


CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनटीपीसी NTPC</div>		
	<p>welded joints this joint must be reinforced with a strap. Flanged and welded joints must be avoided in the middle of the span. Valves should be located in such a manner so as to ensure their convenient operation from the floor or the nearest platform.</p>			
2.04.04	Pipe lines of NB 50 size and below are regarded as field run piping. It is Bidder's responsibility to plan suitable layouts for these system insitu. Bidder shall prepare drawings indicating the layout of field run pipe work. These drawings shall be approved by Project Manager to the installation of the field run pipe work. Based on these approved layouts the Bidder shall prepare the BOQ of field run-pipes and submit to Employer for approval.			
2.04.05	All piping shall be routed so as to avoid interference with other pipes and their hangers and supports, electrical cable trays, ventilation ducting, structural members, equipment etc. Adequate clearance shall be ensured with respect to the above to accommodate insulation and pipe movements, if any.			
2.04.06	Piping shall generally be routed above ground but where specifically indicated/approved by the Project Manager the pipes may be arranged in trenches or buried. Pipes at working temperature above the ambient shall however not be buried.			
2.04.07	Sufficient up stream and down stream lengths shall be provided for flow measuring devices, control valves and other specialties.			
2.04.08	All local instruments shall be located on pipe lines as to render them observable from the nearest available platforms.			
2.04.09	Openings provided in the wall for pipelines must be closed with bricks and mortar with 10-12 mm clearance between brick work and pipe after taking care of insulation and thermal movement, if any. The clear space must be filled with felt or asbestos or approved filling compound.			
2.05.00	Slope/Drains and Vents			
2.05.01	Suitable slope shall be provided for all pipelines towards drain points. It is Bidder responsibility to identify the requirements of drains and vents, and supply the necessary pipe work, valves, fittings, hangers and supports etc. As per the system requirement low points in the pipelines shall be provided with suitable draining arrangement and high points shall be provided with vent connections where air or gas pockets may occur. Vent for use during hydrostatic test shall be plugged after the completion of the test. Vent shall not be less than 15mm size. Drains shall be provided at low points and at pockets in piping such that complete drainage of all systems is possible. Drain shall not be less than 15mm for line size up to 150mm, not less than 20mm up to 300mm and not less than 25mm for 350mm to 600mm pipes and not less than 50mm for 600mm and above pipes.			
2.05.02	Air piping shall be sloped so that any part of the system can be drained through the shut-off drain valve or drain plugs.			
2.06.00	Pipe Joints In general all water lines 65mm NB and above, are to be joined generally by butt welding except the locations where valves/fittings are to be installed with flanged connections and 50mm and below by socket welding unless mentioned otherwise specifically. All air lines shall be of screwed connection and rubber lined pipes of flanged connections.			
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-II:M3 PCP & LPP	PAGE 34 OF 53


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2.06.01	<p>Screwed</p> <p>(a) Threading of pipes shall be carried out after bending, heat treatment etc. If not possible, threading may be done prior to these operations but proper care should be taken to protect them from damage. Threads shall be to ANSI B 2.1 (taper) NPT/IS: 554 unless specified otherwise.</p> <p>(b) Galvanized pipe shall generally be joined by screwing into sockets. The exposed threaded portion on the outside of the pipes shall be given a zinc silicate coating. Galvanized pipes shall not be joined by welding. Screwed ends of GI pipes shall be thoroughly cleaned and painted with a mixture of red and white lead before jointing. For galvanized pipe sizes above 150 mm NB, screw & socket jointing as per ASTM-A-865 shall be employed for both pipe-to-pipe and pipe-to-fitting jointing. For pipe to fitting connection since no direct threading can be done on the fittings (supplied as per ASTM-A-234 Gr. WPB and ANSI B-16.9) necessary straight pipe lengths acting as match pieces shall be welded to the fitting at both ends and subsequently the free ends of the straight lengths shall be threaded as per ASTM A-865 for jointing with main pipe. Once welding of fittings with match pieces and threading of free ends of match pieces are over, the entire fabricated piece shall be galvanized, or in case match pipes and fittings are already galvanized before the above mentioned fabrication then suitable application of Zinc-Silicate paste adequately at the welded surface (both in side & out side) after welding with zinc rich electrode, along with the nascent threaded metal portions at both free ends given the same application of Zinc Silicate paste. Alternatively flanged jointing may be employed for pipe sizes 100 NB and above. However, the bidder shall ensure the galvanized pipe joints do not fail during hydro test.</p> <p>(c) Teflon tapes shall be used to seal out screwed joints and shall be applied to the male threads only. Threaded parts shall be wiped clean of oil or grease with appropriate solvent if necessary and allowing proper time for drying before applying the sealant. Pipe ends shall be reamed and all chips shall be removed. Screwed flanges shall be attached by screwing the pipe through the flange and the pipe and flange shall be refaced accurately.</p> <p>(d) For pipe sizes from 350 mm NB to 550 mm NB (including 350 NB & 550 NB) the GI pipes shall be of flanged connection. However, the pipes after welding of flanges shall be completely galvanized. Any site welding done on galvanized pipes shall be done with zinc-rich special electrodes and the welded surfaces whether inside or outside shall be coated with zinc-silicate paste. Seal welding of flanges with zinc-rich electrode will be permitted only when any flange is leak-prone during hydro testing.</p> <p>(e) For pipe sizes 600 mm NB and above, the GI pipes shall be of welded connection (with zinc-rich special electrodes) followed by application of zinc silicate coating at welded surfaces both inside and outside the pipe, except for the last blank/blind flange, or, equipment connection where application of zinc-silicate paste after welding cannot be done due to inaccessibility of the inside welded surface and where galvanic protection has been impaired due to welding of pipe-to-pipe joint. Thus the last erection joint shall be flanged joint.</p>			
2.06.02	<p>Welded</p> <p>(a) For making up welded joints (butt weld or socket weld) the welding shall be performed by manual shielded metal arc process in accordance with the requirements specified elsewhere in the spec. Any welder employed for carrying butt welding shall be qualified as per ASME section IX for the type of joints he is going to</p>			
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	<p>weld. Jointing by butt weld, or socket weld shall depend upon the respective piping material specifications.</p>			
2.06.03	Flanged			
	(a)	Flanged connections for pipes are to be kept to the minimum and used only for connections to vessel, equipments, flanged valves and other fittings like strainer/traps/orifices etc. for ease of connection and maintenance etc. Rubber lined pipes shall be flange joined only.		
	(b)	All flanged valves intended for installation on steel piping system, shall have their flanges drilled to ANSI B 16.5 (or equivalent) and according to the pressure class stated in their respective piping material specification.		
	(c)	Drilling on flanges of flanged valves must correspond to the drilling of flanges on the piping system on which the valves are installed.		
2.07.00	Bends/elbows/mitre bends/ Tees/ Reducers & other fittings			
2.07.01	For pipe fittings such as elbows (long radius), reducers, tees, etc. the material shall be to ASTM-A-234 Gr. WPB/ASTM-105 up to 300 NB. For pipe fittings above 300 NB, the fittings may be fabricated conforming to parent pipe material. Provision of compensation pads shall be kept as per ANSI B 31.1. The fitting shall conform to the dimensional standard of ANSI B-16.9/ 16.11. Further branching in pipes for sizes 65nb and above is also acceptable (ANSI B 31.1).			
	However, for pipes up to 150 NB, pipe fittings may be supplied with material and dimension conforming to IS 1239 in case parent pipes also conform to IS 1239.			
2.07.02	For pipe size 350Nb and above mitre bends may be used for all pipes except rubber lined pipes. The bend radius shall be 1½ times the nominal pipe diameter. 90 deg. bends (mitre) shall be in 4 pieces (3 cuts) and 45 deg. mitre bends shall be in 3 pieces 22½ deg. Fabrication of mitre bends shall be as detailed in BS 2633/BS534.			
2.07.03	For pipes, above 1200 NB, reducer and tees shall be to dimensional standard of AWWA-C-208.			
2.07.04	Stainless steel fittings shall conform to either ASTM-A-182 Gr. 304 or ASTM-A-403 Grade WP. 304 Class-S, for sizes upto and including 50 mm NB, i.e. the fittings shall be of seamless construction. However, for stainless fittings above 50 mm NB, the same shall conform to ASTM-A-403 Gr. WP 304 Class W i.e. the fittings shall be of welded construction strictly in accordance with ASTM-A-403.			
2.07.07	In no case, the thickness of fittings shall be less than the thickness of parent pipe, irrespective of material of construction.			
2.08.00	Flanges			
2.08.01	Flanges shall be slip on type. Welding of flanges in tension is not permitted.,			
2.08.02	All flanges and-flanged drilling shall be to ANSI B 16.5/BS EN-1092 of relevant pressure/temperature class. Flanges shall be fabricated from steel plates conforming to ASTM A 105/IS 2062 Gr. B. However stainless steel flanges shall be fabricated from SS plates to ASTM-A-240, Gr. 304 (316 for Sea water application, if any) or equivalent.			
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2.09.00	<p>Specific technical requirement of laying buried pipe with anti corrosive treatment</p> <p>The pipe in general shall be laid with the top of the pipe minimum 1.0 (one) meter below finished general ground level.</p>			
2.09.01	<p>Trenching</p> <p>(a) The trench shall be cut true to the line and level and shall follow the gradient of the pipeline. The width of the trench shall be sufficient to give free working space on each side of the pipe. Trenches shall conform to IS 5822.</p> <p>(b) Free access shall be provided for the welding of the circumferential joints by increasing the width and depth of the trench at these points. There should be no obstruction to the welder from any side so that good welded joint is obtained.</p> <p>(c) The free working space shall conform to IS: 5822. The trench shall be excavated so as to provide minimum cover of 1000mm between the top of the pipe and finished grade.</p> <p>(d) Prior to lowering and laying pipe in any trench, the bidder shall backfill and compact the bottom of the trench or excavation in accordance with is: 5822 to provide an acceptable bed for placing the pipe.</p> <p>(e) Coating and Wrapping shall be done as under</p>			
2.09.02	<p>Preparation and cleaning of piping</p> <p>(a) The pipeline shall be thoroughly cleaned of all rust, grease, dirt, weld scales and weld burrs etc. moisture or other foreign matter by power cleaning method such as sand blasting, power tool cleaning, etc. Grease or heavy oil shall be removed by washing with a volatile solvent such as gasoline. Kerosene will not be permitted for cleaning. This cleaning operation shall be immediately followed by priming with the mechanical priming machine.</p> <p>(b) Certain inaccessible portions of the pipeline (which otherwise not possible to be cleaned by power cleaning methods) may be scrubbed manually with a stiff wire brush and scrapped where necessary with specific permission of the Project Manager.</p> <p>(c) The cleaning and priming operation shall be carried out at site. The entire pipe length shall be cleaned but the ends of the pipes shall be left without coating for a distance of 230mm for joints, which shall be coated manually at site after laying, welding and testing the pipe.</p> <p>(d) On the internal surface for pipes 1000 Nb and above, a coat of primer followed by a hot coal-tar enamel or coal tar epoxy painting (cold) shall be applied.</p>			
2.09.03	<p>Coating and wrapping</p> <p>(a) Buried piping shall be coated and wrapped, as per specification, after completion of welded and/or flanged connections, and after completion and approval of Hydro testing. Materials to be used for coating and wrapping of underground pipelines are:</p> <p>(1) Coating primer (coal tar primer)</p>			
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	<div><div>(2) Coating enamel (coal tar enamel)</div><div>(3) Wrapping materials.</div><div>(b) All primer/coating/wrapping materials and methods of application shall conform to IS: 10221 except asphalt/bitumen material. Materials (primer/coating/wrapping) as per AWWA-C-203 are also acceptable.</div><div>(c) Protective coating shall consist of coal tar primer, coal tar enamel coating, glass fiber, tissue inner wrap followed by glass fiber or coal tar impregnated Kraft outer wrap or finish coat</div><div>(d) Number of coats and wraps, minimum thickness for each layer of application shall be as per IS-10221. Number of. Coats and wraps shall be decided based on soil corrosivity/resistivity as indicated in IS-10221. Soil data-for this purpose shall be made available.</div><div>(e) Total thickness of completed coating shall not be less than 4.0 mm.</div><div>(f) Alternatively, the anti-corrosive protection can consist of anti-corrosive protection Coal-tar tapes. Material and application of tapes shall conform to IS 15337 or equivalent. These-tapes shall be applied hot over the cold coal tar primer preferably in steps of 2mm thickness so as to cover the spiral edges of the first tape by the application of second tape. The total thickness of the finished protective coating shall be 4.0 mm minimum.</div></div>			
2.09.04	<div><div>Trench bed preparation and back filling</div><div>Prior to lowering and laying pipe in any excavated trench, the bottom of the trench may require to be back filled and compacted (or as the case may be) to provide an acceptable bed for placing the pipe. Bed preparation in general shall be as per IS: 5822.</div></div>			
2.09.05	<div><div>Laying of galvanized steel (GI) pipes</div><div>All the joints shall be screwed with socket or flanged. Screwed ends of GI pipes shall be thoroughly cleaned and painted with a mixture of red and white lead before jointing Threaded portion on either side of the socket joint shall be applied with Zinc silicate paste.</div><div>All the provisions for trenching' bed preparation' laying the pipe application of primer' coating' wrapping with tapes and back filling etc. as indicated for "laying of buried piping" and " anti corrosive protection for buried piping" are applicable for buried galvanized steel (GI) pipes also.</div></div>			
2.10.00	<div><div>Cleaning and flushing</div></div>			
2.10.01	<div><div>All piping shall be cleaned by the Bidder before and after erection to remove grease, dirt, dust, scale and welding slag.</div></div>			
2.10.02	<div><div>Before erection all pipe work, assemblies, sub-assemblies, fittings, and components, etc. shall be thoroughly cleaned internally and externally by blast cleaning or by power driven wire brushes and followed by air-blowing. The brushes shall be of the same or similar material as the metal being cleaned. Cleaning of Galvanized pipes shall be done in such a manner that the coating on MS pipe is not affected.</div></div>			
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2.10.03	After erection, all water lines shall be mass flushed with water. The cleaning velocities in water lines shall be 1.2-1.5 times the operating velocities in the pipelines.			
2.10.04	All compressed air pipe work shall be cleaned by blowing compressed air.			
2.11.00	Surface preparation and painting Pipes shall be cleaned both internally and externally thoroughly by blast-cleaning or power tool cleaning method as indicated above.. In case of oil piping, cleaning will have to be done by pickling. No painting is required on stainless steel pipe / equipment surface, galvanized pipe surface or galvanized steel surface. However, necessary color banding for identification as per color code shall be done. External surface of piping shall be cleaned and prepared as indicated below.			
2.11.01	Primer painting (a) After the surface is prepared two coats of red oxide (zinc chromate/zinc phosphate) primer conforming to IS-2074/IS-12744 or equivalent shall be applied. Primer coat shall be immediately applied without any time lag after the surface preparation. (b) Any equipment which has been given the shop coat of primer shall be carefully examined after its erection in the field and shall be treated with a touch up coat of primer wherever the shop coat has been abraded, removed or damaged during transit/erection, or defaced during welding.			
2.11.02	Finish painting (a) Paint to be used shall be synthetic enamel paint conforming to IS-2932 or equivalent. Finish painting shall be carried out in three coats consisting of one intermediate coat and two finishing coats. Dry film thickness (DFT) of painting inclusive of primer thickness shall be at least 150 micron. (b) The primed surface shall be cleaned of dust/dirt/grease etc. without scratching or in any way damaging the primer coat. The intermediate coat shall be allowed to dry before applying the finish coat or as recommended by paint manufacturer. (c) Paint shall be applied by brushing. It shall be ensured that brush marks are a minimum and the requirements of workmanship is as specified in IS-1477. (d) Paint used shall be stirred frequently to keep the pigment in suspension. Paint shall be of the ready mix type in original sealed containers as packed by the paint manufacturer. No thinners shall be permitted. (e) No painting shall be done in frost/foggy weather or when the humidity is high to cause-condensation on the surface to be painted. (f) The dry film thickness (DFT) after the painting shall not be less than 150 microns.			
2.11.03	Other requirements (a) Paint manufacturers instructions shall be followed in method of application, handling, drying time etc. (b) The color of the finish paint shall be as per approved color-coding.			
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	<p>(c) If finish paint was applied in shop, one coat of finish paint shall be applied at site.</p> <p>(d) The dry film thickness of paint shall not be less than 0.15 mm.</p>			
2.11.04	Color code for identification			
	The pipes shall be color painted/banded for identification as per the approved color-coding scheme and shall be generally as per IS-9404.			
2.12.00	Specification for hangers and supports			
2.12.01	All supports and parts shall conform to the requirement of power piping code ANSI B 31.1 or approved equivalent.			
2.12.02	While designing supports for rubber lined pipes special consideration should be given. Any kind of welding on these pipes is not allowed after rubber lining.			
2.12.03	Hanger for piping 65mm Nb and larger and all spring support assemblies regardless of size shall be completely engineered in conformance with the provisions of power piping code ANSI B 31.1.			
2.12.04	Hangers, saddles, supports etc. shall be fabricated from plates/pipes sections conforming to ASTM A 53/IS: 2062/IS: 226/or equivalent. They shall be designed to provide the required supporting effects and allow pipe line movements as necessary. The structural steel work shall be as per IS: 800/BS: 4360. Insulation protection saddles shall be used at support point of all insulated piping.			
2.12.05	The support shall be so interspaced as to minimize sagging of the pipes and to keep them within permissible limits where pipes are full with the conveying media.			
2.12.06	The maximum spans of the supports of straight length shall not exceed the recommended values indicated in ANSI B 31.1.			
2.12.07	All pipe supports shall be designed to provide an absolute minimum head room of 2.5 m from floor in passages/walkways.			
2.12.08	At all sliding surfaces of supports suitable arrangement is to be provided to minimize sliding friction.			
2.12.09	All components of hangers/supports shall be provided with two coats of primer (red oxide paint) at shop before dispatch to site. After erection they shall be given finish coat of Long Oil Synthetic enamel to IS: 2932 of total DFT 100 to 140 microns. CLH & VLH will be primed with Epoxy Zinc rich primer of 50 micron followed by finish painting of Aliphatic Acrylic Polyurethane or equivalent of DFT 65 microns.			
2.13.00	Design/Construction/Material Particulars of Gate/ Globe/Check Valves/ Globe Stop Valve/Butterfly valve			
2.13.01	GENERAL			
	(a) All valves shall be suitable for the service conditions i.e flow, temperature and pressure, at which they are required to operate.			
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	<div><div>(b) The valves as well as all accessories shall be designed for easy disassembly and maintenance.</div><div>(c) Valves to be installed outside shall be required to have the stem properly protected against atmospheric corrosion.</div><div>(d) All rising stem valves shall be provided with back seat to permit repacking (of glands) with valves in operation. All valves shall preferably be of outside screw and yoke type.</div><div>(e) All valves shall be closed by rotating the hand wheel in the clockwise direction when looking at the face of the hand wheel. In case where the hand wheel is not directly attached to the valve spindle suitable gearing shall be introduced.</div><div>(f) All valves shall have indicators or direction clearly marked on the hand-wheel so that the valves opening/closing can be readily determined.</div><div>(g) Special attention shall be given to operating mechanism for large size valves with a view to obtaining quick and easy operation ensuring that a minimum of maintenance is required. For valves of size 350mm and above either bevel or spur gearing shall be provided to facilitate manual operation.</div><div>(h) The valves coming in vacuum lines shall be of extended gland type and/or water sealed.</div><div>(i) The actuator-operated valves shall be designed on the basis of the following:<div><div>(1) The internal parts shall be suitable to support the pressure caused by the actuators;</div><div>(2) The valve-actuator unit shall be suitably stiff so as not to cause vibrations, misalignments, etc.</div><div>(3) All actuator-operated valves shall be provided with hand operated gearing mechanism also.</div><div>(4) All actuators operated valves shall open/ close fully within time required by the process.</div></div></div><div>(j) Valves coming under the purview of IBR shall meet IBR requirements.</div><div>(k) Gate/slucice valves shall be used for isolation of flow. Gate valves shall be provided with the following accessories in addition to other standard items:<div><div>(1) Hand wheel</div><div>(2) Position indicator (for above 50 mm NB valve size)</div><div>(3) Draining arrangement wherever required.</div></div></div><div>(l) Globe valves shall be used for regulation purposes. They shall be provided with hand wheel, position indicator, draining arrangement (wherever required) and arrow indicating flow direction.</div></div>			
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2.13.02	(m)	Check valves shall be used for non-return service. They shall be swing. check type or double door (Dual plate)check type with a permanent arrow inscription on the valve body indicating the fluid flow direction. In long distance pipes lines with possibility of surge-occurrence, dual plate check valves are preferable for its spring controlled opening /closing of flaps/doors against flow reversals. However, dual plate check valves shall not be used for sizes more than 600mm NB			
	(n)	All gate and globe valves shall be provided with back seating arrangement to enable on line changing of gland packing.			
	(o)	All gate and globe valves shall be rising stem type and shall have limit switches for full OPEN and full CLOSED indication wherever required. This will include motor-operated valves also wherever required. In such cases the limit switches shall form an integral part of the valve. Stop-gap arrangement in this respect is not acceptable.			
	(p)	All valves shall be provided with embossed name plate giving details such as tag number, type, size etc.			
	(q)	Wherever required valves shall be provided with chain operator, extension spindles and floor stands or any other arrangement approved by employer so that they can be operated with ease from the nearest operating floor. Wherever necessary for safety purpose locking device shall be provided. Further, necessary small platforms for facilitating easy valve operation shall be provided by the contractor wherever necessary in consultation with project manager within the bid price at no extra cost to employer.			
	(r)	All valves except those with rising stems shall be provided with continuous mechanical position indicators; rising stem valves shall have only visual indication through plastic/metallic stem cover for sizes above 50 mm nominal bore.			
	(s)	For CI gate, globe and check valves wherever thickness of body/bonnet is not mentioned in the valves standards, thickness mentioned in IS- 1538 for fitting shall be applicable.			
2.13.03	VALVE BODY MATERIAL				
	Valve body material for various services shall be as follows:				
	Valve body material for water application like circulating water, Secondary circuit auxiliary cooling water of ECW system, Raw water, Ash water make-up, service water, clarified water, DM cooling water (pH corrected) & drinking water shall be cast iron for sizes 65NB and above; gun-metal for sizes 50 Nb and below.				
	For compressed air application, valve body material shall be cast carbon steel or forged carbon steel for sizes 65 mm NB & above and Gun metal for sizes 50 NB and below.				
2.13.03	DM water: SS body and disc along with SS internals.				
	Condensate: Cast Carbon Steel / Forged Carbon Steel.				
	The design, material, construction, manufacture, inspection, testing and performance of valves shall comply with all currently applicable statutes, regulations and safety codes in the locality where the valves will be installed. The valves shall conform to the latest editions of applicable codes and standards as mentioned elsewhere. Nothing in this specification shall				
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2.13.04	be construed to relieve the Bidder of his responsibility. Valves in general shall conform to the requirements of the following standards.				
	Standards and Codes				
	AWWA-C-504	Rubber seated butterfly valves.			
	BS-5155/EN-593	Cast iron and steel body butterfly valves for general purpose.			
	IS-778	Gun-metal gate, globe and check valves for general purpose.			
	BS-5154	Copper alloy globe/globe stop and check and gate valves for general purpose.			
	IS-780	Sluice valves for water works purpose (50-300 mm size)			
	IS-2906	Sluice valves for water works purpose (350-1200 mm size)			
	IS-5150	Cast iron wedge and double disc gate for general purpose.			
	BS-5152	Specification for cast iron globe valves.			
	BS-5153	Cast iron check valves for general purpose.			
	IS-5312	Swing check type reflux (non-return) valves.			
	ANSI B 16.34	Standard for valves.			
	API-594	Standard for Dual-check valves.			
	API-600	Steel gate valves.			
	ANSI-B-16.10	Valves face to face and other relevant dimension.			
	API-598	Valves inspection test.			
	2.13.05	End Connections			
		The end connections, shall comply with the following:			
		Socket welding (SW) - ANSI B 16.11			
Butt Welding (BW) - ANSI B 16.25.					
Threaded (SC) - ANSI B 2.1					
Flanged (FL) - ANSI B 16.5& AWWA-C-207(steel flanges), ANSI B 16.1 (Cast Iron flanges)					
All cast iron body valves (gate, globe and non-return) shall have flanged end connections; (screwed ends for Ductile D.2NI body valves are not acceptable).					
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-II:M3 PCP & LPP	PAGE 43 OF 53


CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनटीपीसी NTPC</div>		
2.13.06	All steel and stainless steel body valves of sizes 65 mm and above shall have flanged or butt welding ends. Valves of sizes below 65mm shall have flanged or socket welded ends. Compatibility of welding between valve body material and connecting pipe material is a pre-requisite in case of butt-welded joints.			
2.13.07	All gun metal body valves shall have screwed ends.			
2.13.08	All flanged end valves/specialties. shall be furnished along with matching counter flanges, fasteners, gaskets etc. as required to complete the joints.			
2.14.00	Check Valves			
2.14.01	Check valves shall comply with the following characteristics: (a) For bore greater than 2" the valves must be swing check type or dual plate check type suitable for installation in all positions (vertical and horizontal); (b) For bore smaller than or equal to 2" the valves must be of the piston type to be installed, in horizontal position. (c) In the case of swing check valves, the body seat shall be inclined at such an angle from the vertical as will facilitate closing and prevent chatter.			
2.14.02	Drilling on flanges of flanged valves must correspond to the drilling on flanges of the piping system on which the valves are to be installed.			
2.14.03	All flanged valves intended for installation in steel piping systems shall have their flanges drilled to ANSI B 16.5 (or equivalent) and according to the pressure class.			
2.14.04	Counter flanges to be installed on air pipes shall be screwed-on type irrespective of size.			
2.15.00	Globe Valves			
2.15.01	The globe valves shall have the following characteristics: Straight conveyed flow. Right angle Preferably, the valves shall be of the vertical stem type.			
2.15.02	Globe valves shall preferably have radiused or spherical seating and discs shall be free to revolve on the spindle.			
2.15.03	The pressure shall preferably be under the disc of the valve. However, globe valves, with pressure over the disc shall also be accepted provided (i) no possibility exists that flow from above the disc can remove either the disc from stem or component from disc (ii) manual globe valves can easily be operated by hand. If the fluid load on the top of the disc is higher than 40-60 KN, bypass valve shall be provided which permits the downstream system to be pressurized before the globe valve is opened.			
2.15.04	For the regulating valves, valves with regulating plug & parabolic outline disc type is preferred.			
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-II:M3 PCP & LPP	PAGE 44 OF 53

CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनटीपीसी NTPC</div>		
2.15.05	All motorized globe valves with regulating plug for which indication of percentage (%) opening are required in the control room shall be provided with necessary position transmitter.			
2.16.00	<p>Gate valves</p> <p>All gate valves shall be of the full-way type, and when in the full open position the bore of the valve shall not be constricted by any part of the gate.</p> <p>Gate valves shall be of the solid/elastic or articulated wedge disc and rising stem type.</p>			
2.17.00	<p>Air Release Valve</p> <p>(a) The air release valves shall be of automatic double air valve with two orifices and two floats. The float shall not close the valve at higher air velocities. The orifice contact joint with the float shall be leak tight joint.</p> <p>(b) The valve shall efficiently discharge the displaced air automatically from ducts/pipes while filling them and admit air automatically into the ducts/pipes while they are being emptied. The valve shall also automatically release trapped air from ducts/pipes during operation at the normal working pressure.</p> <p>(c) Body material of automatic air release valves shall comply generally with BS 1452 Gr. 14/IS: 210 Gr. FG 260. and spindle shall conform to high tensile brass.</p> <p>(d) Air release valves shall not have any integral isolation device within them. Each Air release valve shall be mounted, preceded by a separate isolation gate/ butterfly valve.</p>			
2.18.00	<p>Butterfly valves</p>			
2.18.01	<p>Design/Construction</p> <p>(a) The valves shall be designed for the design pressure/temperature of the system on which it is installed and in accordance with AWWA-C-504, EN-593 or any other approved equivalent standard latest edition. Fabricated steel (IS: 2062 GR. B) butterfly valves instead of cast iron body valves are also acceptable for size above 300 mm nb diameter. In such a case, however, the bidder will have to necessarily submit thickness calculations, in order to establish the integrity of the fabricated valve body under the system operating pressure condition.</p> <p>(1) The valves shall be suitable for installation in any position (horizontal/vertical etc.) and shall be generally of double-flanged construction. However for sizes 600 NB and below the valves of Wafer construction are also acceptable.</p> <p>(2) The seals, both on the body (sleeve) and on the disc shall be of the material specified. Necessary shaft seal shall be provided and adequately designed to ensure no leakage across the seal. This seal shall be designed so that they will allow replacement without removal of the valve shaft. The sealing ring on the disk shall be continuous type and easily replaceable.</p> <p>(3) For all types of valves, the design with shaft eccentric to the disc is preferred. The shaft shall be solid type and shall pivot on bushings.</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-II:M3 PCP & LPP	PAGE 45 OF 53


CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनटीपीसी NTPC</div>	
	<p>Bushings/sleeve type bearings shall be contained in the hub of valve body. The bearing shall be self-lubricated type with low coefficient of friction and should not have any harmful effect on water and on valve components.</p> <p>(4) The design of the shaft shall be such that it will safely sustain maximum differential pressure across the closed valve. The shaft and any key (taper pin etc.) for transmitting the torque between shaft and disc shall be capable of withstanding the maximum torque required to operate the valve. However, the shaft diameter shall not be less than the minimum shaft diameter specified in relevant code. Necessary Torque Calculation and the torque class selected on the basis of the same shall be furnished to the Employer for information.</p> <p>(5) The disc shall rotate from the full open to the tight shut position. The disc shall be contoured to ensure the least possible resistance to flow and shall be suitable for throttling operation. While the disc is in the throttled position, valve shall not create any noise or vibration.</p> <p>(6) The operating mechanism shall be mounted directly on or supported from the valve body.</p> <p>(7) All valves shall be complete with:</p> <p>Position indicator (located in a visible place)</p> <p>Arrow indicating the flow direction;</p> <p>Adjustable mechanical stop limiting devices to prevent over</p> <p>Travel of valve disc in open/close position.</p> <p>All valves shall be "tight shut off"</p> <p>(8) Hand operated valves shall have the following</p> <p>Local hand controls</p> <p>The hand controls shall close the valve with clockwise rotation.</p> <p>The hand controls shall be dimensioned to guarantee an easy maneuver under most severe conditions.</p> <p>The hand controls shall be provided with locking systems suitable to avoid the disc assuming a non-desirable position during the operation.</p> <p>Hand wheel shall be made of malleable iron with arms and rims of adequate strength. The hand wheel of diameters 300mm or less shall be provided with handles for ease of operation.</p> <p>Valves-350Nb and above shall have pressure equalizing bypass valves, wherever system parameters warrant the same.</p> <p>Valves-200Nb and above shall also be provided with gear operator arrangement as a standard practice suitable for manual operation. Manual operation of valve shall be through gear arrangement having totally enclosed</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-II:M3 PCP & LPP	PAGE 46 OF 53

CLAUSE NO.	TECHNICAL REQUIREMENTS				
2.18.02	<p>gearing with hand wheel diameter and gear ratio designed to meet the required operating torque It shall be designed to hold the valve disc in intermediate position between full open and full closed position without creeping or fluttering. Adjustable stops shall be provided to prevent over travel in either direction.</p> <p>Limit and torque switches (if applicable) shall be enclosed in water tight enclosures along with suitable space heaters for motor actuated valves, which may be either for On-Off operation or inching operation with position transmitter.</p>				
	Material of Construction (Butterfly Valves)				
	Materials and other design details shall be as indicated below :				
	(a) Cast Iron Butterfly Valves				
	Body & Disc	ASTM A48, Gr. 40 with 2% Ni/ IS: 210. Gr. FG-260, with 2% Ni and epoxy coated			
	Shaft	BS 970 431 S: 291 / EN 57, or AISI-410 or AWWA-permitted shaft material equivalent to EN-57/AISI-410 or better.			
	Seat ring	18-8 Stainless steel			
	Seal	Nitrile Rubber			
	(b) Stainless Steel Butterfly Valves				
	Body & Disc	ASTM A 351, Gr. CF8M/ ASTM-A-182-Gr.304.			
Shaft	ASTM A 182, Gr. 316 / ASTM-A-479 Gr.316/Equivalent				
	Disc & Seat Rings	EPT/BUNA-N/Neoprene			
2.18.03	(c) Carbon steel Butterfly Valves				
	Body & Disc	ASTM A 216, Gr. WCB			
	Shaft	ASTM A 182, Gr. 304 / ASTM-A-479 Gr.304/Equivalent			
	Disc & Seat Rings	EPT/BUNA-N/Neoprene			
2.18.03	Proof of Design Test (Type Test) for Butterfly Valves				
	Proof of Design (P.O.D.) test certificates shall be furnished by the bidder for all applicable size-ranges and classes of Butterfly valves supplied by him, in the absence of which actual P.O.D. test shall be conducted by the bidder in the presence of Employer's representative.				
	All valves that are designed and manufactured as per AWWA-C-504 shall be governed by the relevant clauses of P.O.D test in AWWA-C-504. For Butterfly valves designed and manufactured to EN-593 or equivalent, the P.O.D. test methods and procedures shall				
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-II:M3 PCP & LPP	PAGE 47 OF 53

CLAUSE NO.	TECHNICAL REQUIREMENTS			
2.20.00	Float operated valves (a) Valve shall automatically control the rate of filling and will shut off when a predetermined level is reached and close to prevent over flow on pre-set maximum water level. Valve shall also open and close in direct proportion to rise or fall of water level. (b) DESIGN AND CONSTRUCTION FEATURES The following design and construction feature of the valve shall be the minimum acceptable. (c) Valves shall be right-angled or globe pattern. (d) Valves shall be balance piston type with float ball. (e) Leather liner shall not be provided. (f) The body and cover material shall be cast iron conforming to ASTM-A 126 Grade 'B' or IS: 210 Grade 200 or equivalent, and Float shall be of copper with epoxy painting of two (2) coats. (g) Valves shall be suitable for flow velocities of 2 to 2.5m/sec. (h) The valves shall have flanged connections.			
2.21.00	PAINTING OF VALVES: Two (2) coats of primer followed by three (3) coats of enamel of approved color code/shade (usually same as that of connected piping) shall be applied to all exposed surfaces except stainless steel surface, Galvanized steel surface and gun metal surface at shop as required to prevent corrosion, before dispatch. The use of grease/oil other than light grade mineral oil, for corrosion protection is prohibited. The total DFT of paining shall be 150 micron (minimum). If during transport, unloading/unpacking or erection at site any part of the painted surface gets damaged, the same shall be made good by the contractor by repainting with compatible painting primer and enamel to the satisfaction of the project manager.			
2.22.00	Tanks and Accessories			
2.22.01	The designer and manufacturer of storage tanks shall comply with and obtain approval of all currently applicable statutory regulations and safety codes in the locality where the equipment will be installed. The tanks shall conform to IS 803/IS804/IS 805/ IS 2825/ API 650/ IS 4049/ IS 4682 (part-I) and IS 4864 to 4870/ ASME B & PV code Sec.-VIII as the case may be.			
2.22.02	DESIGN AND CONSTRUCTION (a) Design of all vertical atmospheric storage tanks containing water, acid, alkali and other chemical shall conform to IS:803 & API 650. (b) Design of all horizontal atmospheric storage tanks containing water, acid, alkali and other chemicals shall generally conform to IS:2825 as regards to fabrication and general construction taking care of combined bending, shear & hoop stresses developed due to supporting arrangement.			
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-II:M3 PCP & LPP	PAGE 49 OF 53

CLAUSE NO.	TECHNICAL REQUIREMENTS				
2.22.03	(c)	Design temperature of vessels shall be 10 deg.C higher than the maximum temperature that any part of the vessel is likely to attain during the course of operation.			
	(d)	Tank shall be made from mild steel plates to BS 4360/IS-2062 Gr.B (or equivalent).			
	(e)	The joint efficiency factors to be adopted for design calculations shall be in accordance with the specified design code.			
	(f)	Tank shall be provided with suitable supporting joints. All vessels shall be provided with lifting lugs, eye bolts etc. for effective handling during erection.			
	(g)	The material for flanges shall be of ASTM A 105/ IS-2062 Gr.B.			
	(h)	For cylindrical tanks, the plates shall be cold rolled through plate bending machine by several number of passes to true curvature.			
	(i)	Vessel seams shall be so positioned that they do not pass through vessel connections. For cylindrical vessel consisting of more than two sections longitudinal seams shall be offset.			
	(j)	Tanks shall be provided with float operated level indicators/level gauges/level transmitters and level switches, as required, with complete assembly. Suitable flanged pads for level switches mounting shall also be provided. The level indicator can be top or side mounted as the case may be.			
	(k)	In addition to inlet and outlet nozzles, the tanks shall be provided with vents, overflow, drain nozzles complete for various connections on tanks. Overflow lines from storage tanks is to be routed to the nearest surface drains. For tanks containing dm water, alkaline water or power cycle water the vent to atmosphere shall be through carbon-di-oxide absorber vessel suitably mounted on the tank. CO2 absorber vessel shall be provided with the initial fill of chemicals. Similarly for equipment cooling water overhead tank, the overflow & drain from tank shall be combined together and shall be led to nearest drain (at zero level) via. a seal-trough so as not to come directly in contact with atmosphere.			
	(l)	Tanks shall have suitable stairs/ladders on inside and outside of the tanks, manholes/inspection covers as required and also platform suitably located.			
	(m)	Tank supporting arrangement as approved by Employer shall be provided with all plates/angles/joints/flats and supporting attachment including lugs, saddles, legs etc.			
	(n)	Piercing nozzles/pipes from tank body / dish ends shall be adequately compensated as per relevant code.			
	(o)	Tank fabrication drg. and design calculations shall be approved by the Project Manager.			
	Corrosion protection				
(a)	A corrosion allowance, applicable to surface in contact with corrosive media, when required, shall be taken into consideration.				
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-II:M3 PCP & LPP	PAGE 50 OF 53

CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनडीपीसी NTPC</div>		
	<p>(b) Manholes shall be provided for easy access into the vessels. The size shall be minimum 500 mm and will be with cover plate, nuts bolts, etc. to ensure leak tightness at the test pressure.</p> <p>(c) Each tank shall be provided with drilled cleats welded to the tank for electrical grounding. Material of cleats shall be same as that of the shell.</p> <p>(d) Epoxy-coating shall be provided on the inside of vessel in three coats (minimum) resulting in total thickness of not less than 200 micron in which ever case required, such as equipment cooling water overhead tank, sodium hydroxide tank, condensate surge tank etc.</p>			
2.22.04	<p>Cleaning & Painting</p> <p>(a) Inside surface of all tanks shall be protected by anti-corrosive paints as required.</p> <p>(b) For tanks/vessel requiring epoxy painting, all inside surface shall be blast cleaned using non-siliceous abrasive after usual wire brushing.</p> <p>(c) Outside surfaces of all vessels shall be provided with two coats of primer with three (3) coats of epoxy minimum 100mm DFT resin based paint of approved color.</p>			
2.23.00	<p>RUBBER EXPANSION JOINTS</p>			
2.23.01	All parts of expansion joints shall be suitably designed for all stresses that may occur during continuous operation and for any additional stresses that may occur during installation and also during transient condition.			
2.23.02	The expansion joints shall be single bellow rubber expansion joints. The arches of the expansion joints shall be filled with soft rubber.			
2.23.03	The tube (i.e. inner cover) and the cover (outer) shall be made of natural or synthetic rubber of adequate hardness. The shore hardness shall not be less than 60 deg. A for outer and 50 deg. A for inner cover.			
2.23.04	The carcass between the tube and the cover shall be made of high quality cotton duck, preferably, square woven to provide equal strength in both directions of the weave. The fabric plies shall be impregnated with age resistant rubber or synthetic compound and laminated into a unit.			
2.23.05	Reinforcement, consisting of solid metal rings embedded in carcass shall be provided.			
2.23.06	Expansion joints shall be complete with stretcher bolt assembly. The expansion joints shall be suitable to absorb piping movements and accommodate mismatch between pipe lines.			
2.23.07	The expansion joints shall be of heavy duty construction made of high grade abrasion-resistant natural or synthetic rubber compound. The basic fabric for the ' duck' shall be either a superior quality braided cotton or synthetic fibre having maximum flexibility and non-set characteristic.			
2.23.08	The expansion joints shall be adequately reinforced, with solid steel rings, to meet the service conditions under which they are to operate.			
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-II:M3 PCP & LPP	PAGE 51 OF 53

CLAUSE NO.	TECHNICAL REQUIREMENTS			
2.23.09	All expansion joints shall be provided with stainless steel retaining rings for DM water application and IS 2062 Gr B galvanized steel retaining rings for ordinary water for use on the inner face of the rubber flanges, to prevent any possibility of damage to the rubber when the bolts are tightened. These rings shall be split and beveled type for easy installation and replacement and shall be drilled to match the drilling on the end rubber flanges and shall be in two or more pieces.			
2.23.10	The expansion joints shall have integral fabric reinforced full-face rubber flanges. The bolt on one flange shall have no eccentricity in relation to the corresponding bolt hole on the flange on the other face. The end rubber flanges shall be drilled to suit the companion pipe flanges.			
2.23.11	All exposed surfaces of the expansion joint shall be given a 3 mm thick coating of neoprene. This surface shall be reasonably uniform and free from any blisters, porosity and other surface defects.			
2.23.12	Each control unit shall consist of two (2) numbers of triangular stretcher bolt plates, a stretcher bolt with washers, nuts, and lock nuts. Each plate shall be drilled with three holes, two for fixing the plate on to the companion steel flange and the third for fixing the stretcher bolt.			
2.23.13	Each joint shall have a permanently attached brass or stainless steel metal tag indicating the tag numbers and other salient design features.			
2.23.14	Bidder to note that any metallic part which comes in contact with DM /corrosive water shall be of Stainless Steel material.			
2.24.00	STRAINERS			
2.24.01	Simplex type			
	The strainers shall be basket type and of simplex construction. The strainer shall be provided with plugged drain/blow off and vent connections. The free area of the strainer element shall be at least four (4) times the internal area of the connecting pipe lines. The strainer element shall be 20 mesh. Pressure drop across the strainers in new condition shall not exceed 1.5 MCW at full flow. Wire mesh of the strainers shall be suitably reinforced, to avoid buckling under operation. Strainer shall have screwed blow off connection fitted with a removable plug. The material of construction of various parts shall be as follows:			
	(a)	Body	IS: 318, Gr. 2 up to 50 mm Nb, and IS: 210 Gr. FG 260 above 50 mm Nb. (For DM water/ -Body: AISI 316 or equivalent)	
	(b)	Strainer Element	Stainless steel (AISI 316)	
	(c)	End connection	Screwed upto 50 mm Nb, and Flanged above 50 mm Nb	
2.24.02	Duplex type			
	(a)	The strainers shall be basket type and of duplex construction. The strainer shall be provided with plugged drain/blow off and vent connections. The free area of the strainer element shall be at least four (4) times the internal area of the connecting pipe. The mesh of strainer element shall be commensurate with the actual service required. Pressure drop across the strainer in new condition shall not exceed 4.0 MWC at full flow.		
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-II:M3 PCP & LPP
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TITLE:
**TECHNICAL SPECIFICATION FOR
MILL REJECT HANDLING SYSTEM**

2X800 MW GADARWAR STPP,STAGE-I

BHEL DOCUMENTS NO.: PE-TS-395-160-A001

VOLUME **II-B**

SECTION -C

REV. NO. 00

DATE: 04/10/2013

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ANNEXURE – VII


SPARES


SUB-SECTION - VII


MANDATORY SPARES


**GAJMARA SUPER THERMAL POWER PROJECT
STAGE-I (2X800MW)
STEAM GENERATOR PACKAGE**


**TECHNICAL SPECIFICATION
SECTION-VI
BID DOCUMENT NO. : CS-9566-102-2**


CLAUSE NO.	MANDATORY SPARES			
1.00.00	GENERAL The Bidder shall include in his scope of supply all the necessary Mandatory spares, Start-up and commissioning spares and Recommended spares and indicate these in the relevant schedules of the Bid Forms & Price Schedules. The general requirements pertaining to the supply of these spares is given below:			
1.01.00	MANDATORY SPARES a) The list of mandatory spares considered essential by the Employer is indicated in the list enclosed to this Sub-Section. The bidder shall indicate the prices for each and every item (except for items not applicable to the bidders design) in the 'Schedule of Mandatory Spares' whether or not he considers it necessary for the Employer to have such spares. If the bidder fails to comply with the above or fails to quote the price of any spare item, the cost of such spares shall be deemed to be included in the contract price. The bidder shall furnish the population per unit of each item in the Bid Forms & Price Schedules. Whenever the quantity is mentioned in 'sets' the bidder has to give the item details and prices of each item. b) Whenever the quantity is indicated as a percentage, it shall mean percentage of total population of that item in the station (project), unless specified otherwise, and the fraction will be rounded off to the next higher whole number. Wherever the requirement has been specified as a 'set'(marked by **) it will include the total requirement of the item for a unit, module or the station as specified. Where it is specified as 'set'(marked by *) it would mean the requirement for the single equipment / system as the case may be. Also one set for the particular equipment. e.g. 'set'of bearings for a pump would include the total number of bearings in a pump. Also the 'set'would include all components required to replace the item; for example, a set of bearings shall include all hardware normally required while replacing the bearings. c) The assembly / sub assembly which have different orientation (like left hand, right hand, top or bottom), different direction of rotation or mirror image positioning or any other regions which result in maintaining two different sets of spares to be used for subject assembly / sub-assembly shall be considered as different type of assembly/sub-assembly. d) The Employer reserves the right to buy any or all the mandatory spare parts. e) The prices of mandatory spares indicated by the Bidder in the Bid Proposal sheets shall be used for bid evaluation purposes. f) All mandatory spares shall be delivered at site at least two months before scheduled date of initial operation of the first unit. However, spares shall not be dispatched before dispatch of corresponding main equipments. g) Wherever quantity is specified both as a percentage and a value, the Bidder has to supply the higher quantity until & unless specified otherwise.			
1.02.00	RECOMMENDED SPARES a) In addition to the spare parts mentioned above, the Contractor shall also provide a list of recommended spares for 3 years of normal operation of the plant and indicate the list and total prices in relevant schedule of the Bid Forms & Price Schedules. This list shall take into consideration the mandatory spares specified in this Sub-Section and should be independent of the list of the mandatory spares. The Employer reserves the right to buy any or all of the recommended spares. The			
GAJMARA SUPER THERMAL POWER PROJECT STAGE -I (2X800 MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9566-102-2	PART-A SUB SECTION-VII MANDATORY SPARES	PAGE 1 OF 32


CLAUSE NO.	MANDATORY SPARES			
	<p>recommended spares shall be delivered at project site at least two months before the scheduled date of initial operation of first unit. However, the spares shall not be dispatched before the dispatch of the main equipment.</p> <p>b) Prices of recommended spares will not be used for evaluation of the bids. The price of these spares will remain valid up to 6 months after placement of Notification of Award for the main equipment. However, the Contractor shall be liable to provide necessary justification for the quoted prices for these spares as desired by the Employer.</p>			
1.03.00	START-UP & COMMISSIONING SPARES			
	<p>a) Start-up & commissioning spares are those spares which may be required during the start-up and commissioning of the equipment/system. All spares used till the Plant is handed over to the Employer shall come under this category. The Contractor shall provide for an adequate stock of such start up and commissioning spares to be brought by him to the site for the plant erection and commissioning. They must be available at site before the equipments are energized. The unused spares, if any, should be removed from there only after the issue of Taking Over certificate. All start up spares which remain unused at the time shall remain the property of the Contractor.</p>			
1.04.00	<p>The Bidder shall include in his scope of supply all the necessary Mandatory spares, Start-up and commissioning spares and indicate these in the relevant schedules of the Bid Forms & Price Schedules. The general requirements pertaining to the supply of these spares is given below:</p>			
2.00.00	<p>The Contractor shall indicate the service expectancy period for the spare parts (both mandatory and recommended) under normal operating conditions before replacement is necessary.</p>			
3.00.00	<p>All spares supplied under this contract shall be strictly inter-changeable with the parts for which they are intended for replacements. The spares shall be treated and packed for long storage under the climatic conditions prevailing at the site e.g. small items shall be packed in sealed transparent plastic with desiccator packs as necessary.</p>			
4.00.00	<p>All the spares (both recommended and mandatory) shall be manufactured along with the main equipment components as a continuous operation as per same specification and quality plan.</p>			
5.00.00	<p>The Contractor will provide Employer with cross-sectional drawings, catalogues, assembly drawings and other relevant documents so as to enable the Employer to identify and finalize order for recommended spares.</p>			
6.00.00	<p>Each spare part shall be clearly marked or labeled on the outside of the packing with its description. When more than one spare part is packed in a single case, a general description of the content shall be shown on the outside of such case and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purposes of identification.</p>			
7.00.00	<p>All cases, containers or other packages are to be opened for such examination as may be considered necessary by the Employer.</p>			
8.00.00	<p>The Contractor will provide the Employer with all the addresses and particulars of his sub-suppliers while placing the order on vendors for items/components/equipments covered under the Contract and will further ensure with his vendors that the Employer, if so desires,</p>			
GAJMARA SUPER THERMAL POWER PROJECT STAGE –I (2X800 MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9566-102-2	PART-A SUB SECTION-VII MANDATORY SPARES	PAGE 2 OF 32

CLAUSE NO.	MANDATORY SPARES			
	<p>will have the right to place order for spares directly on them on mutually agreed terms based on offers of such vendors.</p>			
9.00.00	<p>The Contractor shall warrant that all spares supplied will be new and in accordance with the Contract Documents and will be free from defects in design, material and workmanship.</p>			
10.00.00	<p>In addition to the recommended spares listed by the Contractor, if the Employer further identifies certain particular items of spares, the Contractor shall submit the prices and delivery quotation for such spares within 30 days of receipt of such request with a validity period of 6 months for consideration by the Employer and placement of order for additional spares if the Employer so desires.</p>			
11.00.00	<p>The Contractor shall guarantee the long term availability of spares to the Employer for the full life of the equipment covered under the Contract. The Contractor shall guarantee that before going out of production of spare parts of the equipment covered under the Contract, he shall give the Employer at least 2 years advance notice so that the latter may order his bulk requirement of spares, if he so desires. The same provision will also be applicable to Sub-contractors. Further, in case of discontinuance of manufacture of any spares by the Contractor and/or his Sub-Contractors, Contractor will provide the Employer, two years in advance, with full manufacturing drawings, material specifications and technical information including information on alternative equivalent makes required by the Employer for the purpose of manufacture/procurement of such items.</p>			
GAJMARA SUPER THERMAL POWER PROJECT STAGE –I (2X800 MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9566-102-2	PART-A SUB SECTION-VII MANDATORY SPARES	PAGE 3 OF 32

CLAUSE NO.	MANDATORY SPARES		
SI. NO.	PARTICULARS	QUANTITY	
	9. Diaphragm / hydra tube (as the case may be)	5 nos.	
1.25.00	EQUIPMENT COOLING SYSTEM, PLATE TYPE EXCHANGER		
	A. DMCW Pumps	1 Complete Set	
	1. Impeller	1 No.	
	2. Shafts	2 Nos.	
	3. Shaft Sleeve	2 sets	
	4. Casing wearing rings (if applicable)	2 sets	
	5. Impeller wearing rings (if applicable)	2 Sets of each type and size	
	6. Bearings for the pumps	1 set of each type and size	
	7. Motor Bearings	2 sets of each type & size	
	8. Thrust Bearings (if applicable)	1 set of each type and size	
	9. Sleeve nuts and O-rings	2 sets of each type & size	
	10. Gland & Gland Packing (if applicable)	2 sets of each type & size	
	11. Complete Coupling (Pump and Motor)	1 set of each type and size.	
	12. Mechanical seal (if applicable)	1 Complete Set and size.	
	B. Plate Type Heat Exchangers		
	1. Gaskets	30% of total requirement	
	2. Plates	2% each type	
1.26.00	Mill Reject Handling System		
	A. Pneumatic Conveying System		
	1. Conveying System Spares		
	a) Pneumatic main valves	4 sets of each type	
	b) Pneumatic/Solenoid Two/ Three position control valve	4 sets of each type	
	c) Plate/Dome valve(including seals) with Actuators (pneumatic/hydraulic)	6 nos.	
	d) Plate/Dome valve seals	6 sets	
	B. Compressors (Reciprocating type, if applicable)		
	1. Compressor	1 no of each	
GAJMARA SUPER THERMAL POWER PROJECT STAGE –I (2X800 MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9566-102-2	PART-A SUB SECTION-VII MANDATORY SPARES PAGE 23 OF 32

CLAUSE NO.	MANDATORY SPARES		
SI. NO.	PARTICULARS	QUANTITY	
	5.2 Sensors and Transceivers	20% or 2 nos. of each type and model which is more.	
	5.3 All Electronic Cards including Power Packs	20% or 2 nos. of each type and model which is more.	
	5.4 Seal kit for Sound Generator	20% or 2 nos. of each type and model which is more.	
	6. Furnace and Flame viewing system		
	6.1 Flame Cameras	10% or 2 nos., whichever is more	
	6.2 Electronic Modules	10% or 2 nos. of each type whichever is more	
	7. Conductivity type level monitoring system (for driplegs)		
	7.1 Electrodes	50% of population	
	7.2 Electronic Cards	20% or 2 nos. of each type and model whichever is more.	
	7.3 Lamps/LEDs of display units	100%	
	8. Mill and Air heater Fire detection system.		
	8.1 Thermocouple	10%	
	8.2 Process actuator switches	10%	
	9.. Acoustic steam Leak Detection system (ASLD) (if applicable)		
	(i) Processor and Interface modules	10% or 1 no. of each type and model, whichever is more	
	(ii) Sensors and Transceivers	10% or 1 no. of each type and model, whichever is more	
3.03.00	MEASURING INSTRUMENTS(for all systems including Air Compressor, Auxiliary Boiler, FOPH, Dosing System, ECW System etc.)		
	1. Electronic Transmitters		
	1.1 Transmitters of all types, ranges and model no. (for the measurement of Pressure, differential pressure flow, level, etc.)	10% or 1 No. of each type and model, whichever is more.	
	1.2 Level Transmitters (Ultrasonic/ radar type)	50% of each type and length, including sensors	
	2. Temperature elements		
	2.1 RTD's of each type and length(with head assembly, terminal block & nipple)	10% or 2 nos. of each type and length, whichever is more	
GAJMARA SUPER THERMAL POWER PROJECT STAGE –I (2X800 MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9566-102-2	PART-A SUB SECTION-VII MANDATORY SPARES
		PAGE 29 OF 32	

CLAUSE NO.	MANDATORY SPARES		
SI. NO.	PARTICULARS	QUANTITY	
	2.2 Thermocouples of each type like K-type, R-type, metal etc. (with head assembly, terminal block & nipple)	10% or 2 nos. of each type and length which ever is more	
	2.3 Thermowell for application like mill outlet temperature and SH/RH/Eco/ flue gas temp. in furnace	10% or 2 nos. of each type and length whichever is more	
	2.4 Temperature transmitters	10% of each type and model	
	3. Local Indicators like temperature gauges, pressure gauges, differential pressure gauges, flow gauges, flow meters etc.,	5% or 1 no. of each make, model and type whichever is more (to be divided to various ranges in proportion to main of all make, model, type population)	
	4. Process Actuated Switch Devices Includes all types of Pressure, differential pressure, flow, temperature, differential temperature, level switch Devices	5% or 1 no. of each type and model whichever is more	
	5. PD Type Flow Transmitters	1 no. of each type and model	
	6. Flue Gas Analyzer Instruments for Oxygen (i) Electronic Card Assemblies of each type (ii) Sets of Gaskets/ O-rings (iii) Temperature Sensor & heater Assembly (iv) Complete Probe with shield assembly. (v) Consumables like filter elements.	1 no. each complete instrument. 10% 2 sets 20% 2 nos. 100%	
3.04.00	POWER SUPPLY SYSTEM (24 V DC power supply system) (To be provided for each system)		
	1. Silicon controlled thyristors, diodes, power transistors	100%(1 Lot)	
	2. Capacitors	1 set	
	3. Fuse free Circuit breakers	5% or 1 no. of each type and rating, whichever is more	
	4. Electronic modules of all types.	20% or 2 nos. of each type and model, whichever is more	
	5. Cooling Fans	10% or 2 nos. of each type, whichever is more.	
	6. Indication Lamps	200%	
	7. Lamp holders with series resistor, if any	20%	
	8. Digital / analog panel meters / indicators	10%	
	9. Relays of all types including overload relays	20%	
GAJMARA SUPER THERMAL POWER PROJECT STAGE -I (2X800 MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9566-102-2	PART-A SUB SECTION-VII MANDATORY SPARES
		PAGE 30 OF 32	

CLAUSE NO.	MANDATORY SPARES		
SI. NO.	PARTICULARS	QUANTITY	
3.05.00	PROCESS CONNECTION PIPING (FOR IMPULSE PIPING/TUBING, SAMPLING PIPING / TUBING AND AIR SUPPLY PIPING AS APPLICABLE)		
	1. Valves of all types and models	10% or 1 no. of each type, class, size and model whichever is more.	
	2. 2 way, 3way, 5way valve manifolds	10% or 1 no. of each type, class, size and model whichever is more.	
	3. Fittings	10% or 1 packet of each type, class, size and model whichever is more.	
	4. Purge meters	5% of each model or 1 no. whichever is more.	
	5. Filter regulators	20% of each model or 2 nos. whichever is more.	
3.06.00	INSTRUMENTATION CABLE, INTERNAL WIRING & ELECTRICAL FIELD		
	1. Pre fabricated cable of each type.	10% of installed quantity	
	2. Pre fabricated cable connector of each type	10% or 1 no. of each type and model, whichever is more.	
	3. Other cables	5% of each type, pair and size of actual installed quantity	
3.07.00	CONTROL VALVES, ACTUATORS & ACCESSORIES		
	1. Pneumatic and electro-hydraulic actuator assembly	10% or 1 no. of each type, model and rating, whichever is more	
	2. Valve trim (including cage, plug, stem, seat rings, guide bushings etc.)	1 set for each type of control valve.	
	3. Diaphragms, O-rings, seals etc. of all types, make etc.	200%	
	4. Pressure Gauges of all types, make, rating etc.	10% or 2 nos. of each type whichever is more.	
	5. Solenoid valves (if applicable)	10% or 2 nos. of each type whichever is more.	
	6. Positioner units (complete unit)	10% or 1 no. of each type whichever is more.	
	7. Pneumatic air-filter/Regulator of each type, make, rating etc.	10% or 2 nos., whichever is more	
	8. Air lock relays	10% or 2 nos. of each type, whichever is more	
GAJMARA SUPER THERMAL POWER PROJECT STAGE -I (2X800 MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9566-102-2	PART-A SUB SECTION-VII MANDATORY SPARES
			PAGE 31 OF 32



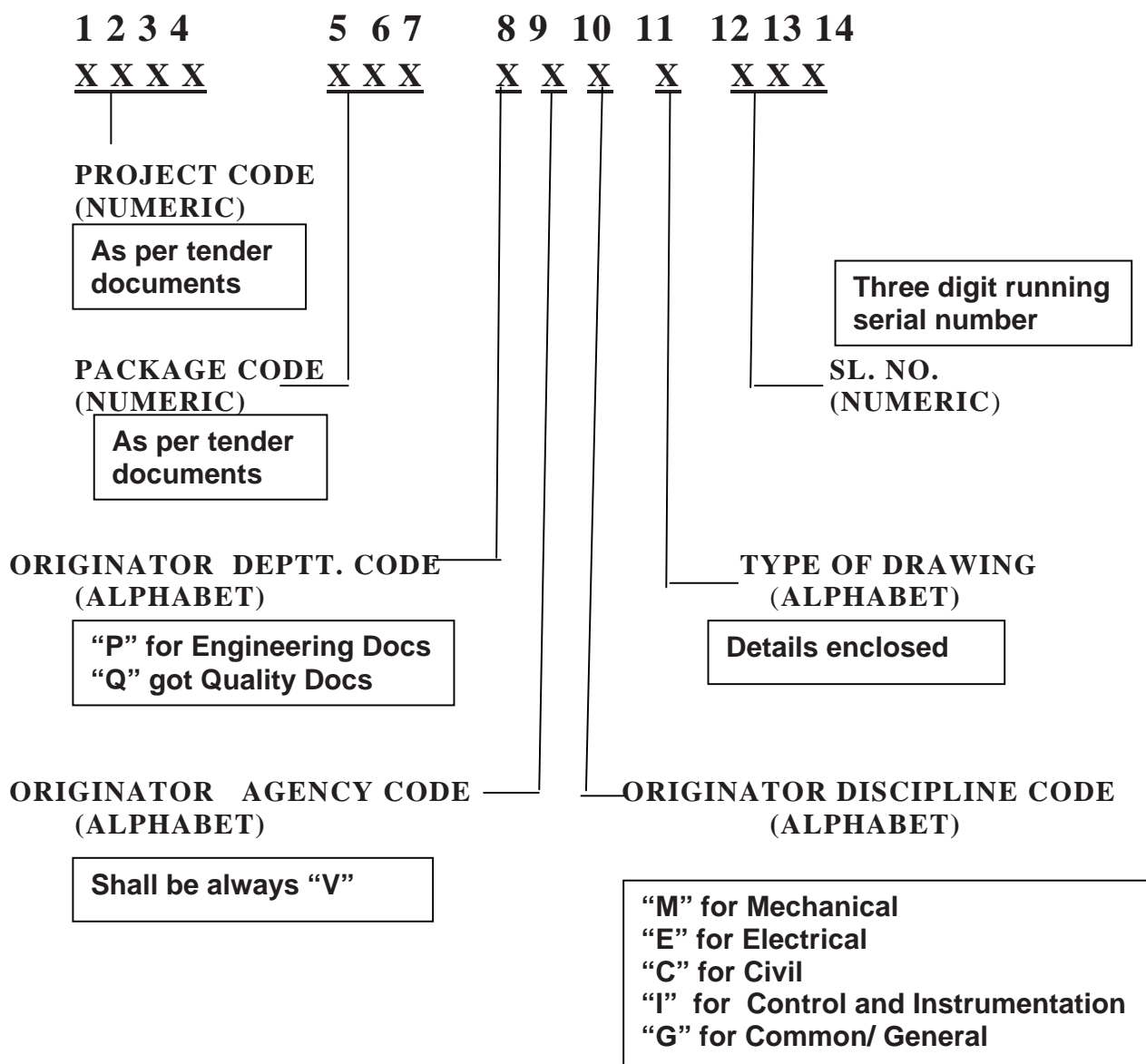
TITLE:
**TECHNICAL SPECIFICATION FOR
MILL REJECT HANDLING SYSTEM**

2X800 MW GADARWARA STPP,STAGE-I

BHEL DOCUMENTS NO.: PE-TS-395-160-A001	
VOLUME II-B	
SECTION - C	
REV. NO. 00	DATE: 04/10/2013
Page	

ANNEXURE – VIII
DRAWING/DOCUMENT DISTRIBUTION

CODIFICATION SCHEME FOR NTPC DOCUMENT NUMBER



Example: Mill Reject system Mechanical Layout drawing for Gadawara -I as given by vendor if the SL NO is taken as 012, the drawing no shall be

"9572 – 102 -PVM-F-012"

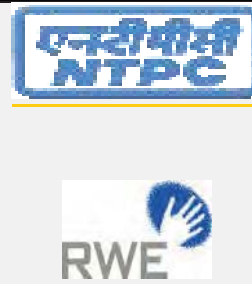
TYPE OF DRAWING / DOCUMENTS & THEIR CODES

(Refer Character no 11 of previous page)

Slno	Description	Code
	GENERAL	
1	G.A. Drawing	B
2	Manufacturer's Drawing/Construction Drawing/Fabrication Drg	C
3	Erection/Installation Drawing	E
4	General Plant layout/Cable layout/P&I diagram /Eqpt layout	F
5	BOQ/Schedule	H
6	Schematics/Flow-diagram/Interconn. Wiring Diagram/Piping Dia.	L
7	Performance Curves	N
8	Master list	R
9	Design calculation/Performance calculation	U
10	Manual	X
11	Data Sheets	Y
12	Purchase Specification	Z
	ELECTRICAL	
1	Single line diagram/flow diagram	P
2	Lighting layout	G
3	Loading data and foundation frame arrangement	V
4	Miscellaneous	W
	MECHANICAL	
1	Piping layout and isometrics	P
2	Logic Interlocks and protections	G
3	Loading data and foundation frame arrangement	V
4	Misc	W
	CIVIL	
1	Loading data and foundation frame arrangement	V
2	Misc	W
	C&I	
1	Input/output listing/Instrument list	G
2	Power Supply schemes (AC/DC)	S
3	Automatic Control System-functional diagram	P
4	Logic diagram	T
5	System configuration hook up cum diagram	Q
6	Video display and flowcharts	V
7	Misc	W
	QA&I	
1	Manufacturer QP	Q
2	Field Quality Plan	G
3	Reference QP	P
4	Reference Field Quality Plan	T
5	Standard QP	S
6	Welding Specification Procedure	W
7	Field Welding Schedule	V
8	Standard Field Quality Plan	I
9	Documents Required-DR related documents	0



cFolders Help Card



NTPC's cFolders is a web based interface provided to the vendors for uploading (submitting) the documents (drawings/Quality Plans) for NTPC's review as per agreed MDL (Master Drawings List) and downloading the approved/commented documents from NTPC upon review.

-
- I. Pre-requisites at Local PC for use of cFolders:**
 - II. Initial/one time settings:**
 - III. Opening cFolders & the collaboration:**
 - IV. Uploading of MDL documents with attachments:**
 - V. Uploading of Package level attachments:**
 - VI. Mass upload:**
 - VII. Mass change of status:**
 - VIII. Downloading the Commented/Approved Documents:**
 - IX. General Guidelines:**
-

NTPC's cFolders is a web based interface provided to the vendors for uploading (submitting) the documents (drawings/Quality Plans) for NTPC's review as per agreed MDL (Master Drawings List) and downloading the approved/commented documents from NTPC upon review.

- I. Pre-requisites at Local PC for use of cFolders:**
 - 1. Internet connection (recommended internet speed 128kbps and above)
 - 2. Internet Explorer 5 and above
 - 3. JVM (Java virtual Machine) on browser and JRE -1.5 or above (Java Runtime Engine).
- II. Initial/one time settings:**
 - 1. Ensure that plug-in option is enabled (Settings->"General" tab page -> "plug-in" check box.
 - 2. Add the cfolder URL <https://cfolder.ntpclakshya.co.in/cfolder> to "favorites" of your internet browser.
- III. Opening cFolders & the collaboration:**
 - 1. Open internet browser & enter the cFolders u URL as mentioned above (or select it from browser favorites, if already added to it).
 - 2. Click OK to the "Choose Digital Certificate Screen".
 - 3. Enter your username & password in the "Connect to" prompt and click OK.
 - 4. If "Collaboration Overview" is your homepage, you will see a list of collaborations with their names consisting of NTPC Project, Package and your company's name. If you have set your homepage to some other function of cFolders, then please click on the "Collaborative Scenarios" under "Functions" in the left of the screen.
 - 5. Click on the relevant collaboration (Project & Package) which you want to work with.
 - 6. You will see following 3 folders:
 - i. Download Folder: From this folder, you can download the approved/commented documents upon NTPC's review.
 - ii. Package Folder: You can upload any file which is not particularly associated with any MDL document but can be used as a reference for all the documents in the MDL during their review.
 - iii. Upload Folder: In this folder, you will submit your documents (appearing in MDL) with associated attachments (if any) for NTPC's review.
 - 7. For quick access, you can added these folders individually to "Favorites" within cFolders by opening the folder, clicking "Additional Functions" button and selecting "Add to Favorites" option.

IV. Uploading of MDL documents with attachments:

The process is to create a cfolders "document" in the "upload" folder, enter the "No. of Att." And "Revision No." and upload the drawing file. In case of Attachments, upload the attachment files as "versions" to cfolders "document". After this, Set the status of cfolders "Document" to "Doc Submitted". In case, the status changes to "Doc Accepted", then your submission is accepted or else, if it is "Doc Rejected", then check corresponding "Notification" in the "Notification" function for reason of the same. The detailed steps are as given below:

1. Open the "Upload Folder" (either by navigating through the collaboration or through "favorites" in cFolders as mentioned at III above.)
2. Click the create button and select "document" from the options displayed.
3. Enter the "Document Name", "No. of Att." (0 in case there is no attachment) and "Revision No". (Minimum 2 characters, e.g. 00 for Rev. 0) and select "Upload local file" option and click "Continue". Please note that **entry in the "No. of Attachments" and "Revision No." fields are mandatory.**
4. Click "Browse" and select the drawing file to be uploaded. Please note the following regarding file name:
 - a) Only documents with .pdf extension can be uploaded.
 - b) File Name should be the drawing/document no. as per the NTPC Drg no. in the agreed MDL (Master Drawing List). Also, it should not be suffixed with the Revision No. Further, **following special characters are not accepted in file name:**

- | | |
|------------------------|------------------|
| i. & | ii. % |
| iii. _ (under score) | iv. , (comma) |

In case, the file name is not as per NTPC Drg. No. In MDL, then please get the MDL modified by the Task Force to get the file included otherwise your submission will not be accepted.

Upon uploading of the drawing file, you will be shown the folder view.

5. Uploading Attachments to the drawing: In the list of documents, click on the document (leftmost cell) loaded at 4 above to open the same. Scroll down to the "Current Version" where you will find one entry as "Version1". Click on "upload" button and browse for the attachment file on your PC & select the same for upload. Upon upload, you will find a new version entry for the file just uploaded by you. Similarly, upload other attachments also. Please note that **Attachment files can be of the following types only:**

- | | | | |
|-----------------------------|----------------------------------|--------------------------|--|
| i.) .doc (Word Document) | ii.) .xls (Excel Spreadsheet) | iii.) .pdf (PDF file) | |
| iv.) .dwg (AutoCAD Drg.) | v.) .std (STAAD data file) | | |

6. Scroll up to the Status row and set the new status to "Doc Submitted" by selecting the same from the drop down. Click "Save" Button. In case you have not entered the no. of Attachments, Revision No. properly or the file names and their extensions of the drawing file and its attachments are not as per the allowed formats (as stated in 4 & 5 above), then an error will be prompted and the status won't be set.

If the document is saved with the new status as "Document Submission", then uploading part of document (with attachments) is over and now, you can't change this document.

7. Your submission will now be validated against the DREAMS data and in case found OK, then status of the document in cfolder will be changed from "Doc submitted" to "Doc accepted". **In following conditions, your submission will be rejected and status of the document in cfolder will be changed from "Doc submitted" to "Doc rejected":**

- a) The drawing file name does not match with the NTPC Drawing No. maintained in MDL.

- b) Review cycle of previous version of this drawing has not been completed yet i.e. you are yet to receive the comments/approval from NTPC for the previous revision submitted.
- c) A submission has already been made earlier whose revision no. matches with the revision no. specified in current submission.

You will be notified the reason of rejection which you can view the "Received Notifications" under the "Functions" in the left side of the screen.

V. Uploading of Package level attachments:

The process of upload is similar to that of uploading an MDL document. Open the "package Level Folder", click "create" and upload the package level files, and then set the status to "Doc Submitted".

VI. Mass upload:

If you have checked the plug-in option available on "settings"->"general" tab, then "mass upload" button appears in the "folder" view. You can use this option to upload the drawings or package level attachments.

Clicking on "Mass upload" button open a window in the browser showing a file explorer wherein you can navigate to the drive & directory where your files are stored in the left area and select a set of files in the right side. Upon selection, click "continue" button and the selected files will be uploaded as individual cfolder documents in the folder (from where you clicked "mass upload"). The document name of the colder document created will be set to the filename (including its extension) by the system.

Now, each cfolder document is to be opened one-by-one and "no. of attachments" and "revision no." is to be specified. In case, there are attachments to any of the documents uploaded, then these attachments are to be uploaded individually as mentioned at IV.5 above.

Set the status to "doc submitted" either individually or through mass change of status as given below. Please note that mass change will work only if none of the validation checks are violated.

VII. Mass change of status:

At folder level, click on the "additional functions" and select "overview". In the new screen displayed:

1. Check the "Group By Folder" checkbox, if not already checked.
2. Select the profile name from the drop box (only 1 entry will be shown) against "Filter according to status profile".
3. Select the existing status ("Initial") from the drop box against "Filter by Status".
4. Click on the "New Selection" button. List of drawings will now be filtered as per the status chosen above and a check box will appear at the left against each drawing. Also, below, "New Selection", "New Status" field will be displayed.
5. Select the drawings whose status you want to change (by checking the checkboxes) and select the desired status for the dropdown against "New Status" and click "Save".

As mentioned in previous section, new status will be set only if all the filtered documents do not violate any of validation conditions which are listed below:

1. Actual no. of attachments uploaded in each document matches with the value specified in "No. of Att." field. (In case of no attachment, then "0" has been entered in this field).
2. Entry in "Revision No." field is of minimum 2 alpha-numeric characters. (e.g.: "00", "01A" etc.)

3. The first physical file uploaded while creating the cfolder document is a pdf file and does have the “.pdf” extension in its file name. Also, there are no special characters (refer IV.4.b above) in the file name.
4. Attachment files are having the allowed file extensions (refer IV.5 above) only.

VIII. Downloading the Commented/Approved Documents:

1. Open the “download folder”. This contains the list of Commented/Approved Documents with document name as NTPC Drawing No. suffixed with hyphen and revision no. as well as category of approval shown as status.
2. Click on the document name of the document which you wish to download and scroll down to “Current Version”. Here, you will find the Drawing file and the transmittal. Right click on the entry under “File” column and select “save as” option from the menu displayed. (This is similar to downloading any file through the link displayed in the internet browser). Browse to the local folder on your PC where you wish to save the file and click OK to save the file.

IX. General Guidelines:

1. You can sort document list displayed in any folder of cfolder by clicking the columns headings (Columns which can be sorted have headings with hyperlinks). These heading click toggle the sort order between ascending and descending. It may help you keep the list displayed in the descending order of the “changed on” so that you always see the latest document on the top of the list.
2. Before uploading, please check that drawing file and attachments are Ok with respect to their name, document formats etc. as specified in above sections. In case, you wish to submit a drawing which does not exist in MDL, then please get the same included in the MDL by requesting for the same to the Task Force.
3. Please create a separate folder in your PC and copy all the documents to be uploaded in this folder, and for MDL documents, set their file names to NTPC drg. nos. Upon successful upload, please make this folder empty by deleting its content. This will avoid confusion on the revision of the file being uploaded besides allowing you to maintain file name according to your own document management system.
4. You may add the “upload folder”, “download folder” and “package level folder” to your “favorites” of cfolder (this “favorites” is different from browser “favorites”) so that you can navigate to desired folder in single click. This will be more useful when your organization is executing more than one package of NTPC, as this will save time in opening the desired folder instead of navigating to same through collaboration tree. For adding a folder to favorite, open it and click on the “additional functions” button, and select “add to favorites”.
5. You may set the homepage to “Received notifications” and set it to display “unread” notifications only, With this, whenever login into the cfolders, you will get to see the latest notifications received regarding the latest approved/commented documents uploaded in download folder as well as the rejection of the documents submitted during their validation with respect to MDL. Also, as a good practice, you should remove the read notifications when there utility is over.

Alternatively, you can set the homepage to “favorites” so that you see a list of folders with which you are working whenever you login into cfolders, so that you can open the desired folder for uploading/downloading the documents.



**ELECTRICAL EQUIPMENT SPECIFICATION
FOR
MRS**

2X800MW GADARWARA TPP

SPECIFICATION NO.
PE-TS-395-160-A001


VOLUME NO. : **II-B**

SECTION : **C**

REV NO. : **00** DATE : 04/10/13

SHEET : 1 OF 3

**TECHNICAL SPECIFICATION
FOR
MILL REJECT SYSTEM
(ELECTRICAL PORTION)**

	ELECTRICAL EQUIPMENT SPECIFICATION FOR MRS 2X800MW GADARWARA TPP	SPECIFICATION NO. PE-TS-395-160-A001
		VOLUME NO. : II-B
		SECTION : C
		REV NO. : 00 DATE : 04/10/13
		SHEET : 2 OF 3

1.0 **EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:**


- a) Services and equipment as per “Electrical Scope between BHEL and Vendor”.
- b) Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the work for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The same shall be provided by the bidder without any extra charge.
- c) Supply of mandatory spares as specified in the specifications of mechanical equipments.
- d) Erection and Commissioning spares.
- e) Erection & Maintenance tools & tackles.
- f) Electrical load requirement for mill reject system.
- g) All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information.
- h) Bidder to furnish list of makes for each equipment at contract stage, which shall be subject to customer /BHEL approval without any commercial and delivery implications to BHEL.
- i) Various drawings, data sheets as per required format, Quality plans, calculations, test reports, test certificates, operation and maintenance manuals etc shall be furnished as specified at contract stage. All documents shall be subject to customer/BHEL approval without any commercial implication to BHEL.
- j) Motor shall meet minimum requirement of motor specification.
- k) LT power & control cables shall meet minimum requirement of LT power & control cables specification.
- l) Cabling, earthing & lightning protection shall meet minimum requirement of cabling, earthing & lightning protection specification.

2.0 **EQUIPMENT & SERVICES TO BE PROVIDED BY PURCHASER FOR ELECTRICAL & TERMINAL POINTS:**

Refer “Electrical Scope between BHEL and Vendor”.

3.0 **DOCUMENTS TO BE SUBMITTED ALONG WITH BID**

- 3.1 Bidder shall confirm total compliance to the electrical specification without any deviation from the technical/quality assurance requirements stipulated. In line with this two signed and stamped copies of the following shall be furnished by the bidder as technical offer:
 - a) A copy of this sheet “Electrical equipment Specification for MILL REJECT SYSTEM” and sheet “Electrical Scope between BHEL and Vendor” with bidder’s signature and company stamp.
 - b) List of Erection and Commissioning spares.
 - c) List of Erection & Maintenance tools & tackles.
 - d) Electrical load requirement
- 3.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer.

	ELECTRICAL EQUIPMENT SPECIFICATION FOR MRS 2X800MW GADARWARA TPP	SPECIFICATION NO. PE-TS-395-160-A001
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- 4.0 List of enclosures :
- Electrical scope between NTPC & vendor.
 - Technical specification, datasheets & quality plans for 415V Electric motors.
 - Technical Specification, datasheets & quality plans for LT power & control cables.
 - Technical Specification, datasheets & quality plans for cabling, earthing & lightning protection.
 - Electrical Load data format.

ANNEXURE – I TO SECTION – C : STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR
PACKAGE : MILL REJECT SYSTEM

PROJECT: 2 X 800MW GADARWARA STPP

<u>S.NO</u>	<u>DETAILS</u>	<u>SCOPE SUPPLY</u>	<u>SCOPE E&C</u>	<u>REMARKS</u>
1	415 V Switchgear	NTPC	NTPC	415 V AC/240 V AC supply shall be provided by NTPC based on load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract. DC supply (battery bank, charger etc) and any other supply as required for PLC/control panel (as applicable) shall be provided by vendor.
2	Local Push Button Station (for motors)	VENDOR	VENDOR	Located near the motors.
3	Power cables, control cables and screened control cables a) both end equipment in vendor's scope b) one end equipment in vendor's scope & one end in NTPC scope. c) one end equipment in Vendor's scope & one end in BHEL scope.	a)Vendor b)NTPC c)Vendor	a)Vendor b)NTPC c)Vendor	Sizes and quantity of cables required shall be informed by vendor at contract stage (based on inputs provided by BHEL/NTPC). Finalisation of cable sizes shall be done by NTPC. Vendor shall provide lugs & glands accordingly.
4	Any special type of cable like compensating, co-axial, prefab, MICC, fibre optical etc	Vendor	Vendor	
5	Cable trays, accessories & cable trays supporting system a) for cables in main route b) for cables in branch route	NTPC Vendor	NTPC Vendor	
6	Cable glands and lugs for equipments supplied by Vendor	Vendor	Vendor	1. Double compression Ni-Cr plated brass cable glands. 2. Solder less crimping type heavy duty tinned copper lugs for power cables 3. Solder less crimping type heavy duty copper lugs for control cables.
7	Conduit and conduit accessories for cabling between equipments supplied by vendor	Vendor	Vendor	Cabling shall be through conduits. However vendor can use the trunk route where available for laying of cables. Conduits shall be supplied by vendor and shall be medium duty, hot dip galvanised cold rolled mild steel rigid conduit as per IS: 9537. Makes of conduits shall be subject to NTPC/ BHEL approval at contract stage.
8	Lighting	NTPC	NTPC	
9	Equipment grounding & lightning protection	Vendor	Vendor	
10	Below grade grounding	NTPC	NTPC	
11	Motors with base plate and foundation hardware	Vendor	Vendor	Makes shall be subject to NTPC/ BHEL approval at contract stage.

ANNEXURE – I TO SECTION – C : STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

PACKAGE : MILL REJECT SYSTEM

12	Mandatory spares		Vendor	-	Vendor to quote as per specification.
13	Recommended O & M spares, E & C spares, erection & maintenance tools & tackle		Vendor	-	
14	Any other equipment/material/service required for completeness of system but not specified above (to ensure trouble free and efficient operation of the system).		Vendor	Vendor	
15	a) Input cable schedules (C & I) b) Cable interconnection detail for the above c) Cable block diagram		Vendor Vendor Vendor	- - -	Cable listing for control cables for vendor supplied equipment (soft copies in the NTPC cable schedule format) shall be furnished during detail engineering by vendor.
16	Equipment layout drawings		Vendor	-	For ensuring cabling requirements are met, vendor shall furnish layout drawings (both in print form as well as in AUTOCAD) of the complete plant (including electrical area) indicating location and identification of all equipments requiring cabling, and shall incorporate cable routing details marked on the drawing as per PEM interface comments. Electrical equipment layout drawing shall be to NTPC approval.
17	Electrical equipment GA drawing		Vendor	-	

NOTES:

1. Make of all electrical equipments/items supplied shall be reputed make & shall be subject to approval of BHEL/NTPC after award of contract.
2. All QPs shall be subject to approval of BHEL/NTPC after award of contract without any commercial implication.
3. Painting: The painting for electrical equipment shall be epoxy based with suitable additives. The thickness of finish coat shall be minimum 50 microns. However in case electro static process of painting is offered for any electrical equipment, minimum paint thickness of 50 microns shall be applicable for finish coat. The vendor shall furnish the complete painting details during detailed engineering.



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GENERAL TECHNICAL REQUIREMENTS

FOR


LV MOTORS

SPECIFICATION NO.
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GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

<div><div>बीएसईएल</div><div></div></div>	TITLE : GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	SPECIFICATION NO. PE-TS-395-160-A001
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1.0

INTENT OF SPECIFIATION

The specification covers the design, materials, constructional features, manufacture, inspection and testing at manufacturer’s work, and packing of Low voltage (LV) squirrel cage induction motors along with all accessories for driving auxiliaries in thermal power station.

Motors having a voltage rating of below 1000V are referred to as low voltage (LV) motors.

2.0

CODES AND STANDARDS

Motors shall fully comply with latest edition, including all amendments and revision, of following codes and standards:

IS:325	Three phase Induction motors
IS : 900	Code of practice for installation and maintenance of induction motors
IS: 996	Single phase small AC and universal motors
IS: 4722	Rotating Electrical machines
IS: 4691	Degree of Protection provided by enclosures for rotating electrical machines
IS: 4728	Terminal marking and direction of rotation rotating electrical machines
IS: 1231	Dimensions of three phase foot mounted induction motors
IS: 8789	Values of performance characteristics for three phase induction motors
IS: 13555	Guide for selection and application of 3-phase A.C. induction motors for different types of driven equipment
IS: 2148	Flame proof enclosures for electrical appliance
IS: 5571	Guide for selection of electrical equipment for hazardous areas
IS: 12824	Type of duty and classes of rating assigned
IS: 12802	Temperature rise measurement of rotating electrical machines
IS: 12065	Permissible limits of noise level for rotating electrical machines
IS: 12075	Mechanical vibration of rotating electrical machines

In case of imported motors, motors as per IEC-34 shall also be acceptable.

3.0

DESIGN REQUIREMENTS

3.1

Motors and accessories shall be designed to operate satisfactorily under conditions specified in data sheet-A and Project Information, including voltage & frequency variation of supply system as defined in Data sheet-A

3.2

Motors shall be continuously rated at the design ambient temperature specified in Data Sheet-A and other site conditions specified under Project Information
Motor ratings shall have at least a 15% margin over the continuous maximum demand of the driven equipment, under entire operating range including voltage & frequency variation specified above.

3.3

Starting Requirements

3.3.1

Motor characteristics such as speed, starting torque, break away torque and starting time shall be properly co-ordinated with the requirements of driven equipment. The accelerating torque at any speed with the minimum starting voltage shall be at least 10% higher than that of the driven equipment.

3.3.2

Motors shall be capable of starting and accelerating the load with direct on line starting without exceeding acceptable winding temperature.



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The limiting value of voltage at rated frequency under which a motor will successfully start and accelerate to rated speed with load shall be taken to be a constant value as per Data Sheet - A during the starting period of motors.

3.3.3 The following frequency of starts shall apply

- i) Two starts in succession with the motor being initially at a temperature not exceeding the rated load temperature.
- ii) Three equally spread starts in an hour the motor being initially at a temperature not exceeding the rated load operating temperature. (not to be repeated in the second successive hour)
- iii) Motors for coal conveyor and coal crusher application shall be suitable for three consecutive hot starts followed by one hour interval with maximum twenty starts per day and shall be suitable for minimum 20,000 starts during the life time of the motor

3.4 Running Requirements

3.4.1 Motors shall run satisfactorily at a supply voltage of 75% of rated voltage for 5 minutes with full load without injurious heating to the motor.

3.4.2 Motor shall not stall due to voltage dip in the system causing momentary drop in voltage upto 70% of the rated voltage for duration of 2 secs.

3.5 Stress During bus Transfer

3.5.1 Motors shall withstand the voltage, heavy inrush transient current, mechanical and torque stress developed due to the application of 150% of the rated voltage for at least 1 sec. caused due to vector difference between the motor residual voltage and the incoming supply voltage during occasional auto bus transfer.

3.5.2 Motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.

3.6 Maximum noise level measured at distance of 1.0 metres from the outline of motor shall not exceed the values specified in IS 12065.

3.7 The max. vibration velocity or double amplitude of motors vibration as measured at motor bearings shall be within the limits specified in IS: 12075.

4.0 CONSTRUCTIONAL FEATURES

4.1 Indoor motors shall conform to degree of protection IP: 54 as per IS: 4691. Outdoor or semi-indoor motors shall conform to degree of protection IP: 55 as per IS: 4691 and shall be of weather-proof construction. Outdoor motors shall be installed under a suitable canopy

4.2 Motors upto 160KW shall have Totally Enclosed Fan Cooled (TEFC) enclosures, the method of cooling conforming to IC-0141 or IC-0151 of IS: 6362.

Motors rated above 160 KW shall be Closed Air Circuit Air (CACA) cooled


4.3 Motors shall be designed with cooling fans suitable for both directions of rotation.



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- 4.4. Motors shall not be provided with any electric or pneumatic operated external fan for cooling the motors.
- 4.5. Frames shall be designed to avoid collection of moisture and all enclosures shall be provided with facility for drainage at the lowest point.
- 4.6. In case Class 'F' insulation is provided for LV motors, temperature rise shall be limited to the limits applicable to Class 'B' insulation.
In case of continuous operation at extreme voltage limits the temperature limits specified in table-1 of IS:325 shall not exceed by more than 10°C.
- 4.7. **Terminals and Terminal Boxes**
- 4.7.1 Terminals, terminal leads, terminal boxes, windings tails and associated equipment shall be suitable for connection to a supply system having a short circuit level, specified in the Data Sheet-A.
- Unless otherwise stated in Data Sheet-A, motors of rating 110 kW and above will be controlled by circuit breaker and below 110 kW by switch fuse-contactor. The terminal box of motors shall be designed for the fault current mentioned in data sheet "A".
- 4.7.2 Unless otherwise specified or approved, phase terminal boxes of horizontal motors shall be positioned on the left hand side of the motor when viewed from the non-driving end.
- 4.7.3 Connections shall be such that when the supply leads R, Y & B are connected to motor terminals A B & C or U, V & W respectively, motor shall rotate in an anticlockwise direction when viewed from the non-driving end. Where such motors require clockwise rotation, the supply leads R, Y, B will be connected to motor terminals A, C, B or V W & V respectively.
- 4.7.4 Permanently attached diagram and instruction plate made preferably of stainless steel shall be mounted inside terminal box cover giving the connection diagram for the desired direction of rotation and reverse rotation.
- 4.7.5 Motor terminals and terminal leads shall be fully insulated with no bar live parts. Adequate space shall be available inside the terminal box so that no difficulty is encountered for terminating the cable specified in Data Sheet-A.
- 4.7.6 Degree of protection for terminal boxes shall be IP 55 as per IS 4691.
- 4.7.7 Separate terminal boxes shall be provided for space heaters.. If this is not possible in case of LV motors, the space heater terminals shall be adequately segregated from the main terminals in the main terminal box. Detachable gland plates with double compression brass glands shall be provided in terminal boxes.
- 4.7.8. Phase terminal boxes shall be suitable for 360 degree of rotation in steps of 90 degree for LV motors.
- 4.7.9 Cable glands and cable lugs as per cable sizes specified in Data Sheet-A shall be included. Cable lugs shall be of tinned Copper, crimping type.
- 4.8 Two separate earthing terminals suitable for connecting G.I. or MS strip grounding conductor of size given in Data Sheet-A shall be provided on opposite sides of motor frame. Each terminal box shall have a grounding terminal.

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4.9

General

4.9.1

Motors provided for similar drives shall be interchangeable.

4.9.2

Suitable foundation bolts are to be supplied alongwith the motors.

4.9.3

Motors shall be provided with eye bolts, or other means to facilitate safe lifting if the weight is 20Kgs. and above.

4.9.4

Necessary fitments and accessories shall be provided on motors in accordance with the latest Indian Electricity rules 1956.

4.9.5

All motors rated above 30 kW shall be provided with space heaters to maintain the motor internal air temperature above the dew point. Unless otherwise specified, space heaters shall be suitable for a supply of 240V AC, single phase, 50 Hz.

4.9.6

Name plate with all particulars as per IS: 325 shall be provided

4.9.7

Unless otherwise specified, the colour of finish shall be grey to Shade No. 631 and 632 as per IS:5 for motors installed indoor and outdoor respectively. The paint shall be epoxy based and shall be suitable for withstanding specified site conditions.

5.0

INSPECTION AND TESTING

5.1

All materials, components and equipments covered under this specification shall be procured, manufactured, as per the BHEL standard quality plan No. PED-506-00-Q-006/0 and PED-506-00-Q-007/2 enclosed with this specification and which shall be complied.

5.2

LV motors of type-tested design shall be provided. Valid type test reports not more than 5 year shall be furnished. In the absence of these, type tests shall have to be conducted by manufacturer without any commercial implication to purchaser.

5.3

All motors shall be subjected to routine tests as per IS: 325 and as per BHEL standard quality plan.

5.4

Motors shall also be subjected to additional tests, if any, as mentioned in Data Sheet A.

6.0

DRAWINGS TO BE SUBMITTED AFTER AWARD OF CONTRACT

a)

OGA drawing showing the position of terminal boxes, earthing connections etc.

b)

Arrangement drawing of terminal boxes.

c)

Characteristic curves:
(To be given for motor above 55 kW unless otherwise specified in Data Sheet).

i)

Current vs. time at rated voltage and minimum starting voltage.

ii)

Speed vs. time at rated voltage and minimum starting voltage.

iii)

Torque vs. speed at rated voltage and minimum voltage.
For the motors with solid coupling the above curves i), ii), iii) to be furnished for the motors coupled with driven equipment. In case motor is coupled with mechanical equipment by fluid coupling, the above curves shall be furnished with and without coupling.

iv)

Thermal withstand curve under hot and cold conditions at rated voltage and max. permissible voltage.

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	TITLE	LV MOTORS <u>DATA SHEET-A</u>		SPECIFICATION NO.	
				VOLUME	II B
				SECTION	D
				REV NO.	DATE
				SHEET 1	OF 1
1.0	Design ambient temperature	:	50 °C		
2.0	Maximum acceptable kW rating of LV motor	:	200 KW		
3.0	Installation (Indoors/ Outdoors)	:	As required		
4.0	Details of supply system				
	a) Rated voltage (with variation)	:	415V \pm 10%, 11/3.3kV \pm 6%,		
	b) Rated frequency (with variation)	:	50 Hz \pm 5%		
	c) Combined voltage & freq. variation	:	10% (sum of absolute values)		
	d) System fault level at rated voltage	:	40 kA for 1 sec for 11kV & 3.3kV 45 kA for 1 sec for 415V system		
	e) LV System grounding	:	Solidly		
5.0	Class of insulation	:	Class 'F', with temp rise limited to Class B.		
6.0	Minimum voltage for starting (As percentage of rated voltage)	:	80% of rated voltage		
7.0	Power cables data	:	Details attached		
8.0	Earth Conductor Size & Material	:	Details attached		
9.0	Space heater supply	:	240 V, 1 ϕ , 50 Hz		
10.0	Rating up to which Single phase motor	:	Acceptable below 0.2 kW		
11.0	Locked rotor current				
	a) Limit as percentage of FLC	:	Details as per spec attached		
	b) Permissible tolerance, if any	:	\pm 20%		
12.0	Energy Efficient Motors	:	Details as per spec attached		
13.0	Additional tests	:	As per QP		
14.0	Flame-proof motor				
	a) Enclosure suitable (As per IS:2148)	:	As per requirement		
	b) Classification of Hazardous area (As per IS: 5572 part-I)	:	As per requirement		
15.0	Makes	:	ABB/ Bharat Bijlee/ CGL / KEC/ NGEF/Siemens/ALSTOM (SUBJECT TO CUSTOMER APPROVAL DURING DETAILED ENGG)		
Note: Motor name plate rating at 50°C shall have at least 10% margin over input power requirement at rated duty point unless otherwise stated in driven equipment specification					

SUB-SECTION-III:E1


MOTORS


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			
	MOTORS			
1.00.00	GENERAL REQUIREMENTS			
1.01.00	For the purpose of design of equipment/systems, an ambient temperature of 50 deg. Centigrade and relative humidity of 95% (at 40 deg C) shall be considered. The equipment shall operate in a highly polluted environment.			
1.02.00	All equipments shall be suitable for rated frequency of 50 Hz with a variation of +3% & - 5%, and 10% combined variation of voltage and frequency unless specifically brought out in the specification.			
1.03.00	Contractor shall provide fully compatible electrical system, equipments, accessories and services.			
1.04.00	All the equipment, material and systems shall, in general, conform to the latest edition of relevant National and international Codes & Standards, especially the Indian Statutory Regulations.			
1.05.00	The auxiliary AC voltage supply arrangement shall have 11kV, 3.3 kV and 415V systems and DC voltage shall be 220 V. It shall be designed to limit voltage variations as given below under worst operating condition :			
	(a)	11kV, 3.3 kV	+/- 6%	
	(b)	415/240V	+/- 10%	
	(c)	220 V DC	-15% to +10%. However the nominal continuous DC power supply shall be 242V.	
1.06.00	The voltage level for motors shall be as follows :-			
	a)	Upto 0.2KW	: Single phase 240V AC / 3 phase 415V AC	
	b)	Above 0.2KW and upto 200KW	: 3 phase 415V AC	
	c)	Above 200KW and upto 1500 KW:	3.3 kV	
	d)	Above 1500 KW	: 11 kV	
1.07.00	Fault level shall be limited to 40kA RMS for 1 second for 11kV & 3.3 kV system and 45 kA RMS 1 second for 415V system. 415V system shall be solidly grounded and 220 VDC system shall be isolated type.			
1.08.00	Paint shade shall be as per RAL 5012 (Blue) for indoor and outdoor equipment.			
1.09.00	The responsibility of coordination with electrical agencies and obtaining all necessary clearances shall be of the contractor.			
1.10.00	Degree of Protection			
	Degree of protection for various enclosures as per IS:4691, IEC60034-05 shall be as follows :-			
	i)	Indoor motors	-	IP 54
	ii)	Outdoor motors	-	IP 55
	iii)	Cable box-indoor area	-	IP 54
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-IIIIE-01 MOTORS
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CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
2.00.00	iv) Cable box-Outdoor area - IP 55 CODES AND STANDARDS			
	1) Three phase induction motors : IS:325, IEC:60034 2) Single phase AC motors : IS:996, IEC:60034 3) Crane duty motors : IS:3177, IEC:60034 4) DC motors/generators : IS:4722 5) Energy Efficient motors : IS 12615, IEC:60034-30			
3.00.00	TYPE			
3.01.00	AC Motors: a) Squirrel cage induction motor suitable for direct-on-line starting. b) Continuous duty LT motors upto 160 KW Output rating (at 50 deg.C ambient temperature), shall be Energy Efficient motors, Efficiency class-Eff 1, conforming to IS 12615, or High efficiency (IE2) as per IEC:60034-30. c) Crane duty motors shall be slip ring/ squirrel cage Induction motor as per the requirement.			
3.02.00	DC Motors Shunt wound.			
4.00.00	RATING (a) Continuously rated (S1). However, crane motors shall be rated for S4 duty, 40% cyclic duration factor. (b) Whenever the basis for motor ratings are not specified in the corresponding mechanical specification sub-sections, maximum continuous motor ratings shall be at least 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations.			
5.00.00	TEMPERATURE RISE Air cooled motors 70 deg. C by resistance method for both thermal class 130(B) & 155(F) insulation. Water cooled 80 deg. C over inlet cooling water temperature mentioned elsewhere, by resistance method for both thermal class 130(B) & 155(F) insulation. 41 deg.C over inlet cooling water maximum temperature of 39 deg.C for thermal class Y wet wound Boiler circulation pump motor.			
6.00.00	OPERATIONAL REQUIREMENTS			
6.01.00	Starting Time			
6.01.01	For motors with starting time upto 20 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 2.5 secs. more than starting time.			
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-IIIIE-01 MOTORS	PAGE 2 OF 8


CLAUSE NO.	TECHNICAL REQUIREMENTS			
6.01.02	For motors with starting time more than 20 secs. and upto 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 5 secs. more than starting time.			
6.01.03	For motors with starting time more than 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be more than starting time by at least 10% of the starting time.			
6.01.04	Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met.			
6.02.00	Torque Requirements			
6.02.01	Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque.			
6.02.02	Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors.			
6.03.00	Starting voltage requirement (a) 85% below 110 KW (b) 80% from 110 KW to 200 KW (c) 85% above 200 KW to 1000 KW (d) 80% from 1001 KW to 4000 KW (e) 75% above 4000KW			
7.00.00	DESIGN AND CONSTRUCTIONAL FEATURES			
7.01.00	Suitable single phase space heaters shall be provided on motors rated 30KW and above to maintain windings in dry condition when motor is standstill. Separate terminal box for space heaters & RTDs shall be provided. However for flame proof motors , space heater terminals inside the main terminal box may be acceptable.			
7.02.00	All motors shall be either Totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or Closed air circuit air cooled (CACA) type. However, motors rated 3000KW or above can be Closed air circuit water cooled (CACW). CW motors can be screen protected drip proof (SPDP) type. Motors and EPB located in hazardous areas shall have flame proof enclosures conforming to IS:2148 as detailed below (a) Fuel oil area : Group ..IIB (b) Hydrogen generation :Group - IIC (or Group-I, Div-II as per plant area NEC) or (Class-1, Group-B, Div-II as per NEMA /IEC60034)			
7.03.00	Winding and Insulation (a) Type : Non-hygroscopic, oil resistant, flame resistant (b) Starting duty : Two hot starts in succession, with motor initially at normal running temperature.			
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-IIIIE-01 MOTORS	PAGE 3 OF 8

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	<p>(c) 11kV & 3.3 kV AC : Thermal class 155 (F) insulation. motors The winding insulation process shall be total Vacuum Pressure Impregnated i.e resin poor method. The lightning Impulse & interturn insulation surge withstand level shall be as per IEC-60034 part-15</p> <p>(d) 240VAC, 415V AC & : Thermal Class(B) or better 220V DC motors</p> <p>7.04.00 Motors rated above 1000KW shall have insulated bearings to prevent flow of shaft currents.</p> <p>7.05.00 Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.</p> <p>7.06.00 Noise level for all the motors shall be limited to 85dB(A) except for BFP motor for which the maximum limit shall be 90dB(A). Vibration shall be limited within the limits prescribed in IS:12075 / IEC 60034-14 . Motors shall withstand vibrations produced by driven equipment. HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads.</p> <p>7.07.00 In HT motors, at least four numbers simplex / two numbers duplex platinum resistance type temperature detectors shall be provided in each phase stator winding. Each bearing of HT motor shall be provided with dial type thermometer with adjustable alarm contact and preferably 2 numbers duplex platinum resistance type temperature detectors.</p> <p>7.08.00 Motor body shall have two earthing points on opposite sides.</p> <p>7.09.00 HT motors can be offered with either elastimould termination or dust tight phase separated double walled (metallic as well as insulated barrier) cable boxes. In case elastimould terminations are offered, then protective cover and trifurcating sleeves shall also be provided. In case cable box is offered, then Employer shall provide termination kit. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non magnetic material for single core cables) shall be provided in case of cable boxes.</p> <p>7.10.00 The spacing between gland plate & centre of terminal stud shall be as per Table-I.</p> <p>7.11.00 All motors shall be so designed that maximum inrush currents and locked rotor and pullout torque developed by them at extreme voltage and frequency variations do not endanger the motor and driven equipment.</p> <p>7.12.00 The motors shall be suitable for bus transfer schemes provided on the 11kV, 3.3 kV /415V systems without any injurious effect on its life.</p> <p>7.13.00 For motors rated 2000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.</p> <p>7.14.00 11kV and 3.3 kV motor Terminal Box shall be suitable for fault level of 750MVA for 0.12 sec and 250 MVA for 0.12 sec respectively. Elastimould termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.</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-IIIIE-01 MOTORS PAGE 4 OF 8

CLAUSE NO.	TECHNICAL REQUIREMENTS			
7.15.00	The size and number of cables (for HT and LT motors) to be intimated to the successful bidder during detailed engineering and the contractor shall provide terminal box suitable for the same.			
8.00.00	The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance) .			
	(a) Below 110KW	:	10.0	
	(b) From 110 KW & upto 200 KW	:	9.0	
	(c) Above 200 KW & upto 1000KW	:	10.0	
	(d) From 1001KW & upto 4000KW	:	9.0	
	(e) Above 4000KW	:	6 to 6.5	
10.00.00	TYPE TEST			
10.01.00	HT MOTORS			
10.01.01	The contractor shall carry out the type tests as listed in this specification on the equipment to be supplied under this contract. The bidder shall indicate the charges for each of these type tests separately in the relevant schedule of Section - VII- (BPS) and the same shall be considered for the evaluation of the bids. The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract and upon certification by the employer's engineer.			
10.01.02	The type tests shall be carried out in presence of the employer's representative, for which minimum 15 days notice shall be given by the contractor. The contractor shall obtain the employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set.up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.			
10.01.03	In case the contractor has conducted such specified type test(s) within last ten years as on the date of bid opening, he may submit during detailed engineering the type test reports to the owner for waiver of conductance of such test(s). These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The owner reserves the right to waive conducting of any or all the specified type test(s) under this contract. In case type tests are waived, the type test charges shall not be payable to the contractor.			
10.01.04	Further the Contractor shall only submit the reports of the type tests as listed in "LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED" and carried out within last ten years from the date of bid opening. These reports			
	should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under			
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-IIIIE-01 MOTORS
PAGE 5 OF 8				

CLAUSE NO.	TECHNICAL REQUIREMENTS			
10.01.05	<p>this contract at no additional cost to the owner either at third party lab or in presence of client/owners representative and submit the reports for approval.</p> <p>LIST OF TYPE TESTS TO BE CONDUCTED</p> <p>The following type tests shall be conducted on each type and rating of HT motor</p> <ul style="list-style-type: none"> (a) No load saturation and loss curves upto approximately 115% of rated voltage (b) Measurement of noise at no load. (c) Momentary excess torque test (subject to test bed constraint). (d) Full load test(subject to test bed constraint) (e) Temperature rise test at rated conditions. During heat run test, bearing temp., winding temp., coolant flow and its temp. shall also be measured. In case the temperature rise test is carried at load other than rated load, specific approval for the test method and procedure is required to be obtained. Wherever ETD's are provided, the temperature shall be measured by ETD's also for the record purpose. (f) Lightning Impulse withstand test on the sample coil shall be as per clause no. 4.3 IEC-60034, part-15 (g) Surge-withstand test on interturn insulation shall be as per clause no. 4.2 of IEC 60034, part-15 			
10.01.06	<p>LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED</p> <p>The following type test reports shall be submitted for each type and rating of HT motor</p> <ul style="list-style-type: none"> (a) Degree of protection test for the enclosure followed by IR, HV and no load run test. (b) Terminal box-fault level withstand test for each type of terminal box of HT motors only. 			
10.02.00	LT Motors			
10.02.01	<p>LT Motors supplied shall be of type tested design. During detailed engineering, the contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.</p>			
10.02.02	<p>However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client/owners representative and submit the reports for approval.</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-IIIIE-01 MOTORS	PAGE 6 OF 8

CLAUSE NO.	TECHNICAL REQUIREMENTS			
10.02.03	<p>LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED</p> <p>The following type test reports shall be submitted for each type and rating of LT motor of above 50 KW only</p> <ol style="list-style-type: none"> Measurement of resistance of windings of stator and wound rotor. No load test at rated voltage to determine input current power and speed Open circuit voltage ratio of wound rotor motors (in case of Slip ring motors) Full load test to determine efficiency power factor and slip . Temperature rise test . Momentary excess torque test. High voltage test . Test for vibration severity of motor. Test for noise levels of motor(Shall be limited as per clause no 7.06.00 of this section) Test for degree of protection and Overspeed test. Type test reports for motors located in fuel oil area having flame proof enclosures as per IS 2148 / IEC 60079-1 			
10.03.00	All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.			
10.04.00	The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and <input type="checkbox"/> No design Change <input type="checkbox"/> Minor changes if any shall be highlighted on the endorsement sheet.			
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-IIIIE-01 MOTORS	PAGE 7 OF 8

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	TABLE - I			
	DIMENSIONS OF TERMINAL BOXES FOR LV MOTORS			
	Motor MCR in KW	Minimum distance between centre of stud and gland plate in mm		
	UP to 3 KW	As per manufacturer's practice.		
	Above 3 KW - upto 7 KW	85		
	Above 7 KW - upto 13 KW	115		
	Above 13 KW - upto 24 KW	167		
	Above 24 KW - upto 37 KW	196		
	Above 37 KW - upto 55 KW	249		
	Above 55 KW - upto 90 KW	277		
	Above 90 KW - upto 125 KW	331		
	Above 125 KW-upto 200 KW	203		
	For HT motors the distance between gland plate and the terminal studs shall not be less than 500 mm.			
	PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE:			
	NOTE: Minimum inter-phase and phase-earth air clearances for LT motors with lugs installed shall be as follows:			
	Motor MCR in KW	Clearance		
	UP to 110 KW	10mm		
	Above 110 KW and upto 150 KW	12.5mm		
Above 150 KW	19mm			
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-IIIIE-01 MOTORS	PAGE 8 OF 8	

B - 3

L.T. POWER CABLES

LARA SUPER THERMAL POWER PROJECT, STAGE-I (2X800 MW)
DARLIPALI SUPER THERMAL POWER PROJECT, STAGE-I (2X800 MW)
GAJMARA SUPER THERMAL POWER PROJECT, STAGE-I (2X800 MW)
KUDGI SUPER THERMAL POWER PROJECT, STAGE-I (3X800 MW)
STEAM TURBINE GENERATOR PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
PART-B

CLAUSE NO.	TECHNICAL REQUIREMENTS		<div>एनटीपीसी NTPC</div>																							
	LT POWER CABLES																									
1.00.00	CODES & STANDARDS																									
1.01.00	<p>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 the cables shall conform to the requirements of the following standards and codes:</p> <table><tr><td>IS :1554 -I</td><td>PVC insulated (heavy duty) electric cables for working voltages upto and including 1100V.</td></tr><tr><td>IS : 3961</td><td>Recommended current ratings for cables</td></tr><tr><td>IS : 3975</td><td>Low carbon galvanised steel wires, formed wires and tapes for armouring of cables.</td></tr><tr><td>IS : 5831</td><td>PVC insulation and sheath of electrical cables.</td></tr><tr><td>IS:7098 (Part -I)</td><td>Cross linked polyethylene insulated PVC sheathed cables for working voltages upto and including 1100V.</td></tr><tr><td>IS : 8130</td><td>Conductors for insulated electrical cables and flexible cords.</td></tr><tr><td>IS : 10418</td><td>Specification for drums for electric cables.</td></tr><tr><td>IS : 10810</td><td>Methods of tests for cables.</td></tr><tr><td>ASTM-D -2843</td><td>Standard test method for density of smoke from the burning or decomposition of plastics.</td></tr><tr><td>IEC-754 (Part-I)</td><td>Tests on gases evolved during combustion of electric cables.</td></tr><tr><td>IEC-332</td><td>Tests on electric cables under fire conditions. Part-3: Tests on bunched wires or cables (Category-B).</td></tr></table>				IS :1554 -I	PVC insulated (heavy duty) electric cables for working voltages upto and including 1100V.	IS : 3961	Recommended current ratings for cables	IS : 3975	Low carbon galvanised steel wires, formed wires and tapes for armouring of cables.	IS : 5831	PVC insulation and sheath of electrical cables.	IS:7098 (Part -I)	Cross linked polyethylene insulated PVC sheathed cables for working voltages upto and including 1100V.	IS : 8130	Conductors for insulated electrical cables and flexible cords.	IS : 10418	Specification for drums for electric cables.	IS : 10810	Methods of tests for cables.	ASTM-D -2843	Standard test method for density of smoke from the burning or decomposition of plastics.	IEC-754 (Part-I)	Tests on gases evolved during combustion of electric cables.	IEC-332	Tests on electric cables under fire conditions. Part-3: Tests on bunched wires or cables (Category-B).
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CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC															
2.00.00	TECHNICAL REQUIREMENTS																
2.01.00	The cables shall be suitable for laying on racks, in ducts, trenches, conduits and under ground buried installation with chances of flooding by water.																
2.02.00	Cables shall be flame retardant, low smoke (FRLS) type designed to withstand all mechanical, electrical and thermal stresses developed under steady state and transient operating conditions as specified elsewhere in this specification.																
2.03.00	Aluminium conductor used in power cables shall have tensile strength of more than 100 N/ sq.mm. Conductors shall be stranded.																
2.04.00	XLPE insulation shall be suitable for a continuous conductor temperature of 90 deg. C and short circuit conductor temperature of 250 deg C. PVC insulation shall be suitable for continuous conductor temperature of 70 deg C and short circuit conductor temperature of 160 deg. C.																
2.05.00	The cable cores shall be laid up with fillers between the cores wherever necessary. It shall not stick to insulation and inner sheath. All the cables, other than single core unarmoured cables, shall have distinct extruded PVC inner sheath of black colour as per IS : 5831.																
2.06.00	<p>For single core armoured cables, armouring shall be of aluminium wires/ formed wires. For multicore armoured cables, armouring shall be of galvanised steel as follows :</p> <table><thead><tr><th>Calculated nominal dia. of cable under armour</th><th>Size and Type of armour</th></tr></thead><tbody><tr><td>Upto 13 mm</td><td>1.4mm dia GS wire</td></tr><tr><td>Above 13 & upto 25mm</td><td>0.8 mm thick GS formed wire / 1.6 mm dia GS wire</td></tr><tr><td>Above 25 & upto 40 mm</td><td>0.8mm thick GS formed wire / 2.0mm dia GS wire</td></tr><tr><td>Above 40 & upto 55mm</td><td>1.4 mm thick GS formed wire /2.5mm dia GS wire</td></tr><tr><td>Above 55 & upto 70 mm</td><td>1.4mm thick GS formed wire / 3.15mm dia GS wire</td></tr><tr><td>Above 70mm</td><td>1.4 mm thick GS formed wire / 4.0 mm dia GS wire</td></tr></tbody></table>			Calculated nominal dia. of cable under armour	Size and Type of armour	Upto 13 mm	1.4mm dia GS wire	Above 13 & upto 25mm	0.8 mm thick GS formed wire / 1.6 mm dia GS wire	Above 25 & upto 40 mm	0.8mm thick GS formed wire / 2.0mm dia GS wire	Above 40 & upto 55mm	1.4 mm thick GS formed wire /2.5mm dia GS wire	Above 55 & upto 70 mm	1.4mm thick GS formed wire / 3.15mm dia GS wire	Above 70mm	1.4 mm thick GS formed wire / 4.0 mm dia GS wire
Calculated nominal dia. of cable under armour	Size and Type of armour																
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Above 25 & upto 40 mm	0.8mm thick GS formed wire / 2.0mm dia GS wire																
Above 40 & upto 55mm	1.4 mm thick GS formed wire /2.5mm dia GS wire																
Above 55 & upto 70 mm	1.4mm thick GS formed wire / 3.15mm dia GS wire																
Above 70mm	1.4 mm thick GS formed wire / 4.0 mm dia GS wire																
LARA STPP, STAGE-I (2X800 MW) DARLIPALI STPP, STAGE-I (2X800 MW) GAJMARA STPP, STAGE-I (2X800 MW) KUDGI STPP, STAGE-I (3X800 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B	SUB-SECTION-B-3 L.T. POWER CABLES	PAGE 2 OF 8													

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
2.06.01	The aluminium used for armouring shall be of H4 grade as per IS: 8130 with maximum resistivity of 0.028264 ohm mm ² per meter at 20 deg C. The sizes of aluminium armouring shall be same as indicated above for galvanized steel.		
2.06.02	The gap between armour wires / formed wires shall not exceed one armour wire / formed wire space and there shall be no cross over / over-riding of armour wire / formed wire. The minimum area of coverage of armouring shall be 90%. The breaking load of armour joint shall not be less than 95% of that of armour wire / formed wire. Zinc rich paint shall be applied on armour joint surface of G.S.wire/ formed wire.		
2.07.00	Outer sheath shall be of PVC as per IS: 5831 & black in colour. In addition to meeting all the requirements of Indian standards referred to, outer sheath of all the cables shall have the following FRLS properties. (a.) Oxygen index of min. 29 (as per IS 10810 Part-58). (b.) Acid gas emission of max. 20% (as per IEC-754-I). (c.) Smoke density rating shall not be more than 60 % (as per ASTMD-2843).		
2.08.00	Cores of the cables shall be identified by colouring of insulation. Following colour scheme shall be adopted: 1 core - Red, Black, Yellow or Blue 2 core - Red & Black 3 core - Red, Yellow & Blue 4 core - Red, Yellow, Blue and Black		
2.09.00	For reduced neutral conductors, the core shall be black.		
2.10.00	In addition to manufacturer's identification on cables as per IS, following marking shall also be provided over outer sheath. (a.) Cable size and voltage grade - To be embossed (b.) Word 'FRLS' at every 5 metre - To be embossed (c.) Sequential marking of length of the cable in metres at every one metre -To be embossed / printed The embossing shall be progressive, automatic, in line and marking shall be legible and indelible.		
LARA STPP, STAGE-I (2X800 MW) DARLIPALI STPP, STAGE-I (2X800 MW) GAJMARA STPP, STAGE-I (2X800 MW) KUDGI STPP, STAGE-I (3X800 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B	SUB-SECTION-B-3 L.T. POWER CABLES PAGE 3 OF 8

CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनटीपीसी NTPC</div>		
2.11.00	All cables shall meet the fire resistance requirement as per Category-B of IEC 332 Part-3.			
2.12.00	Allowable tolerances on the overall diameter of the cables shall be ± 2 mm maximum, over the declared value in the technical data sheets.			
2.13.00	In plant repairs to the cables shall not be accepted. Pimples, fish eye, blow holes etc. are not acceptable.			
3.00.00	Cable selection & sizing			
3.01.00	LT Power cables shall be sized based on the following considerations: (a) Rated current of the equipment (b) The voltage drop in the cable, during motor starting condition, shall be limited to 10% and during full load running condition, shall be limited to 3% of the rated voltage (c) Short circuit withstand capability This will depend on the feeder type. For a fuse protected circuit, cable should be sized to withstand the let out energy of the fuse. For breaker controlled feeder, cable shall be capable of withstanding the system fault current level for total breaker tripping time inclusive of relay pickup time. (d) The minimum conductor size shall be 6 sqmm for aluminium conductor cables and 2.5 sqmm for copper conductor cables. The constructional details of copper conductor cables shall be same as indicated for copper control cable.			
302.00	Derating Factors Derating factors for various conditions of installations including the following shall be considered while selecting the cable sizes: a) Variation in ambient temperature for cables laid in air b) Grouping of cables c) Variation in ground temperature and soil resistivity for buried cables.			
3.03.00	Cable lengths shall be considered in such a way that straight through cable joints are avoided.			
3.04.00	Cables shall be armoured type if laid in switchyard area or directly buried.			
LARA STPP, STAGE-I (2X800 MW) DARLIPALI STPP, STAGE-I (2X800 MW) GAJMARA STPP, STAGE-I (2X800 MW) KUDGI STPP, STAGE-I (3X800 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B	SUB-SECTION-B-3 L.T. POWER CABLES	PAGE 4 OF 8

CLAUSE NO.	TECHNICAL REQUIREMENTS			<div>एनटीपीसी NTPC</div>
3.05.00	All LT power cables of sizes more than 120 sq.mm. shall be XLPE insulated and preferable sizes are 1Cx150, 1Cx300, 1Cx630, 3Cx150 & 3Cx240 sq.mm.			
4.00.00	CONSTRUCTIONAL FEATURES			
	(a.) 1.1 KV grade XLPE power cables shall have compacted aluminium conductor, XLPE insulated, PVC inner sheathed (as applicable), armoured/ unarmoured, FRLS PVC outer sheathed conforming to IS:7098. (Part-I).			
	(b.) 1.1KV grade PVC power cables shall have aluminium conductor (compacted type for sizes above 10 sq.mm), PVC Insulated, PVC inner sheathed, armoured/ unarmoured, FRLS PVC outer sheathed conforming to IS:1554 (Part-I).			
5.00.00	CABLE DRUMS			
	(a) Cables shall be supplied in non returnable wooden or steel drums of heavy construction. The surface of the drum and the outer most cable layer shall be covered with water proof cover. Both the ends of the cables shall be properly sealed with heat shrinkable PVC/ rubber caps secured by 'U' nails so as to eliminate ingress of water during transportation, storage and erection. Wood preservative anti-termite treatment shall be applied to the entire drum. Wooden drums shall comply with IS: 10418.			
	(b) Each drum shall carry manufacturer's name, purchaser's name, address and contract number, item number and type, size and length of cable and net gross weight stencilled on both sides of the drum. A tag containing same information shall be attached to the leading end of the cable. An arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.			
	(c) The standard drum length for power cables shall not be less than 500 meters. The length per drum shall be subjected to a maximum tolerance of +/- 5% of the standard drum length. The Employer shall have the option of rejecting cable drum with shorter lengths. For each size, the variance of total quantity, adding all the supplied drum lengths, from the ordered quantity, shall not exceed +/- 2%.			
5.00.00	TYPE TESTS			
5.01.00	General			
	All equipments to be supplied shall be of type tested design. During detailed engineering, the contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the			
LARA STPP, STAGE-I (2X800 MW) DARLIPALI STPP, STAGE-I (2X800 MW) GAJMARA STPP, STAGE-I (2X800 MW) KUDGI STPP, STAGE-I (3X800 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B	SUB-SECTION-B-3 L.T. POWER CABLES	PAGE 5 OF 8

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC																												
	<p>date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.</p> <p>However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client /owners representative and submit the reports for approval.</p> <p>All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.</p> <p>The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design Change". Minor changes if any shall be highlighted on the endorsement sheet.</p>																													
5.02.00	Type Tests																													
5.02.01	The reports for the following type tests shall be submitted for one size each of LT XLPE and LT PVC Power cables. Size shall be decided by the employer during detailed engineering :																													
	<table><tr><th>S.No.</th><th>Type test</th><th>Remarks</th></tr><tr><td colspan="3">For Conductor</td></tr><tr><td>1.</td><td>Resistance test</td><td></td></tr><tr><td>2.</td><td>Tensile test</td><td>For circular non-compacted conductors only</td></tr><tr><td>3.</td><td>Wrapping test</td><td>For circular non-compacted only</td></tr><tr><td colspan="3">For Armour Wires/ Formed Wires</td></tr><tr><td>4.</td><td>Measurement of Dimensions</td><td></td></tr><tr><td>5.</td><td>Tensile Test</td><td></td></tr><tr><td>6.</td><td>Elongation test</td><td></td></tr></table>	S.No.	Type test	Remarks	For Conductor			1.	Resistance test		2.	Tensile test	For circular non-compacted conductors only	3.	Wrapping test	For circular non-compacted only	For Armour Wires/ Formed Wires			4.	Measurement of Dimensions		5.	Tensile Test		6.	Elongation test			
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AUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
7.		Torsion test	For round wires only	
8.		Wrapping test	For aluminium wires / formed wires only.	
9.		Resistance test		
10(a)		Mass of zinc coating test	For GS Formed wires/wires only	
10(b)		Uniformity of zinc coating	For GS Formed wires /wires only	
11.		Adhesion test	For GS Formed wires/wires only	
For PVC/XLPE insulation & PVC Sheath				
12.		Test for thickness		
13.		Tensile strength & elongation	before ageing and after ageing tests	
14.		Ageing in air oven		
15.		Loss of mass test	For PVC insulation and sheath only	
16.		Hot deformation test	For PVC insulation and sheath only	
17.		Heat shock test	For PVC insulation and sheath only	
18.		Shrinkage test		
19.		Thermal stability test	For PVC insulation and sheath only	
20.		Hot set test	For XLPE insulation only	
21.		Water absorption test	For XLPE insulation only	
22.		Oxygen index test	For outer sheath only	
23.		Smoke density test	For outer sheath only	
LARA STPP, STAGE-I (2X800 MW) DARLIPALJ STPP, STAGE-I (2X800 MW) GAJMARA STPP, STAGE-I (2X800 MW) KUDGI STPP, STAGE-I (3X800 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B		PAGE 7 OF 8

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC
	24. Acid gas generation test For outer sheath only	
	For completed cables	
	25. Insulation resistance test (Volume resistivity method)	
	26. High voltage test	
	27. Flammability test as per IEC-332 Part-3 (Category-B)	
5.02.02	Acceptance Tests (as per QA table)	
5.02.03	Routine Tests (as per QA table)	
LARA STPP, STAGE-I (2X800 MW) DARLIPALI STPP, STAGE-I (2X800 MW) GAJMARA STPP, STAGE-I (2X800 MW) KUDGI STPP, STAGE-I (3X800 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B SUB-SECTION-B-3 L.T. POWER CABLES PAGE 8 OF 8

B - 4

L.T. CONTROL CABLES

LARA SUPER THERMAL POWER PROJECT, STAGE-I (2X800 MW)
DARLIPALI SUPER THERMAL POWER PROJECT, STAGE-I (2X800 MW)
GAJMARA SUPER THERMAL POWER PROJECT, STAGE-I (2X800 MW)
KUDGI SUPER THERMAL POWER PROJECT, STAGE-I (3X800 MW)
STEAM TURBINE GENERATOR PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
PART-B

CLAUSE NO.	TECHNICAL REQUIREMENTS		<div>एनटीपीसी NTPC</div>																							
	LT CONTROL CABLES																									
1.00.00	CODES & STANDARDS																									
1.01.00	<p>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 the cables shall conform to the requirements of the following standards and codes :</p> <table><tr><td>IS :1554 - I</td><td>PVC insulated (heavy duty) electric cables for working voltages upto and including 1100V.</td></tr><tr><td>IS : 3961</td><td>Recommended current ratings for cables</td></tr><tr><td>IS : 3975</td><td>Low carbon galvanised steel wires, formed wire and tapes for armouring of cables.</td></tr><tr><td>IS : 4905</td><td>Methods for random sampling.</td></tr><tr><td>IS : 5831</td><td>PVC insulation and sheath of electrical cables.</td></tr><tr><td>IS : 8130</td><td>Conductors for insulated electrical cables and flexible cords.</td></tr><tr><td>IS : 10418</td><td>Specification for drums for electric cables.</td></tr><tr><td>IS : 10810</td><td>Methods of tests for cables.</td></tr><tr><td>ASTM-D -2843</td><td>Standard test method for density of smoke from the burning or decomposition of plastics.</td></tr><tr><td>IEC-754 (Part-I)</td><td>Test on gases evolved during combustion of electric cables.</td></tr><tr><td>IEC -332</td><td>Tests on Electric cables under fire conditions Part-3 : Tests on bunched wires or cables (category - B)</td></tr></table>				IS :1554 - I	PVC insulated (heavy duty) electric cables for working voltages upto and including 1100V.	IS : 3961	Recommended current ratings for cables	IS : 3975	Low carbon galvanised steel wires, formed wire and tapes for armouring of cables.	IS : 4905	Methods for random sampling.	IS : 5831	PVC insulation and sheath of electrical cables.	IS : 8130	Conductors for insulated electrical cables and flexible cords.	IS : 10418	Specification for drums for electric cables.	IS : 10810	Methods of tests for cables.	ASTM-D -2843	Standard test method for density of smoke from the burning or decomposition of plastics.	IEC-754 (Part-I)	Test on gases evolved during combustion of electric cables.	IEC -332	Tests on Electric cables under fire conditions Part-3 : Tests on bunched wires or cables (category - B)
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2.00.00	TECHNICAL REQUIREMENTS																									
2.01.00	<p>The cables shall be suitable for laying on racks, in ducts, trenches, conduits and under ground burried installation with chances of flooding by water.</p>																									
LARA STPP, STAGE-I (2X800 MW) DARLIPALI STPP, STAGE-I (2X800 MW) GAJMARA STPP, STAGE-I (2X800 MW) KUDGI STPP, STAGE-I (3X800 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B	SUB-SECTION-B-4 L.T. CONTROL CABLES	PAGE 1 OF 7																						

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC
2.02.00	Cables shall be flame retardant, low smoke (FRLS) type designed to withstand all mechanical, electrical and thermal stresses develop under steady state and transient operating conditions as specified elsewhere in this specification.	
2.03.00	Conductor of control cables shall be made of multi stranded, plain annealed copper.	
2.04.00	PVC insulation shall be suitable for continuous conductor temperature of 70 deg C and short circuit conductor temperature of 160 deg. C.	
2.05.00	The cable cores shall be laid up with fillers between the cores wherever necessary. It shall not stick to insulation and inner sheath. All the cables, other than single core unarmoured cables, shall have distinct extruded PVC inner sheath of black colour as per IS : 5831.	
2.06.00	For multicore armoured cables, the armouring shall be of galvanised steel as follows :-	
	Calculated nominal dia of cable under armour	Size and Type of armour
	1) Upto 13 mm	1.4mm dia GS wire
	2) Above 13 upto 25 mm	0.8 mm thick GS formed wire / 1.6 mm dia GS wire
	3) Above 25 upto 40 mm	0.8mm thick GS formed wire / 2.0mm dia GS wire
	4) Above 40 upto 55mm	1.4 mm thick GS formed wire/ 2.5mm dia GS wire
	5) Above 55 upto 70 mm	1.4mm thick GS formed wire / 3.15mm dia GS wire
	6) Above 70mm	1.4 mm thick GS formed wire / 4.0 mm dia GS wire
2.07.00	The gap between armour wire / formed wire shall not exceed one armour wire / formed wire space and there shall be no cross over / over-riding of armour wire / formed wire. The minimum area of coverage of armouring shall be 90%. The breaking load of armour joint shall not be less than 95% of that of armour wire / formed wire. Zinc rich paint shall be applied on armour joint surface.	
	Outer sheath shall be of PVC(grade as applicable) and grey in colour . In addition to meeting all the requirements of Indian standards referred to, outer sheath of all the cables shall have the following FRLS properties.	
LARA STPP, STAGE-I (2X800 MW) DARLIPALI STPP, STAGE-I (2X800 MW) GAJMARA STPP, STAGE-I (2X800 MW) KUDGI STPP, STAGE-I (3X800 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B
SUB-SECTION-B-4 L.T. CONTROL CABLES		PAGE 2 OF 7

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
2.08.00	<p>(a) Oxygen index of min. 29 (As per IS:10810 (part-58))</p> <p>(b) Acid gas emission of max. 20% (As per IEC-754-I).</p> <p>(c) Smoke density rating shall not be more than 60% during Smoke Density Test as per ASTM-D-2843.</p> <p>Cores of the cables of upto 5 cores shall be identified by colouring of insulation. Following colour scheme shall be adopted.</p> <p>1 core - Red, Black, Yellow or Blue</p> <p>2 core - Red & Black</p> <p>3 core - Red, Yellow & Blue</p> <p>4 core - Red, Yellow, Blue and Black</p> <p>5 core - Red, Yellow, Blue, Black and Grey</p>			
2.09.00	<p>For cables having more than 5 cores, core identification shall be done by numbering the insulation of cores sequentially, starting by number 1 in the inner layer (e.g. say for 10 core cable, core numbering shall be from 1 to 10). The number shall be printed in Hindu-Arabic numerals on the outer surfaces of the cores. All the numbers shall be of the same colour, which shall contrast with the colour of insulation. The colour of insulation for all the cores shall be grey only. The numerals shall be legible and indelible. The numbers shall be repeated at regular intervals along the core, consecutive numbers being inverted in relation to each other. When the number is a single numeral, a dash shall be placed underneath it. If the number consists of two numerals, these shall be disposed one below the other and a dash placed below the lower numeral. The spacing between consecutive numbers shall not exceed 50 mm.</p>			
2.10.00	<p>In addition to manufacturer's identification on cables as per IS, following marking shall also be provided over outer sheath :</p> <p>(a) Cable size and voltage grade - To be embossed</p> <p>(b) Word 'FRLS' at every 5 metre - To be embossed</p> <p>(c) Sequential marking of length of the cable in metres at every one metre. - To be embossed / printed.</p> <p>The embossing / printing shall be progressive, automatic, in line and marking shall be legible and indelible.</p>			
LARA STPP, STAGE-I (2X800 MW) DARLIPALI STPP, STAGE-I (2X800 MW) GAJMARA STPP, STAGE-I (2X800 MW) KUDGI STPP, STAGE-I (3X800 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B	SUB-SECTION-B-4 L.T. CONTROL CABLES	PAGE 3 OF 7

CLAUSE NO.	TECHNICAL REQUIREMENTS	एन टी पी सी NTPC		
2.11.00	All cables shall meet the fire resistance requirement as per Category-B of IEC 332 Part -3.			
2.12.00	Allowable tolerances on the overall diameter of the cables shall be ± 2 mm maximum over the declared value in the technical data sheets.			
2.13.00	In plant repairs to the cables shall not be accepted. Pimples, fish eye, blow holes etc. are not acceptable.			
2.14.00	Cable selection & sizing			
2.14.01	LT Control cables shall be sized based on the following considerations:			
	<ul style="list-style-type: none"> (a) Rated current of the equipment (b) The voltage drop in the cable, during motor starting condition, shall be limited to 10% and during full load running condition, shall be limited to 3% of the rated voltage (c) Short circuit withstand capability <p>This will depend on the feeder type. For a fuse protected circuit, cable should be sized to withstand the let out energy of the fuse. For breaker controlled feeder, cable shall be capable of withstanding the system fault current level for total breaker tripping time inclusive of relay pickup time.</p> <ul style="list-style-type: none"> (d) The minimum size of conductor shall be 1.5 sqmm 			
2.14.02	Derating Factors			
	<p>Derating factors for various conditions of installations including the following shall be considered while selecting the cable sizes:</p> <ul style="list-style-type: none"> a) Variation in ambient temperature for cables laid in air b) Grouping of cables c) Variation in ground temperature and soil resistivity for buried cables. 			
2.14.03	Cable lengths shall be considered in such a way that straight through cable joints are avoided.			
2.14.04	Cables shall be armoured type if laid in switchyard area or directly buried.			
LARA STPP, STAGE-I (2X800 MW) DARLIPALI STPP, STAGE-I (2X800 MW) GAJMARA STPP, STAGE-I (2X800 MW) KUDGI STPP, STAGE-I (3X800 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B	SUB-SECTION-B-4 LT. CONTROL CABLES	PAGE 4 OF 7

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CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC		
3.00.00	CONSTRUCTIONAL FEATURES			
3.01.00	1.1 KV Grade Control Cables			
	Control Cables shall have stranded copper conductor multicore PVC insulated, PVC inner-sheathed, armoured / unarmoured, PVC outer-sheathed conforming to IS:1554. (Part-I).			
3.02.00	Cable Drums			
	<p>(a) Cables shall be supplied in non returnable wooden or steel drums of heavy construction. The surface of the drum and the outer most cable layer shall be covered with water proof layer. Both the ends of the cables shall be properly sealed with heat shrinkable PVC/ rubber caps secured by 'U' nails so as to eliminate ingress of water during transportation, storage and erection. Wood preservative anti-termite treatment shall be applied to the entire drum. Wooden drums shall comply with IS : 10418.</p> <p>(b) Each drum shall carry manufacturer's name, purchaser's name, address and contract number, item number and type, size and length of cable and net gross weight stencilled on both the sides of the drum. A tag containing same information shall be attached to the leading end of the cable. An arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.</p> <p>(c.) The standard drum length for control cables shall not be less than 1000 metres. The length per drum shall be subjected to a maximum tolerance of +/- 5% of the standard drum length. The Employer shall have the option of rejecting cable drums with shorter lengths. For each size, the variance of total quantity, adding all the supplied drum lengths, from the ordered quantity, shall not exceed +/- 2%.</p>			
4.00.00	TESTS			
4.01.00	GENERAL			
	All equipments to be supplied shall be of type tested design. During detailed engineering, the contractor shall submit for Owner's approval the reports of all the type tests as listed in this specification and carried out within last ten years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.			
LARA STPP, STAGE-I (2X800 MW) DARLIPALI STPP, STAGE-I (2X800 MW) GAJMARA STPP, STAGE-I (2X800 MW) KUDGI STPP, STAGE-I (3X800 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B	SUB-SECTION-B-4 L.T. CONTROL CABLES	PAGE 5 OF 7

CLAUSE NO.	TECHNICAL REQUIREMENTS		<div>एनटीपीसी NTPC</div>	
	<p>However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the owner either at third party lab or in presence of client /owners representative and submit the reports for approval.</p> <p>All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.</p> <p>The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design Change". Minor changes if any shall be highlighted on the endorsement sheet.</p>			
4.02.00	TYPE TESTS:			
4.02.01	The Type tests reports for the following shall be submitted for one size of LT control cable :			
	S. No.	Type Test	Remarks	
	a)	For Conductor		
	1.	Resistance test		
	b)	For Armour Wires / Formed wires		
	2.	Measurement of Dimensions		
	3.	Tensile Test		
	4.	Elongation test		
	5.	Torsion test	For round wire only	
	6.	Winding test	For Formed wires	
	7.	Resistance test		
	8.	Zinc Coating test	For G.S. conductors only.	
	c)	For PVC insulation & PVC Sheath		
	9.	Test for thickness		
LARA STPP, STAGE-I (2X800 MW) DARLIPALI STPP, STAGE-I (2X800 MW) GAJMARA STPP, STAGE-I (2X800 MW) KUDGI STPP, STAGE-I (3X800 MW) STEAM TURBINE GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI PART-B	SUB-SECTION-B-4 L.T. CONTROL CABLES	PAGE 6 OF 7

10. Tensile strength and elongation test before ageing and after ageing
11. Ageing in air oven
12. Loss of mass test For PVC insulation and sheath only
13. Hot deformation test For PVC insulation and sheath only
14. Heat shock test For PVC insulation and sheath only
15. Shrinkage test
16. Thermal stability test For PVC insulation and sheath only
17. Oxygen index test For outer sheath only
18. Smoke density test For outer sheath only
19. Acid gas generation test For outer sheath only

d) **For completed cables**

20. Insulation resistance test
(Volume resistivity method)
21. High voltage test
23. Flammability test as per
IEC - 332 Part-3 (Category-B)

4.02.02 **Acceptance Tests** (as per QA table)4.03.00 **Routine Tests** (as per QA table)


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			<div>एनटीपीसी NTPC</div>	
	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				
	S. No.		Property		Requirement
	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.	
<div>LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE</div>					
<div>TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2</div>					
<div>PART - B SUB-SECTION-IV: I7 (INSTR. AND POWER SUPPLY CABLE)</div>					
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: 17 (INSTR. AND POWER SUPPLY CABLE)	PAGE 2 OF 14


CLAUSE NO.	<div> <div> TECHNICAL REQUIREMENTS </div> <div>  </div> </div>			
	<div> <div>Reference Standard</div> <div>As per ANSI MC 96.1</div> <div>VDE 0815</div> <div>As per ANSI MC 96.1</div> </div> <div> <div>B. Insulation</div> <div>Material</div> <div>PVC type YI 3</div> <div>Teflon (i.e. extruded FEP)</div> </div> <div> <div>Thickness in mm (Min/Nom/Max)</div> <div>0.25/0.3/0.35</div> <div>0.4/0.50</div> </div> <div> <div>Volume Resistivity (Min) in ohm-cm</div> <div>1 x 10¹⁴ at 20 deg. C & 1x10¹¹ at 70 deg. C.</div> <div>---</div> </div> <div> <div>Voltage Rating</div> <div>225 V peak operating voltage</div> </div> <div> <div>Reference Standard</div> <div>VDE 0207 Part 4</div> <div>VDE 0207 Part 6 & ASTM D 2116.</div> </div> <div> <div>Core diameter above insulation</div> <div>Suitable for cage clamp connector</div> </div> <div> <div>C. Pairing & Twisting</div> <div>Max. lay of pairs (mm)</div> <div>50</div> </div> <div> <div>Single layer of polyester numbered tape on each pair provided</div> <div>Each core printed with</div> <div>Yes</div> </div> <div> <div>Unit formation of four pairs with printing of no. of Unit provided</div> <div>N.A.</div> <div>Yes</div> <div>N.A.</div> </div> <div> <div>Conductor /pair identification as per VDE0815</div> <div>N.A.</div> <div>To be provided (color coding attached).</div> <div>N.A.</div> </div> <div> <div>D. Shielding</div> <div>Type of shielding</div> <div>←----- Al-Mylar tape -----→</div> </div> <div> <div>Individual pair shielding</div> <div>No</div> <div>To be provided for F-type cable</div> <div>No</div> </div> <div> <div>Minimum thickness of Individual pair shielding</div> <div>No</div> <div>28 micron</div> <div>No</div> </div>			
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.	<div> <div> TECHNICAL REQUIREMENTS </div> <div>  </div> </div>			
	<div> <div>Overall cable assembly shielding</div> <div>To be provided</div> </div> <div> <div>Minimum thickness of Overall cable assembly shielding</div> <div>55 micron</div> </div> <div> <div>Shielding coverage</div> <div>100% with at least 20% overlap</div> </div> <div> <div>Drain wire provided for individual shield</div> <div>N.A.</div> <div>Yes (for F-type) 7-strand 20 AWG (0.51 mm²) annealed Tin coated copper</div> <div>N.A.</div> </div> <div> <div>Drain wire provided for overall shield</div> <div>Yes. 7-strand 20 AWG (0.51 mm²) annealed Tin coated copper</div> </div> <div> <div>E. FILLERS</div> </div> <div> <div>Non-hygroscopic, flame retardant</div> <div>To be provided</div> </div> <div> <div>F. Outer Sheath</div> </div> <div> <div>Material</div> <div>←--- Extruded PVC compound YM1 with---→ FRLS properties</div> <div>Teflon (i.e. extruded FRP)</div> </div> <div> <div>Minimum Thickness at any point</div> <div>1.8 mm</div> <div>0.4 mm</div> </div> <div> <div>Nominal Thickness at any point</div> <div>>1.8 mm</div> <div>0.5 mm</div> </div> <div> <div>Color</div> <div>Blue</div> </div> <div> <div>Resistant to water, fungus, termite & rodent attack</div> <div>Required</div> </div> <div> <div>Oxygen index as per ASTM D-2863</div> <div>not less than 29%</div> <div>N.A.</div> </div> <div> <div>Temperature index as per ASTM D-2863</div> <div>not less than 250 deg.C</div> <div>N.A.</div> </div> <div> <div>Acid gas generation by weight as per IEC-60754-1</div> <div>Maximum 20%</div> <div>N.A.</div> </div>			
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 4 OF 14


CLAUSE NO.	TECHNICAL REQUIREMENTS			
	Smoke Density Rating as per ASTM-D2843	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-D2843)	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			
	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		
<hr/>				
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																																																				
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.																																																				
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	<table><tr><th>Application</th><th colspan="2">Type Of Termination</th><th>Type Of</th><th rowspan="2">Cable</th></tr><tr><th>FROM (A)</th><th>TO (B)</th><th>END A</th><th>END B</th></tr><tr><td>Valves/dampers drives (Integral Junction box)</td><td>Marshalling cubicle/ Marshalling cum termination Cubicle/local group JB</td><td>Plug in connector</td><td>Posts mount cage clamp type.</td><td>G</td></tr><tr><td>Transmitters, Process Actuated switches mounted in LIE/LIR</td><td>Integral Junction box of LIE/LIR</td><td>Plug in connector</td><td>Cage clamp (Rail mount) type.</td><td>F,G</td></tr><tr><td>RTD heads</td><td>Local junction box</td><td>Plug in connector</td><td>Cage clamp (Rail mount) type.</td><td>F</td></tr><tr><td>Thermocouple</td><td>CJC Box (if applicable)</td><td>Plug in connector</td><td>Cage clamp (Rail mount) type.</td><td>A,B,C*</td></tr><tr><td>Other Field Mounted Instrument</td><td>Local JB/Group JB</td><td>Plug in connector</td><td>Screwed, Cage clamp (Rail mount) type</td><td>F,G</td></tr><tr><td>RTD</td><td>Temperature transmitter</td><td>Plug in connector</td><td>Screwed, Cage clamp type</td><td>F</td></tr><tr><td>Thermocouple</td><td>Temperature transmitter</td><td>Plug in connector</td><td>Screwed, Cage clamp type</td><td>A,B,C*</td></tr><tr><td>Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/Group JB/ MCC/SWGR</td><td>Group JB</td><td>Cage clamp (Rail mount) type.</td><td>Cage clamp (Rail mount) type.</td><td>F,G</td></tr></table>				Application	Type Of Termination		Type Of	Cable	FROM (A)	TO (B)	END A	END B	Valves/dampers drives (Integral Junction box)	Marshalling cubicle/ Marshalling cum termination Cubicle/local group JB	Plug in connector	Posts mount cage clamp type.	G	Transmitters, Process Actuated switches mounted in LIE/LIR	Integral Junction box of LIE/LIR	Plug in connector	Cage clamp (Rail mount) type.	F,G	RTD heads	Local junction box	Plug in connector	Cage clamp (Rail mount) type.	F	Thermocouple	CJC Box (if applicable)	Plug in connector	Cage clamp (Rail mount) type.	A,B,C*	Other Field Mounted Instrument	Local JB/Group JB	Plug in connector	Screwed, Cage clamp (Rail mount) type	F,G	RTD	Temperature transmitter	Plug in connector	Screwed, Cage clamp type	F	Thermocouple	Temperature transmitter	Plug in connector	Screwed, Cage clamp type	A,B,C*	Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/Group JB/ MCC/SWGR	Group JB	Cage clamp (Rail mount) type.	Cage clamp (Rail mount) type.	F,G
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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																																		
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CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनटीपीसी NTPC</div>		
	<p>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.</p>			
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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CLAUSE NO.	TECHNICAL REQUIREMENTS			
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.		
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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.			
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 11 OF 14

CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनटीपीसी NTPC</div>																																										
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.		
(i)	No. of ways	12/24/36/48/64/72/96/128 with 20% spares terminals.																																										
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(vii)	Grounding	To be provided.																																										
(viii)	Color	To be decided during detailed engineering & subject to Employer's 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: I7 (INSTR. AND POWER SUPPLY CABLE)	PAGE 12 OF 14																																							

CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनटीपीसी NTPC</div>		
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	<p>The Bidder shall install conduits according to the general routing as approved by Employer and shall coordinate conduit locations with other works.</p>			
11.03.00	<p>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.</p>			
11.04.00	<p>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.</p>			
11.05.00	<p>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.</p>			
11.06.00	<p>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.</p>			
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	<p>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</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: I7 (INSTR. AND POWER SUPPLY CABLE)	PAGE 13 OF 14

CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनटीपीसी NTPC</div>		
	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 JB's 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: I7 (INSTR. AND POWER SUPPLY CABLE)	PAGE 14 OF 14

SUB-SECTION-VII:QE1

MOTORS

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.	QUALITY ASSURANCE								<div>एनटीपीसी NTPC</div>
INDUCTION MOTOR & SYNCHRONOUS MACHINE									
<div>TESTS/CHECKS</div> <div>TEMS/COMPONENTS</div>	Visual	Dimensional	Make/Type/Rating/TC/General Physical Inspection	Mech/Chem. Properties	NDT /DP/MPI/UT	Metallography	Electrical Characteristics	Welding/Brazing(WPS/PQR)	Heat Treatment
Plates for stator frame, end shield, spider etc.	Y	Y	Y	Y					Y
Shaft	Y	Y	Y	Y	Y	Y			Y
Magnetic Material	Y	Y	Y	Y	Y		Y		
Rotor Copper/Aluminium	Y	Y	Y	Y		Y	Y		Y
Stator copper	Y	Y	Y	Y			Y		Y
SC Ring	Y	Y	Y	Y	Y	Y	Y	Y	Y
Insulating Material	Y		Y	Y			Y		
Tubes for Cooler	Y	Y	Y	Y	Y				Y
Sleeve Bearing	Y	Y	Y	Y	Y				Y
Stator/Rotor, Exciter Coils	Y	Y	Y				Y	Y	
Castings, stator frame, terminal box and bearing housing etc.	Y	Y	Y	Y	Y			Y	
Fabrication & machining of stator, rotor, terminal box	Y	Y			Y				Y
Wound stator	Y	Y					Y	Y	
Wound Exciter	Y	Y					Y	Y	
Rotor complete	Y	Y					Y		
Exciter, Stator, Rotor, Terminal Box assembly	Y	Y					Y		
Accessories, RTD, BTD,CT, Brushes, Diodes, Space heater, antifriction bearing, cable glands, lugs, gaskets etc.	Y	Y	Y						
Motor (IS 325 / 4722/ 9283)	Y	Y	Y						
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-VII:QE1 MOTOR		PAGE 1 OF 2	


CLAUSE NO.	QUALITY ASSURANCE						<div>एनटीपीसी</div> <div>NTPC</div>			
INDUCTION MOTOR & SYNCHRONOUS MACHINE										
TESTS/CHECKS ITEMS/COMPONENTS		Magnetic Characteristics	Hydraulic/Leak/Pressure Test	Thermal Characteristics	Run out	Dynamic Balancing	All routine & acceptance tests as per IS-325/IS-4722 /IS- 9283/IS 2148/IEC 60079-I	Vibration	Over speed	Tan delta, shaft voltage & polarization index test
Plates for stator frame, end shield, spider etc.										
Shaft										
Magnetic Material		Y		Y						
Rotor Copper/Aluminium										
Stator copper				Y						
SC Ring										
Insulating Material				Y						
Tubes for Cooler			Y							
Sleeve Bearing			Y							
Stator/Rotor, Exciter Coils										
Castings, stator frame, terminal box and bearing housing etc.										
Fabrication & machining of stator, rotor, terminal box										
Wound stator										
Wound Exciter										
Rotor complete					Y	Y				
Exciter, Stator, Rotor, Terminal Box assembly										
Accessories, RTD, BTD,CT, Brushes, Diodes, Space heater, antifriction bearing, cable glands, lugs, gaskets etc.										
Motor (IS 325 / 4722 / 9283/2148/IEC 60079-I)							Y	Y	Y	Y1
<div>Note : 1. This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed along with relevant supporting documents during QP finalisation. However, No QP for LT motor upto 50KW.</div> <div>2. Makes of all major bought out items will be subject to NTPC approval.</div> <div>Y1 = for HT Motor / Machines only.</div>										
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-VII:QE1 MOTOR		PAGE 2 OF 2	

SUB-SECTION-VII:QE3


LT POWER CABLES

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.	QUALITY ASSURANCE																
QUALITY ASSURANCE & INSPECTION																MODULE NO. SQE 13	
L.T POWER CABLES																	
(1.1 KV PVC & XLPE CABLES)																	
Attributes / Characteristics																	
Item / Components / Sub System Assembly		Make, Rating, Type & TC	Dimension/surface finish	Mechanical Properties	Chemical Composition	Electrical Properties	Spark Test	Hot set test (XLPE)	Lay length / Sequence	Armour coverage, Cross over, looseness, Gap between two armour wire/strip	Sequential marking/surface finish /cable length	Tensile strength, elongation before & after ageing of insulation & outer sheath	Thermal Stability of insulation and outer sheath *	Anti termite treatment on wooden drums	Constructional / requirement as per NTPC Spec.	Routine and acceptance test as per Relevant Standard and NTPC specification	FRLS Test
Aluminum (IS-8130)		Y	Y	Y	Y	Y											
PVC Compound (IS-5831)		Y		Y		Y						Y					
XLPE Compound (IS-7098 Part-I)		Y		Y		Y		Y				Y					
FRLS PVC Compound (IS-5831) ASTM-D-2843/ IS 10810 (Part-58) IEC-60754 Part-I		Y		Y								Y					
Armour wire/strip (IS-3975)		Y	Y	Y													
Insulated Core			Y				Y	Y					Y				
Laid up core			Y						Y								
PVC Inner sheath			Y														
Armouring			Y							Y							
Outer sheath			Y								Y	Y	Y			Y	Y
Finish cable (IS-1554 & 7098 – Part-1) ASTM-D-2843/ IS 10810 (Part- 58) IEC-60754 Part-I Swedish Chimney SS 4241475 for (F3 category) Flammability test IEC-60332 Part –3 Cat-B		Y	Y							Y	Y	Y	Y		Y	Y	Y
Wooden drum (IS-10418) / Steel drum			Y											Y			
Note: This is an indicative list of test/checks. The manufacturer is to furnish a detailed quality plan indicating the practice and procedure along with relevant supporting documents.																	
2. Not applicable for XLPE insulation																	
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-VII:QE3 LT POWER CABLES				PAGE 1 OF 3			

CLAUSE NO.	QUALITY ASSURANCE			<div>एनटीपीसी NTPC</div>
	<div>ROUTINE TESTS</div> <div>Routine tests shall be carried out on each drum of finished cables for all types & sizes. Following shall constitute routine tests:</div> <div><div>1)</div><div>Conductor Resistance test</div></div> <div><div>2)</div><div>High voltage test at room temperature</div></div> <div>ACCEPTANCE TESTS</div> <div>Following Acceptance tests shall be carried out for each type and size of the cables on the cable drums selected at random as per sampling plan mentioned in IS: 1554 Part 1 & IS 7098 Part-I</div> <div>A) For Conductor</div> <div><div>1)</div><div>Annealing test</div><div>For copper conductor only</div></div> <div><div>2)</div><div>Tensile test</div><div>For aluminium conductor only</div></div> <div><div>3)</div><div>Wrapping test</div><div>For aluminium conductor only</div></div> <div><div>4)</div><div>Resistance test</div></div> <div>B) For Armour Wires / Formed Wires (If applicable)</div> <div><div>1)</div><div>Measurement of Dimensions</div></div> <div><div>2)</div><div>Tensile Tests</div></div> <div><div>3)</div><div>Elongation Test</div></div> <div><div>4)</div><div>Torsion Test</div><div>For Round wires only</div></div> <div><div>5)</div><div>Wrapping Test</div></div> <div><div>6)</div><div>Resistance Test</div></div> <div><div>7)</div><div>Mass of Zinc coating test</div><div>For G S wires / Formed wires only</div></div> <div><div>8)</div><div>Uniformity of Zinc coating</div><div>For G S wires / Formed wires only</div></div> <div><div>9)</div><div>Adhesion test</div><div>For G S wires / Formed wires only</div></div> <div><div>10)</div><div>Freedom from defects</div></div> <div>C) For PVC / XLPE insulation & PVC Sheath</div> <div><div>1)</div><div>Test for thickness</div></div> <div><div>2)</div><div>Hot set test</div><div>For XLPE insulation only</div></div> <div><div>3)</div><div>Tensile strength & Elongation before ageing</div></div> <div>D) For completed cables</div> <div><div>1)</div><div>Insulation resistance test (Volume resistivity method)</div></div> <div><div>2)</div><div>High voltage test at room temperature</div></div>			
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-VII:QE3 LT POWER CABLES	PAGE 2 OF 3

CLAUSE NO.	<div data-bbox="619 237 943 271" style="text-align: center;">QUALITY ASSURANCE</div> <div data-bbox="1251 215 1385 282" style="text-align: right;">  </div>		
	<p>E) Following tests shall be carried out and only one sample shall be taken from each offered lot of all sizes for these tests:-</p> <ol style="list-style-type: none"> 1) Tensile strength & elongation after ageing on PVC / XLPE insulation and PVC outer sheath 2) Thermal stability test on PVC insulation and outer sheath 3) Oxygen index test on outer sheath 4) Smoke density rating test on outer sheath as per ASTM –D 2843 5) Acid gas generation test on outer sheath as per IEC – 60754 (Part 1) 6) Flammability test as per IEC-60332 - Part- 3 (Category- B) on completed cable 7) Fire resistance test as per SS 4241475 (F3 Category) on completed cable <p>F) Following tests shall be carried on one length of each size of offered lot:</p> <ol style="list-style-type: none"> 1) Surface finish, length measurement, sequence of cores, armour coverage, Gap between two consecutive armour wires / formed wires 		
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-VII:QE3 LT POWER CABLES	PAGE 3 OF 3


SUB-SECTION-VII:QE4

LT CONTROL CABLES

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.		QUALITY ASSURANCE														<div>एनटीपीसी NTPC</div>	
QUALITY ASSURANCE & INSPECTION										MODULE NO. SQE 14							
L.T CONTROL CABLES																	
(1.1 KV PVC CABLES)																	
Attributes / Characteristics		Item / Components / Sub System Assembly	Make, Type, Rating, T.C	Dimension/surface finish	Mechanical Properties	Chemical Composition	Electrical Properties	Spark Test	Lay length/Sequence	Armour coverage, cross over, looseness, gap between two armour wire	Sequential marking/surface finish/cable length	Tensile strength, elongation before & after ageing of insulation &outer sheath sheath	Thermal stability of insulation and outer sheath	Anti termite treatment on wooden drums	Constructional feature as per NTPC Spec.	Routine & Acceptance test as per relevant standard & page 2 & 3 of this table	FRLS Test
Copper Conductor (IS-8130)		Y	Y	Y	Y	Y											
PVC Compound (IS-5831)		Y		Y		Y						Y					
FRLS PVC Compound IS-5831 ASTM-D-2843/ IS 10810 (Part-58) IEC 60754 Part-1		Y		Y								Y					Y
Armour wire/strip (IS-3975)		Y	Y	Y													
Insulated Core			Y				Y	Y					Y				
Laid up core			Y					Y									
PVC Inner sheath			Y														
Armouring			Y						Y								
Outer sheath			Y							Y	Y	Y	Y				Y
Finish cable (IS-1554- 1) ASTM-D-2843/ IS 10810 (Part-58) IEC-60754 Part-1 Swedish Chimney: SEN SS 424-1475(F3 category) Flammability test IEC-60332 Part-3 Cat-B		Y	Y						Y	Y	Y	Y			Y	Y	Y
Wooden drum(IS : 10418) / Steel drum			Y											Y			
<div>• 1.Note : This is an indicative list of test/checks. The manufacturer is to furnish a detailed quality plan indicating the Practice and procedure along with relevant supporting documents.</div>																	
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-VII:QE4 LT CONTROL CABLES				PAGE 1 OF 3	

CLAUSE NO.	<div style="text-align: center;"> QUALITY ASSURANCE  </div>			
	<p>CONTROL CABLE</p> <p>ROUTINE TESTS</p> <p>Routine tests shall be carried out on each drum of finished cables for all types & sizes.</p> <p>Following shall constitute routine tests:</p> <ol style="list-style-type: none"> 1) Conductor Resistance test 2) High voltage test at room temperature <p>ACCEPTANCE TESTS</p> <p>Following Acceptance tests shall be carried out for each type and size of the cables on the cable drums selected at random as per sampling plan mentioned in IS: 1554 Part 1</p> <p>A) For Conductor</p> <ol style="list-style-type: none"> 1) Annealing test For copper conductor only 2) Resistance test <p>B) For Armour Wires / Formed Wires (If applicable)</p> <ol style="list-style-type: none"> 1) Measurement of Dimensions 2) Tensile Tests 3) Elongation Test 4) Torsion Test For Round wires only 5) Wrapping Test 6) Resistance Test 7) Mass of Zinc coating test For G S wires / Formed wires only 8) Uniformity of Zinc coating For G S wires / Formed wires only 9) Adhesion test For G S wires / Formed wires only 10) Freedom from defects <p>C) For PVC insulation & PVC Sheath</p> <ol style="list-style-type: none"> 1) Test for thickness 2) Tensile strength & Elongation before ageing <p>D) For completed cables</p> <ol style="list-style-type: none"> 1) Insulation resistance test (Volume resistivity method) High voltage test at room temperature 			
LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARIA 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-VII:QE4 LT CONTROL CABLES	PAGE 2 OF 3

CLAUSE NO.	QUALITY ASSURANCE			<div>एनटीपीसी NTPC</div>
	<div>E) Following tests shall be carried out and only one sample shall be taken from each offered lot of all sizes for these tests:-</div> <div><div>1) Tensile strength & elongation after ageing on PVC insulation and PVC outer sheath</div><div>2) Thermal stability test on PVC insulation and outer sheath</div><div>3) Oxygen index test on outer sheath</div><div>4) Smoke density rating test on outer sheath as per ASTM –D 2843</div><div>5) Acid gas generation test on outer sheath as per IEC –60 754 (Part 1)</div><div>6) Flammability test as per IEC 60332 - Part- 3 (Category- B) on completed cable</div><div>7) Fire resistance test as per SS 4241475 (F3 Category) on completed cable</div></div> <div>F) Following tests shall be carried on one length of each size of offered lot:</div> <div><div>1) Surface finish, length measurement, sequence of cores, armour coverage, Gap between two consecutive armour wires / formed wires</div></div>			
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-VII:QE4 LT CONTROL CABLES	PAGE 3 OF 3	