




CLAUSE NO.	TECHNICAL REQUIREMENTS			<div>एनटीपीसी</div> <div>NTPC</div>
5.02.00	Contractor shall submit certified flow calculation and differential pressure vs. flow curves for each element for Employer's approval. Sizing calculation, precise flow calculation for all the flow elements, fabrication and assembly drawings and installation drawings shall be submitted for Employer's approval. One Flow element of each type shall be calibrated in the test laboratory for validation of computed flow calculations.			
	Flow Nozzle			
	Features		Essential/Minimum Requirements	
	Type		Long radius, welded type as per ASME PTC-19.5 (Part-III) or BS-1042	
	Material		316 SS	
	Thickness		Suitable for intended application.	
	Material of branch pipe		Same as main pipe	
	Root valve type		Globe	
	Root valve material		316 SS	
	Root valve size		1 inch	
	Impulse pipe of same material up to root valve		Required	
	Tapping		D and D/2 (3 Nos. of tapings)	
	Beta Ratio		Around 0.7	
	Beta Ratio calculation to be submitted		Yes	
	Assembly drg. and flow Vs DP Curves		Yes	
Accessories		Root valves, vent and drain hole.		
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LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2		PART - B SUB-SECTION-IV I-4 (MEASURING INSTRUMENTATION)
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CLAUSE NO.	<div style="text-align: right;">  </div> TECHNICAL REQUIREMENTS																																																																									
6.00.00	SPECIFICATIONS FOR PR. GAUGE, D.P. GAUGE, TEMP. GAUGE AND LEVEL GAUGE. <table border="1" data-bbox="375 283 1427 1837"> <thead> <tr> <th data-bbox="375 283 462 346">SI.No</th><th data-bbox="462 283 641 346">FEATURES</th><th colspan="3" data-bbox="641 283 901 346">ESSENTIAL/MINIMUM REQUIREMENTS</th></tr> <tr> <th></th><th></th><th data-bbox="641 346 901 451">Pr. Gauge/ DP Gauge/ Draught gauges</th><th data-bbox="901 346 1128 451">Temperature Gauge</th><th data-bbox="1128 346 1427 451">Level Gauge</th></tr> </thead> <tbody> <tr> <td>1</td><td>Sensing Element and material</td><td>Bourdon for high pressure, Diaphragm/ Bellow for low pr. Of 316 SS</td><td>Mercury in steel for below 450°C and inert gas actuated for above 450°C of SS bulb and capillary.</td><td>Tempered *toughened Borosilicate gauge glass steel armoured reflex or transparent type.</td></tr> <tr> <td>2</td><td>Body material</td><td>Die-cast aluminium</td><td>Die-cast aluminium</td><td>Forged carbon steel/304 SS</td></tr> <tr> <td>3</td><td>Dial size</td><td>150mm</td><td>150 mm</td><td>Tubular covering entire range</td></tr> <tr> <td>4</td><td>End connection</td><td>1/2 inch NPT (M)</td><td>3/4" NPT (M)</td><td>Process connection as per ASME PTC and drain/vent 15 NB</td></tr> <tr> <td>5</td><td>Accuracy</td><td>±1% of span</td><td>± 1% of span</td><td>± 2%</td></tr> <tr> <td>6</td><td>Scale</td><td>Linear, 270° arc graduated in metric units</td><td>Linear, 270° arc graduated in °C</td><td>Linear vertical</td></tr> <tr> <td>7</td><td>Range selection</td><td>Cover 125% of max. of scale</td><td>Cover 125% of max. of scale</td><td>Cover 125% of max. of scale</td></tr> <tr> <td>8</td><td>Over range test</td><td colspan="3">Test pr. for the assembly shall be 1.5 to the max. Design pr. at 38°C.</td></tr> <tr> <td>9</td><td>Housing</td><td>Weather and per IP-55</td><td>Weather and dust proof as per IP-55</td><td>CS/304 SS leak dust proof as proof</td></tr> <tr> <td>10</td><td>Zero/span adjustment</td><td>Provided</td><td>Provided</td><td>--</td></tr> <tr> <td>11</td><td>Identification</td><td colspan="3">Engraved with service legend or laminated phenolic name plate</td></tr> <tr> <td>12</td><td>Accessories</td><td>Blow out disc, siphon, snubber, pulsation dampener, chemical seal (if required by process) gauge isolation valve</td><td>SS Thermowell</td><td>Gasket for all KEL-F shield for transparent type vent and drain valves of Steel/SS as per CS/ Alloy process Requirement.</td></tr> </tbody> </table>				SI.No	FEATURES	ESSENTIAL/MINIMUM REQUIREMENTS					Pr. Gauge/ DP Gauge/ Draught gauges	Temperature Gauge	Level Gauge	1	Sensing Element and material	Bourdon for high pressure, Diaphragm/ Bellow for low pr. Of 316 SS	Mercury in steel for below 450°C and inert gas actuated for above 450°C of SS bulb and capillary.	Tempered *toughened Borosilicate gauge glass steel armoured reflex or transparent type.	2	Body material	Die-cast aluminium	Die-cast aluminium	Forged carbon steel/304 SS	3	Dial size	150mm	150 mm	Tubular covering entire range	4	End connection	1/2 inch NPT (M)	3/4" NPT (M)	Process connection as per ASME PTC and drain/vent 15 NB	5	Accuracy	±1% of span	± 1% of span	± 2%	6	Scale	Linear, 270° arc graduated in metric units	Linear, 270° arc graduated in °C	Linear vertical	7	Range selection	Cover 125% of max. of scale	Cover 125% of max. of scale	Cover 125% of max. of scale	8	Over range test	Test pr. for the assembly shall be 1.5 to the max. Design pr. at 38°C.			9	Housing	Weather and per IP-55	Weather and dust proof as per IP-55	CS/304 SS leak dust proof as proof	10	Zero/span adjustment	Provided	Provided	--	11	Identification	Engraved with service legend or laminated phenolic name plate			12	Accessories	Blow out disc, siphon, snubber, pulsation dampener, chemical seal (if required by process) gauge isolation valve	SS Thermowell	Gasket for all KEL-F shield for transparent type vent and drain valves of Steel/SS as per CS/ Alloy process Requirement.
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7.00.00	13	Material of Bourdon/ movement	316 SS / 304 SS	316 SS / 304 SS																									
	Notes:-																												
	* Bicolour type level gauges will be provided for applications involving steam and water except for condensate and feed water services.																												
	Length of gauge glass shall not be more than 1400 mm. If the vessel is higher, multiple gauge glasses with 50 mm overlapping shall be provided.																												
	Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.																												
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8.00.00	Over range proof pressure	150% of max. design pr.	-	150% of max. design pressure
	Repeatability	+ 0.5% of full range		
	No. of contacts	2 No.+2NC. SPDT snap action dry contact		
	Rating of contacts	60 V DC, 6 VA- (or more if required by DDCMIS)		
	Elect. Connection	Plug in socket.		
	Set point/ dead band adjustment	Provided over full range.		
	Enclosure	Weather and dust proof as per IP-55		
	Accessories	Siphon, snubber, chemical seal, pulsation dampeners as required by process	Thermo well of 316 SS and packing glands	All mounting accessories
	Mounting	Suitable for enclosure/ rack mounting or direct mounting	Suitable for rack mounting or direct mounting	-
	Power Supply (wherever required)	24 V DC, to be arranged by Contractor except for Ash Level Switches, where the same shall be as per Contractor's Standard practice.		
Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.				
POSITIVE DISPLACEMENT TYPE FLOW TRANSMITTERS				
The Bidder shall provide positive displacement type flow transmitters for fuel oil flow measurement, suitable for the fuel oil being used for the project, i.e., keeping in view the pressure, temperature and viscosity of the fuel oil.				
The meter shall be a volumetric meter type consisting of two meshing oval wheels driven by the fluid. Each revolution of the oval wheels shall displace a precisely known volume of the fluid from inlet to outlet. The housing/measuring chamber and oval wheels shall be of 316 SS.				
The measurement accuracy of the transmitter shall be better than +0.2%.				
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2		PART - B SUB-SECTION-IV I-4 (MEASURING INSTRUMENTATION)
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9.00.00	<p>The transmitter shall provide suitable 4-20mA dc output signal for control and indication/recording. Converters if necessary shall be provided to generate the 4-20mA signal.</p> <p>A local indicator of fuel oil flow shall also be provided. The instrument shall be calibrated in Tons/hr.</p> <p>Suitable strainer shall be provided before the transmitter for the protection of oval wheel meters against foreign matter contained in the fuel oil.</p> <p>The exact model no. and type of material being used, etc., shall be subject to Employer's approval during detailed engineering without any price repercussion to Employer.</p>																																																						
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All the calibration gases required for one year continuous operation shall be provided. The calibration gas container material shall not contaminate the calibration gas. The construction of the sensor shall be such that joints between dissimilar materials are avoided to prevent formation of cracks. </td></tr> <tr> <td data-bbox="375 1682 509 1730">11</td><td data-bbox="509 1682 672 1730">Type of Instrument</td><td data-bbox="672 1682 1068 1730">Non-heated in-situ dry type</td><td data-bbox="1068 1682 1427 1730">Heated type in-situ</td></tr> <tr> <td data-bbox="375 1730 509 1801">12</td><td data-bbox="509 1730 672 1801">Principle of Measurement</td><td data-bbox="672 1730 1068 1801">Partial-pressure using Zirconium Oxide Cell</td><td data-bbox="1068 1730 1427 1801">Partial-pressure using zirconium oxide cell</td></tr> </tbody> </table>	SI No	Specification Requirements system	Oxygen Analyser cum monitor (High temp.)	Low Temp. O2 Analyser cum monitor	1	Output signals a) Analog b) Binary	4-20 mA DC galvanically isolated. If analyser provides superimposed HART signal on 4-20 mA DC output, It shall also be connected to PC based station. 2 NO + 2 NC for high alarm		2	Zero & span Adjustment	To be provided with range selection facility.		3	Ambient temp.	50°C		4	Indication	Digital Alphanumeric Display. Display of reading in engineering units shall be provided		5	Enclosure Type/Material	Weather & Dust proof (IP 55) Die cast Aluminium/SS.		6	Type of Electronics	Microprocessor based with self diagnostic.		7	Digital Signal transmission	HART / RS 485 Port Modbus Protocol / Ethernet TCP/IP protocol for communication with plant control system.		8	Calibration	Auto & Manual (from Remote)		9	Power Supply	To be arranged by Contractor subject to Employer's approval.		10	Others	All interconnection tubing and cabling between probe and analyser / analyser panel and cabling from analyser/ analyser panel to local junction box are to be provided. All the calibration gases required for one year continuous operation shall be provided. The calibration gas container material shall not contaminate the calibration gas. 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CLAUSE NO.	<div> TECHNICAL REQUIREMENTS  </div>		
13	Measurement Range	0.01% to 10% oxygen	0 to 25% oxygen programmable upto min 0.5% of O ₂
14	Accuracy	+/-1% of F.S. or 0.5 % O ₂ , whichever is more	+/-1% of Full Scale
15	Linearity	+/- 1% of F.S.	+/- 1% of F.S.
16	Repeatability	≤ 0.5% of Span	≤ 0.5% of Span
17	Response time(up to 90% of full scale)	≤ 5 secs	≤ 5 secs
18	a) Temperature Drift	-	-
19	b) Zero Drift	-	< 1% span/week
20	c) Span Drift	Stability:- 1% deviation through out life of sensor	< 1% measured value/week
21	Operating Temperature Range	600-1600 deg.C	0-450 deg.C
22	Filter	Cell shall be protected using ceramic boot	Suitable filter to be provided
23	Accessories purging system	Not applicable	Not applicable
24	Temperature	Yes With R/B type thermocouples (to be finalised during detailed Engineering) required.	Automatic temperature control of heating circuit through thermostat.
25	Location	SH Zone	Air heater inlet
10.00.00	DEW POINT METER Sensor Type : Capacitance type with change in output proportional to moisture present. Service : Dry Air Range : -50 to 0 Degree Centigrade Dew-Point Sensor Accuracy : Better than +/-0.5^ Operating Temperature : 0 to 50 degree C. Operating Pressure : 0-10 Kg./Cm2, suitable for process application. Analyser Input : Change in capacitance from dew point sensor.		
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CLAUSE NO.	TECHNICAL REQUIREMENTS			<div>एनटीपीसी NTPC</div>
	<div>Display : Combined enclosure with two three-digit seven segments LED display with decimal point after two digits. LED height shall be 4 inches, clearly legible from a distance of atleast 10 meters.</div> <div>Range : -50 to 0 Degree Centigrade Dew-Point</div> <div>Display Accuracy : Better than \pm2 Degree C.</div> <div>Mounting : Table top/Flush mounting, to be finalised during detailed engineering.</div> <div>Power supply : 240V AC, 50 Hz to be arranged by the contractor.</div> <div>Output : 4-20 mA DC capable of driving a load impedance of 500 ohms minimum.</div> <div>4-20 mA DC Output signal is to be connected to control system in Contractor's Scope (Interconnection cables are to be provided by the Contractor).</div> <div>In case the system is not suitable for Direct online mounting, then all the required sampling system is to be provided by the contractor.</div> <div>All required accessories including cables, sensor holder, desiccant chambers, mounting fixtures etc. are to be supplied by the Contractor within his quoted lumpsum price.</div>			
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SUB-SECTION-IV: I8


CONTROL VALVES, ACTUATORS

LARA SUPER THERMAL POWER PROJECT (2x800MW) /
DARLIPALI SUPER THERMAL POWER PROJECT -I (2 x 800MW) /
GAJMARA SUPER THERMAL POWER PROJECT -I (2x 800MW) /
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STEAM GENERATOR PACKAGE


TECHNICAL SPECIFICATION
SECTION-VI
BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	CONTROL VALVES, ACTUATORS & ACCESSORIES			
1.00.00	CONTROL VALVES, ACTUATORS & ACCESSORIES			
1.01.00	General Requirements			
1.01.01	The control valves and accessories equipment furnished by the Bidder shall be designed constructed and tested in accordance with the latest applicable requirements of code for pressure piping ANSI B 31.1, the ASME Boiler & pressure vessel code, Indian Boiler Regulation (IBR), ISA, and other standards specified elsewhere as well as in accordance with all applicable requirements of the "Federal Occupational Safety and Health Standards, USA" or acceptable equal standards. All the Control Valves, their actuators and accessories to be furnished under this Sub-section will be fully suitable and compatible with the modulating loops covered under the Specification.			
1.01.02	All the control valves and accessories offered by the Bidder shall be from reputed, experienced manufacturers of specified type and range of valves.			
1.01.03	For special type of control valves such as combined pressure and temperature control valves for Aux PRDS application, separator drain control valves, refer to the corresponding mechanical sections.			
1.02.00	CONTROL VALVE SIZING & CONSTRUCTION			
1.02.01	The design of all valve bodies shall meet the specification requirements and shall conform to the requirements of ANSI (USA) for dimensions, material thickness and material specification for their respective pressure classes.			
1.02.02	The valve sizing shall be suitable for obtaining maximum flow conditions with valve opening at approximately 80% of total valve stem travel and minimum flow conditions with valve stem travel not less than 10% of total valve stem travel. All the valves shall be capable of handling at least 120% of the required maximum flow. Further, the valve stem travel range from minimum flow condition to maximum flow condition shall not be less than 50% of the total valve stem travel. The sizing shall be in accordance with the latest edition of ISA handbook on control valves. While deciding the size of valves, Bidder shall ensure that valves trim exit outlet velocity as defined in ISA handbook does not exceed 8 m/sec for liquid services, 150 m/sec. for steam services and 50% of sonic velocity for flashing services. Bidder shall furnish the sizing calculations clearly indicating the outlet velocity achieved with the valve size selected by him as well as noise calculations, which will be subject to Employer's approval during detailed engineering.			
1.02.03	Control valves for steam and water applications shall be designed to prevent cavitation, wire drawing, flashing on the downstream side of valve and down stream piping. Thus for cavitation/flashing service, only valve with anti cavitation trim shall be provided. Detailed calculations to establish whether cavitation will occur or not for any given application shall be furnished.			
1.02.04	Control valves for application such as SH Spray Control, RH spray Control, Heavy Oil Heating, pressurizing and Control system shall have permissible leakage rate as per leakage Class V. All other control valves shall have leakage rate as per leakage Class-IV.			
1.02.05	The control valve induced noise shall be limited to 85 dBA at 1 meter from the valve surface under actual operating conditions. The noise abatement shall be achieved by valve body and trim design and not by use of silencers.			
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART - B SUB-SECTION-IV:18 CONTROL VALVES, ACTUATORS & ACCESSORIES	PAGE 1 OF 6

CLAUSE NO.	TECHNICAL REQUIREMENTS				
2.00.00	VALVE CONSTRUCTION				
2.01.00	All valves shall be of globe body design & straightaway pattern with single or double port, unless other wise specified or recommended by the manufacturer to be of angle body type. Rotary valve may alternatively be offered when pressure and pressure drops permit.				
2.02.00	Valves with high lift cage guided plugs & quick-change trims shall be supplied.				
2.03.00	Cast Iron valves are not acceptable.				
2.04.00	Bonnet joints for all control valves shall be of the flanged and bolted type or other construction acceptable to the Employer. Bonnet joints of the internal threaded or union type will not be acceptable.				
2.05.00	Plug shall be of one-piece construction cast, forged or machined from solid bar stock. Plug shall be screwed and pinned to valve stems or shall be integral with the valve stems.				
2.06.00	All valves connected to vacuum on down stream side shall be provided with packing suitable for vacuum applications (e.g. double vee type chevron packing)				
2.07.00	Valve characteristic shall match with the process characteristics.				
2.08.00	Extension bonnets shall be provided when the maximum temperature of flowing fluid is greater than 280 deg. C.				
2.09.00	Flanged valves shall be rated at no less then ANSI press class of 300 lbs.				
3.00.00	VALVE MATERIALS				
	Sr. No.	Service	Body material	Trim Material	
	1	Non-corrosive, non-flashing and non-cavitation service except DM water	Carbon steel ASTM-A216 Gr. WCB for fluid temperature below 275 Deg. C Alloy steel ASTM-A217Gr. WC9 for fluid temperature above 275 Deg. C	316SS stellited with stellited faced guide posts and bushings.	
	2.	Severe flashing/cavitati on services	Alloy steel ASTM-A217 Gr. WC9	440 C	
	3.	Low flashing/cavitati on service	Alloy steel ASTM-A217 Gr. WC6	17-4 PH SS	
	4.	DM water service	316 SS	316 SS	
	NOTE Valve body rating shall meet the process pressure and temperature requirement as per ANSI B16.34.				
	However, Bidder may offer valves with body and trim materials better than specified materials and in such cases Bidder shall furnish the comparison of properties including cavitation resistance, hardness, tensile strength, strain energy, corrosion resistance and erosion resistance etc. of the offered material vis-a-vis the specified material for Employer's consideration and approval.				
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE			TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2		PART - B SUB-SECTION-IV:18 CONTROL VALVES, ACTUATORS & ACCESSORIES
					PAGE 2 OF 6

CLAUSE NO.	TECHNICAL REQUIREMENTS																					
4.00.00	END PREPARATION Valve body ends shall be either butt welded/socket welded, flanged (Rubber lined for condensate service) or screwed as finalized during detailed engineering and as per Employer's approval. The welded ends wherever required shall be butt welded type as per ANSI B 16.25 for control valves of sizes 65 mm and above. For valves size 50 mm and below welded ends shall be socket welded as per ANSI B 16.11. Flanged ends wherever required shall be of ANSI pressure-temperature class equal to or greater than that of the control valve body.																					
5.00.00	VALVE ACTUATORS All control valves shall be furnished with pneumatic actuators except for pressure and temperature control valve for auxiliary PRDS application (electro-hydraulic / pneumatically operated) and separator drain control valve (electro-hydraulic type).The Bidder shall be responsible for proper selection and sizing of valve actuators in accordance with the pressure drop and maximum shut off pressure and leakage class requirements. The valve actuators shall be capable of operating at 60 deg.C continuously. Valve actuators and stems shall be adequate to handle the unbalanced forces occurring under the specified flow conditions or the maximum differential pressure specified. An adequate allowance for stem force, at least 0.15 Kg/sq.cm. per linear millimeter of seating surface, shall be provided in the selection of the actuator to ensure tight seating unless otherwise specified. The travel time of the pneumatic actuators shall not exceed 10 seconds.																					
6.00.00	CONTROL VALVE ACCESSORY DEVICES																					
6.01.00	All pneumatic actuated control valve accessories such as air locks, hand wheels/hand-jacks, limit switches, microprocessor based electronic Positioner, diffusers, external volume chambers, position transmitters (capacitance or resistance type only), reversible pilot for Positioner, tubing and air sets, solenoid valves and junction boxes etc. shall be provided as per the requirements.																					
7.00.00	SPECIFICATIONS FOR MICROPROCESSOR BASED ELECTRONIC POSITIONER																					
<table><tr><td rowspan="4">1</td><td rowspan="4">Electrical</td><td>a) Input Demand Signal</td><td>4-20 mA</td></tr><tr><td>b) Power Supply</td><td>Loop Powered from the output card of Control System.</td></tr><tr><td>c) HART Protocol</td><td>Compatibility for Remote Calibration & Diagnostics (Super-imposed HART signal on input Signal (4-20 mA)</td></tr><tr><td>d. Valve position sensing</td><td>Position sensing, 4-20 mA output signal to be provided for control system.</td></tr><tr><td rowspan="3">2</td><td rowspan="3">Environment</td><td>a) Operating temp.</td><td>(-)30 To 80 Deg. C</td></tr><tr><td>b) Humidity</td><td>0-95 %</td></tr><tr><td>c) Protection class</td><td>IP-65 Minimum</td></tr></table>					1	Electrical	a) Input Demand Signal	4-20 mA	b) Power Supply	Loop Powered from the output card of Control System.	c) HART Protocol	Compatibility for Remote Calibration & Diagnostics (Super-imposed HART signal on input Signal (4-20 mA)	d. Valve position sensing	Position sensing, 4-20 mA output signal to be provided for control system.	2	Environment	a) Operating temp.	(-)30 To 80 Deg. C	b) Humidity	0-95 %	c) Protection class	IP-65 Minimum
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2	Environment	a) Operating temp.	(-)30 To 80 Deg. C																			
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LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART - B SUB-SECTION-IV:18 CONTROL VALVES, ACTUATORS & ACCESSORIES	PAGE 3 OF 6																		

CLAUSE NO.	TECHNICAL REQUIREMENTS			<div>एनटीपीसी</div> <div>NTPC</div>
	3	Software for Configuration and Diagnostics	Software	Windows based software. Software shall meet the requirements for Configuration, Diagnostics, Calibration and Testing of the actuator.
			Diagnostic/Test features	Advanced diagnostic features like Stroke counter or Travel counter, Leakage in actuators, Valve Signature analysis, Step Response test, Valve friction /Jamming detection etc to be provided.
	4	Test reports/ Certificates	Factory Valve Signature Tests Reports (Pr Vs Valve travel and Travel Vs I/P signal) are to be provided.	
			Test certificates as per Manufacture Standard/Relevant Standard are to be submitted.	
	5	Configuration/ Calibration.	Remote & Local Calibration, Auto & Manual Calibration shall be possible.	
	6	Operating Range	Full range/ Split range.	
	7	Modes	Valve Action	Direct / Reverse Valve Action
			Flow Characterization	Possible to fit Valve Characteristic Curves- Linear , Equal percentage etc.
	8	Fail Safe/Fail Freeze	Fail Safe/Fail Freeze feature is to be provided. (In case the fail freeze feature is not intrinsic to the positioner, Bidder shall achieve the same externally through solenoid valve connected in the pneumatic circuit).	
	9	Pneumatic	Air capacity	Sufficient to handle the valves & actuators selected/ Boosters to be supplied, if required.
			Air pressure	To suit the air supply pressure/quality available.
			Process connection	¼" NPT
	10	Performance	Characteristic deviation	<=0.5 % of span.
			Ambient temp effect	<=0.01 %/ deg C or better.
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2		PART - B SUB-SECTION-IV:18 CONTROL VALVES, ACTUATORS & ACCESSORIES PAGE 4 OF 6

CLAUSE NO.	<div style="text-align: right;">  </div> TECHNICAL REQUIREMENTS			
	10	EMC & CE Compliance	Required to International Standard like EN/IEC.	EN50081-2 & EN50082 or equivalent.
	11	Accessories	In-built Operator Panel	Display with push buttons for configuration and display on the positioner itself (Password protected/Hardware lock).
			Hand Held Hart Calibrator	Universal Hart Calibrator to be provided (for quantity, refer <i>Part-A: Contract quantities</i> of the specification).
			Press Gauge Block	For supply & output pressures, Air Filter Regulator and other accessories shall be provided on as required basis for making system complete.
			Electrical Cable Entry	1/2"NPT, side or bottom entry to avoid water ingress.
			Valves Mounting Assembly	For Sliding Stem/Rotary/Single acting/Double acting actuators on as required basis
<p>* Note:</p> <p>Employer is providing a centralized HART management system including the HART multiplexing/ interfacing system. The HART signals shall be picked up from marshalling terminals of DDCMIS (SG/TG DDCMIS as well as BOP DDCMIS), as applicable. The details of the above mentioned employer's HART management system are as below:</p> <p>The following functionalities are achieved through industry standard softwares of the HART management system for electronic transmitters, temperature transmitters and analysers:</p> <ol style="list-style-type: none"> Constant scanning to monitor faults or changes to instrument configuration. Employer-defined and standard calibration and configuration procedures for all transmitters. Constant signal data collection facilities to maintain continuously updated records. Automatic tracking of configuration changes made in the field, such as may be introduced by hand-held communicator. All configuration function associated with hand-held communicators shall be available in the system. Event and log reports on screen as well as on printer. 				
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2		PART - B SUB-SECTION-IV:18 CONTROL VALVES, ACTUATORS & ACCESSORIES <div style="text-align: right;">PAGE 5 OF 6</div>

CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनटीपीसी NTPC</div>	
	<p>f) Any addition/deletion of transmitter will be reported on printer and logged in hard disk.</p> <p>Further, the positioners shall be monitored from the above described HART management system .To achieve this, Bidder shall provide the necessary software to achieve the functionalities described above under "Remote Configuration and Diagnostics", and this software shall be loaded in the Employer's HART management system.</p>		
8.00.00	<p>TEST AND EXAMINATION</p> <p>All valves shall be tested in accordance with the quality assurance programme agreed between the Employer and Contractor, which shall meet the requirements of IBR and other applicable codes mentioned elsewhere in the specifications. The tests shall include but not be limited to the following:</p>		
8.01.00	Non Destructive Test as per ANSI B-16.34.		
8.02.00	Hydrostatic shell test in accordance with ANSI B 16.34 prior to seat leakage test.		
8.03.00	Valve closure test and seat leakage test in accordance with ANSI-B 16.34 and as per the leakage class indicated above.		
8.04.00	Functional Test: The fully assembled valves including actuators control devices and accessories shall be functionally tested to demonstrate times from open to close position.		
8.05.00	<p>CV Test: Please refer CI No. 1.00.00, Sub-section-IV:19 (Type test requirements), Control Valves.</p> <p>Bidder shall furnish all the control valves under this main plant package as finalized during detailed engineering stage without any price repercussions whatsoever depending on the process requirements. All the control valves provided by the Bidder for this project shall meet the specifications requirements specified herein. Specification for control valves in this Sub-section has to be read in conjunction with other relevant Sub-sections of this specification.</p>		
<p>LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE</p>		<p>TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2</p>	<p>PART - B SUB-SECTION-IV:18 CONTROL VALVES, ACTUATORS & ACCESSORIES</p>
		PAGE 6 OF 6	

SUB-SECTION-III:E6

ELECTRICAL ACTUATORS WITH INTEGRAL STARTERS


LARA SUPER THERMAL POWER PROJECT (2x800MW) /
DARLIPALI SUPER THERMAL POWER PROJECT -I (2 x 800MW) /
GAJMARA SUPER THERMAL POWER PROJECT -I (2x 800MW) /
KUDGI SUPER THERMAL POWER PROJECT -I (3 x 800MW)
STEAM GENERATOR PACKAGE


TECHNICAL SPECIFICATION
SECTION-VI
BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2


CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
1.00.00	CODES AND STANDARDS:			
1.01.00	All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions. In case of conflict between this specification and those (IS codes, standards, etc.) referred to herein, the former shall prevail. All work shall be carried out as per the following standards/ codes as applicable.			
2.00.00	ELECTRIC ACTUATORS WITH INTEGRAL STARTERS			
2.01.00	TYPE:			
2.01.01	The actuators shall have integral starters along with over load relays with built in SPP (Single Phasing Preventer). A 415, 3 phase 3 wire power supply shall be given to the actuator from vendor's/employer's switch board as applicable through a switch fuse unit. Control voltage of the motor starter shall be 110 V AC / 24 V DC, derived suitably from 415V power supply.			
2.01.02	In case supplier's standard control voltage for Open/Close contactors is 110V AC, the same is acceptable if suitable Opto Isolation circuit is provided with coupling relays for 24 V DC command inputs.			
2.02.00	INTERFACES:			
2.02.01	<p>Open/Close command termination logic with position & torque Limit Switches, positioner circuit shall be suitably built in the PCB inside the actuator.</p> <p>(a) For Binary Drive (both ON-OFF and INCHING type) :- Open/Close command & status thereof and disturbance monitoring signal (common contact for Overload, Thermostat, control supply failure, L/R selector switch at local & other protections operated) shall be provided.</p> <p>Interface with the control system shall be through hardware signal only. Inter posing relays provided (with coil burden 2.5 VA) in the actuator shall be energized to initiate opening and closing, by 24V DC signal from the external control system.</p> <p>(b) For Modulating Drive:- the command to actuator shall be in form of 4-20mA signal. The necessary positioning circuit and motor protection shall be provided</p> <p>(c) Open/close command termination logic shall be suitably built inside actuator.</p>			
2.03.00	RATING : <p>(a) Supply Voltage & frequency: 415V +/- 10%, 3 Phase, 3 Wire 50HZ +/-5%.</p> <p>(b) Sizing:-</p> <p>Open/Close at rated speed against designed differential pressure at 90% of rated voltage.</p> <p>For isolating service:- Three successive open-close operations or 15 mins, whichever is higher. For regulating service 150 starts per hour or required cycles, whichever is higher.</p>			
2.04.00	CONSTRUCTION: <p>(a) Enclosure:</p> <p>Totally enclosed weatherproof minimum IP-55 degree of protection.</p>			
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9568-102-2	PART-B SUB-SECTION-IIIIE-06 ELECTRIC ACTUATORS WITH INTEGRAL STARTERS	PAGE 1 OF 3

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
2.05.00	<p>(b) Gear Train :</p> <p>Metal (Fibre gears are not acceptable)) self-locking to prevent drift under torque switch (where ever applicable) spring pressure when motor is de-energized.</p> <p>(c) Manual Wheel:</p> <p>Shall disengage automatically during motor operation.</p> <p>MOTOR :</p> <p>(a) Type :</p> <p>Squirrel cage induction motor suitable for Direct On Line (DOL) starting.</p> <p>(b) Enclosure:</p> <p>Totally enclosed, self ventilated IP-55 degree of protection.</p> <p>(c) Insulation</p> <p>Class B or better. Temperature rise 70 Deg C. over 50 Deg C ambient</p> <p>(d) Bearings:</p> <p>Double shielded, grease lubricated antifriction.</p> <p>(e) Earth Terminals:</p> <p>Two</p> <p>(f) Protection:</p> <p>Single Phasing Protection, Over heating protection through Thermostat and wrong phase sequence protection shall be provided over and above other protection features standard to bidder's design Suitable means shall be provided to diagnose the type of fault locally.</p>			
2.06.00	POSITION/TORQUE SWITCHES:			
2.06.01	<p>Four nos. (2 each in open and close position) position limit switches and two nos. (one in open and other in close direction) torque switches each having two nos. NO and two nos. NC contacts shall be provided. A single shaft shall actuate all contacts of limit switches at each position.</p> <p>Limit switch and disturbance signals shall be available to DCS even when the power supply to the actuators is not available.</p> <p>Torque switches shall be bypassed in both the end positions with the other end Limit switches.</p> <p>Limit switches</p> <p>Limit switches shall be Silver plated with high conductivity and non –corrosive type. Contact rating shall be sufficient to meet the requirement of Control System subject to a minimum of 60 V, 6 VA rating. Protection class shall be IP-55.</p>			
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2		PART-B SUB-SECTION-III-E-06 ELECTRIC ACTUATORS WITH INTEGRAL STARTERS PAGE 2 OF 3

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
2.07.00	LOCAL OPERATION:			
2.07.01	It shall be possible to operate the actuator locally also. Lockable local/remote selection shall be provided on the actuator.			
2.08.00	POSITION INDICATOR :			
2.08.01	To be provided for 0 to 100% travel.			
2.09.00	POSITION TRANSMITTER (FOR MODULATING/INCHING TYPE) :			
2.09.01	As required. Suitable for stabilized 4-20 mA signal, 2 wire inductive type, 24 volts DC operated.			
2.10.00	WIRING :			
2.10.01	Suitable voltage grade copper wire.			
2.11.00	TERMINAL BOX : <ul style="list-style-type: none"> (i) 9 pin plug and socket (1 no. per actuator to suit 4 pair 0.5 sq.mm. copper overall shielded (16 mm OD), instrumentation cable) suitably mounted in the starter box itself to terminate open/close command and status feedback signals with external control systems. (ii) Additional one number 9 pin plug and socket (to suit 4 pair 0.5 sq.mm copper (16 mm OD) individual and overall shielded instrumentation cable) suitably mounted in the starter box itself for actuators with 4-20 mA position transmitters. (iii) Necessary glands for power cables shall be provided. 			
2.12.00	TERMINAL BLOCK :			
2.12.01	650V grade. For power cables.			
2.13.00	SPACE HEATER :			
2.13.01	Space heater of suitable rating. The supply shall be derived from the main power supply available in the actuator.			
2.14.00	TYPICAL WIRING DIAGRAM :			
2.14.01	Refer Tender Drawing No. 0000-999-POI-A-063.			
3.00.00	TRAINING <p>Contractor shall provide training on Integral Actuator for Employer's personnel. The duration of the training shall be as elaborated in Part-C, Section-VI of technical specifications.</p>			
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART-B SUB-SECTION-III-E-06 ELECTRIC ACTUATORS WITH INTEGRAL STARTERS	PAGE 3 OF 3

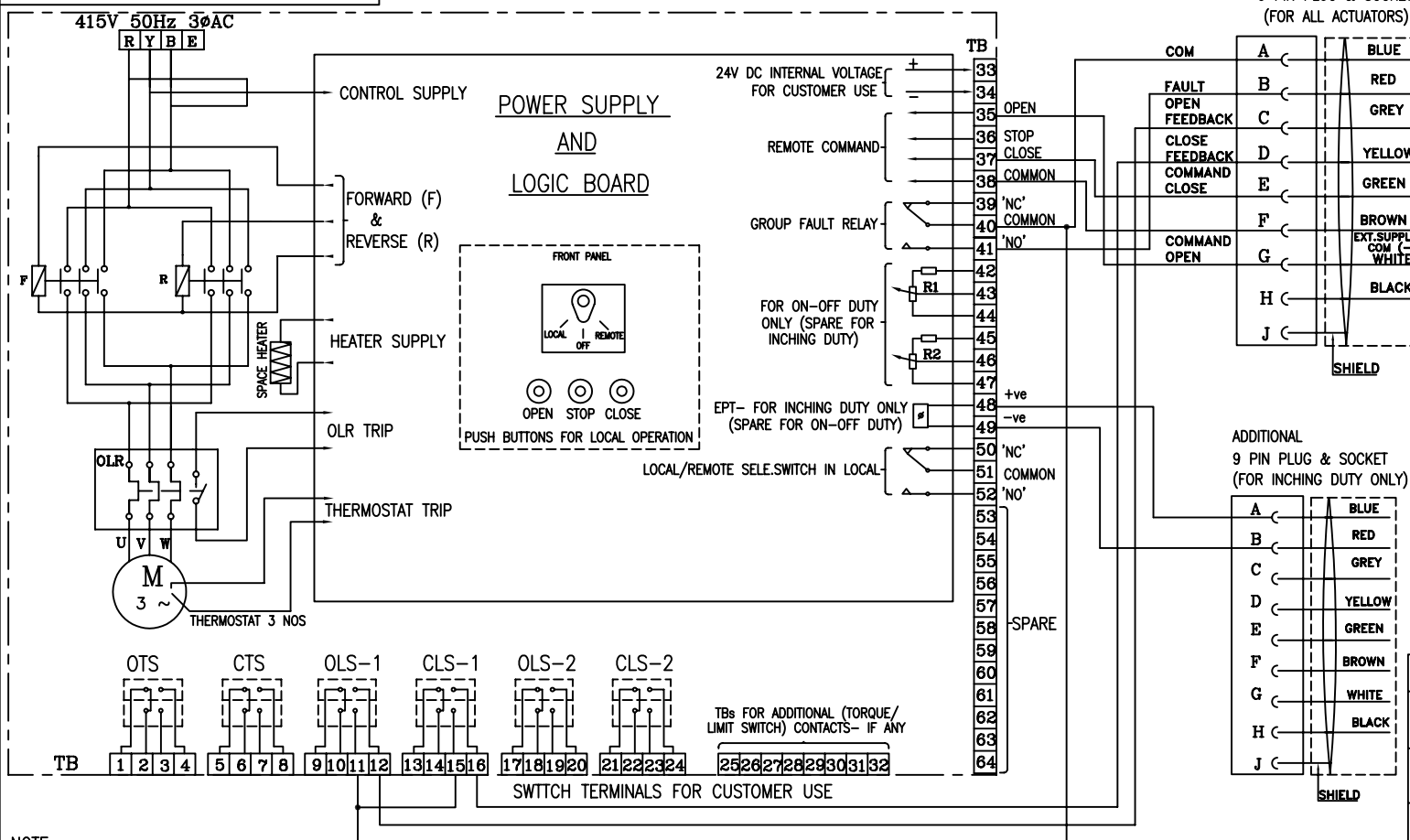
	SPECIFICATION FOR MOTORISED VALVE ACTUATOR		SPECIFICATION NO.: PE-SS-394-145-I007	
			VOLUME II B	
			SECTION D	
			REV. NO. 00	DATE: 01.08.13
			SHEET 1	OF 3
Data Sheet A & B				
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
GENERAL *	* PROJECT	2X800 MW GADARWARA-TG		
	OFFER REFERENCE			
	* TAG NO. SERVICE			
	* DUTY	<input type="checkbox"/> ON / OFF <input type="checkbox"/> INCHING		
	* LINE SIZE (inlet/outlet): MATERIAL			
	* VALVE TYPE	<input type="checkbox"/> GLOBE <input type="checkbox"/> GATE <input type="checkbox"/> REG. GLOBE <input type="checkbox"/> BUTTERFLY		
	* OPENING / CLOSING TIME			
	* WORKING PRESSURE			
	AMBIENT CONDITION	SHALL BE SUITABLE FOR CONTINUOUS OPERATION UNDER AN AMBIENT TEMP. OF 0-55 DEG C AND RELATIVE HUMIDITY OF 0-95%		
	VALVE SEAT TEST PRESS	BIDDER TO SPECIFY		
	REQUIRED VALVE TORQUE	BIDDER TO SPECIFY		
	ACTUATOR RATED TORQUE	BIDDER TO SPECIFY		
	CONSTRUCTION AND SIZING	CONSTRUCTION	TOTALLY ENCLOSED, WEATHER PROOF, IP:55	
MECHANICAL POSITION INDICATOR		TO BE PROVIDED FOR 0-100% TRAVEL		
BEARINGS		DOUBLE SHIELDED, GREASE LUBRICATED ANTI-FRICTION.		
GEAR TRAIN FOR LIMIT SWITCH/TORQUE SWITCH OPERATION		METAL (NOT FIBRE GEARS). SELF-LOCKING TO PREVENT DRIFT UNDER TORQUE SWITCH SPRING PRESSURE WHEN MOTOR IS DE-ENERGIZED.		
SIZING		OPEN/CLOSE AT RATED SPEED AGAINST DESIGNED DIFFERENTIAL PRESSURE AT 85% OF RATED VOLTAGE. FOR ISOLATING SERVICE THREE SUCCESSIVE OPEN-CLOSE OPERATIONS OR 15 MINS. WHICHEVER IS HIGHER. FOR INCHING SERVICE - 150 STARTS/HR MINIMUM & FOR REGULATING SERVICE - 600 STARTS/HR MINIMUM.		
HANDWHEEL	* REQUIRED	<input type="checkbox"/> YES <input type="checkbox"/> NO		
	* ORIENTATION	<input type="checkbox"/> TOP MOUNTED <input type="checkbox"/> SIDE MOUNTED		
	*TO DISENGAGE AUTOMATICALLY DURING MOTOR OPERATION.			
ELECTRIC ACTUATOR	ACTUATOR MAKE/MODEL	BIDDER TO SPECIFY		
	MOTOR MAKE / MODEL / TYPE / RATING (KW)	BIDDER TO SPECIFY		
	@ MOTOR TYPE	SQUIRREL CAGE INDUCTION MOTOR, STARTING CURRENT LIMITED TO SIX TIMES THE RATED CURRENT-INCLUSIVE OF I.S. TOLERANCE		
	ACTUATOR APPLICABLE WIRING DIAGRAM	<input checked="" type="checkbox"/> ENCLOSED (BIDDER TO CONFIRM) A: <input type="checkbox"/> DRG. NO. 3-V-MISC-24227 R00 B: <input type="checkbox"/> DRG. NO. 3-V-MISC-24550 R00 C: <input checked="" type="checkbox"/> DRG. NO. 3-V-MISC-24283 R00 D: <input type="checkbox"/> DRG. NO. 4-V-MISC-90271 R11 E: <input type="checkbox"/> For Thyristor based Integral starter, Bidder/Vendor to furnish wiring diagram		
	COLOUR SHADE	<input checked="" type="checkbox"/> BLUE (RAL 5012) <input type="checkbox"/>		
	PAINT TYPE (## Refer Notes)	<input checked="" type="checkbox"/> ENAMEL <input type="checkbox"/> EPOXY <input type="checkbox"/>		
	SHAFT RPM	BIDDER TO SPECIFY		
	OLR SET VALUE	BIDDER TO SPECIFY		
	@ STARTING / FULL LOAD CURRENT	BIDDER TO SPECIFY		
	NO. OF REV FOR FULL TRAVEL	BIDDER TO SPECIFY		
	@ PWR SUPP TO MTR / STARTER	415V, 3PH,3 wire, 50Hz AC		
	@ CONTROL VOLTAGE REQUIREMENT	TO BE DERIVED FROM THE POWER SUPPLY TO THE STARTER <input type="checkbox"/> 230 V <input type="checkbox"/> 110 V		

	SPECIFICATION FOR MOTORISED VALVE ACTUATOR		SPECIFICATION NO.: PE-SS-394-145-I007		
			VOLUME II B		
			SECTION D		
			REV. NO. 00	DATE: 01.08.13	
			SHEET 2	OF	3
Data Sheet A & B					
DATA SHEET-A (TO BE FILLED BY PURCHASER)				DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
INTEGRAL STARTER	@ ENCLOSURE CLASS OF MOTOR	<input type="checkbox"/> IP 67 <input type="checkbox"/> FLAME PROOF			
	@ INSULATION CLASS	CLASS-F TEMP. RISE LIMITED TO CLASS-B			
	@ WINDING TEMP PROTECTION	<input checked="" type="checkbox"/> THERMOSTAT (3 Nos., 1 IN EACH PHASE) <input type="checkbox"/>			
	SINGLE PHASE / WRONG PHASE SEQUENCE PROTECTION	REQUIRED			
	INTEGRAL STARTER	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	TYPE OF SWITCHING DEVICE	<input checked="" type="checkbox"/> CONTACTORS <input type="checkbox"/> THYRISTORS			
	TYPE	<input checked="" type="checkbox"/> CONVENTIONAL <input type="checkbox"/> SMART (NON-INTRUSIVE)			
	IF SMART				
	a) SERIAL LINK INTERFACE	<input type="checkbox"/> INTEGRAL <input type="checkbox"/> FIELD MOUNTED			
	b) SERIAL LINK PROTOCOL	<input type="checkbox"/> FOUNDATION FIELD-BUS <input type="checkbox"/> PROFI-BUS <input type="checkbox"/> DEVICE NET <input type="checkbox"/>			
	c) SERIAL LINK MEDIA	<input type="checkbox"/> TWISTED PAIR Cu-CBL <input type="checkbox"/> CO-AXIAL Cu-CBL <input type="checkbox"/> OFC			
	d) HAND HELD PROGRAMMER	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	e) TYPE OF HAND HELD PROGRAMMER	<input type="checkbox"/> BLUETOOTH <input type="checkbox"/> INFRARED <input type="checkbox"/>			
	f) MASTER STATION	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	g) MASTER STN INTRFACE WITH DCS	<input type="checkbox"/> MODBUS <input type="checkbox"/> TCP/IP			
	h) DETAILS OF SPECIAL CABLE	<input type="checkbox"/> ENCLOSED <input type="checkbox"/> NOT REQUIRED			
	STEP DOWN CONT. TRANSFORMER	<input type="checkbox"/> REQUIRED			
	OPEN / CLOSE PB	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	STOP PB	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	INDICATING LAMPS	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
LOCAL REMOTE S/S	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED				
STATUS CONTACTS FOR MONITORING	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED				
INTEGRAL STARTER DISTURBED SIGNAL	REQUIRED (O/L RELAY OPERATED, CONT./POWER SUPPLY FAILED, S/S IN LOCAL, TORQUE SWITCH OPTD. MID WAY)				
INTERPOSING RELAY/OPTO COUPLER (Applicable for integral Starter)	TYPE OF ISOLATING DEVICE	<input checked="" type="checkbox"/> INTERPOSING RELAY <input type="checkbox"/> OPTO COUPLER <input type="checkbox"/> EITHER			
	QUANTITY	<input checked="" type="checkbox"/> 2 NOs. <input type="checkbox"/> 3 NOs.			
	DRIVING VOLTAGE	<input checked="" type="checkbox"/> 20.5 – 24V DC <input type="checkbox"/> _____ V DC			
	DRIVING CURRENT	<input checked="" type="checkbox"/> 125mA MAX <input type="checkbox"/> _____ mA MAX			
	LOAD RESISTANCE	<input checked="" type="checkbox"/> > 192 ohms - <25 k ohms <input type="checkbox"/> > _____ ohms - < _____ ohms			
TORQUE SWITCH (Not Applicable for Smart Actuator) (\$\$ Refer Notes)	MFR & MODEL NO.	BIDDER TO SPECIFY			
	OPEN / CLOSE	<input checked="" type="checkbox"/> 1 No. <input type="checkbox"/> 2Nos. / <input checked="" type="checkbox"/> 1 No. <input type="checkbox"/> 2Nos			
	CONTACT TYPE	2 NO + 2 NC			
	RATING	5A 240V AC AND 0.5A 220V DC			
	CALIBRATED KNOBS(OPEN&CLOSE TS)	REQUIRED FOR SETTING DESIRED TORQUE			
	ACCURACY	+3% OF SET VALUE			
LIMIT SWITCH (Not Applicable for Smart Actuator) (\$\$ Refer Notes)	MFR & MODEL NO.	BIDDER TO SPECIFY			
	OPEN : INT : CLOSE	<input checked="" type="checkbox"/> 1 No. <input type="checkbox"/> 2 Nos.	2 Nos. (ADJ.)	<input checked="" type="checkbox"/> 1 No. <input type="checkbox"/> 2Nos.	
	CONTACT TYPE	2 NO + 2 NC			
	RATING (AC / DC)	5A 240V AC AND 0.5A 220V DC			

	SPECIFICATION FOR MOTORISED VALVE ACTUATOR		SPECIFICATION NO.: PE-SS-394-145-I007	
			VOLUME II B	
			SECTION D	
			REV. NO. 00	DATE: 01.08.13
			SHEET 3	OF 3
Data Sheet A & B				
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
POSITION TRANSMITTER	POSITION TRANSMITTER (For inching duty & other specific applications)	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		
	MFR & MODEL NO.	BIDDER TO SPECIFY		
	TYPE	<input type="checkbox"/> ELECTRONIC (2 WIRE) R/I CONVERTER <input checked="" type="checkbox"/> ELECTRONIC (2 WIRE) CONTACTLESS		
	SUPPLY	<input checked="" type="checkbox"/> 24V DC <input type="checkbox"/>		
	OUTPUT	<input checked="" type="checkbox"/> 4-20mA		
	ACCURACY	$\pm 1\%$ FS		
SPACE HEATER	@SPACE HEATER	REQUIRED		
	@ POWER SUPPLY (NON INTEGRAL)	230V AC, 1 PH., 50 Hz		
	@ POWER SUPPLY (INTEGRAL)	BIDDER TO SPECIFY		
	@ RATING			
TERMINAL BOX	ACTUATOR/MOTOR TERMINAL BOX	REQUIRED		
	ENCL CLASS ACTUATOR/MOTOR T.B.	@ <input type="checkbox"/> IP 68 @ <input type="checkbox"/>		
	@ EARTHING TERMINAL	REQUIRED		
	PLUG & SOCKET (9 PIN) (FOR COMM, LS/TS FEED BACK, PoT)	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> 2 NOS. <input type="checkbox"/>		
CABLE GLANDS	@ POWER CABLE GLAND	SIZE:-----		
	@ SPACE HEATER CABLE GLAND	SIZE:-----		
	OTHER CONTROL CABLE GLANDS-1	<input type="checkbox"/> 1No. for BFV of CW PUMP (Cable size 2Px1.5mm2)		
	OTHER CONTROL CABLE GLANDS-2	QUANTITY & SIZE :-----		
WEIGHT	TOTAL WEIGHT (ACTUATOR + ACCESSORIES)	BIDDER TO SPECIFY		_____ Kg.
NOTES: 1. SCOPE: DESIGN, MANUFACTURE, INSPECTION, TESTING AND DELIVERY TO SITE OF ELECTRIC ACTUATOR FOR INCHING OR OPEN / CLOSE DUTY. 2. CODES & STANDARDS: DESIGN AND MATERIALS USED SHALL COMPLY WITH THE RELEVANT LATEST NATIONAL AND INTERNATIONAL STANDARD. AS A MINIMUM, THE FOLLOWING STANDARDS SHALL BE COMPLIED WITH: IS-9334, IS-2147, IS-2148, IS-325, IS-2959, IS-4691 AND IS-4722 3. TEMPERATURE RISE SHALL BE RESTRICTED TO 70 DEG. C FOR AMBIENT TEMPERATURE OF 50 DEG C. 4. CABLE GLANDS OF DOUBLE COMPRESSION TYPE, BRASS MATERIAL SHALL BE PROVIDED. 5. THE TORQUE SWITCHES SHALL BE PROVIDED WITH MECHANICAL LATCHING DEVICE TO PREVENT OPERATION WHEN UNSEATING FROM THE END POSITIONS. THE LATCHING DEVICE SHALL UNLATCH AS SOON AS THE VALVE LEAVES THE END POSITION. IF SUCH PROVISION IS NOT POSSIBLE, THE TORQUE SWITCHES SHALL BE BYPASSED BY END-POSITION LIMIT SWITCHES WHICH OPENS ON VALVE LEAVING END POSITION. THESE LIMIT SWITCHES ARE ADDITIONAL TO THE NUMBER OF LIMIT SWITCHES SPECIFIED ELSEWHERE. 6. THE MOTOR SHALL OPERATE SATISFACTORILY UNDER THE +/- 10% SUPPLY VOLTAGE VARIATION AT RATED FREQUENCY, -5% TO +3% VARIATION IN FREQUENCY AT RATED SUPPLY VOLTAGE, SIMULTANEOUS VARIATION IN VOLTAGE & FREQUENCY THE SUM OF ABSOLUTE PERCENTAGE NOT EXCEEDING 10%. 7. THE MOTOR SHALL BE SUITABLE FOR DIRECT ON LINE STARTING. \$\$ TORQUE SWITCH & LIMIT SWITCH SHALL ACT INDEPENDENT OF EACH OTHER. TANDEM OPERATION IS NOT ACCEPTABLE. ## EPOXY PAINT IS RECOMMENDED FOR COASTAL AREAS.				
NAME SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY	VENDOR COMPANY SEAL
	ANUJ WADHWA	CHETAN MALIK	M.A.MANSOORI	NAME
				SIGNATURE
	20.06.2013	20.06.2013	20.06.2013	DATE
NOTES* = TO BE FILLED BY MPL (LEAD AGENCY). @ = TO BE FILLED BY ES				

3-V-MISC-24283

DRAWING NO.



NOTE:-

- ALL TORQUE AND LIMIT SWITCHES (OTS, CTS, OLS1&2, CLS1&2) ARE WITH 2NO+2NC CONTACTS '1NO+1NC' IS TERMINATED IN TBS 1-24, REMAINING CONTACTS ARE FOR INTERNAL USE.
- ANY SPARE CONTACTS WHICH ARE NOT USED INTERNALLY ARE TO BE TERMINATED IN TBS 25-32
- CTS - TORQUE SWITCHES FOR CW ROTATION (CLOSE)
- OTS - TORQUE SWITCHES FOR CCW ROTATION (OPEN)
- OLS-1, OLS-2 - LIMITSWITCHES FOR POSITION OPEN
- CLS-1, CLS-2 - LIMITSWITCHES FOR POSITION CLOSE
- EPT - ELECTRONIC POSITION TRANSMITTER (CONTACTLESS TYPE, FOR INCHING DUTY)
- R1-R2-POTENTIOMETER 2 x 100 OHMS (FOR ON-OFF DUTY)
- FOR COMMANDS & EPT EITHER INTERNALLY GENERATED 24 VDC OR EXTERNAL SUPPLY OF 24VDC CAN BE USED
- M - MOTOR 3φ 415V 50 Hz AC SUPPLY
- TORQUE SWITCH BYPASS WITH LIMITSWITCH BOTH ON OPEN & CLOSE DIRECTION TO BE DONE INTERNALLY.

REV	DATE	ALTERED
		CHD & APPD

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.


TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		ELECTRICAL VALVE ACTUATORS (AC) WITH INTEGRAL STARTERS FOR NTPC PROJECTS (DRAWN FOR INTERMEDIATE POSITION OF VALVES)			
BHARAT HEAVY ELECTRICALS LTD., UNIT: HIGH PRESSURE BOILER PLANT. TIRUCHIRAPALLI-620014.		DRN N.P.ESWAR	SIGN N.P	DATE 17.03.05	NO.OF VAR.
365-121		CHD D.DINAKARAN	D.D	17.03.05	-
APPD K.ARUNACHALAM		K.A	17.03.05		
DEPT VL	SCALE NTS	WEIGHT (KG).	REFERENCE INFORMATION		NO. OF ITEMS
CODE					
TITLE WIRING DIAGRAM (TERMINAL PLAN) FOR ACTUATOR WITH INTEGRAL STARTER WITH PLUG & SOCKET FOR NTPC PROJECTS		CARD CODE U 01	DRAWING NO. 3-V-MISC-24283		REV 0


SUB-SECTION-IV: I7

INSTRUMENTATION AND POWER SUPPLY CABLE

LARA SUPER THERMAL POWER PROJECT (2x800MW) /
DARLIPALI SUPER THERMAL POWER PROJECT -I (2 x 800MW) /
GAJMARA SUPER THERMAL POWER PROJECT -I (2x 800MW) /
KUDGI SUPER THERMAL POWER PROJECT -I (3 x 800MW)
STEAM GENERATOR PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2

CLAUSE NO.	TECHNICAL REQUIREMENTS																					
	INSTRUMENTATION AND POWER SUPPLY CABLE																					
1.00.00	INSTRUMENTATION CABLE, POWER SUPPLY CABLE, INTERNAL WIRING AND ELECTRICAL FIELD CONSTRUCTION MATERIAL																					
1.01.00	General Requirements																					
1.01.01	All cables including special cables, internal wiring and electrical field construction material shall conform to this specification, Employer approved detail engineering drawings & documents and the latest edition of the relevant standards & guidelines. The Bidder shall furnish all material and services required for the completeness of the work identified in his scope as per this specification.																					
1.01.01	The Contractor shall supply, erect, terminate and test all instrumentation cables for control and instrumentation equipment/devices/systems included under Contractor's scope as illustrated in the enclosed Drg. No. 0000-101/102-POI-A-021 and ensuring completeness of the control system.																					
1.01.02	Any other application where it is felt that instrumentation cables are required due to system/operating condition requirements, are also to be provided by Contractor.																					
1.01.03	Other type of cables like fiber optic/co-axial cables for system bus, cables for connection of peripherals etc. (under Contractor's scope) are also to be furnished by the Contractor.																					
1.01.04	Contractor shall supply all cable erection and laying hardware from the main trunk routes like branch cable trays/sub-trays, supports, flexible conduits, cable glands, lugs, pull boxes etc. on as required basis for all the systems covered under this specification.																					
1.01.05	Wherever the quantity has been defined as on as required basis, the same are to be furnished by contractor on as required basis within his quoted lump sump price without any further cost implication to the Employer.																					
2.00.00	Specification of Instrumentation cable																					
2.01.00	Common Requirements																					
<hr/>																						
<table><tr><th>S. No.</th><th>Property</th><th>Requirement</th></tr><tr><td colspan="3"><hr/></td></tr><tr><td>1</td><td>Voltage grade</td><td>225 V (peak value)</td></tr><tr><td>2.</td><td>Codes and standard</td><td>All instrumentation cables shall comply with VDE 0815, VDE 0207, Part 4, Part 5, Part 6, VDE 0816, VDE 0472, SEN 4241475, ANSI MC 96.1, IS-8784, IS-10810 (latest editions) and their amendments read along with this specification.</td></tr><tr><td>3.</td><td>Continuous operation suitability</td><td>At 70 deg. C for all types of cables, while 205 Deg C for Type-C cables.</td></tr><tr><td>4.</td><td>Progressive automatic on-line sequential marking of length in meters</td><td>To be provided at every one meter on outer sheath.</td></tr></table>					S. No.	Property	Requirement	<hr/>			1	Voltage grade	225 V (peak value)	2.	Codes and standard	All instrumentation cables shall comply with VDE 0815, VDE 0207, Part 4, Part 5, Part 6, VDE 0816, VDE 0472, SEN 4241475, ANSI MC 96.1, IS-8784, IS-10810 (latest editions) and their amendments read along with this specification.	3.	Continuous operation suitability	At 70 deg. C for all types of cables, while 205 Deg C for Type-C cables.	4.	Progressive automatic on-line sequential marking of length in meters	To be provided at every one meter on outer sheath.
S. No.	Property	Requirement																				
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1	Voltage grade	225 V (peak value)																				
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LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART - B SUB-SECTION-IV: 17 (INSTR. AND POWER SUPPLY CABLE)	PAGE 1 OF 14																		

CLAUSE NO.	TECHNICAL REQUIREMENTS				
2.02.00	5.	Marking to read 'FRLS'	To be provided at every 5 meters on outer sheath except for Type-C cable.		
	6.	Allowable Tolerance on overall diameter	+/- 2 mm (maximum) over the declared value in data sheet		
	7.	Variation in diameter	Not more than 1.0 mm throughout the length of cable.		
	8	Ovality at any cross-section	Not more than 1.0 mm		
	9	Others	a) Durable marking at intervals not exceeding 625 mm shall include manufacturer's name, insulation material, conductor's size, number of pairs, voltage rating, type of cable, year of manufacturer to be provided.		
				b) Cables shall be suitable for laying in conduits, ducts, trenches, racks and underground-buried installation	
				c) Repaired cables shall not be acceptable.	
	<hr/>				
	Specific Requirements				
	<hr/>				
Specification Requirements		Type-A cable	Type-B cable	Type F & G cable	Type-C cable
<hr/>					
A. Conductors					
Cross section area		(Same as T/C)		0.5 sq. mm	0.5 sq. mm.
Conductor material		ANSI type KX	ANSI type SX	High conductivity Annealed bare copper	ANSI type KX
Colour code		Yellow-Red	Black-Red	As per VDE-815	Yellow-Red
Conductor Grade		As per ANSI MC 96.1		Electrolytic	As per ANSI MC 96.1
No & dia of strands		7x0.3 mm (nom)			
No. of Pairs		2	2	4,8,12,16,24,48	2
Max. conductor resistance per Km (in ohm) at 20 deg. C		As per ANSI MC 96.1		73.4 (loop)	As per ANSI MC 96.1
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2		PART - B SUB-SECTION-IV: I7 (INSTR. AND POWER SUPPLY CABLE)	PAGE 2 OF 14


CLAUSE NO.	TECHNICAL REQUIREMENTS				<div>एनटीपीसी NTPC</div>
	Reference Standard	As per ANSI MC 96.1	VDE 0815	As per ANSI MC 96.1	
	B. Insulation				
	Material	PVC type YI 3		Teflon (i.e. extruded FEP)	
	Thickness in mm (Min/Nom/Max)	0.25/0.3/0.35		0.4/0.50	
	Volume Resistivity (Min) in ohm-cm	1 x 10 ¹⁴ at 20 deg. C & 1x10 ¹¹ at 70 deg. C.		---	
	Voltage Rating	225 V peak operating voltage			
	Reference Standard	VDE 0207 Part 4		VDE 0207 Part 6 & ASTM D 2116.	
	Core diameter above insulation	Suitable for cage clamp connector			
	C. Pairing & Twisting				
	Max. lay of pairs (mm)		50		
	Single layer of polyester numbered tape on each pair provided	Each core printed with	Yes		
	Unit formation of four pairs with printing of no. of Unit provided	N.A.	Yes	N.A.	
	Conductor /pair identification as per VDE0815	N.A.	To be provided (color coding attached).	N.A.	
	D. Shielding				
	Type of shielding	←----- Al-Mylar tape -----→			
	Individual pair shielding	No	To be provided for F-type cable	No	
	Minimum thickness of Individual pair shielding	No	28 micron	No	
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2		PART - B SUB-SECTION-IV: I7 (INSTR. AND POWER SUPPLY CABLE)	PAGE 3 OF 14

CLAUSE NO.	TECHNICAL REQUIREMENTS				<div>एनटीपीसी NTPC</div>
	Overall cable assembly shielding	To be provided			
	Minimum thickness of Overall cable assembly shielding	55 micron			
	Shielding coverage	100% with at least 20% overlap			
	Drain wire provided for individual shield	N.A.	Yes (for F-type) 7-strand 20 AWG (0.51 mm2) annealed Tin coated copper	N.A.	
	Drain wire provided for overall shield	Yes. 7-strand 20 AWG (0.51 mm2) annealed Tin coated copper			
	E. FILLERS				
	Non-hygroscopic, flame retardant	To be provided			
	F. Outer Sheath				
	Material	←--- Extruded PVC compound YM1 with---→ FRLS properties		Teflon (i.e. extruded FRP)	
	Minimum Thickness at any point	1.8 mm		0.4 mm	
	Nominal Thickness at any point	>1.8 mm		0.5 mm	
	Color	Blue			
	Resistant to water, fungus, termite & rodent attack	Required			
	Oxygen index as per ASTM D-2863	not less than 29%		N.A.	
	Temperature index as per ASTM D-2863	not less than 250 deg.C		N.A.	
	Acid gas generation by weight as per IEC-60754-1	Maximum 20%		N.A.	
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2		PART - B SUB-SECTION-IV: 17 (INSTR. AND POWER SUPPLY CABLE)	PAGE 4 OF 14

CLAUSE NO.	TECHNICAL REQUIREMENTS			<div>एनटीपीसी</div> <div>NTPC</div>
	Smoke Density Rating as per ASTM D-2843	Maximum 60% (defined as the average area under the curve when the results of smoke density test plotted on a curve indicating light absorption vs. time as per ASTM D-2843)		N.A.
	Reference standard	VDE207 Part 5		VDE207 Part 6 & ASTM D2116
	G. Electrical Parameters			
	Mutual Capacitance Between Conductors At 0.8 KHz (Max.)	200 nF/km	120 nF/km for F type 100 nF/km for G-type	200 nF/km
	Insulation Resistance (Min.)	100 M Ohm/Km		
	Cross Talk Figure (Min.) At 0.8 KHz	60 dB	60 dB	N.A.
	Characteristic Impedance (Max) At 1 KHz	N.A.	320 OHM FOR F-TYPE 340 OHM FOR G-TYPE	N.A.
	Attenuation Figure at 1 KHz (Max)	N.A.	1.2 db/km	N.A.
	H. Complete Cable			
	Complete Cable assembly	Shall pass Swedish Chimney test as per SEN-SS 4241475 class F3.		N.A.
	Flammability	Shall pass flammability as per IEEE-383 read in conjunction to this specification		N.A.
	I. Accessories			
	Cable accessories of flame retardant quality.	Yes. (Accessories such as harnessing components, markers, bedding, cable jointer, binding tape etc.)		
	J. Tests			
	Routine & Acceptance tests	Refer sub-section IIIE		
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART - B SUB-SECTION-IV: I7 (INSTR. AND POWER SUPPLY CABLE)	PAGE 5 OF 14


CLAUSE NO.	TECHNICAL REQUIREMENTS		<div>एनटीपीसी</div> <div>NTPC</div>	
	Type tests	Submission of type test results and certificate shall be acceptable provided the test has been conducted within last 5 years from the date of bid opening. In case the test is not conducted within last 5 years or spec requirements are not met, the same shall be conducted by contractor free of cost to Employer. Also, refer sub-section-IV:19 TYPE TEST REQUIREMENTS FOR C&I.		
	K Cable Drum			
	Type	Non-returnable wooden drum (wooden drum to be constructed from seasoned wood free from defects with wood preservative applied to the entire drum) or steel drum.		
	Outermost layer covered with waterproof paper	Yes		
	Painting	Entire surface to be painted		
	Length	1000 m + 5% for up to & including 12 pairs 500 m + 5% for above 12 pairs		
3.00.00	SPECIFICATION OF OPTICAL FIBER CABLES (OFC)			
3.01.00	Optic Fiber cable shall be 4/8/12 core, galvanised corrugated steel taped armoured, fully water blocked with dielectric central member for outdoor/indoor application so as to prevent any physical damage. The cable shall have multiple single-mode or multi mode fibers on as required basis so as to avoid the usage of any repeaters. The core and cladding diameter shall be 9 +/- 1 micrometer and 125 +/- 1 micrometer respectively. The outer sheath shall have Flame Retardant, UV resistant properties and are to be identified with the manufacturer's name, year of manufacturer, progressive automatic sequential on-line marking of length in meters at every meter on outer sheath.			
3.02.00	The cable core shall have suitable characteristics and strengthening for prevention of damage during pulling viz. Steel central member, Loose buffer tube design, 4 fibers per buffer tube (minimum), Interstices and buffer tubes duly filled with Thixotropic jelly etc. The cable shall be suitable for a maximum tensile force of 2000 N during installation, and once installed, a tensile force of 1000 N minimum. The compressive strength of cable shall be 3000 N minimum& crush resistance 4000 N minimum. The operating temperature shall be - 20 deg. C to 70 deg.C			
3.03.00	All testing of the fiber optic cable being supplied shall be as per the relevant IEC, EIA and other international standards.			
3.04.00	Bidder to ensure that minimum 100% cores are kept as spares in all types of optical fibre cables.			
3.05.00	Cables shall be suitable for laying in conduits, ducts, trenches, racks and under ground buried installation.			
3.06.00	Spliced / Repaired cables are not acceptable.			
3.07.00	Penetration of water resistance and impact resistance shall be as per IEC standard.			
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2		PART - B SUB-SECTION-IV: 17 (INSTR. AND POWER SUPPLY CABLE)
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CLAUSE NO.	TECHNICAL REQUIREMENTS				<div>एनटीपीसी NTPC</div>																																																	
4.00.00	SPECIFICATION OF POWER SUPPLY CABLES For technical specification, testing requirements etc, refer relevant subsections of this specification.																																																					
5.00.00	INSTRUMENTATION CABLE INTERCONNECTION AND TERMINATION PHILOSOPHY The cable interconnection philosophy to be adopted shall be such that extensive grouping of signals by large scale use of field mounted Group Junction Boxes (JBs) at strategic locations (where large concentration of signals are available, e.g. valves limit & torque switches, switchgear) is done and consequently cable with higher number of pairs are extensively used. The details of termination to be followed are mentioned in the given Table A. TABLE A: CABLE TERMINATION TO BE FOLLOWED																																																					
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	<p>Notes</p> <ol style="list-style-type: none">Normally 10% spare cores shall be provided when the numbers of pairs of cables are more than four pairs except for pre-fabricated cables which shall be as per manufacturer's standard.For analog signals, individual pair shielding & overall shielding & for Binary signals, only overall shielding of instrumentation cables shall be provided.Also refer Drg. 0000-101/102-POI-A-021.*For high temperature applications only.Instrument Cabling for instruments/equipments covered under subsection-IV:13 (MAIN EQP INST SYS) shall be as per manufacturer's standard .																																	
6.00.00	TERMINAL BLOCKS																																	
6.01.00	All terminal blocks shall be rail mounted/post mounted, cage clamp type with high quality non-flammable insulating material of melamine suitable for working temperature of 105 deg.C. The terminal blocks in field mounted junction boxes, temperature transmitters, instrument enclosures/racks, etc., shall be suitable for cage clamp connections. The terminal blocks in Control Equipment Room logic/termination/marshalling cubicles shall be suitable for post mounted cage clamp connection at the field input end. The terminal blocks for DDCMIS input/output connections from/to SWGR/MCC, Actuators with Integral Starter (for coupling																																	
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2		PART - B SUB-SECTION-IV: 17 (INSTR. AND POWER SUPPLY CABLE)	PAGE 8 OF 14																													

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	relays and check back signals of 11 kV and 3.3 kV auxiliaries, LT drives/valves & dampers/solenoids, CT & VT, etc.) shall be provided with built in test and disconnect facilities complete with plug, slide clamp, test socket etc. The exact type of terminal blocks to be provided by the Bidder and the technical details of the same including width etc. shall be subject to Employer's approval.			
6.02.00	All the terminal blocks shall be provided complete with all required accessories including assembly rail, locking pin and section, end brackets, partitions, small partitions, test plug bolts and test plug (as specified above for SWGR connections) transparent covers, support brackets, distance sleeves, warning label, marking, etc.			
6.03.00	The marking on terminal strips shall correspond to the terminal numbering on wiring diagrams. At least 20% spare unused terminals shall be provided everywhere including local junction boxes, instrument racks/enclosures, termination/marshalling cabinets, etc. All terminal blocks shall be numbered for identification and grouped according to the function. Engraved labels shall be provided on the terminal blocks.			
6.04.00	For terminating each process actuated switches, drive actuators, control valves, Thermocouple, RTD, etc. in Local Junction Boxes, etc, refer Drg no. 0000-999-POI-A-065.			
6.05.00	The terminal blocks shall be arranged with at least 100 mm clearance between two sets of terminal blocks and between terminal blocks and junction box walls.			
6.06.00	For ensuring proper connections, Bidder shall provide suitable accessories, along with insulation sleeves. The exact connecting accessory shall be finalized as per application during detail engineering stage subject to Employer's approval without any cost repercussions.			
6.07.00	Internal wiring in factory pre-wired electronic equipment cabinets may be installed according to the Bidder's standard as to wire size and method of termination or internal equipment. Terminal blocks for connection of external circuits into factory prewired electronic equipment cabinets shall meet all the requirements as specified above.			
7.00.00	INTERNAL PANELS/ SYSTEM CABINETS WIRING			
7.01.00	Internal panel/cabinet wiring shall be of multi-stranded copper conductor with FRLS PVC insulation without shield and outer sheath meeting the requirements of VDE 0815.			
7.02.00	Wiring to door mounted devices shall be done by 19 strand copper wire provided with adequate loop lengths of hinge wire so that multiple door opening shall not cause fatigue breaking of the conductor.			
7.03.00	All internal wires shall be provided with tag and identification nos. etched on tightly fitted ferules at both ends in Employer's approved format. All wires directly connected to trip devices shall be distinguished by one additional red color ferrule.			
7.04.00	All external connection shall be made with one wire per termination point. Wires shall not be tapped or spliced between terminal points.			
7.05.00	All floor slots of desk/panels/cabinets used for cable entrance shall be provided with removable gasketed gland plates and sealing material. Split type grommets shall be used for prefabricated cables.			
7.06.00	All the special tools as may be required for solder less connections shall be provided by Bidder.			
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7.07.00	Wire sizes to be utilized for internal wiring.			
	(i)	Current (4-20 mA), low voltage signals (48V); Ammeter/Voltmeter circuit, control switches etc. for electrical system.	0.5 Sq.mm.	
	(ii)	Power supply and internal illumination.	2.5Sq.mm. minimum (shall be as per load requirement.)	
8.00.00	INSTRUMENTATION CABLE INSTALLATION AND ROUTING			
8.01.00	All cables assigned to a particular duct/conduit shall be grouped and pulled in simultaneously using cable grips and suitable lubricants. Cables removed from one duct/conduit shall not be reused without approval of Employer.			
8.02.00	Cables shall be segregated as per IEEE Std.-422. In vertically stacked trays, the higher voltage cable shall be in higher position and instrumentation cable shall be in bottom tier of the tray stack. The distance between instrumentation cables and those of other system shall be as follows:			
	From 11 kV/6.6 kV/3.3 kV tray system	-	914 mm	
	From 415V tray system	-	610 mm	
	From control cable tray system	-	305 mm	
8.03.00	Cables shall terminate in the enclosure through cable glands. All cable glands shall be properly gasketed. Fire proof sealing (to prevent ingress of dust entry and propagation of fire) shall be provided for all floor slots used for cable entrance. Compression cable glands (double for armoured and single for other cables) shall be provided.			
8.04.00	All cables shall be identified by tag. Nos. provided in Employer's approved format at both the ends as well as at an interval of 5 meters.			
8.05.00	Line voltage drop due to high resistance splices, terminal contacts, insulation resistance at terminal block, very long transmission line etc. shall be reduced as far as practicable.			
8.06.00	The cables emanating from redundant equipment/devices shall be routed through different paths. The above segregation of cables & wiring for redundant equipments/devices shall be in accordance with IEEE-Std-422.			
9.00.00	CABLE LAYING AND ACCESSORIES			
9.01.00	CABLE LAYING			
	1	Cables shall be laid strictly in line with cable schedule.		
	2	Identification tags for cables.		
		Indelible tags to be provided at all terminations, on both sides of wall or floor crossing, on each conduit/duct/pipe entry/exit, and at every 20 m in cable trench/tray.		
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART - B SUB-SECTION-IV: 17 (INSTR. AND POWER SUPPLY CABLE)	PAGE 10 OF 14

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9.02.00	3	Cable tray numbering and marking.		
		To be provided at every 10m and at each end of cable way & branch connection.		
	4	Joints for less than 250 Meters run of cable shall not be permitted.		
	5	Buried cable protection		
		With concrete slabs; Route markers at every 20 Meters along the route & at every bend.		
	6	Road Crossings		
		Cables to pass through buried high density PE pipes encased in PCC. At least 300 mm clearance shall be provided between		
		<ul style="list-style-type: none">- HT power & LT power cables,- LT power & LT control cables- LT control & instrumentation cables,		
		Spacing between cables of same voltage grade shall be in accordance with the de-rating criteria adopted for cable sizing.		
	7	Segregation (physical isolation to prevent fire jumping)		
	a	All cable associated with the unit shall be segregated from cables of other Units.		
	b	Interplant cables of station auxiliaries and unit critical drives shall be segregated in such a way that not more than half of the drives are lost in case of single incident of fire.		
8	Cable clamping			
		All cables laid on trays shall be neatly dressed up & suitably clamped/tied to the tray. For cables in trefoil formation, trefoil clamps shall be provided.		
9	Optical fiber cables inside conduit shall be laid on cable trays wherever available and feasible. In areas where the same are required to be buried, the same shall be buried in separate trench approx.1.6 meter depth, to be laid in 2" GI/rodent proof HDPE conduits covered with sand, brick and soil along the pipe line route;			
		While crossing roads - to be laid in GI/rodent proof HDPE conduits with sand filling at bottom and sand, soil filling at top with cement concrete;		
		While crossing canals/river- to be laid in GI/rodent proof HDPE conduits within hume pipe.		
	Bidder shall supply and install all cable accessories and fittings like Light Interface Units, Surge suppressors, Opto isolators, Interface Converters, Fibre Optic Card Cage, Fibre Optic Line Driver, Repeater / Modem (for Optical Fibre Cables), cable glands, grommets, lugs, termination kits etc. on as required basis.			
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9.03.00	Bidder shall furnish two completely new sets of cable termination kits like Crimping tools, etc., which are required for maintenance of the system as per the type of termination used.																																											
9.04.00	Cables, which terminate in cabinets of draw out sections shall have sufficient cable coiled in the bottom of the cabinet to permit full withdrawal of draw out sections without disconnecting the cables. When prefabricated cables with factory connectors on both ends are longer than required, the excess cable shall be coiled in the bottom of one or both termination cabinets.																																											
9.05.00	No splices shall be made in conductors for instrument and control circuits except where required at connections to devices equipped with factory installed pigtails. Such splices shall be made only in approved splicing boxes of fitting with removable cover. The splices shall be made with sufficient slack left in the wires to permit withdrawal of the splice from the splicing box for ease of future disconnection of the splices. All exposed conductor or connector surfaces shall be covered with a minimum of three half-lapped layers of all weather vinyl plastic electrical tape. Taping shall extend a minimum of two cable diameters over the cable jacket and a similar distance over the other insulation or connections requiring insulation.																																											
9.06.00	The Bidder shall be responsible for proper grounding of all equipment under C&I package. Further, proper termination of cable shields shall be verified and the grounding of the same shall be coordinated so as to achieve grounding of all instrumentation cable shields at same potential. This shall be completed prior to system tests. All the cables etc. required for grounding of all equipments supplied under this package are to be supplied by the Bidder.																																											
9.07.00	The Contractor shall take full care while laying / installing cables as recommended by cable manufacturers regarding pulling tensions and cable bends. Cables damaged in any way during installation shall be replaced at the expense of the Contractor.																																											
10.00.00	FIELD MOUNTED LOCAL JUNCTION BOXES <table><tr><td>(i)</td><td>No. of ways</td><td colspan="3">12/24/36/48/64/72/96/128 with 20% spares terminals.</td></tr><tr><td>(ii)</td><td>Material and Thickness</td><td colspan="3">4mm thick Fiberglass Reinforced Polyester (FRP).</td></tr><tr><td>(iii)</td><td>Type</td><td colspan="3">Door gasket shall be of synthetic rubber.</td></tr><tr><td>(iv)</td><td>Mounting clamps and accessories</td><td colspan="3">Suitable for mounting on walls, columns, structures etc. The brackets, bolts, nuts, screws, glands and lugs required for erection shall be of brass, included in Bidders scope of supply.</td></tr><tr><td>(v)</td><td>Type of terminal blocks</td><td colspan="3">Rail mounted cage-clamp type suitable for conductor size upto 2.5 mm². A M6 earthing stud shall be provided.</td></tr><tr><td>(vi)</td><td>Protection Class</td><td colspan="3">IP: 55 minimum for indoor & IP-65 minimum for outdoor applications.</td></tr><tr><td>(vii)</td><td>Grounding</td><td colspan="3">To be provided.</td></tr><tr><td>(viii)</td><td>Color</td><td colspan="3">To be decided during detailed engineering & subject to Employer's approval.</td></tr></table>				(i)	No. of ways	12/24/36/48/64/72/96/128 with 20% spares terminals.			(ii)	Material and Thickness	4mm thick Fiberglass Reinforced Polyester (FRP).			(iii)	Type	Door gasket shall be of synthetic rubber.			(iv)	Mounting clamps and accessories	Suitable for mounting on walls, columns, structures etc. The brackets, bolts, nuts, screws, glands and lugs required for erection shall be of brass, included in Bidders scope of supply.			(v)	Type of terminal blocks	Rail mounted cage-clamp type suitable for conductor size upto 2.5 mm ² . A M6 earthing stud shall be provided.			(vi)	Protection Class	IP: 55 minimum for indoor & IP-65 minimum for outdoor applications.			(vii)	Grounding	To be provided.			(viii)	Color	To be decided during detailed engineering & subject to Employer's approval.		
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11.00.00	CONDUITS			
11.01.00	<p>Conduits shall be generally used for interconnecting cables from field instruments to Local JB's. All rigid conduits, couplings and elbows shall be hot dipped galvanized rigid mild steel in accordance with IS: 9537 Part-I (1980) and Part-II (1981). The conduit interior and exterior surfaces shall have continuous zinc coating with an overcoat of transparent enamel lacker or zinc chromate. Flexible conduit shall be heat resistant lead coated steel, The temperature rating of flexible conduit shall be suitable for the following areas:</p> <p>(i) Mills (ii) Drum (iii) Main steam, RH steam (iv) Air Heaters (v) Furnace,BFPDTs</p> <p>For the remaining applications, water leak, fire and rust proof flexible GI conduits shall be provided.</p>			
11.02.00	The Bidder shall install conduits according to the general routing as approved by Employer and shall coordinate conduit locations with other works.			
11.03.00	All grounding bushings within all enclosures shall be wired together and connected internally to the enclosure grounding lug or grounding bus with 8 AWG bare copper conductor. Conduit runs to individually mounted equipment shall be grounded to the Employer's cable tray grounding conductor with 12 AEG bare copper conductor. All grounding bushings, clamps and connectors shall be subject to approval of the Employer.			
11.04.00	All rigid conduit fittings shall conform to the requirements of IS: 2667, 1976. Galvanized steel fitting shall be used with steel conduit. All flexible conduit fittings shall be liquid tight, galvanized steel. The end fittings shall be compatible with the flexible conduit supplied.			
11.05.00	All individually mounted equipment and devices shall be connected to the supply conduit, using not more than one meter of flexible conduit adjacent to the equipment or device. Flexible conduit shall be installed in all conduit runs, which are supported by both building steel and structures subject to vibration or thermal expansion. This shall include locations where conduit supported by building steel enters or becomes supported by the turbine generator foundation and where conduit supported by building steel or foundation becomes supported by steam generator framing.			
11.06.00	Special areas, such as control rooms in which external noise is to be minimized, shall have flexible conduit in conduit runs where the runs cross from the main building framing to the control room framing.			
11.07.00	<p>Conduit supports shall be furnished and installed in accordance with these specifications. Support material shall comply with the following requirements.</p> <p>i) Hanger rods shall be 12 mm diameter galvanized threaded steel rods.</p> <p>ii) Single conduit supports shall be one-hole cast metal straps and clamp backs unless other types are acceptable to the Employer. Multiple conduit bank supports shall be constructed of special galvanized support channels with associated conduit clips.</p>			
11.08.00	Conduit sealing, explosion proof, dust proof and other types of special fittings shall be provided as required by these specifications and shall be consistent with the area and equipment with which they are installed. Fittings installed outdoors and in damp locations			
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	shall be sealed and gasketed. Hazardous area fittings and conduits sealing shall conform to NEC requirements for the area classification.			
11.09.00	Contractor shall provide double locknuts on all conduit terminations not provided with threaded hubs and couplings. Water tight conduit unions and rain tight conduit hubs shall be utilized for all the application which shall be exposed to weather. Moisture pockets shall be eliminated from conduits.			
11.10.00	Conduits shall be securely fastened to all boxes and cabinets.			
12.00.00	CABLE SUB-TRAY & SUPPORT			
12.01.00	The cable sub-trays and the supporting system, to be generally used between Local/Group JBs and the main cable trays and the same shall be furnished and installed by the Contractor. It is the assembly of sections and associated fittings forming a rigid structural system used to support the cable from the equipment or instrument enclosure upto the main cable trays (trunk route).			
12.02.00	The covers on the cable sub-trays shall be used for protection of cables in areas where damage may occur from falling objects, welding spark, corrosive environment, etc. & shall be electrically continuous and solidly grounded. The cable trays shall not have sharp edges, burrs or projections injurious to the insulation or outer sheath of the cables.			
12.03.00	The supporting arrangement of cable tray system shall be able to withstand the weight of the cable and cable tray system. The supporting interval shall not be more than the recommended span for the above loading for the type of cable tray selected. The tray shall not overhang by more than one meter from the support at the dead end. As far as practicable the cable sub-tray system shall be supported from one side only, in order to facilitate installation and maintenance of cables.			
12.04.00	The Bidder shall furnish and install the estimated quantities and sizes of sub trays/troughs including all required fittings and adaptors on as required basis.			
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART - B SUB-SECTION-IV: 17 (INSTR. AND POWER SUPPLY CABLE)	PAGE 14 OF 14


SUB-SECTION-IV: I6


PROCESS CONNECTION AND PIPING


LARA SUPER THERMAL POWER PROJECT (2x800MW) /
DARLIPALI SUPER THERMAL POWER PROJECT -I (2 x 800MW) /
GAJMARA SUPER THERMAL POWER PROJECT -I (2x 800MW) /
KUDGI SUPER THERMAL POWER PROJECT -I (3 x 800MW)
STEAM GENERATOR PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	PROCESS CONNECTION AND PIPING			
1.00.00	PROCESS CONNECTION PIPING			
1.01.00	The Contractor shall provide, install and test all required material for completeness of Impulse Piping System and Air Piping System as per the requirements of this Sub-section enclosed installation drawings and source connection drawings on as required basis for the connection of instruments and control equipment to the process and make the system complete. The installation & source connection of various items shall generally as per installation drawings (drawing no. 0000-999-POI-A-022 to 034) and source connection drawings (drawing nos. 0000-999-POI-A-035), however, the Contractor shall furnish during detailed engineering all relevant drawings, material and tech. specifications of various items service wise for Employer's approval.			
1.01.01	All materials supplied under this Sub-section shall be suitable for intended service, process, operating conditions and type of instruments used and shall fully conform to the requirements of this specification. The material offered by the Bidder shall be from reputed, experienced manufacturer whose guaranteed and trouble free operation has been proven at least for two years in not less than two pulverized coal fired utility stations.			
1.02.00	IMPULSE PIPING, TUBING, FITTINGS, VALVES AND VALVE MANIFOLDS			
1.02.01	All impulse pipe shall be of seamless type conforming to ANSI B36.10 for schedule numbers, sizes and dimensions etc. The material of the impulse pipe shall be same as that of main process pipe. For various applications specification of associated fittings and valves shall be as given in Table PCP. For protection against sea environment all impulse pipes fittings etc. shall be provided with durable epoxy coating with poly urethane finish.			
1.02.02	Stainless steel tube shall be provided inside enclosures & racks from tee connection to valve manifold and then to instrument. For high pressure/temperature applications (piping class A, B, C & D of the table no. PCP) the material shall be ASTM A 213 TP 316H and for other applications material shall be ASTM A 213 TP 316L. The wall thickness of the tube shall be in accordance with the ANSI B31.1 standard.			
1.02.03	All fittings shall be forged steel and shall conform to ANSI B16.11. The material of forged tube fittings for shaped application (e.g. Tee, elbow etc.) shall be ASTM A 182 Gr. 316 H for high pressure/ temperature applications (as defined above) and ASTM A 182 Gr. 316L for other applications. The material for bar stock tube fitting (for straight application) shall be 316 SS. Metal thickness in the fittings shall be adequate to provide actual bursting strength equal to or greater than those of the impulse pipe or SS tube, with which they are to be used.			
1.02.04	The source shut-off (primary process root valve) and blow down valve shall be of 1/2 inch size globe valve type for all applications except for air and flue gas service wherein no source shut-off valves are to be provided. The disc and seat ring materials of carbon steel and alloy steel valves be ASTM A-105 and ASTM A-182, Gr. F22, hard faced with stellite (minimum hardness - 350 BHN.) The surface finish of 16 RMS or greater is required in the area of stem packing. The valve design shall be such that the seats can be reconditioned and stem and disc may be replaced without removing the valve body from the line.			
1.02.05	The valve manifolds shall be of 316 stainless steel with pressure rating suitable for intended application. 2 valve manifold and 3 valve manifold shall be used for pressure measurements using pressure transmitters/ pressure switches and diff. pressure transmitter/ switches respectively. 5-valve manifold shall be used for remaining applications like DP, flow and level measurements.			
1.02.06	For Pr./D.P gauges in fluid application two-way globe valve on each impulse line to the instrument and in A/F application two-way gate valve on each impulse line to the instrument			
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART - B SUB-SECTION-IV I-6 (PROCESS CONNECTION & PIPING)	PAGE 1 OF 6

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	shall be provided near the instrument. These shall be in addition to the three ways gauge cock provided along with the pressure /D.P gauges.			
2.00.00	AIR SUPPLY PIPING			
2.01.00	All pneumatic piping, fittings, valves, air filter cum regulator and other accessories required for instrument air for the various pneumatic devices/ instruments shall be provided.			
2.01.01	This will include as a minimum air supply to pneumatically operated control valves, actuators, instruments, continuous and intermittent purging requirements of etc.			
2.02.00	For individual supply line and control signal line to control valve, 1/4-inch size light drawn tempered copper tubing conforming to ASTM B75 shall be used. The thickness of cu-tubing shall not be less than 0.065 inch and shall be PVC coated. The fittings to be used with copper tubes shall be of cast brass, screwed type.			
2.03.00	All other air supply lines of 1/2 inch to 2 inch shall be of mild steel hot dipped galvanized inside and outside as per IS-1239, heavy duty with threaded ends. The threads shall be as per ASA B.2.1. Fittings material shall be of forged carbon steel A234 Gr. WPB galvanized inside and outside, screwed as per ASA B2.1. Dimensions of fittings shall be as per ASA B16.11 of rating 3000 lbs.			
2.04.00	For air supply to various devices mentioned above, the bidder shall provide 2 inch size GI pipe header with isolation valve from the instrument air and service air terminal points. In the boiler area the 2 inch head shall be provided upto top most elevation of boiler floor and from this 2 inch header, 1 inch sub-header shall be branched off at each floor with isolation valve. From this 1 inch sub-header, branch line of 1/2 inch, with isolation valve shall be provided upto various devices. Similar system is to be followed for service air required for intermittent purging in the Local Instrument Enclosures (LIEs) etc.			
2.05.00	All instrument air filters cum regulator set with mounting accessories shall be provided for each pneumatic device requiring air supply. The filter regulators shall be suitable for 10-kg/sq.cm max. Inlet pressure. The filter shall be of size 5 microns and of material sintered bronze. The air set shall have 2-inch size pressure gauge and built in filter housing blowdown valve. The end connection shall be as per the requirement to be finalized during detailed engineering.			
2.06.00	All the isolation valves in the air supply line shall be gate valves as per ASTM B62 inside screw rising stem, screwed female ends as per ASA B2.1. Valve bonnet shall be union type & trim material shall be stainless steel, body rating 150 pounds ASA. The valve sizes shall be ½ inch to 2 inch.			
2.07.00	Purge Air Connection for Air and Flue gas Applications			
	The continuous purging with instrument air shall be done, for all air and flue gas measurements excepting instrument air and service air instruments, at the process source connection end. Necessary arrangements required for continuous purging shall be provided inside all the Air and Flue gas enclosures as per enclosed drawing no. 0000-999-POI-A-034.			
	For intermittent purging with service air, necessary arrangements inside all the air and Flue gas enclosures shall be provided. The SS three way valve provided in the SS tubing shall be used for isolating the transmitter & connecting the service air quick disconnect line.			
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART - B SUB-SECTION-IV I-6 (PROCESS CONNECTION & PIPING)	PAGE 2 OF 6

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	Purging arrangement is not required for Instrument air and service air measurement applications.			
3.00.00	INSTALLATION AND ROUTING			
3.01.00	Instrument Piping System			
3.01.01	For steam and liquid measurements, the impulse pipe should preferably slope downward from source connection to instrument and instrument shall be installed below the source point. If due to any reason instrument is installed above the source point, the impulse pipe should slope upwards continuously and a 'pigtail' should be provided at the instrument to assure water seal for temperature protection. For vacuum measurements instrument shall be installed above source point and impulse pipe should slope upwards.			
3.01.02	Impulse piping for air and flue gas shall slope upwards and instrument shall be installed above source point. If this requirement cannot be met special venting or drain provision shall be provided with vent & drain lines along with isolation valves and other accessories including drainpipes. This drain is to be connected to plant drain through open funnel also.			
3.01.03	All impulse piping shall be installed to permit free movement due to thermal expansion. Wherever required expansion loops shall be provided.			
3.01.04	Special accessories such as condensing pots/ reservoirs shall be provided and installed wherever required. In any case condensing pots shall be provided for all level measurements in steam and water services, all flow measurement in steam services and flow measurements water services above 120 Deg.C. For drum/ separator level measurement required balancing chamber shall be provided.			
3.01.05	Color coding of all impulse pipes shall be done by the bidder in line with the colour coding being followed for the parent pipes.			
3.02.00	Instrument Air & Service Air Piping/ Tubing System			
3.02.01	Instrument air & service air headers and their branches with all associated fittings & accessories shall be provided for giving supply to all consumers, as per the requirements. Air piping shall be installed always with a slope of over 1/20 to prevent accumulation of water within the pipe.			
3.02.02	Single and multi tubes shall run with the minimum number of changes in direction. Suitable identification tags shall be provided for easy checkup and for connections.			
4.00.00	PIPING/TUBING SUPPORT			
4.01.00	Impulse piping and sample piping shall be supported at an interval not exceeding 1.5 meters. Each pipe shall be supported individually using slotted angle mounted clamps with necessary fixtures. Tubing shall run in proper perforated trays with proper cover. Tubing shall be supported inside the trays by aluminium supports. Hangers and other fixtures required for support of piping and trays shall be provided, either by welding or by bolting on walls, ceilings and structures. Hanger clamps and other fastening hardware shall be of corrosion resistant metals and hot-dip galvanized.			
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2		PART - B SUB-SECTION-IV I-6 (PROCESS CONNECTION & PIPING)
PAGE 3 OF 6				

CLAUSE NO.	TECHNICAL REQUIREMENTS			
5.00.00	SHOP AND SITE TESTS			
5.01.00	General Requirements			
5.01.01	The equipment and work performed as per this Sub-section shall be subject to shop and site test as per requirements of Sub-section-Q (Quality Assurance & Inspection) other applicable clauses of this Sub-section and Employer approved quality assurance plan.			
5.01.02	Hydrostatic and pneumatic tests shall be performed on all pipes, tubing and systems and shall conform to ANSI B31.1.			
5.02.00	Hydrostatic Testing			
5.02.01	All instrument piping/ tubing shall be hydrostatically tested upon completion of erection. The test pressure shall be 1.5 times the maximum process pressure. The test shall be performed either with the testing of associated process piping or without the associated process piping (by closing the root valve). In both the cases the instrument shall be isolated by closing the shut-off valve.			
5.03.00	Air Testing			
5.03.01	All air headers & branch pipes shall be air tested by pressure decay method as per ANSI B31.1. Flexible hoses and short signal tubing shall be tested at normal pressure for leakage. Long signal tubing shall be tested by charging each tube with air at 2 kg/ sq. cm. through a bubbler sight glass. The boiler draft and vacuum piping shall be air tested by the same method as long signal tubing.			
6.00.00	LOCAL INSTRUMENT ENCLOSURE AND RACKS			
	<p>Transmitters, switches, devices ,temperature transmitters etc. (except for all fuel oil applications which shall be mounted close to be tapping points) mounted in the field shall be suitably grouped together and mounted (i) local instruments enclosure in case of open areas of the plant like boiler area, etc. and (ii) In local instrument racks in case of covered areas. Gauges are to be mounted on a channel or a frame or a rack (Gauges shall not be mounted directly on process pipe). These local instrument enclosures and racks shall be furnished as per the actual requirements finalized during detailed engineering stage. The exact grouping of instruments in a particular instrument enclosure/instrument rack shall be as finalized during detailed engineering stage subject to Employer's approval.</p> <p>For mounting of PT/DPT/LT/FT, LIEs / LIRs shall be of three types depending on the number of transmitters located in it as elaborated in the typical GA of the LIE/LIR, drawing no. 0000-999-POI-A-064 (Sh Nos. 1 to 3 of 5).</p> <p>These dimensions and number of instruments indicated therein are only indicative and the exact dimensions along with the number of instruments shall be as finalized during detailed engineering stage without any price repercussions.</p> <p>The internal layout shall be such that the impulse piping/ blow down lines are accessible from back side of the enclosure / rack and the transmitters etc. are accessible from front side for easy maintenance. Bulkheads, especially designed to provide isolation from process line vibration shall be installed on instrument enclosures/racks to meet the process sensing line connection requirement.</p> <p>Vibration dampeners shall be installed for each enclosure / rack.</p>			
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2		PART - B SUB-SECTION-IV I-6 (PROCESS CONNECTION & PIPING)
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CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनटीपीसी NTPC</div>	
	<p>The enclosures shall be constructed of 3 mm sheet plate and shall be of modular construction with one or more modules and two end assemblies bolted together to form an enclosure. Double inter locking doors shall be provided. The doors shall be the three-point locking type constructed of not less than 1.6 mm thick steel. Doors shall have concealed quick removal type pinned hinges and locking handles. Door locks shall accept the same key.</p> <p>Gaskets shall be used between all mating sections to achieve protection class of IP-55.</p> <p>The instrument racks shall be free standing type constructed of suitable 5 mm thick channel frame of steel and shall be provided with a canopy to protect the equipment mounted in racks from falling objects, water etc. The canopy shall not be less than 3 mm thick steel, and extended beyond the ends of the rack. Bulk heads, especially designed to provide isolation from process line vibration shall be provided. Exact fabrication details shall be as finalized during detailed engineering stage. The junction box for racks also shall conform to IP 55 protection class.</p> <p>Enclosures/racks shall be reinforced as required to ensure true surface and to provide adequate support for instruments and equipment mounted therein. Centre posts or any member which would reduce access shall not be provided.</p> <p>Each transmitter enclosure housing instruments requiring purge air for continuous air purging, shall be provided with common purge air header, redundant air filter regulators of sufficient capacity, required pressure gauges, valves, fittings, SS tubing and individual purge meters for each purge line etc. as required and indicated in Instrument Installation drawings enclosed herewith.</p> <p>A 15 mm NB service air header shall be furnished in each instrument enclosure housing air & flue gas and coal mill instruments. The header shall be furnished complete with a pressure regulating valve, pressure gauge, and quick disconnect connections. A hose for connecting each header to the draft instrument line four-way valves shall be furnished. The hose shall be self-storing nylon tubing having a burst pressure of 15 kg/sq. cm. The size of the hose shall be 1/2" minimum. The service air header shall originate at a bulkhead penetration or fitting located on one of the bulkhead plates.</p> <p>The contractor shall prepare the piping drawings and the general arrangement layout drawings for each of the enclosures and racks. Special attention shall be given in the piping layout to avoid air traps in liquid filled piping or water pockets in piping intended to be dry. Drawings shall indicate the arrangement of all equipment, piping, valves and fittings within, the enclosure/racks and shall be subject to Employer's approval.</p> <p>All liquid filled blow down lines, except those measuring vacuum shall be connected to a two inch header which is extended through one end of the enclosure and turned downward for directing the blow down into a drain. The material of the blow down header shall be carbon steel as per ASTM A 106 Gr. C.</p> <p>The Contractor shall submit to the Employer with his proposal a copy of his welding procedure specification together with proof of his compliance with the latest applicable welding ANSI code. Prior to any welding being performed, the Contractor shall submit the qualifications of the craftsmen who will perform the work.</p>		
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART - B SUB-SECTION-IV I-6 (PROCESS CONNECTION & PIPING)	PAGE 5 OF 6

7.00.00 TABLE PCP

System/Line Description	Piping Class	Schedule (Size)	Materials Fitting/Valve Body	for Valve Material	Stem	Rating Piping/ Fittings	of Pr. Class of Valve
Main Steam/ Upstream of HP bypass and Auxiliary Steam Pressure reducing valve, Drum Level	A	XXS (1/2 inch)	(Note-2)	(Note-2)		9000 lb	3000 SPL
BFP disch, superheater attemperator, spray to PRDS, Phosphate dosing pp disch, BCW pump	B	160 (1/2 inch)	ASTM-A105	ASTM-A-182 Gr.F6a		6000 lb	2500
Reheater attemperator	C	160 (1/2 inch)	ASTM-A105	-do-		6000 lb	1500
Hot Reheat/ down stream of Aux. Steam press. Reducing valve upto desuper heater/ Flash tank drain manifold, HP heater level.	D	160 (1/2 inch)	ASTM-A182 22	Gr.F- (Note-2		3000 lb	900
Cold reheat upto Tee-off for HP Bypass / Extraction steam to HPH	E	80 (1/2 inch)	ASTM-A182 22	Gr.F- ASTM-A-182 Gr.F6a		3000 lb	800
Cold reheat down steam of Tee-off (HP Bypass)	F	80 (1/2 inch)	ASTM-A105	-do-		3000 lb	800
BFP suction, Condensate System/ Extraction to LPH/ Ext-4 to BFPT, Deaerator/ auxiliary steam, service air, inst air, ECW pump, ACW pump and other low pr water services	G	80 (1/2 inch)	ASTM-A105	-do-		3000 lb	800
Air/ Flue gas outside furnace	M	80 (3/4 inch)	ASTM-A105	-do-		3000 lb	800
Air/ Flue gas inside furnace	N	80 (3/4 inch)	ASTM-A182 22	Gr. F- -do-		3000 lb	800

NOTE:

- Rating of piping/fittings/valves etc. is subjected to the final design pressure & temperature during the detailed engineering.
- Specification for fittings and valves in this table are minimum requirement. Bidder to provide fittings and valves meeting process requirements and as per piping specified in Mechanical Sub-Section- Power Cycle piping System & LPP. Materials for fittings, specialties and valves shall be compatible with process pipe material.


LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART - B SUB-SECTION-IV I-6 (PROCESS CONNECTION & PIPING)	PAGE 6 OF 6
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SUB-SECTION-IV: I9

TYPE TEST REQUIREMENTS


LARA SUPER THERMAL POWER PROJECT (2x800MW) /
DARLIPALI SUPER THERMAL POWER PROJECT -I (2 x 800MW) /
GAJMARA SUPER THERMAL POWER PROJECT -I (2x 800MW) /
KUDGI SUPER THERMAL POWER PROJECT -I (3 x 800MW)
STEAM GENERATOR PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2

CLAUSE NO.	TECHNICAL REQUIREMENTS			
1.00.00	TYPE TEST REQUIREMENTS			
	<p>TYPE TEST REQUIREMENTS</p> <p>General Requirements</p> <p>The Contractor shall furnish the type test reports of all type tests as per relevant standards and codes as well as other specific tests indicated in this specification. A list of such tests are given for various equipment in table titled 'TYPE TEST REQUIREMENT FOR C&I SYSTEMS' at the end of this chapter and under the item Special Requirement for Solid State Equipments/Systems. If the bidder proposes a different standard/code from that indicated at table 3.00.00, the same is acceptable provided the equivalence of the proposed standard is established by the bidder. For the balance equipment instrument, type tests may be conducted as per manufactures standard or if required by relevant standard.</p> <p>(a) Out of the tests listed, the Bidder/ sub-vendor/ manufacturer is required to conduct certain type tests specifically for this contract (and witnessed by Employer or his authorized representative) even if the same had been conducted earlier, as clearly indicated subsequently against such tests.</p> <p>(b) For the rest, submission of type test results and certificate shall be acceptable provided.</p> <p>i. The same has been carried out by the Bidder/ sub-vendor on exactly the same model /rating of equipment. (For control valves, this shall be same size, type & design).</p> <p>ii. There has been no change in the components from the offered equipment & tested equipment.</p> <p>iii. The test has been carried out as per the latest standards along with amendments as on the date of Bid opening.</p> <p>(c) In case the approved equipment is different from the one on which the type test had been conducted earlier or any of the above grounds, then the tests have to be repeated and the cost of such tests shall be borne by the Bidder/ sub-vendor within the quoted price and no extra cost will be payable by the Employer on this account.</p> <p>As mentioned against certain items, the test certificates for some of the items shall be reviewed and approved by the main Bidder or his authorized representative and the balance have to be approved by the Employer.</p> <p>The schedule of conduction of type tests/ submission of reports shall be submitted and finalized during pre-award discussion.</p> <p>For the type tests to be conducted, Contractor shall submit detailed test procedure for approval by Employer. This shall clearly specify test setup, instruments to be used, procedure, acceptance norms (wherever applicable), recording of different parameters, interval of recording precautions to be taken etc. for the tests to be carried out.</p> <p>The Bidder shall indicate in the relevant BPS schedule, the cost of the type test for each item only for which type tests are to be conducted specifically for this project. The cost shall only</p>			
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART - B SUB-SECTION-IV:19 TYPE TESTS REQUIREMENTS	PAGE 1 OF 6

CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनटीपीसी NTPC</div>					
2.00.00	be payable after the respective type tests are conducted in presence of authorized representative of Employer. If a test is waived off, then the cost shall not be payable.						
	SPECIAL REQUIREMENT FOR SOLID STATE EQUIPMENTS/ SYSTEMS The minimum type test reports, over and above the requirements of above clause, which are to be submitted for each of the major C&I systems shall be as indicated below: i) Surge Withstand Capability (SWC) for Solid State Equipments/ Systems All solid state systems/ equipments shall be able to withstand the electrical noise and surges as encountered in actual service conditions and inherent in a power plant. All the solid state systems/ equipments shall be provided with all required protections that needs the surge withstand capability as defined in ANSI 37.90.1/ IEEE-472. Hence, all front end cards which receive external signals like Analog input & output modules, Binary input & output modules etc. including power supply, data highway, data links shall be provided with protections that meets the surge withstand capability as defined in ANSI 37.90.1/ IEEE-472. Complete details of the features incorporated in electronics systems to meet this requirement, the relevant tests carried out, the test certificates etc. shall be submitted along with the proposal. As an alternative to above, suitable class of EN 61000-4-12 which is equivalent to ANSI 37.90.1/ IEEE-472 may also be adopted for SWC test. ii) Dry Heat test as per IEC-68-2-2 or equivalent. iii) Damp Heat test as per IEC-68-2-3 or equivalent. iv) Vibration test as per IEC-68-2-6 or equivalent. v) Electrostatic discharge tests as per EN 61000-4-2 or equivalent. vi) Radio frequency immunity test as per EN 61000-4-6 or equivalent. vii) Electromagnetic Field immunity as per EN 61000-4-3 or equivalent. Test listed at item no. v, vi, vii, above are applicable for electronic cards only as defined under item (i) above.						
3.00.00	TYPE TEST REQUIREMENT FOR C&I SYSTEMS						
		Sl. No	Item	Test Requirement	Standard	Test To Be Specifically Conducted	NTPC's Approval Req. On Test Certificate
		Col 1	Col 2	Col 3	Col 4	Col 5	Col 6
		1	Elect. Metering instruments	As per standard (col 4)	IS-1248	No	Yes
		2	Thermocouple	Degree of protection test	IS-2147	No	No
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2			PART - B SUB-SECTION-IV:19 TYPE TESTS REQUIREMENTS		PAGE 2 OF 6

CLAUSE NO.	<div data-bbox="1273 117 1414 191" style="float: right;">एनटीपीसी NTPC</div> TECHNICAL REQUIREMENTS					
	3	RTD	As per standard (col 4)	IEC-60751	No	No
	4	Electronic transmitter	As per standard (col 4)	BS-6447 / IEC-60770	No	Yes
	5	E/P converter	As per standard (col 4)	Mfr. standard	No	Yes
	6	Instrumentation Cables Twisted & Shielded				
		-Conductor	Resistance test	VDE-0815	No	Yes
			Diameter test	IS-10810	No	Yes
			Tin Coating test (Persulphate test)	IS-8130	No	Yes
		-Insulation	Loss of mass	VDE 0472	No	Yes
			Ageing in air ovens**	VDE 0472	No	Yes
			Tensile strength and elongation test before and after ageing**	VDE 0472	No	Yes
			Heat shock	VDE 0472	No	Yes
			Hot deformation	VDE 0472	No	Yes
			Shrinkage	VDE 0472	No	Yes
			Bleeding & blooming	IS-10810	No	Yes
		-Inner sheath***	Loss of mass	VDE 0472	No	Yes
			Heat shock	VDE 0472	No	Yes
			Cold bend/cold impact test	VDE 0472	No	Yes
			Hot deformation	VDE 0472	No	Yes
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE			TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2		PART - B SUB-SECTION-IV:19 TYPE TESTS REQUIREMENTS	PAGE 3 OF 6

CLAUSE NO.	TECHNICAL REQUIREMENTS					
		Shrinkage	VDE 0472	No	Yes	
	-Outer sheath	Loss of mass	VDE 0472	No	Yes	
		Ageing in air ovens**	VDE 0472	No	Yes	
		Tensile strength and elongation test before and after ageing**	VDE 0472	No	Yes	
		Heat shock	VDE 0472	No	Yes	
		Hot deformation	VDE 0472	No	Yes	
		Shrinkage	VDE 0472	No	Yes	
		Bleeding & blooming	IS-10810	No	Yes	
		Colour fastness to water	IS-5831	No	Yes	
		Cold bend/ cold impact test	VDE-0472	No	Yes	
		Oxygen index test	ASTMD-2863	No	Yes	
		Smoke Density Test	ASTMD-2843	No	Yes	
		Acid gas generation test	IEC-60754-1	No	Yes	
	-fillers	Oxygen index test	ASTMD-2863	No	Yes	
		Acid gas generation test	IEC-60754-1	No	Yes	
	-AL-MYLAR shield	Continuity test		No	Yes	
		Shield thickness		No	Yes	
		Overlap test		No	Yes	
	-Over all cable	Flammability Test	IEEE 383	No	Yes	
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2		PART - B SUB-SECTION-IV:19 TYPE TESTS REQUIREMENTS	PAGE 4 OF 6	