NCTPS.

1.2 Location

The proposed site for main power plant is located near Ennore port (approx 5 kms).

The nearest Railway station is at Athipattu Pudunagar (approx 5 kms)

All weather road from Pattamandri on the Thiruvottiyur-Ponneri district highway is the nearest road access.

The nearest airport is at Chennai at a distance of 60 km.

1.3 NA

1.4 PROJECT INFORMATION

Project Title : **2 x 660 MW Ennore SEZ Coal Based Supercritical Thermal Power Project at Ash Dyke of NCTPS**

Owner : **TAMIL NADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)**

LOCATION

The site is located near Vayalur Village, Ennore

Latitude : 13°17' N to 13°18' N

Longitude : 80°18' E to 80°19' E

Distance from Chennai City : 35 km

Nearest Airport is at Chennai at a

Distance of : 60 km

Nearest Seaport is : Ennore

Nearest Railway Station is : Athipattu Pudunagar (approx 5 kms)

Meteorological Condition

Climate : Tropical ,very dry and hot summer, dry and cold winter and good rain-fall in monsoon accompanied with strong wind.

Climatological data	:		
Ambient temp. (°C)	:	Annual Maximum Mean Temp	41.5(°C)
	:	Annual Minimum Mean Temp	24(°C)
	:	Design Ambient temperature	50(°C)
Relative Humidity	:	Maximum 100% Minimum 36% Design 75%	
Annual Rainfall	:	Maximum 2540 mm Average 1600 mm Minimum 1175 mm	
Prevailing Wind Direction	:	Nov to Jan – From NW & NE Feb to Mar – From East & SE Apr to May – From South & SE June – From SW July to Aug – From NW Sept to Oct – From SE & SW Wind Speed 11.8 kmph (avg) 50 kmph (max)	
Seismic Zone	:	Seismic Zone III as per IS:1893-2002	

		minimum 0.16 g horizontal	
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1.5

1.7

Access to Site

Site is well connected to all weather road from Pattamandri on the Thiruvottiyur – Ponneri district highway. Site is located adjacent to the Chennai – Howrah broad gauge line and thus well connected by rail also.

CHAPTER – 2

GENERAL TECHNICAL REQUIREMENTS

1.00.00 ELECTRICAL SYSTEM PARTICULARS

1) Standard voltage levels

The standardized voltage levels as shall be adopted as specified elsewhere in this specification.

2) Permissible variations:

The system unit/plant equipment shall be designed suitable for continuous operation with variation in voltage and frequency as indicated below:

3) Variation in voltage and frequency

	Voltage	Frequency
Permissible variation for power supply with rated Performance /rated current and control effectiveness maintained	+/- 10%	-5% to +3%
Permissible variation for control and regulation equipment with rated Performance and control quality maintained		

4) Basic insulation levels

Equipment shall be designed suitable for basic insulation levels as given below:

Nominal Voltage (kV)	BIL kV (peak)
400 kV	1425
33 kV	170
11 kV	75
3.3 kV	40

5) Symmetrical short circuit ratings

The three phase symmetrical short circuit ratings of the switchgear at different voltage levels shall be as indicated in the Table below:

S. No.	Voltage level	Symmetrical Breaking Capacity	Making Capacity
1.	400 kV	63 kA for 1 sec	163 kA
2.	33 kV	25 kA for 3 sec	62.5 kA
3.	11 kV	50 kA for 3 sec	125 kA
4.	3.3 kV	40 kA for 3 sec	100 kA
5.	415 V	50 kA for 1 sec	125 kA
6.	220 V DC	25 kA for 1 sec	-
7.	48 V DC	10 kA for 1 sec	

6) Criteria for selection of voltage levels for motors

Sr. No	Rating	Voltage Level
1	LV Motors- Up to 160 kW	415 V, 3 phase, 50 Hz
2	MV Motors- More than 160 kW and up to 1500 kW	3.3 kV, 3 phase, 50 Hz
3	HV Motors- Above 1500 kW	11 kV, 3 phase, 50 Hz

7) System Earthing

- i. 33kV/11 kV and 3.3 kV : Resistance grounded.
- ii. 415 V : Solidly grounded.

8) Degree of Protection:

Degree of protection for various electrical equipment shall be as follows:

S.No.	Equipment	Degree of Protection
1.	Marshalling Boxes, Panels, Motors located outdoor	IP55
2.	Electrical Equipment of CH System	IP55 with dust proof enclosure
3.	HV Switchgear	IP-4X for bus bar chamber, IP-6X for other compartments
4.	LV Switchgear	IP52 up to 1600 A and IP42 above 1600 A

2.00.00 GENERAL TECHNICAL PARTICULARS FOR EHV SYSTEM

(a)	Rated voltage	400 kV
(b)	Rated frequency	50 Hz
(c)	Rated short time current withstand capacity	63 kA rms for one (1) second
(d)	Rated one minute power frequency withstand voltage	650 kV rms between live terminals and earth b) 815 kV rms across isolating distance
(e)	Rated lightning impulse withstand voltage	a) 1425 kVp between live terminals b) 1425 (+240) kVp across isolating distance & earth.
(f)	Rated Switching Impulse withstand voltage	a) 1575 kVp (between phases) b) 900 (+345) (across isolating distance)
(g)	Phase to phase spacing	4000 mm
(h)	Rated terminal load	Adequate to withstand 100 kg static load as well as wind, seismic and short circuit forces without impairing reliability or current carrying capacity.
(i)	System neutral earthing	Effectively earthed
(j)	Support structure height	Adequate so that lowest part of support insulator of equipment is 2550 mm (minimum) from ground and/or plinth level.
(k)	Creepage distance	Minimum 31 mm / kV
(l)	Electrical Clearances	

Clearances shall be as given below and as per relevant statutory rules/codes.		
1.	Phase to earth	3500 mm
2.	Phase to phase	4000 mm
3.	Sectional clearance	6500 mm
4.	Ground clearance	8000 mm

3.00.00 NA

4.00.00 COMPLETENESS

4.01.00 Bidders may note that this is a contract inclusive of the scope as indicated elsewhere in the specification. Each of the plant shall be engineered and designed in accordance with the specification requirement. All engineering and associated services are required to ensure that a completely engineered plant is provided.

4.02.00 All equipment furnished by the Bidder shall be complete in every respect, with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/or those needed for erection, completion and safe operation & maintenance of the equipment and for the safety of the operating personnel, as required by applicable codes, though they may not have been specifically detailed in the respective specifications, unless included in the list of exclusions.

All similar standard components/ parts of similar standard equipment provided, shall be interchangeable with one another.

5.00.00 CODES & STANDARDS

5.01.00 In addition to the codes and standards specifically mentioned in the relevant technical specifications for the equipment / plant / system, all equipment parts, systems and works covered under this specification shall comply with all currently applicable statutory regulations and safety codes of the Republic of India as well as of the locality where they will be installed, including the following:

- (a.) Bureau of Indian Standards (BIS)
- (b.) Indian electricity act
- (c.) Indian electricity rules
- (d.) Indian Explosives Act

- (e.) Indian Factories Act and State Factories Act
- (f.) Indian Boiler Regulations (IBR)
- (g.) Regulations of the Central Pollution Control Board, India
- (h.) Regulations of the Ministry of Environment & Forest (MoEF), Government of India
- (i.) Pollution Control Regulations of Department of Environment, Government of India
- (j.) State Pollution Control Board.
- (k.) Rules for Electrical installation by Tariff Advisory Committee (TAC).
- (l.) Any other statutory codes / standards / regulations, as may be applicable.

5.02.00 Unless covered otherwise by Indian codes & standards and in case nothing to the contrary is specifically mentioned elsewhere in the specifications, the latest editions (as applicable as on date of bid opening), of the codes and standards given below shall also apply:

- (a.) Japanese Industrial Standards (JIS)
- (b.) American National Standards Institute (ANSI)
- (c.) American Society of Testing and Materials (ASTM)
- (d.) American Society of Mechanical Engineers (ASME)
- (e.) American Petroleum Institute (API)
- (f.) Standards of the Hydraulic Institute, U.S.A.
- (g.) International Organisation for Standardization (ISO)
- (h.) Tubular Exchanger Manufacturer's Association (TEMA)
- (i.) American Welding Society (AWS)
- (j.) National Electrical Manufacturers Association (NEMA)
- (k.) National Fire Protection Association (NFPA)
- (l.) International Electro-Technical Commission (IEC)
- (m.) Expansion Joint Manufacturers Association (EJMA)
- (n.) Heat Exchange Institute (HEI)

5.03.00 Other International/ National standards such as DIN, VDI, BS, etc. shall also be accepted for only material codes and manufacturing standards, subject to the Owner's approval, for which the Bidder shall furnish, alongwith the offer, adequate information to justify that these standards are equivalent or superior to the standards mentioned above. In all such cases the Bidder shall furnish specifically the variations and deviations from the standards mentioned else

where in the specification together with the complete word to word translation of the standard that is normally not published in English.

~~5.04.00~~ — NA

5.05.00 NA

5.06.00 NA

5.07.00 In case of any change in codes, standards & regulations between the date of bid opening and the date when vendors proceed with fabrication, the Owner shall have the option to incorporate the changed requirements or to retain the original standard. It shall be the responsibility of the Bidder to bring to the notice of the Owner such changes and advise Owner of the resulting effect.

6.00.00 EQUIPMENT FUNCTIONAL GUARANTEE

6.01.00 The Equipment and Auxiliaries shall be capable of continuous operation in frequency range of 47.5 to 51.5 Hz.

DRAWING DOCUMENT SUBMISSION

4.1 DISCREPANCIES BETWEEN DRAWING AND SPECIFICATION:

Should there be any discrepancy between the specifications and/or schedule of prices and/or drawings or any inconsistency, error or omission in either of them, reference must be made to the BHEL/CUSTOMER for an explanation and the Supplier will be held responsible for any errors that may occur in the work through neglect of this precaution. The explanation of the BHEL/CUSTOMER shall be final and binding on the Supplier.

4.2 APPROVAL PROCEDURE

The scheduled dates for the submission of drawings as well as for, any data/information to be furnished by the Employer would be as per the following schedule. The supplier shall also submit required no. of copies as mentioned in this specification of all drawings/design documents/test reports for approval by the Employer. The following schedule shall be followed generally for approval.

i.	First Submission	Within 7 days from the date of LOI/PO
ii.	Approval/comments/by employer on Initial submission	Reasonable time
iii.	Resubmission	Within 7 days (whenever from date of comments required) Including both ways postal time.
iv.	Approval or comments	Within 2 weeks of receipt of resubmission.
v.	Furnishing of distribution copies	2 weeks from the date of last approval.

Note: The supplier may please note that all resubmissions must incorporate, all comments given in the submission by the Employer failing which the submission of documents is likely to be returned. Every revision shall be a revision number, date and subject, in a revision block provided in the drawing, clearly marking the changes incorporated.

The title block of drawings shall contain the following information incorporated in all contract drawings. Please refer enclosed sheet for details of Title block.

4.3 TITLE BLOCK

Following Title Blocks to be used in drawings at the time of drawing approvals

Project:	400kV GIS at 2 x 660 MW Ennore SEZ Supercritical Thermal Power Project at Ash Dyke of NCTPS, Chennai-120		
NOA No:	CE/P/SE/M/P/EE-10/E/P/F.2X660MW	ENNORE	SEZ
Customer :	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)		
Consultant	DESEIN PRIVATE LIMITED, NEW DELHI		
Contractor	BHARAT HEAVY ELECTRICALS LIMITED		

4.4 DOCUMENTS TO BE SUBMITTED ALONG WITH OFFER

- 1) Drawings
- 2) Guaranteed Technical Particulars
- 3) Type Test Reports
- 4) List of Part Supplies with rating

Drawings & Documents submitted at the time of offer shall be subject to review at contract stage.

4.5 DOCUMENTATION SCHEDULE

Following Documentation schedule to be followed per project.

S. No.	DESCRIPTION	TENDER STAGE	CONTRACT STAGE FOR APPROVAL	FINAL DOCUMENTATION	
			Hard Copy / Prints	Hard Copy / Prints	CDs
1	Drawings and Data Sheets	1	7	10	5
2	Drawings "As Built "	-	-	10	
3	Type Test Reports	1	7	10	
4	Erection Manuals	-	7	10	
5	Operation and Maintenance Manuals	-	7	10	
6	Manufacturing Quality Plan	-	7	10	
7	Field Quality Plan	-	7	10	

8	Inspection Test Reports	-	7	10	
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Supplier to submit Hard copies of the drawing to following address

To,
<Name of BHEL's concerned engineering official>
Bharat Heavy Electricals Limited
Transmission Business Group- Engineering Management
Advant Navis IT Business Park
Plot No.-7, Greater Noida Expressway,
Sector 142, **NOIDA**, Uttar Pradesh 201305

Note: Drawings will also be submitted in CD/DVD in Latest AUTOCAD version or any other CAD package along with conversion files for all major items.

Final Documentation shall be submitted in bound volumes with details of Customer & Project etc. written on top.

ANNEXURE-A.1: SCHEDULE OF TECHNICAL DEVIATIONS

Bidder shall list out all technical deviation(s) along with clause with respect to technical specifications.

Sl. No.	Page No.	Clause No.	Deviation	Reason / Justification
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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:

Bidder's Stamp & Signature

ANNEXURE-A.2: COMPLIANCE CERTIFICATE

The bidder shall confirm compliance to the following by signing/ stamping this compliance certificate and furnishing same with the offer.

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same.
2. There are no deviation with respect to specification other than those furnished in the 'schedule of deviations'.
3. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.
4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.
5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in 'BOQ' of the specification shall not be considered (i.e., technical description & quantities as per the specification shall prevail).

Date:

Bidder's Stamp & Signature

ANNEXURE-B.1: Clamps & Connectors with Accessories

(To be submitted by the supplier at the contract execution stage)

- 1.0 Name of the Project :
- 2.0 Manufacture's name and address :
- 3.0 Applicable standards :
- 4.0 Application :
- 5.0 Type :
- 6.0 For connection to :
- a) Conductor size and arrangement :
- b) Equipment terminal and arrangement :
- 7.0 Material (state percentage – composition of constituents and impurities present) :
- a) Clamp body :
- b) Bolts and nuts :
- c) Spring washers :
- d) Liners, if any :
- 8.0 Rated current (A) :
- 9.0 Maximum temperature rise over reference ambient temperature when carrying rated current (°C) :
- 10.0 Rated terminal load and factor of safety (Kg):
- 11.0 Minimum thickness of any part (mm) :
- 12.0 Weight of clamp complete with hardware (Kg):
- 13.0 Machine accuracy for matching surface :
- 14.0 Service (Indoor/Outdoor) :

Date:

Bidder's Stamp & Signature

ANNEXURE-C.1: Technical Checklist for Clamps & Connectors with Accessories

(Checklist for information to be furnished with offer. Return this technical checklist as a part of technical offer duly signed. The offer may not be considered if the following information, if this checklist is not enclosed with this offer)

BHEL Enquiry No.:

Bidder Offer Ref.:

(1) TECHNICAL REQUIREMENTS (CLAMPS & CONNECTORS WITH ACCESSORIES)

(1)	(2)	(3)	(4)	(5)
S.No.	Parameter/ Requirement	400 kV	Yes / No	Remarks in case reply in Col (4) is No
1.	Material of Clamps & Connectors with accessories			
a)	Clamp body	Designation A6 of IS 617	YES/NO	
b)	Bolts, nuts and plain washers	For sizes below M12, electro galvanized mild steel, For sizes M12 and above, for Hot dip galvanized	YES/NO	
c)	Spring washers	Electro galvanized mild steel suitable for at least service conditions-3 as per IS:1573	YES/NO	
d)	Liners for terminals which are of copper alloy	Liner of minimum thickness 2mm shall be cast integral with the aluminium alloy body (For Bimetallic connectors)	YES/NO	
2.	Continuous current rating	As per Annexure I (Bill of Quantity)	YES/NO	
3.	Maximum temperature rise when carrying estimated fault current (63kA for 1s for 400kV)	35°C over ambient temperature 50°C	YES/NO	
4.	Corona extinction voltage	320kV	YES/NO	
5.	Fault current level for 1second	63kA	YES/NO	
6.	Highest system voltage	420kVrms	YES/NO	
7.	Rated lightning (Full wave) impulse withstand voltage (1.2/50 micro sec.) dry & wet	1425kVp	YES/NO	
8.	Rated Switching impulse withstand voltage ((250/2500 micro sec.) dry & wet	1050 kVp	YES/NO	

9.	Rated one minute power frequency withstand voltage	650kVrms	YES/NO	
10.	Corona extinction voltage	320kV	YES/NO	
11.	Minimum thickness of any current carrying part of clamps & connector and accessories	10mm	YES/NO	

2. TYPE TESTS

Whether Type test reports as per clause no. 1.4 of section-1 has been submitted.

YES/NO

If yes, kindly indicate report number.

If the valid type test reports are not available as per clause no. of section -1 of technical specification with the bidder, then the type tests shall be conducted by the bidder without any price implication

YES/NO

Date:

Bidder's Stamp & Signature