

**TELANGANA SUPER THERMAL POWER PROJECT
PHASE-1 (2X800MW) STEAM GENERATOR ISLAND
PACKAGE**

***TECHNICAL SPECIFICATION FOR
LT NON-SEGREGATED BUSDUCT***

BHEL DOCUMENT NO. : EPD-BD-CPBG-CPM013, REV-0



**BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAINS DIVISION
BANGALORE – 560012**



**TELANGANA SUPER THERMAL POWER PROJECT
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STEAM GENERATOR ISLAND PACKAGE**

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SPECIFICATION NO. : EPD-BD-
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VOLUME NO. :

SECTION :

REV NO. : 00 DATE: 21-05-2018

SHEET : 1 OF 1

DOCUMENTS TO BE SUBMITTED

1. GENERAL TECHNICAL PARTICULARS/DATASHEET
2. SIZING CALCULATION
3. TYPE TEST REPORTS
4. GA DRAWING
5. MANUFACTURING QUALITY PLAN



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SCOPE OF ENQUIRY

- 1.0** This specification covers the design, manufacture, site support, inspection and testing at manufacturer's works, proper packing and delivery to site of **LOW VOLTAGE NON-SEGREGATED BUSUDCT** as mentioned in different sections of this specification for **TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE**.
- 2.0** It is not the intent to specify herein all the details of design & manufacture. However, the equipment shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation up to vendor's guarantee.
- 3.0** The general terms and conditions, instruction to tenderer and other attachment referred to elsewhere are hereby made part of the tender specification.
- 4.0** The tendered shall be responsible for and governed by all requirements stipulated hereinafter.
- 5.0** Deviations, if any should be brought out very clearly on deviation sheet enclosed with specification only. Otherwise it will be presumed that the tenderer's offer is in line with what has been stated/asked for in this specification.
- 6.0** The offer should be complete with technical data, catalogues, brochures and drawings as applicable.
- 7.0** Qualification data: In order to be able to propose to the client the proven-ness of the equipment's/ item offered, the bidder is required to elaborate details of experience, capabilities, reference list etc. in the offer.
- 8.0** The documents shall be in English language and MKS system of units.

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
	TEMPERATURE -RISE The temperature rise of the horizontal and vertical busbars and main bus links including all power draw out contacts when carrying 90% of the rated current along the full run shall in no case exceed 55 deg C with silver plated joints and 40 deg C with all other types of joints over an outside ambient temperature of 50 deg C. The temperature rise of the accessible parts/external enclosures expected to be touched in normal operation shall not exceed 20deg. C. The temperature rise of manual operating means shall not exceed 10deg. C for metallic & 15 deg. C for insulating material. Temperature rise for the busbars shall be carried out at 90% of the rated current. The above temperature rise limits are applicable for busducts also without any current derating.		
28.00.00	METAL ENCLOSED NON SEGREGATED PHASE BUSDUCT(AIR INSULATED)		
28.1.00	Three phase and neutral metal enclosed non segregated phase bus duct assemblies shall be supplied for incoming connections from the transformers to the switch boards and inter connecting sections between switch boards, wherever transformer rating is 1000KVA and above. The rating of the incoming and interconnecting bus ducts shall be same as the rating of the switchboard.		
28.2.00	The enclosure shall be made of minimum 3 mm thick aluminum alloy. The section of the bus duct shall be rectangular. The design of the bus duct enclosures shall be of sturdy construction such that it will withstand the internal or external forces resulting from the various operating conditions.		
28.3.00	The entire bus duct shall be designed for dust, vermin and weather proof construction. A suitable aluminum sheet flange-protection hood shall be provided to cover all outdoor bus duct enclosure joints to facilitate additional protection against rain water ingress. All horizontal runs of bus ducts shall have a suitable sloped enclosure top to prevent retention of water for both indoor and out door portion of bus ducts. Bus duct enclosure shall have a degree of protection of IP-55.		
28.4.00	The inside of the bus enclosure may be treated with black paint to enable efficient heat dissipation. The matt paint used shall be suitable for temperature experienced during continuous loading of the bus conductor. The bus duct exterior paint shade shall be RAL 5012.		
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE		TECHNICAL SPECIFICATION SECTION –VI, PART-B BID DOC NO : CS-9591-101-2	SUB SECTION B-06 LT SWITCHGEARS & LT BUSDUCT
			PAGE 35 OF 66

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
28.5.00	Flexible expansion joints for the enclosure shall be provided wherever deemed necessary by the Contractor. Necessary bonding shall be provided at the expansion joints if made of insulating materials.		
28.6.00	Enclosures shall be provided with flanged ends with drilling dimensions to suit the flanges at the switchgear and transformer terminals. Any adapter boxes required for this purpose are in the Contractor's scope of supply. The flanges shall be provided with gaskets, nuts, bolts, etc. Details of the flanges provided on transformer ends will be furnished to the successful Contractor.		
28.7.00	Suitable Inspection covers shall be provided for periodic inspection of insulators. Handle shall be provided on each inspection cover to facilitate easy lifting.		
28.8.00	The EPDM / Neoprene gaskets shall be provided so as to satisfy the operating conditions imposed by temperature, weathering, durability etc. Flange gaskets shall be provided at the equipment terminal connections.		
28.9.00	Necessary earthing arrangement as applicable shall be provided with clamps to receive station earthing bus. All accessories and hardware required for the earthing arrangement shall be provided by the Contractor. This shall be a GI strip of adequate size, continuously running along the bus duct and shall be earthed at both ends. Bus duct enclosures shall be bolted type.		
28.10.00	The material of the conductor shall be aluminum. The minimum clearance in air between phase to phase, phase to neutral and phase to earth for the entire run of bus duct shall be 25 mm The bus bars shall be rated in accordance with the service conditions and the rated continuous and short time current ratings calculated for specific application / specified elsewhere.		
28.11.00	All steel structures required for bus duct support shall be hot dip galvanized.		
28.12.00	Space heaters shall be provided in the bus duct wherever the manufacturer considers them necessary and recommends their provision for preventing harmful moisture condensation.		
28.13.00	The space heaters shall be suitable for continuous operation on 240 V AC, 50 Hz single phase supply and shall be automatically controlled by thermostats. Necessary wiring upto junction boxes mounted on bus duct and from junction boxes to switch boards shall be provided by the Contractor.		
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE		TECHNICAL SPECIFICATION SECTION –VI, PART-B BID DOC NO : CS-9591-101-2	SUB SECTION B-06 LT SWITCHGEARS & LT BUSDUCT
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Technical Data Sheet
For
Non Segregated Phase Busduct

Standard Technaical Data sheet for 415V, 4000A/3000A/2500A/1600A Non Segregated Phase Busduct

Sl. No.	Description	
1.0	General	
1.1	Make	
1.1	Service	Outdoor / Indoor
1.2	Cooling System	Natural Air Cool
1.3	Type of Busduct	Non Segregated Phase Busduct
1.4	System Nominal Voltage	415V 61439
1.5	Reference Standard	IEC 61435 - Part 1 & 2 IS 8623 - Part 1 & 2
1.6	System	Triple Pole & Neutral
1.7	Short Time Current Rating for One Second Withstand	50 KA (RMS)
1.8	Dynamic Current Rating	105 KA (PEAK)
1.9	Temperature Rise over the specified an ambient	50° C
	a) Busbar / Conductor	40° C
	b) Enclosure	20° C
1.10	Degree of Protection	IP - 55
1.11	Power Frequency for one minute	2.5 KV
2.0	Busbar	
2.1	Material	Al Alloy
2.2	Make	BALCO / Hindalco,Jindal & Century
2.3	Grade	63401 WP as per IS:5082 (Latest)
2.4	Shape	Flat
2.5	Type of joints	Rigid joint/Expansion joint
2.6	Busbar Joint Hardware Material	H.T.S. Electro Plated

Sl. No.	Description	
3.0	Enclosure	
3.1	Material	AL. Alloy
3.2	MAKE	BALCO / Hindalco,Jindal & Century
3.3	Grade	19000 H2 as per IS : 737
3.4	Shape	Rectangular
	a) Outdoor	Rectangular with slopping top
	b) Indoor	Rectangular with slopping top
3.5	Thickness of Enclosure	3 mm
3.6	Type of Flange Joints	With EPDM Gasket
3.7	Flange Joint Hardware Material	M.S. Electro Galvanised
4.0	Access door/Inspection cover	
4.1	Material	AL. Alloy
4.2	Grade	19000 H2
4.3	Size	As per requirement
4.4	Thickness	3 mm
4.5	Location / Position of Access door	19000 H2
	a) Outdoor	Top / Bottom
	b) Indoor	Top / Bottom
4.6	Type of Flange Joints	With EPDM Gasket
4.7	Flange Joints Hardware Material	M.S. Electro Galvanised
5.0	Busbars Supports	
5.1	Material	SMC (Polyster Glass Field)

Sl. No.	Description	
5.2	Make	
5.3	Creepage distance	25 mm (min)
5.4	Thickness	10 mm/12 mm
5.5	Type	Finger Support
6.0	Minimum Air Clearance	
6.1	Phase to Phase	25 mm. (min.)
6.2	Phase to Earth	25 mm. (min.)
7.0	Grounding Conductor (Earthing jumper)	
7.1	Material	AL. Alloy
7.2	Shape	Flat
7.3	Size	2-50x10 (Between two enclosure Joint & Both side)
8.0	Space Heater [*]	
8.1	Type	Indoor
8.2	Power	60 W
8.3	Voltage	240 V
8.4	Phase	Single
8.5	Thermostat	30-110°C
9.0	Painting	
9.1	Busbar/Elclosure Interior	Matt Black
9.3	Elclosure Exterior	PU Spray paint of RAL 5012.
•		

The above mentioned details are tentative, however same shall be as per manufacturer standard and approved type test by NTPC.

GEN. NOTES:-

1. All dimensions are in mm unless otherwise specified.
2. Tightening torque for M12 bolt = 55 Nm (Busbar joint)
3. Tightening torque for M8 bolt = 17 Nm (Enclosure Joint)

CLAUSE NO.	DATA REQUIREMENTS
	TECHNICAL DATA SHEET FOR 415V LT BUSDUCT 19.00.00 415 V NON SEGREGATED BUSDUCTS a) Manufacturer's name & address b) Type of busduct c) Material and cross section of busbars d) Rated voltage (volts) e) Maximum voltage at which busduct can operate continuously (volts) f) Continuous current rating of busbars (Amps)
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800MW) STEAM GENERATOR ISLAND PACKAGE	TECHNICAL DATA SHEETS SECTION-VI, PART-G BID DOC NO:CS-9591-101-2 DB4: LT SWITCHGEAR PAGE 8 OF 10

CLAUSE NO.	DATA REQUIREMENTS		
	g) Short circuit current ratings & duration (kA /Sec) h) Momentary current rating kA peak i) Temperature rise over the ambient temperature i) Busbars ii) Enclosures j) Material of support insulator k) No. and arrangement of support insulators l) Material of Gaskets m) One minute power frequency withstand voltage (kV) n) Minimum creepage distance over insulator (mm) o) Conductor treatment p) Clearance (mm) i) Phase to Phase ii) Phase to earth q) Average weight per meter of busduct (kg) r) Material and thickness of Busduct s) Shape & size of enclosure 		
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800MW) STEAM GENERATOR ISLAND PACKAGE		TECHNICAL DATA SHEETS SECTION-VI, PART-G BID DOC NO:CS-9591-101-2	DB4: LT SWITCHGEAR PAGE 9 OF 10

SL NO		COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT#	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
						M	C/N				M	C	N	
REFERENCE QUALITY PLAN ITEM / EQUIPMENT LT BUSDUCT (415V) QP NO.: BD/QC/2006 DATE : 30-08-07 PAGE : 5 OF 5 एनटीपीसी NTPC SIGN. OF MFR TO BE FILLED IN BY NTPC QP NO: 0000-999-QVE-P-178 REV. NO.: 1 DATE : 28-05-08 VALID UPTO: 27-05-11 REVIEWED BY: A. MANDAL V. TALWAR S.D. SINGH O.P. NIRANJAN APPROVED BY: S. K. KHOSLA														
1	2	3	4	5	6	7	8	9	D*	**	10	11		
		7. Busbar joint & fish plate dim. including clearance	- do -	- do -	- do -	- do -	- do -	- do -	- do -	- do -	✓	P	W	W
		8. Paint shade, finish thickness & adhesion	- do -	- do -	- do -	- do -	- do -	- do -	- do -	- do -	✓	P	W	W
		9. Trail assembly (Few sections)	- do -	- do -	100%	100%	- do -	- do -	- do -	- do -	✓	P	W	W
Electrical Tests														
		1. HV test on busbars	Critical	Electrical	100%	100%	IS: 8623: 1993	IS: 8623: 1993	QC Record	- do -	✓	P	W	W
		2. IR test on busbar	- do -	- do -	- do -	- do -	- do -	- do -	- do -	- do -	✓	P	W	W
		3. Continuity test of space heater / thermostat	- do -	- do -	- do -	- do -	NTPC appd. Drg.	NTPC appd. Drg.	- do -	- do -	✓	P	W	W
		4. HV test on space Heater wiring at 1.5kV for 1 min.	- do -	- do -	- do -	- do -	- do -	- do -	- do -	- do -	✓	P	W	W
		5. Milli Volt drop test at 100A DC a. For flexible joint b. For rigid joint	- do -	- do -	1 sample for each rating	1 sample for each rating	IS 5561: 1970	IS 5561: 1970	- do -	- do -	✓	P	W	W
4.1	MS Structure (Galvanizing to be carried out from NTPC approved source)	1. Dimension	Major	Measurement	100%	100%	NTPC appd. Drg.	NTPC appd. Drg.	- do -	- do -		P	V	V
		2. Physical properties	- do -	Test	Sample	Sample	IS: 2060: 1992	IS: 2060: 1992	- do -	- do -		P	V	V
		3. Galvanizing												
		a. Hammer test	- do -	Mech	IS:4759:1996	IS:4759:1996	IS: 4759: 1996	IS: 4759: 1996	- do -	- do -		P	W	V
		b. Preece test	- do -	- do -	- do -	- do -	- do -	- do -	- do -	- do -		P	W	V
		c. Stripping	- do -	Chemical	- do -	- do -	- do -	- do -	- do -	- do -		P	W	V
		d. Visual	- do -	Visual	- do -	- do -	- do -	- do -	- do -	- do -		P	W	V
		e. Check for Galv thickness	- do -	Measurement	- do -	- do -	- do -	- do -	- do -	- do -		P	W	V

LEGEND: * RECORDS IDENTIFIED WITH 'TICK' (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
 ** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER, N: NTPC, P: PERFORM, W: WITNESS AND V: VERIFICATION AS APPROPRIATE. CHP: NTPC SHALL IDENTIFY IN COLUMN 'N' AS 'W'

Note: # NTPC Inspection Engineer to check approval date/revision no. of reference documents at the time of inspection

		REFERENCE QUALITY PLAN					एनटीपीसी NTPC		TO BE FILLED IN BY NTPC				
		ITEM / EQUIPMENT LT BUSDUCT (415V)		QP NO.: BD/QC/2006 DATE: 30-08-07 PAGE: 4 OF 5		SIGN. OF MER 		QP NO.: 0000-999-QVE-P-178 REV. NO.: 1 DATE: 28-05-08 VALID UPTO: 27-05-11		REVIEWED BY A. MANDAL V. TALWAR S. D. SINGH O. P. NIRANJAN		APPROVED U. R. KHOSLA 28 MAY 2008	
SL NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK M G/N		REFERENCE DOCUMENT#	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY M C N			REMARKS
1	2	3	4	5	6	7	8	9	10	11	12		
		3 Bolting & overlap check	- do -	- do -	- do -	- do -	- do -	- do -	- do -		P	V	-
3.4	Assembly & Busbar supporting arrangement	1 Support insulator "C" to "C" distance	Major	Measurement	100%	100%	Fabrication drawing	Fabrication drawing	QC Record		P	V	-
		2 Completeness	- do -	- do -	- do -	- do -	NTPC appd. Drg	NTPC appd. Drg	- do -		P	V	-
3.5	Aluminum Flexible	1 Marking lamination bunch after deburring	- do -	Counting	- do -	- do -	Fabrication drawing	Fabrication drawing	QC Record		P	V	-
		2 Lamination bunch bending	- do -	Visual	- do -	- do -	- do -	- do -	- do -		P	V	-
		3 Palm plate tracking	- do -	Measurement	- do -	- do -	- do -	- do -	- do -		P	V	-
		4 Quality of butt joint welding	- do -	NDT (DP) NDT (RT)	10% 2%	10% 2%	GD&D 198-79 GD&D 198-79	GD&D 198-79 GD&D 198-79	- do - - do -		P	W	W
4	Final Inspection												
	Type test	Type test clearance from NTPC Engg. To be verified by NTPC RIO											
4.1	Busduct section	Routine Tests											
		1 Check on assembly of Busduct w.r.t. a Busbar Location b Earth Bus Location c Manhole, Inspection window, Flange holes	Critical	Measurement	100%	One full run per offered Lot	NTPC appd. Drg	NTPC appd. Drg	QC Record		P	W	W
		2 Dimension, general arrangement & marking	Critical	Measurement	100%	100%	NTPC appd. Drg	NTPC appd. Drg	QC Record		P	W	W
		3 Busbar support center line distance	- do -	- do -	- do -	- do -	- do -	- do -	- do -	✓	P	W	W
		4 Busbar flexible joint DP test	- do -	Visual	At random	At random	GD&D 198	GD&D 198	- do -	✓	P	W	W
		5 Insulator tightness by torque measure	- do -	Measurement	- do -	- do -	NTPC appd. Drg	NTPC appd. Drg	- do -	✓	P	W	W
		6 Ph to Ph & Ph to earth clearance	- do -	- do -	- do -	- do -	- do -	- do -	- do -	✓	P	W	W

LEGEND: * RECORDS IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION
 ** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION. AS APPROPRIATE. CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS W

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REFERENCE QUALITY PLAN



TO BE FILLED IN BY NTPC

ITEM / EQUIPMENT
**LT BUSDUCT
(415V)**

QP NO.: BD/QC/2006
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QP NO.: 0000-999-QVE-P-178
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VALID UPTO: 27-05-11

REVIEWED BY:
A. MANDAL
V. TALWAR
S. D. SINGH
D. P. NIRANJAN

APPROVED BY



SL NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT#	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
1.	2.	3.	4.	5.	M	C/N	7.	8.	9.	D*	**	10.	
2.6	Hardware												
	a) HT bolt & nut Gr. 8.8 for busbar	1. Dimension	Major	Measurement	Random	-	IS 1363, 1364 & IS 1367	IS 1363, 1364 & IS 1367	QC Record		P	-	-
	b) HT bolt & nut Gr. 4.6 for Structure	2. Threading	- do -	Visual	Sample	-	- do -	- do -	- do -		P	-	-
	c) Plan / Spring washer	3. Electroplating (Galvanizing)	- do -	Chemical	Sample	-	- do -	- do -	Mfg TC		P	-	-
3	In-process inspection												
3.1	Welders Qualification	1. WPS	Critical	-	100%	100%	ASME-IX	ASME-IX	QW - 482		P	V	V
		2. PQR	- do -	-	- do -	- do -	- do -	- do -	QW - 483		P	V	W
		3. Welder qualification	- do -	-	- do -	- do -	- do -	- do -	QW - 483		P	V	W
3.2	Fabrication of Enclosure	1. Marking	Major	Measurement	100%	-	Fabrication drawings	Fabrication drawings	QC Record		P	-	-
		2. Cutting	- do -	- do -	- do -	-	- do -	- do -	- do -		P	-	-
		3. Bending	- do -	- do -	- do -	-	- do -	- do -	- do -		P	-	-
		4. Tacking	- do -	- do -	- do -	-	- do -	- do -	- do -		P	-	-
		5. Welding quality	Critical	DP test & RT test (circumferential Butt Joint)	DP 10% RT 2%	DP 10% RT 2%	As per GD&D 198-79	As per GD&D 198-79	- do -		P	W	W
		6. Inside painting thickness check											
	a) Primer		Major	Measurement	100%	100%	Mfr's std.	Mfr's std.	- do -		P	-	-
	b) Black paints & matt finish		- do -	- do -	- do -	- do -	- do -	- do -	- do -		P	-	-
	7. Drilling & dressing		- do -	Visual	100%	100%	Fabrication drawing	Fabrication drawing	- do -		P	V	-
3.3	Conductor & fish plate fabrication	1. Marking Dimension	Major	Measurement	100%	100%	Fabrication drawing	Fabrication drawing	QC Record		P	V	-
		2. Cutting & preparation	- do -	- do -	- do -	- do -	- do -	- do -	- do -		P	V	-

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** M MANUFACTURER/SUB-SUPPLIER C MAIN SUPPLIER N NTPC P PERFORM W WITNESS AND V VERIFICATION AS APPROPRIATE. CHP NTPC SHALL IDENTIFY IN COLUMN 'N' AS W

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REFERENCE QUALITY PLAN

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NTPC

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ITEM / EQUIPMENT
**LT BUSDUCT
(415V)**

QP NO.: BD/QC/2006
DATE: 30-08-07
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SIGN. OF MFR



QP NO: 0000-999-QVE-P-178
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REVIEWED BY
A. MANDAL
V. TALWAR
S.D. SINGH
G.P. NIRANJAN

APPROVED BY

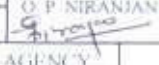


VALID UPTO: 27-05-11

Sl. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT#	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY		
					M	C/N					M	C	N
1.	2.	3.	4.	5.	6.	7.	8.	9.	D*	**	10.		
2.2	Thermostat	1. Rating Plate	Major	Visual	100%	-	NTPC appd. Drg. & data sheet	NTPC appd. Drg. & data sheet	QC Record		P	-	-
		2. Operational test	- do -	Elect.	- do -	-	Mfr Std	Mfr Std	- do -		P	-	-
2.3	EPDM Bellow / Synthetic rubber / Neoprene gasket	1. Dimension & make	Major	Measurement	10%	10%	NTPC Spec	NTPC Spec	Mfr's TC		V	V	V
		2. Surface finish	- do -	Visual	100%	100%	No crack & mfg defect	No crack & mfg defect	- do -		V	V	V
		3. Shore hardness	- do -	Mech.	1 sample per lot	1 sample per lot	IS - 3400 (II) : 1995 / IS 11149	IS - 3400 (II) : 1995 / IS 11149	- do -		V	V	V
		4. Aging test	- do -	- do -	- do -	- do -	- do -	- do -	- do -		V	V	V
		a. Tensile strength before & after ageing	- do -	- do -	- do -	- do -	- do -	- do -	- do -		V	V	V
		b. Shore hardness before & after ageing	- do -	- do -	- do -	- do -	- do -	- do -	- do -		V	V	V
2.4	Paint	1. Type & grade of paint	Major	Verify	100%	100%	IS 101 : 1964	IS 101 : 1964	Mfr's TC		V	V	-
		2. All routine test i.e. flash point, viscosity etc	- do -	Chem / Visual	1 Sample / lot	1 Sample / lot	- do -	- do -	- do -		V	V	-
		3. Shade & make	- do -	Verify	100%	100%	IS - 5 : 1994 / NTPC appd Drg	IS - 5 : 1994 / NTPC appd Drg	QC Record		P	V	-
2.5	Busbar support insulator (FRP)	1. Tensile strength	Major	Mech.	1 sample per lot	1 sample per lot	IS - 10192 : 1982	IS - 10192 : 1982	Mfr's TC		V	V	V
		2. Cross breaking strength	- do -	- do -	- do -	- do -	- do -	- do -	- do -		V	V	V
		3. Compressive strength	- do -	- do -	- do -	- do -	- do -	- do -	- do -		V	V	V
		4. Comparative tracking index	- do -	- do -	- do -	- do -	IS - 2824 : 1975	IS - 2824 : 1975	- do -		V	V	V
		5. HV test (flatwise & edgewise)	- do -	Elect.	5 sample per lot	5 sample per lot	IS - 10192 : 1982	IS - 10192 : 1982	- do -		V	V	V
		6. IR test	- do -	- do -	- do -	- do -	- do -	- do -	- do -		V	V	V
		7. Dimension	- do -	Measurement	- do -	- do -	NTPC appd. Drg	NTPC appd. Drg	NTPC appd. Drg		P	V	V
		8. Surface finish	- do -	Visual	- do -	- do -	No mfg. defect	No mfg. defect	NTPC appd. Drg		P	V	V

LEGEND: * RECORDS IDENTIFIED WITH 'TICK' (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION AS APPROPRIATE. CHP: NTPC SHALL IDENTIFY IN COLUMN 'N' AS 'W'

Note: # NTPC Inspection Engineer to check approval date/revision no. of reference documents at the time of inspection

		REFERENCE QUALITY PLAN					एनटीपीसी NTPC		TO BE FILLED IN BY NTPC				
		ITEM / EQUIPMENT LT BUSDUCT (415V)		QP NO.: BD/QC/2006 DATE: 30-08-07 PAGE: 1 OF 5		SIGN. OF MFR 		QP NO: 0000-999-QVE-P-178 REV. NO.: 1 DATE: 28-05-08 VALID UPTO: 27-05-11		REVIEWED BY A. MANDAL V. TALWAR S. D. SINGH O. P. NIRANJAN 		QUALITY ASSURANCE  REMARKS	
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK M C/N		REFERENCE DOCUMENT#	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY M C N			
1	2	3	4	5	6		7	8	9	10	11	12	

Note # 1. Makes of bought out items will be as agreed for specific package / project with NTPC QA.
2. Documents identified in the QP for NTPC verification will be maintained. However, other documents i.e. QC records & supplier's TC's mentioned in the QP will also be maintained by the Manufacturer, which NTPC may verify on surveillance basis at the time of final inspection.

1 Raw Material													
1.1	Aluminum Sheet	1. Aluminum grade	Major	Visual	100% per lot	100% per lot	NTPC appd. Drg. & data sheet	NTPC appd. Drg. & data sheet	Mfgr's TC		V	V	V
		2. Chemical composition	- do -	Chemical	1 sample per lot	1 sample per lot	IS : 737 : 1986	IS : 737 : 1986	- do -		V	V	-
		3. Tensile strength	- do -	Mech	1 sample per lot	1 sample per lot	IS : 1816 : 1979	IS : 1816 : 1979	- do -		V	V	-
		4. % of elongation	- do -	- do -	- do -	- do -	IS : 1816 : 1979	IS : 1816 : 1979	- do -		V	V	-
		5. Bend test	- do -	- do -	Sample as per IS 737	Sample as per IS 737	IS : 737 : 1986	IS : 737 : 1986	- do -		V	V	-
		6. Surface finish	- do -	Visual	1 sample per lot	1 sample per lot	No manufacturing defect	No manufacturing defect	QC Record		P	V	-
		7. Dimension check	- do -	Measurement	-do-	-do-	Mnfr Standard	Mnfr Standard	- do -		P	V	-
1.2	Aluminum Busbar (Channel / Flat)	1. Aluminum grade	Major	Visual	100% per lot	100% per lot	NTPC appd. Drg. & data sheet	NTPC appd. Drg. & data sheet	Mfgr's TC		V	V	V
		2. Chemical composition	- do -	Chemical	1 sample per lot	1 sample per lot	IS : 5082 : 1998	IS : 5082 : 1998	- do -		V	V	-
		3. Tensile strength	- do -	Mech	- do -	- do -	IS : 1816 : 1979	IS : 1816 : 1979	- do -		V	V	-
		4. % of elongation	- do -	- do -	- do -	- do -	IS : 1816 : 1979	IS : 1816 : 1979	- do -		V	V	-
		5. Bend test	- do -	- do -	Sample as per IS 737	Sample as per IS 737	IS : 5082 : 1998	IS : 5082 : 1998	- do -		V	V	-
		6. Surface finish	- do -	Visual	1 sample per lot	1 sample per lot	No manufacturing defect	No manufacturing defect	QC Record		P	V	-
		7. Dimension check	- do -	Measurement	- do -	- do -	NTPC appd. Drg. & data sheet	NTPC appd. Drg. & data sheet	- do -		P	V	-
		8. Conductivity	- do -	Elect	- do -	- do -	IS : 5082 : 1998	IS : 5082 : 1998	QC Record / Mfgr's TC		P	V	V
2 Components													
2.1	Space Heater	1. Voltage / wattage rating	Major	Visual	10%	-	NTPC appd. Drg. & data sheet	NTPC appd. Drg. & data sheet	QC Record		P	-	-
		2. HV test at 1.5 KV for 1 min.	- do -	Elect	100%	-	IS : 8623	IS : 8623	- do -		P	-	-
		3. Functional test	- do -	- do -	- do -	-	Mfd Std	Mfd Std	- do -		P	-	-

LEGEND: * RECORDS, IDENTIFIED WITH 'TICK' (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
** M: MANUFACTURER/SUB-SUPPLIER C: MAIN SUPPLIER N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION AS APPROPRIATE. CHP: NTPC SHALL IDENTIFY IN COLUMN 'N' AS 'W'.

Note # NTPC Inspection Engineer to check approval date/revision no. of reference documents at the time of inspection.



PRICE SCHEDULE FOR LT BUSDUCT
PROJECT:- TELANGANA SUPER THERMAL POWER PROJECT
PHASE-I (2X800 MW)
STEAM GENERATOR ISLAND PACKAGE

MATL CODE	DESCRIPTION	UNIT	QTY	unit Price	Total Price
ELCPBGBD190101	4000A PER METER LENGTH BUSDUCT	MTR	270		
ELCPBGBD190102	3200A PER METER LENGTH BUSDUCT	MTR	234		
ELCPBGBD190103	2500A PER METER LENGTH BUSDUCT	MTR	60		
ELCPBGBD190104	1600A PER METER LENGTH BUSDUCT	MTR	80		
ELCPBGBD190105	ADNL HRDWR FOR 90DEG BEND 4000A	SET	50		
ELCPBGBD190106	ADNL HRDWR FOR 90DEG BEND 3200A	SET	36		
ELCPBGBD190107	ADNL HRDWR FOR 90DEG BEND 2500A	SET	18		
ELCPBGBD190108	ADNL HRDWR FOR 90DEG BEND 1600A	SET	24		
ELCPBGBD190109	TINNED LAM CU FLEX SET 4000A	SET	14		
ELCPBGBD190110	TINNED LAM CU FLEX SET 3200A	SET	9		
ELCPBGBD190111	TINNED LAM CU FLEX SET 2500A	SET	6		
ELCPBGBD190112	TINNED LAM CU FLEX SET 1600A	SET	8		
ELCPBGBD190113	AL FLEX SET 4000A	SET	24		
ELCPBGBD190114	AL FLEX SET 3200A	SET	9		
ELCPBGBD190115	AL FLEX SET 2500A	SET	6		
ELCPBGBD190116	AL FLEX SET 1600A	SET	8		
ELCPBGBD190117	ADNL HRDWR OF ADOPTER (SWGR&TRAFO) 4000A	SET	42		
ELCPBGBD190118	ADNL HRDWR OF ADOPTER (SWGR&TRAFO) 3200A	SET	18		
ELCPBGBD190119	ADNL HRDWR OF ADOPTER (SWGR&TRAFO) 2500A	SET	12		
ELCPBGBD190120	ADNL HRDWR OF ADOPTER (SWGR&TRAFO) 1600A	SET	16		
ELCPBGBD190121	PHASE CROSS OVER -4000A	SET	12		
ELCPBGBD190122	PHASE CROSS OVER -3200A	SET	9		
ELCPBGBD190123	PHASE CROSS OVER -2500A	SET	6		
ELCPBGBD190124	PHASE CROSS OVER -1600A	SET	8		
ELCPBGBD190125	RUBBER BELLOW-4000A	EA	42		
ELCPBGBD190126	RUBBER BELLOW-3200A	EA	18		
ELCPBGBD190127	RUBBER BELLOW-2500A	EA	12		
ELCPBGBD190128	RUBBER BELLOW-1600A	EA	16		
ELCPBGBD190129	SILICAGEL GEL BREATHER ASSEMBLY	SET	150		
ELCPBGBD190130	SPACE HEATER AND THERMOSTAT	SET	150		
ELCPBGBD190131	WALL FRAME ASSEMBLY-4000A	SET	14		
ELCPBGBD190132	WALL FRAME ASSEMBLY-3200A	SET	6		



PRICE SCHEDULE FOR LT BUSDUCT
PROJECT:- TELANGANA SUPER THERMAL POWER PROJECT
PHASE-I (2X800 MW)
STEAM GENERATOR ISLAND PACKAGE

ELCPBGBD190133	WALL FRAME ASSEMBLY-2500A	SET	6		
ELCPBGBD190134	WALL FRAME ASSEMBLY-1600A	SET	8		
ELCPBGBD190135	BUSDUCT SUPPORT STRUCTURE	KG	9000		
ELCPBGBD190136	MARSHALING BOX	EA	45		

Remarks:

1. Length of the busduct is considered from the center line of transformer flange to center line of panel flange.
2. Price quoting for 90 degree bend, Adopter and Rubber Bellow should be only for addition hardware requirement to make these items from straight run of busduct. Hence the length for busduct mentioned in BOQ is the total length from the panel
3. The total length of the busduct may vary by +/- 30%.

