







CLAUSE NO.	TECHNICAL REQUIREMENTS				
2.02.00	Specific Requirements				
	Specification Requirements	Type-A cable	Type-B cable	Type F & G cable	Type-C cable
	A. Conductors				
	Cross section area	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
	Reference Standard	As per ANSI MC 96.1		VDE 0815	As per ANSI MC 96.1
	B. Insulation				
	Material	PVC type YI 3			Teflon (i.e. extruded FEP)
	Thickness in mm (Min/Nom/Max)	0.25/0.3/0.35			0.4/0.50
	Volume Resistivity (Min) in ohm-cm	1 x 10 ¹⁴ at 20 deg. C & 1x10 ¹¹ at 70 deg. C.			---
DARLIPALI SUPER THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATIONS SECTION-VI PART-B		SUB-SECTION-IIIC-07 INSTRUMENTATION AND POWER SUPPLY CABLE	PAGE 4 OF 19	


CLAUSE NO.	TECHNICAL REQUIREMENTS			
	Voltage Rating	225 V peak operating voltage		
	Reference Standard	VDE 0207 Part 4	VDE 0207 Part 6 & ASTM D 2116.	
	Core diameter above insulation	Suitable for cage clamp connector		
	C. Pairing & Twisting			
	Max. lay of pairs (mm)	50		
	Single layer of Polyester tape on each pair provided	Numbered tape	Yes	N.A.
	Unit formation of four pairs with printing of no. of Unit provided	N.A.	Yes	N.A.
	Conductor /pair identification as per VDE0815	N.A.	To be provided (color coding attached).	N.A.
	D. Shielding			
	Type of shielding	Al-Mylar tape		
	Individual pair shielding	No	To be provided for F-type cable	No
	Minimum thickness of Individual pair shielding	No	28 micron	No
	Overall cable assembly shielding	To be provided		
	Minimum thickness of	55 micron		
	DARLIPALI SUPER THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATIONS SECTION-VI PART-B	SUB-SECTION-IIIC-07 INSTRUMENTATION AND POWER SUPPLY CABLE	PAGE 5 OF 19

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	Overall cable assembly shielding			
	Shielding coverage	100% with at least 20% overlap		
	Drain wire provided for individual shield	N.A.	Yes (for F-type) 7-strand 20 AWG (0.51 mm ²) annealed Tin coated copper	N.A.
	Drain wire provided for overall shield	Yes. 7-strand 20 AWG (0.51 mm ²) annealed Tin coated copper		
	E. FILLERS			
	Non-hygroscopic, flame retardant	To be provided		
	F. Outer Sheath			
	Material	Extruded PVC compound YM1 with FRLS properties		Teflon (i.e. extruded FRP)
	Minimum Thickness at any point	1.8 mm		0.4 mm
	Nominal Thickness at any point	>1.8 mm		0.5 mm
	Color	Blue		
	Resistant to water, fungus, termite & rodent attack	Required		
	Oxygen index as per ASTM D-2863	not less than 29%		N.A.
DARLIPALI SUPER THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATIONS SECTION-VI PART-B	SUB-SECTION-IIIC-07 INSTRUMENTATION AND POWER SUPPLY CABLE	PAGE 6 OF 19	

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	Temperature index as per ASTMD-2863	not less than 250 deg.C		N.A.
	acid gas generation by weight as per IEC-60754-1	Maximum 20%		N.A.
	Smoke Density Rating as per ASTMD-2843	Maximum 60% (defined as the average area under the curve when the results of smoke density test plotted on a curve indicating light absorption vs. time as per ASTMD-2843)		N.A.
	Reference standard	VDE207 Part 5		VDE207 Part 6 & ASTM D2116
	G. Electrical Parameters			
	MUTUAL CAPACITANCE BETWEEN CONDUCTORS AT 0.8 KHZ (MAX.)	200 nF/km	120 nF/km for F type 100 nF/km for G-type	200 nF/km
	INSULATION RESISTANCE (MIN)	100 M Ohm/Km		
	CROSS TALK FIGURE (MIN.) AT 0.8 KHZ	60 Db	60 dB	N.A.
	CHARACTERISTIC IMPEDANCE (MAX) AT 1 KHZ	N.A.	320 ohm for F-type 340 ohm for G-type	N.A.
	ATTENUATION	N.A.	1.2 db/km	N.A.
DARLIPALI SUPER THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATIONS SECTION-VI PART-B	SUB-SECTION-IIIC-07 INSTRUMENTATION AND POWER SUPPLY CABLE	PAGE 7 OF 19	

CLAUSE NO.	TECHNICAL REQUIREMENTS				
<p>3.00.00</p> <p>3.01.00</p>	FIGURE AT 1 KHZ (MAX)				
	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 III E			
	Type tests	Refer sub-section-CNI TYPE TEST			
	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 \pm 5% for up to & including 12 pairs 500 m \pm 5% for above 12 pairs			
		SPECIFICATION OF OPTICAL FIBER CABLES (OFC)			
	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				
DARLIPALI SUPER THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATIONS SECTION-VI PART-B	SUB-SECTION-III C-07 INSTRUMENTATION AND POWER SUPPLY CABLE	PAGE 8 OF 19		

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	While crossing canals/river- to be laid in GI/rodent proof HDPE conduits within hume pipe.			
9.02.00	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.			
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	<p>FIELD MOUNTED LOCAL JUNCTION BOXES</p> <p>(i) No. of ways 12/24/36/48/64/72/96/128 with 20% spares terminals.</p> <p>(ii) Material and Thickness 4mm thick Fiberglass Reinforced Polyester (FRP).</p>			
DARLIPALI SUPER THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATIONS SECTION-VI PART-B	SUB-SECTION-IIIC-07 INSTRUMENTATION AND POWER SUPPLY CABLE	PAGE 16 OF 19	


CLAUSE NO.	TECHNICAL REQUIREMENTS			
	(iii) Type (iv) Mounting clamps and accessories (v) Type of terminal blocks (vi) Protection Class (vii) Grounding (viii) Color	Door gasket shall be of synthetic rubber. 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. Raceways shall be provided inside JB's for proper termination of cables. Rail mounted cage-clamp type suitable for conductor size upto 2.5 mm ² . A M6 earthing stud shall be provided. IP: 55 minimum for indoor & IP-65 minimum for outdoor applications. To be provided. To be decided during detailed engineering & subject to Employer's approval.		
11.00.00 11.01.00 11.02.00 11.03.00	CONDUITS 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 galvanised 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, water leak, fire and rust proof. The temperature rating of flexible conduit shall be suitable for the following areas. (i) Mills (ii) Drum (iii) Main steam, RH steam (iv) Air heater (v) Furnace, BFP DT's And for remaining applications, water leak, fire & rust proof flexible G.I conduits shall be provided. The Bidder shall install conduits according to the general routing as approved by Employer and shall coordinate conduit locations with other works. 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			
DARLIPALI SUPER THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATIONS SECTION-VI PART-B	SUB-SECTION-IIIC-07 INSTRUMENTATION AND POWER SUPPLY CABLE	PAGE 17 OF 19	

LUGS

CLAUSE NO.	TECHNICAL REQUIREMENTS		
22.00.00	INTERNAL WIRING		
22.01.00	All switchboards shall be supplied completely wired internally upto the terminals, ready to receive external cables. All inter-cubicle and inter-panel wiring all bus wiring for AC and DC supplies shall be provided by the Bidder.		
22.02.00	All auxiliary wiring shall be carried out with 650V grade, single core stranded copper conductor, colour coded, PVC insulated wires. Conductor size shall be 1.5 mm ² (min.) for control circuit wiring and 2.5 mm ² (min) for CT and space heater circuits.		
22.03.00	Extra flexible wires shall be used for wiring to devices mounted on moving parts such as hinged doors. The wire bunches from the panel inside to the doors shall be properly sleeved or taped.		
22.04.00	All wiring shall be properly supported, neatly arranged, readily accessible and securely connected to equipment terminals and terminal blocks.		
22.05.00	All internal wiring terminations shall be made with solderless crimping type tinned copper lugs which shall firmly grip the conductor or an equally secure method. Similar lugs shall also be provided at both ends of component to component wiring. Insulating sleeves shall be provided over the exposed parts of lugs to the extent possible. Screw-less (spring loaded) / cage clamp type terminal shall also be provided with lugs.		
22.06.00	Printed single tube ferrules marked to correspond with panel wiring diagram shall be fitted at both ends of each wire. The wire identification marking shall be in accordance with IS: 375. Red Ferrules should be provided on trip circuit wiring.		
22.07.00	Wiring for equipment, which are to be supplied by the Employer and for which the Contractor has to provide mounting arrangement in his panels, shall also be provided by the Contractor, upto the terminal blocks.		
22.08.00	All connections from vertical busbars for individual modules above 100 A shall be by Copper / Aluminum links only. The cable connections for modules less than 100 A shall be selected in such a way that there will not be any melting / shorting in case of a short circuit inside the module and the cable shall have current rating to carry the let through energy of the corresponding fuses in case of a fault. The insulation of the cable and its cross section shall be decided considering the high ambient temperature within the module. For all modules where use of cable is envisaged by the Contractor specific approval from the Employer regarding cable details are to be taken. For power wiring colour coded wire insulation / tapes shall be provided.		
23.00.00	CONTROL TERMINAL BLOCKS		
DARLIPALI SUPER THERMAL POWER PROJECT STAGE-I (2X800 MW)	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	SUB-SECTION-B-8 LT SWITCHGEARS & LT BUSDUCTS	Page 22 of 44

LUGS

CLAUSE NO.	TECHNICAL REQUIREMENTS		
23.01.00	Terminal blocks shall be 650V grade, 10Amps rated, made up of unbreakable polyamide 6.6 grade. The terminals shall be either screw type or screw-less (spring loaded) / cage clamp type with lugs. Marking on terminal strips shall correspond to the terminal numbering in wiring diagrams. All metal parts shall be of non-ferrous material. In case of screw type terminals the screw shall be captive, preferably with screw locking design.		
23.02.00	Terminal blocks for CT and VT secondary leads shall be of stud type, made up of unbreakable polyamide 6.6 grade. They shall be provided with links to facilitate testing, isolation star / delta formation and earthing. Terminal blocks for CT secondary shall have the short circuiting facility. The terminals for remote ammeter connection etc. shall also be disconnecting type only. All metal parts shall be of non-ferrous material.		
23.03.00	In all circuit breaker panels and MCC modules at least 10% spare terminals for external connections shall be provided and these spare terminals shall be uniformly distributed on all terminal blocks.		
23.04.00	All terminal blocks shall be suitable for terminating on each side two (2) nos. stranded copper conductors of size upto 2.5 sq. mm each, or alternatively, the terminal blocks shall have the possibility of double shorting space to facilitate looping. However for DDCMIS terminals shall be suitable for 1.5 sq. mm cable.		
23.05.00	All terminals shall be numbered for identification and grouped according to the function. Engraved black-in-white labels shall be provided on the terminal blocks.		
23.06.00	Wherever duplication of a terminal block is necessary it shall be achieved by solid bonding links.		
23.07.00	Terminal blocks shall be arranged with at least 100mm clearance between two sets of terminal blocks. The minimum clearance between the first row of terminal blocks and the associated cable gland plate shall be 250 mm.		
24.00.00	POWER CABLE TERMINATION		
24.01.00	Cable termination compartment and arrangement for power cables shall be suitable for heavy duty, 1.1 kV grade, stranded aluminum conductor, PVC/ XLPE insulated, armoured / unarmoured and PVC sheathed cables. All necessary cable terminating accessories such as supporting clamps and brackets, hardware etc., shall be provided by the contractor.		
24.02.00	All power cable terminals shall be of stud type and the power cable lugs shall be of tinned copper solderless crimping ring type conforming to IS: 8309. All lugs shall be insulated/ sleeved.		
25.00.00	LOCAL PUSH BUTTON STATIONS		
DARLIPALI SUPER THERMAL POWER PROJECT STAGE-I (2X800 MW)	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	SUB-SECTION-B-8 LT SWITCHGEARS & LT BUSDUCTS	Page 23 of 44

CLAUSE NO.	TECHNICAL REQUIREMENTS												
8.02.00	<p>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:</p> <table border="0" data-bbox="343 392 1165 571"> <tr> <td>From 11 kV/6.6 kV/3.3 kV tray system</td> <td>-</td> <td>914 mm</td> </tr> <tr> <td>From 415V tray system</td> <td>-</td> <td>610 mm</td> </tr> <tr> <td>From control cable tray system</td> <td>-</td> <td>305 mm</td> </tr> </table>			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	
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	<p>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.</p> <p>Compression cable glands (double for armoured and single for other cables) shall be provided.</p>												
8.04.00	<p>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.</p>												
8.05.00	<p>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.</p>												
8.06.00	<p>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.</p>												
9.00.00	<p>CABLE LAYING AND ACCESSORIES</p>												
9.01.00	<p>CABLE LAYING</p> <ol style="list-style-type: none"> 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. 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 												
<p>DARLIPALI SUPER THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION-VI PART-B</p>	<p>SUB-SECTION-IIIC-07 INSTRUMENTATION AND POWER SUPPLY CABLE</p>	<p>PAGE 14 OF 19</p>										

SPECIFIC ELECTRICAL REQUIREMENT FOR MILL REJECT SYSTEM

SL.NO.	PARAMETERS	UNIT	DARLIPALI
	MOTOR		
1	DESIGN AMBIENT TEMP	DEG. C	50
2	VOLTAGE SUPPLY AND VARIATION	VOLT	415V, \pm 10%
3	FREQUENCY WITH VARIATION	Hz	50 (+) 3% to (-) 5%
4	COMBINED VOLTAGE & FREQUENCY VARIATION		10%
5	MAX ACCEPTABLE RATING OF MOTOR AT 415 V	KW	Above 200W and upto 200 kW
6	SYSTEM FAULT LEVEL AND ITS DUARTION	KA	45 KA, 1 Sec
7	SUTABILITY OF TERMINAL BOX FOR FAULT LEVEL AND DURATION		50 KA, 0.25 sec
8	CLASS OF INSULATION & TEMP RISE LIMITED TO		Class-F and temp rise limited to Class-B
9	MIN. STARTING VOLTAGE		(a) 85% below 110 KW (b) 80% from 110 KW to 200 KW
10	MOTOR RATING FOR SINGLE PHASE SUPPLY		Upto 200W
11	MAXIMUM LOCKED ROTOR CURRENT	% OF FLC	For LT motors of continuous duty (S1) type motors, starting current shall be as per IS: 12615.
12	ACCEPTABLE NOISE LEVEL	DB	85dB at 1.0m in line with IS 12065
13	TYPE OF STARTER PROVIDED IN MCC		DOL
14	DOP OF ENCLOSURE		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 iv) Cable box-Outdoor area - IP 55
15	SPACE HEATER REQUIREMENT		30KW & ABOVE
16	PAINT SHADE		RAL 5012 (Blue)
17	SPECIAL REQUIREMENT		(i) Continuous duty LT motors upto 160 KW Output rating (at 50 deg.C ambient temperature), shall be Premium Efficiency class-IE3 , conforming to IS 12615, or IEC:60034-30. (ii) For testing requirements, refer attached NTPC Spec of Motors.

CLAUSE NO.	BIDDERS'S NAME		
DE-1B	<p>LT MOTORS</p> <p>A. GENERAL</p> <p>1. Manufacturer & Country of origin. (Shall be as per approved QA make)</p> <p>2. Equipment driven by motor</p> <p>3. Motor type</p> <p>4. Quantity</p> <p>B. DESIGN AND PERFORMANCE DATA</p> <p>1. Frame size</p> <p>2. Type of duty</p> <p>3. Type of enclosure /Method of cooling/Degree of protection</p> <p>4. Applicable standard to which motor generally conforms</p> <p>5. Efficiency class as per IS 12615</p> <p>6. (a) Whether motor is flame proof Yes/No</p> <p>(b) If yes, the gas group to which it conforms as per IS:2148</p> <p>7. Type of mounting</p> <p>8. Direction of rotation as viewed from DE END _____</p> <p>9. Standard continuous rating at 40 deg.C. ambient temp. as per Indian Standard (KW)</p> <p>10. Derated rating for specified normal condition i.e. 50 deg. C ambient temperature (KW)</p> <p>11. Maximum continuous load demand of driven equipment in KW</p> <p>12. Rated Voltage (volts)</p> <p>13. Permissible variation of :</p> <p>a. Voltage (Volts)</p>		
<p>DARLIPALI THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE</p>	<p>TECHNICAL DATA SHEETS SECTION-VI PART-G</p>	<p>DB2 MOTORS</p>	<p>PAGE 9 OF 15</p>

CLAUSE NO.	BIDDERS'S NAME		
	<ul style="list-style-type: none"> b. Frequency (Hz) c. Combined voltage and frequency 14. Rated speed at rated voltage and frequency(RPM) 15. At rated Voltage and frequency: <ul style="list-style-type: none"> a. Full load current b. No load current 16. Power Factor at <ul style="list-style-type: none"> a. 100% load b. NO load c. Starting. 17. Efficiency at rated voltage and frequency, <ul style="list-style-type: none"> a. 100% load b. 75% load c. 50% load 18. Starting current (amps) at <ul style="list-style-type: none"> a. 100 % voltage b. 85% voltage c. 80% voltage 19. Minimum permissible starting Voltage (Volts) 20. Starting time with minimum permissible voltage <ul style="list-style-type: none"> a. Without driven equipment coupled b. With driven equipment coupled 		
DARLIPALI THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL DATA SHEETS SECTION-VI PART-G	DB2 MOTORS	PAGE 10 OF 15

CLAUSE NO.	BIDDERS'S NAME		
	<p>21. Safe stall time with 100% and 110% of rated voltage</p> <p>a. From hot condition</p> <p>b. From cold condition</p> <p>22. Torques :</p> <p>a. Starting torque at min. permissible voltage(kg-mtr.)</p> <p>b. Pull up torque at rated voltage.</p> <p>c. Pull out torque</p> <p>d. Min accelerating torque (kg.m) available</p> <p>e. Rated torque (kg.m)</p> <p>23. Stator winding resistance per phase (ohms at 20 Deg.C.)</p> <p>24. GD² value of motors</p> <p>25. No of permissible successive starts when motor is in hot condition</p> <p>26. Locked Rotor KVA Input</p> <p>27. Locked Rotor KVA/KW</p> <p>28. Vibration limit :Velocity (mm/s)</p> <p>29. Noise level limit (dBA)</p> <p>C. CONSTRUCTIONAL FEATURES</p> <p>1. Stator winding insulation</p> <p>a. Class & Type</p> <p>b. Winding Insulation Process</p> <p>c. Tropicalised (Yes/No)</p>		
<p>DARLIPALI THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE</p>	<p>TECHNICAL DATA SHEETS SECTION-VI PART-G</p>	<p>DB2 MOTORS</p>	<p>PAGE 11 OF 15</p>

CLAUSE NO.	BIDDERS'S NAME		
	<ul style="list-style-type: none"> d. Temperature rise over specified maximum ambient temperature of 50 deg C e. Method of temperature measurement f. Stator winding connection <p>2. Main Terminal Box</p> <ul style="list-style-type: none"> a. Type b. Location (viewed from NDE side) c. Entry of cables(bottom/side) d. Recommended cable size (To be matched with cable size envisaged by owner) e. Fault level (MVA), Fault level duration (sec) f. Cable glands & lugs details (shall be suitable for power cable) <p>3. Type of DE/NDE Bearing</p> <p>4. Motor Paint shade</p> <p>5. Weight of</p> <ul style="list-style-type: none"> a. Motor stator (KG) b. Motor Rotor (KG) c. Total weight (KG) <p>D. List of accessories.</p> <ul style="list-style-type: none"> 1. Space Heaters (Applicable for 30 KW & above motor) (Nos./Power in watts/supply voltage) 2. Terminal Box for Space Heater (Yes/No) 3. Speed switch (Yes/No) No of contacts and contact ratings of speed switch 		
<p>DARLIPALI THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE</p>	<p>TECHNICAL DATA SHEETS SECTION-VI PART-G</p>	<p>DB2 MOTORS</p>	<p>PAGE 12 OF 15</p>

CLAUSE NO.	BIDDERS'S NAME		
	<p>4. Insulation of bearing (Yes/No)</p> <p>5. Noise reducer(Yes/No)</p> <p>6. Grounding pads</p> <p style="padding-left: 20px;">i) No and size on motor body</p> <p style="padding-left: 20px;">ii) Nos on terminal Box</p> <p>7. Vibration pads</p> <p style="padding-left: 20px;">i) Nos and size</p> <p style="padding-left: 20px;">ii) Location</p> <p>8. Any other fitments</p> <p>E. List of curves.</p> <p>1. Torque speed characteristic of the motor</p> <p>2. Thermal withstand characteristic</p> <p>3. Starting. current Vs. Time</p> <p>4. Starting. current Vs speed</p> <p>5. P.F. and Effi. Vs Load</p> <p>F. Additional Data to be filled for each rating of DC Motor</p> <p>1. Rated armature voltage (Volt)</p> <p>2. Rated field excitation (Amp)</p> <p>3. Permissible % variation in voltage</p> <p>4. Minimum Permissible Starting voltage (volt)</p> <p>5. At rated voltage</p> <p style="padding-left: 20px;">i) Full load Armature current.(Amp)</p> <p style="padding-left: 20px;">ii) Full load Field current (Amp)</p>		
<p>DARLIPALI THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE</p>	<p>TECHNICAL DATA SHEETS SECTION-VI PART-G</p>	<p>DB2 MOTORS</p>	<p>PAGE 13 OF 15</p>

CLAUSE NO.	BIDDERS'S NAME		
	<ul style="list-style-type: none"> iii) No load Armature current (Amp) 6. Full load Field current (Amp) 7. No load Aramature current (Amp) 8. Minimum permissible field current(Amp) to avoid overspeeding at <ul style="list-style-type: none"> i) Maximum permissible voltage ii) Rated voltage iii) Minimum Permissible Voltage 9. Resistance (indicative Values) in ohm <ul style="list-style-type: none"> i) Armature winding (Arm + IP + Series) at 25 deg.C ii) Field Winding at 25 deg. C 10. Inductance (indicative values) <ul style="list-style-type: none"> i) Armature winding ii) Field winding 11. Value of trimmer resistance (ohm) to be connected in series with the shunt field to obtain rated speed at <ul style="list-style-type: none"> i) 220 V DC ii) 250 V DC iii) 187 V DC 12. Value of the external resistance (ohm) required to be connected in series with armature during starting only 13. Technical data sheet for external resistance box 14. GA drawing of motor 15. Starting time calculation 		
DARLIPALI THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL DATA SHEETS SECTION-VI PART-G	DB2 MOTORS	PAGE 14 OF 15

CLAUSE NO.	BIDDERS'S NAME		
	<p>16. Starter resistance design calculation</p> <p>17. Electrical connection diagram of motor</p>		
<p>DARLIPALI THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE</p>	<p>TECHNICAL DATA SHEETS SECTION-VI PART-G</p>	<p>DB2 MOTORS</p>	<p>PAGE 15 OF 15</p>

CLAUSE NO.	BIDDERS'S NAME		
	<p>POWER AND CONTROL CABLES (Use separate sheet for each type and size of cables)</p> <p>1.00.00 Make (Shall be as per approved QA make)</p> <p>1.02.00 Country of Manufacturer</p> <p>1.03.00 Type & designation</p> <p>1.04.00 Applicable standard</p> <p>1.05.00 Cable size & no. of cores</p> <p>1.06.00 Rated voltage</p> <p>1.07.00 Catalogue attached as Annexure No.</p> <p>1.08.00 Continuous current rating for max. conductor temperature</p> <p>a) When laid in air at an ambient temperature of 50 deg. C</p> <p>b) When buried in soil having thermal resistivity of 150 deg.C cm/w at a depth of 1000 mm at ground ambient temperature of 40 deg. C</p> <p>1.09.00 Short circuit withstand capacity and duration for</p> <p>a) Conductor</p> <p>b) Screen</p> <p>c) Armour</p> <p>1.10.00 Conductor</p> <p>a) Material</p> <p>b) Nominal cross section area in sq. mm</p> <p>c) Shape of conductor</p> <p>d) DC resistance at 20°C (Maxm.)</p> <p>1.11.00 Insulation</p> <p>a) Material</p>		
<p>DARLIPALI THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE</p>	<p>TECHNICAL DATA SHEETS SECTION-VI PART-G</p>	<p>DB3 POWER AND CONTROL CABLES</p>	<p>PAGE 1 OF 2</p>

CLAUSE NO.	BIDDERS'S NAME		
1.12.00	b) Nominal thickness (in mm) c) Type of curing (for XLPE) Metallic screen (wherever applicable)		
1.13.00	a) Material b) Type c) Short Ckt. (KA) & Period (Sec.)		
1.14.00	Material & Type of Inner sheath		
1.15.00	Armour material & shape		
1.16.00	Outer sheath material & type		
1.17.00	Over all dia of cable (in mm)		
1.18.00	Guaranteed value of minimum oxygen index of outer sheath		
1.19.00	Maximum acid-gas generation by weight (%) of outer sheath		
	Smoke Density rating of outer sheath		
DARLIPALI THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL DATA SHEETS SECTION-VI PART-G	DB3 POWER AND CONTROL CABLES	PAGE 2 OF 2

CLAUSE NO.	BIDDERS'S NAME		
CABLE SUPPORT SYSTEM			
1.00.00	Cable Trays, Fittings & Accessories		
1.01.00	Makers, Name, Country of manufacturer (Shall be as per approved QA Make)		
1.02.00	Type & Material of cable tray		
Conduit Pipes & Accessories			
2.01.00	Maker's Name and Country of manufacture (Shall be as per approved QA Make)		
2.02.00	Material		
2.03.00	Class of duty		
2.04.00	Type of Coating		
2.05.00	Applicable Standard		
Junction Boxes			
3.01.00	Maker's Name and Country of manufacture (Shall be as per approved QA Make)		
3.02.00	Material		
3.03.00	Applicable Standard		
3.04.00	Degree of Protection		
Cable Glands			
4.01.00	Maker's Name and Country of manufacture (Shall be as per approved QA Make)		
4.02.00	Type of cable gland		
4.03.00	Applicable Standard		
4.04.00	Material		
Cable lugs & Ferrules			
5.01.00	Maker's Name & Country of Manufacturer		
DARLIPALI THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL DATA SHEETS SECTION-VI PART-G	DB4 CABLING, EARTHING AND LIGHTNING PROTECTION	PAGE 1 OF 2

CLAUSE NO.	BIDDERS'S NAME		
5.02.00	Material		
5.03.00	Applicable Standard (i) HT		
	(ii) LT		
6.00.00	Earthing System Equipment earthing i) Material		
	ii) Size		
	iii) Applicable Standard		
7.00.00	Lightning Protection System i) Applicable Standard		
	ii) Size & material for Air termination and down conductor		
8.00.00	Cable Jointing/Termination Kits (a) Maker's Name & Country of Manufacturer		
	(b) Type of System		
	(i) Termination H.T./L.T.		
	(ii) Joints H.T./L.T.		
	(c) Outdoor/Indoor		
9.00.00	Cable Tray Support System (a) Maker's Name, Country of Manufacturer (Shall be as per approved QA Make)		
	(b) Type & Material of cable tray support system		
	(c) Catalogue and indicative sketch attach as annexure No.		
DARLIPALI THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL DATA SHEETS SECTION-VI PART-G	DB4 CABLING, EARTHING AND LIGHTNING PROTECTION	PAGE 2 OF 2



INDUCTION MOTOR & SYNCHRONOUS MACHINE

TESTS/CHECKS																			
TEMS/COMPONENTS	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	Magnetic Characteristics	Hydraulic/Leak/Pressure Test	Thermal Characteristics	Run out	Dynamic Balancing	All tests as per IS-325/IS-4722 / 9283	Vibration	Over speed	Tan delta, shaft voltage & polarisation index test	
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			Y		Y							
Rotor Copper/Aluminium	Y	Y	Y	Y		Y	Y		Y										
Stator copper	Y	Y	Y	Y			Y		Y			Y							
SC Ring	Y	Y	Y	Y	Y	Y	Y	Y	Y										
Insulating Material	Y		Y	Y			Y					Y							
Tubes for Cooler	Y	Y	Y	Y	Y				Y		Y								
Sleeve Bearing	Y	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						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												Y	Y	Y	Y1	
<p>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 finalization. However, No QP for LT motor up to 50KW.</p> <p>2. Makes of all major bought out items will be subject to NTPC approval.</p> <p>Y1 = for HT Motor / Machines only.</p>																			



QUALITY PLAN

SHEET 1 OF 9

CUSTOMER :

PROJECT

SPECIFICATION :

BIDDER/ VENDOR

TITLE

NUMBER :


QUALITY PLAN
NUMBER PED-506-00-Q-007, REV-03


SPECIFICATION :


TITLE

SECTION VOLUME III

SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
1.0	RAW MATERIAL & BOUGHT OUT CONTROL											
1.1	SHEET STEEL, PLATES, SECTION, EYEBOLTS	1.SURFACE CONDITION	MA	VISUAL	100%	-	FREE FROM BLINKS, CRACKS, WAVINESS ETC	LOG BOOK	3	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANFR'S DRG./SPEC	MANFR'S DRG./SPEC	-DO-	3	-	-	
		3.PROOF LOAD TEST (EYE BOLT)	MA	MECH. TEST	-DO-	-DO-	-DO-	INSPEC. REPORT	3	-	2	
1.2	HARDWARES	1.SURFACE CONDITION	MA	VISUAL	100%		FREE FROM CRACKS, UN-EVENNESS ETC.	-DO-	3	-	-	
		2.PROPERTY CLASS	MA	VISUAL	SAMPLES	MANFR'S DRG./SPEC BOOK	RELEVANT IS/SPEC.	SUPPLIERS TC & LOG	3	-	2	PROPERTY CLASS MARKING SHALL BE CHECKED BY THE VENDOR
1.3	CASTING	1.SURFACE CONDITION	MA	VISUAL	100%		FREE FROM CRACKS, BLOW HOLES ETC.	LOG BOOK	3	-	2	
		2.CHEM. & PHY. PROP.	MA	CHEM & MECH TEST	1/HEAT NO.	MANFR'S DRG./SPEC	RELEVANT IS/	SUPPLIER'S TC	3	-	2	HEAT NO. SHALL BE VERIFIED
		3.DIMENSIONS	MA	MEASUREMENT	100%	MANUFR'S DRG.	MANUFR'S DRG.	LOG BOOK	3	-	2	
1.4	PAINT & VARNISH	1.MAKE, SHADE, SHELF LIFE & TYPE	MA	VISUAL	100% CONTINUOUS	MANFR'S DRG./SPEC	MANFR'S DRG./SPEC	LOG BOOK	3	-	2	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

		QUALITY PLAN			CUSTOMER :				PROJECT			SPECIFICATION :			
					BIDDER/ VENDOR :				TITLE				NUMBER :		
SHEET 2 OF 9		SYSTEM				ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)				SECTION			VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS			
									P	W	V				
1	2	3	4	5	6	7	8	9	10			11			
1.5	SHAFT (FORGED OR ROLLED)	1. SURFACE COND.	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	-	VENDOR'S APPROVAL IDENTIFICATION SHALL BE MAINTAINED			
		2. CHEM. & PHYSICAL PROPERTIES	MA	CHEM. & PHYSICAL TESTS	1/HEAT NO. OR HEAT TREATMENT BATCH NO	MFG. DRG. SPEC.	RELEVANT IS	SUPPLIER'S TC	3	-	2				
		3. DIMENSIONS	MA	MEASUREMENT	100%	-DO-	MANUFR'S DRG.	LOG BOOK	3	-	2				
		4. INTERNAL FLAWS	CR	UT	-DO-	ASTM-A388	MANUFR'S SPEC. BHEL SPEC.	-DO-	3	2	1		FOR DIA OF 55 MM & ABOVE		
1.6	SPACE HEATERS, CONNECTORS, TERMINAL BLOCKS, CABLES, CABLE LUGS, CARBON BRUSH TEMP. DETECTORS, RTD, BTD'S	1. MAKE & RATING	MA	VISUAL	-DO-	MANUFR'S DRG. SPEC.	MANUFR'S DRG. SPEC.	-DO-	3	-	2				
		2. PHYSICAL COND.	MA	-DO-	-DO-	-	NO PHYS. DAMAGE, NO ELECTRICAL DISCONTINUITY	-DO-	3	-	2				
		3. DIMENSIONS (WHEREVER APPLICABLE)	MA	MEASUREMENT	SAMPLE	MANUFR'S DRG./ SPEC.	MANUFR'S DRG. / SPEC.	-DO-	3	-	2				
		4. PERFORMANCE/ CALIBRATION	MA	TEST	100%	-DO-	-DO-	INSP. REPORT	3	-	2				
BHEL			PARTICULARS		BIDDER/VENDOR										
			NAME												
			SIGNATURE												
			DATE		BIDDER'S/VENDORS COMPANY SEAL										

		QUALITY PLAN			CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :		
SHEET 3 OF 9		BIDDER/ VENDOR SYSTEM			QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03			SPECIFICATION : TITLE			SECTION VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
									P	W	V		
1	2	3	4	5	6	7	8	9	10			11	
1.7	OTHER INSULATING MATERIALS LIKE SLEEVES, BINDINGS CORDS, PAPERS, PRESS BOARDS ETC.	1. SURFACE COND. ETC. 2. OTHER CHARACTERISTICS	MA MA	VISUAL TEST	100% SAMPLE	- MANUF'S SPEC.	NO VISUAL DEFECTS MANUF'S SPEC.	INSPT. REPORT LOG BOOK AND OR SUPPLIER'S TC	3 3	- -	2 2		
1.8	SHEET STAMPING (PUNCHED)	1. SURFACE COND. 2.DIMENSIONS INCLUDING BURS HEIGHT 3. ACCEPTANCE TESTS	MA MA MA	VISUAL MEASUREMENT ELECT. & MECH TESTS	100% SAMPLE -DO-	- MANUFR'S DRG. . MANUF'S SPEC./ RELEVANT IS	NO VISUAL DEFECTS (FREE FROM BURS) MANUFR'S DRG. RELEVANT IS	LOG BOOK -DO- SUPPLIER'S TC	3 3 3	- -	- 2 2	FOR MV MOTOR INSULATION/VARNISH THICKNESS SHALL BE MORE THAN THE BURS HEIGHT	
1.9	CONDUCTORS	1. SURFACE FINISH 2.ELECT. PROP. & MECH. PROP	MA MA	VISUAL ELECT. & MECH.TEST	100% SAMPLES	- RELEVANT IS/ BS OR OTHER STANDARDS	FREE FROM VISUAL DEFECTS RELEVANT IS/ BS OR OTHER STANDARDS	LOG BOOK SUPPLIERS TC & VENDOR'S INSPN. REPORTS	3* 3	- -	2* 2	* MOTOR MANUFACTURER TO CONDUCT VISUAL CHECK FOR SURFACE FINISH ON RANDOM BASIS (10% SAMPLE) AT HIS WORKS AND MAINTAIN RECORD FOR VERIFICATION BY BHEL/CUSTOMER.	
BHEL			PARTICULARS			BIDDER/VENDOR							
			NAME										
			SIGNATURE										
			DATE						BIDDER'S/VENDORS COMPANY SEAL				

		QUALITY PLAN			CUSTOMER :		PROJECT			SPECIFICATION :		
					BIDDER/ VENDOR :		TITLE			NUMBER :		
SHEET 4 OF 9		SYSTEM		ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION		VOLUME III			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	P	W	V	11
1.10	BEARINGS	3.DIMENSIONS	MA	MEASUREMENT	-DO-	-DO-	-DO-	Log Book	3	-	2	
		1.MAKE & TYPE	MA	VISUAL	100%	MANFR'S DRG./ APPROVED DATASHEET	MANFR'S DRG./ APPROVED DATASHEET	-DO-	3	-	2	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	BHEL DATA SHEET	BHEL DATA SHEET BEARING MANUF'S CATALOGUES	-DO-	3	-	2	
1.11	SLIP RING (WHEREVER APPLICABLE)	3.SURFACE FINISH	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	2	
		1.SURFACE COND.	MA	VISUAL	100%	-	-DO-	-DO-	3	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANUF'S DRG	MANUF'S DRG	-DO-	3	-	-	
		3.TEMP.WITH-STAND CAPACITY	MA	ELECT.TEST	-DO-	MANUF'S SPEC./ BHEL SPEC.	MANUF'S SPEC./ BHEL SPEC.	-DO-	3	-	2	
1.12	OIL SEALS & GASKETS	4.HV/IR	MA	-DO-	100%	-DO-	-DO-	-DO-	3	-	2	
		1.MATERIAL OF GASKET	MA	VISUAL	100%	MANUF'S DRG/SPECS	MANUF'S DRG./ SPECS.	-DO-	3	-	-	
		2.SURFACE COND.	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	-	
		3.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANUF'S DRG	MANUF'S DRG	-DO-	3	-	-	
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									
			DATE					BIDDER'S/VENDORS COMPANY SEAL				



QUALITY PLAN

SHEET 5 OF 9

CUSTOMER :

PROJECT
TITLE

SPECIFICATION :
NUMBER :

BIDDER/
VENDOR


QUALITY PLAN
NUMBER PED-506-00-Q-007, REV-03

SPECIFICATION :
TITLE

ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)

SECTION VOLUME III

SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.0	IN PROCESS											
2.1	STATOR FRAME WELDING (IN CASE OF FABRICATED STATOR)	1.WORKMANSHIP & CLEANNESS	MA	VISUAL	100%	-DO-	GOOD FINISH	LOG BOOK	3/2	2	-	
		2.DIMENSIONS	MA	MEASUREMENT	-DO-	MANUF'S DRG	MANUF'S DRG	-DO-	2	-	-	
2.2	MACHINING	1.FINISH	MA	VISUAL	100%	-DO-	GOOD FINISH	LOG BOOK	2	-	-	
		2.DIMENSIONS	MA	MEASUREMENT	-DO-	MANUF'S DRG	MANUF'S DRG	-DO-	2	-	-	
		3.SHAFT SURFACE FLOWS	MA	PT	-DO-	RELEVENT SPEC./ ASTM-E165	MANUFR'S SPEC./ BHEL SPEC./	-DO-	2	-	1	
2.3	PAINTING	1.SURFACE PREPARATION	MA	VISUAL	100%	MANFR'S SPEC/BHEL SPEC./ RELEVANT STAND	BHEL SPEC. SAME AS COL.7	LOG BOOK	2	-	-	
		2.PAINT THICKNESS (BOTH PRIMER & FINISH COAT)	MA	MEASUREMENT BY ELCOMETER	SAMPLE	-DO-	-DO-	-DO-	2	-	-	
		3.SHADE	MA	VISUAL	-DO-	-DO-	-DO-	Log Book	2	-	-	
		4.ADHESION	MA	CROSS CUTTING & TAPE TEST	-DO-	-DO-	-DO-	Log Book	2	-	-	
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									
			DATE					BIDDER'S/VENDORS COMPANY SEAL				

		QUALITY PLAN			CUSTOMER :			PROJECT			SPECIFICATION :		
					BIDDER/ VENDOR			TITLE			NUMBER :		
SHEET 6 OF 9		SYSTEM			ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)			SECTION			VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
									P	W	V		
1	2	3	4	5	6	7	8	9	10			11	
2.4	SHEET STACKING	1.COMPLETENESS	MA	MEASUREMENT	SAMPLE	MANUFR'S SPEC.	MANUFR'S SPEC.	Log Book	2	-	-	(FOR MOTORS OF 2MW AND ABOVE) * ON 10% RANDOM SAMPLE	
		2.COMPRESSION & TIGHTENING	MA	MEASUREMENT	100%	-DO-	-DO-	Log Book	2	-	-		
		3.CORE LOSS & HOTSPOT	MA	ELECT.TEST	-DO-	-DO-	-DO-	Log Book	2	1*	1		
2.5	WINDING	1.COMPLETENESS	CR	VISUAL	100%	MANUFR'S SPEC./BHEL SPEC.	MANUFR'S SPEC./BHEL SPEC.	Log Book	2	-	-		
		2.CLEANLINESS	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	-		
		3.IR-HV-IR	CR	ELECT. TEST	-DO-	-DO-	-DO-	Log Book	2	-	1		
		4.RESISTANCE	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1		
		5.INTERTURN INSULATION	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	-		
		6.SURGE WITH STAND AND TAN. DELTA TEST	CR	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1		FOR MV MOTOR
2.6	IMPREGNATION	1.VISCOSITY	MA	PHY. TEST	AT STARTING	-DO-	-DO-	Log Book	2	-	-		
		2.TEMP. PRESSURE VACCUM	MA	PROCESS CHECK	CONTINUOUS	-DO-	-DO-	Log Book	2	-	-		
		3.NO. OF DIPS	MA	-DO-	-DO-	-DO-	-DO-	Log Book	2	-	1	THREE DIPS TO BE GIVEN	
BHEL			PARTICULARS		BIDDER/VENDOR								
			NAME										
			SIGNATURE										
			DATE					BIDDER'S/VENDORS COMPANY SEAL					



QUALITY PLAN

SHEET 7 OF 9

CUSTOMER :

PROJECT
TITLE

SPECIFICATION :
NUMBER :

BIDDER/
VENDOR :

QUALITY PLAN
NUMBER PED-506-00-Q-007, REV-03

SPECIFICATION :
TITLE


SYSTEM

ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)

SECTION

VOLUME III

SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.7	COMPLETE STATOR ASSEMBLY	4.DURATION 1.COMPACTNESS & CLEANLINESS	MA MA	-DO- VISUAL	-DO- 100%	-DO- -DO-	-DO- -DO-	Log Book Log Book	2 2	- -	1 -	VERIFICATION FOR MV MOTOR ONLY
2.8	BRAZING/COMPRESSION JOINT	1.COMPLETENESS 2.SOUNDNESS	CR CR	-DO- MALLETT TEST & UT	-DO- -DO-	-DO- -DO-	-DO- -DO-	Log Book Log Book	2 2	- -	- 1	
2.9	COMPLETE ROTOR ASSEMBLY	3.HV 1.RESIDUAL UNBALANCE	MA CR	ELECT. TEST DYN. BALANCE	-DO- -DO-	-DO- MFG SPEC./ ISO 1940	-DO- MFG. DWG.	Log Book Log Book	2 2	- -	1 1	
2.10	ASSEMBLY	2.SOUNDNESS OF DIE CASTING	CR	ELECT. (GROWLER TEST)	-DO-	MFG. SPEC.	MFG. SPEC.	Log Book	2	-	1	
		1.ALIGNMENT	MA	MEAS.	-DO-	-DO-	-DO-	Log Book	2	-	-	
		2.WORKMANSHIP	MA	VISUAL	-DO-	-DO-	-DO-	Log Book	2	-	-	
		3.AXIAL PLAY	MA	MEAS.	-DO-	-DO-	-DO-	Log Book	2	-	1	
		4.DIMENSIONS	MA	-DO-	-DO-	MFG.DRG./ MFG SPEC.	MFG. DRG/ RELEVANT IS	Log Book	2	-	-	
		5.CORRECTNESS, COMPLETENESS TERMINATIONS/ MARKING/ COLOUR CODE	MA	VISUAL	100%	MFG SPEC. RELEVANT IS	MFG SPEC. RELEVANT IS	Log Book	2	-	-	
		6. RTD, BTD & SPACE HEATER MOUNTING.	MA	VISUAL	100%	MFG SPEC. RELEVANT IS	MFG SPEC. RELEVANT IS	Log Book	2	-	1	
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									
			DATE					BIDDER'S/VENDORS COMPANY SEAL				

		QUALITY PLAN	CUSTOMER :			PROJECT			SPECIFICATION :			
			BIDDER/ VENDOR :			TITLE			NUMBER :			
SHEET 8 OF 9		CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SPECIFICATION :			
SL. NO.	COMPONENT/OPERATION								SYSTEM	ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)	SECTION	VOLUME III
1	2	3	4	5	6	7	8	9	10			11
									P	W	V	
3.0	TESTS	1.TYPE TESTS INCLUDING SPECIAL TESTS AS PER BHEL SPEC.	MA	ELECT.TEST	1/TYPE/SIZE	IS-325/ BHEL SPEC./ DATA SHEET	IS-325/ BHEL SPEC./ DATA SHEET	TEST REPORT	2	1*	1	* NOTE - 1
		2.ROUTINE TESTS INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	-DO-	-DO-	-DO-	2	1 ^s	1	^s NOTE - 2
		3.VIBRATION & NOISE LEVEL	MA	-DO-	100%	IS-12075 & IS-12065	IS-12075 & IS-12065	-DO-	2	1 ^s	1	^s NOTE - 2
		4.OVERALL DIMENSIONS AND ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPC. REPORT	2	1	-	
		5.DEGREE OF PROTECTION	MA	ELECT. & MECH. TEST	1/TYPE/ SIZE	RELEVANT IS	BHEL SPEC. AND DATA SHEET	TC	2	-	1	TC FROM AN INDEPENDENT LABORATORY, REFER NOTE-3
		6. MEASUREMENT OF RESISTANCE OF RTD & BTD	MA	-DO-	100%	-DO-	-DO-	-DO-	2	1 ^s	1	^s NOTE - 2
		7. MEASUREMENT OF RESISTANCE, IR OF SPACE HEATER	MA	-DO-	100%	-DO-	-DO-	-DO-	2	1 ^s	1	^s NOTE - 2
		8. NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPC. REPORT	2	1 ^s	1	^s NOTE - 2
		9.EXPLOSION FLAME PROOF NESS (IF SPECIFIED)	MA	EXPLOSION FLAME PROOF TEST	1/TYPE	IS-3682 IS-8239 IS-8240	IS-3682 IS-8239 IS-8240	TC	2	-	1	TC FROM AN INDEPENDENT LABORATORY, REFER NOTE-3
		10. PAINT SHADE, THICKNESS & FINISH	MA	VISUAL & MEASUREMENT BY ELKOMETER	SAMPLE	BHEL SPEC. & DATA SHEET	BHEL SPEC. & DATA SHEET	TC	2	1 ^s	1	SAMPLING PLAN TO BE DECIDED BY INSPECTION AGENCY ^s NOTE - 2
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			



QUALITY PLAN

SHEET 9 OF 9

CUSTOMER :

PROJECT
TITLE

SPECIFICATION :
NUMBER :

BIDDER/
VENDOR

QUALITY PLAN
NUMBER PED-506-00-Q-007, REV-03

SPECIFICATION :
TITLE

SYSTEM

ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)

SECTION VOLUME III

SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11

NOTES:


- 1 DEPENDING UPON THE SIZE AND CRITICALLY, WITNESSING BY BHEL SHALL BE DECIDED.
- 2 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON.
- 3 IN CASE TEST CERTIFICATES FOR THESE TESTS ON SIMILAR TYPE, SIZE AND DESIGN OF MOTOR FROM INDEPENDENT LABORATORY ARE AVAILABLE, THESE TEST MAY NOT BE REPEATED.
- 4 WHEREVER CUSTOMER IS INVOLVED IN INSPECTION, AGENCY (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER.


Legends for Inspection agency

1. BHEL/CUSTOMER
2. VENDOR (MOTOR MANUFACTURER)
3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER)

- P. PERFORM
W. WITNESS
V. VERIFY

BHEL	PARTICULARS	BIDDER/VENDOR	
	NAME		
	SIGNATURE		
	DATE		BIDDER'S/VENDORS COMPANY SEAL

		QUALITY PLAN	CUSTOMER :			PROJECT			SPECIFICATION :			
			BIDDER/ VENDOR :			TITLE			NUMBER :			
SHEET 1 OF 2		SYSTEM			ITEM AC ELECT. MOTORS BELOW 55KW (LV)			SECTION		VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
1.0	ASSEMBLY	1.WORKMANSHIP	MA	VISUAL	100%	MANUF'S SPEC	MANUF'S SPEC	-DO-	2	-	-	
		2.DIMENSIONS	MA	-DO-	-DO-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	-DO-	2	-	-	
		3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOUR CODE	MA	VISUAL	100%	MFG.SPEC./ RELEVANT IS	MFG.SPEC. RELEVANT IS	-DO-	2	-	-	
2.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	MANUFR'S SPEC/BHEL SPEC./RELEVANT STANDARD	BHEL SPEC. SAME AS COL.7	LOG BOOK	2	-	-	
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	IS-325/ BHEL SPEC./ DATA SHEET	SAME AS COL.7	TEST REPORT	2	1	-	NOTE -1 & NOTE-3
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPN. REPORT	2	1	-	NOTE -1 & NOTE-3
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									

		QUALITY PLAN			CUSTOMER :			PROJECT			SPECIFICATION :		
					BIDDER/ :			TITLE			NUMBER :		
		SHEET 2 OF 2			VENDOR			NUMBER PED-506-00-Q-006, REV-01			SPECIFICATION :		
			SYSTEM			ITEM AC ELECT. MOTORS BELOW 55KW (LV)			SECTION		VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
									P	W	V		
1	2	3	4	5	6	7	8	9	10			11	
		3.NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPN. REPORT	2	1	-		
<p>NOTES:</p> <p>1 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON</p> <p>2 WHERE EVER CUSTOMER IS INVOLVED IN INSPECTION, (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER.</p> <p>3 FOR EXHAUST/VENTILATION FAN MOTORS OF RATING UPTO 1.5KW , ONLY ROUTINE TEST CERTIFICATES SHALL BE FURNISHED FOR SCRUTINY.</p> <p><u>Legends for Inspection agency</u></p> <p>1. BHEL/CUSTOMER 2. VENDOR (MOTOR MANUFACTURER) 3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER)</p> <p>P. PERFORM W. WITNESS V. VERIFY</p>													
BHEL			PARTICULARS			BIDDER/VENDOR							
			NAME										
			SIGNATURE										
			DATE						BIDDER'S/VENDORS COMPANY SEAL				



Technical specification for
Mill Reject Handling System

2 X 800 MW DARLIPALI TPP, ODISHA

REV. NO. 00

DATE : 04.06.2015

C&I TECHNICAL SPECIFICATION FOR MILL REJECT HANDLING SYSTEM



Table of Contents

	No.	Sheet
Section C		
1.1	Specific Technical Requirement.....	3
Section D		
1.1	Applicable Control Philosophy.....	6
1.2	Drive Control Philosophy.....	8
1.3	Instrumentation Datasheets.....	10
1.4	Instrumentation Check Lists.....	26
1.5	Process Connection & Piping.....	32
1.6	LCP Specification.....	55
1.7	LCP Quality Plan.....	66
1.8	TYPE Test Requirements.....	74
1.9	KKS Philosophy.....	81
1.10	Mandatory Spares(C&I).....	86



Technical specification for
CONTROL & INSTRUMENTATION
2 X 800 MW DARLIPALI TPP, ODISHA

SECTION D

REV. NO. 00

DATE : 04.06.2015

SECTION - C
SPECIFIC TECHNICAL REQUIREMENT(C&I)

	2X800 MW STPP Darlipalli	
	SPECIFIC TECHNICAL REQUIREMENTS (C&I) MILL REJECT HANDLING SYSTEM	

- 1.0** The Bidder shall provide all material, equipment and services so as to make a complete Instrumentation and Control System for Mill Reject Handling System together with all accessories and associated equipments ensuring operability, maintainability and reliability. Further, Bidder shall also include in his proposal and shall furnish all equipment, devices and services which may not be specifically stated in the specification but are needed for completeness of the equipments/systems furnished by the Bidder and for meeting the intent and requirements of the specification.
- 2.0** Mill Reject Handling System shall be operated from DCS (SG-C&I) through operator work stations located in central control room. In addition, provision of local operation from local control panel shall also be provided.
- 3.0** Bidder to provide local control panel for mill reject system of each Mills and each pyrite hoppers. This local panel will act as interface between the DCS (SG-C&I) and the field devices for commands & feedbacks.
- 4.0** Local Control Panel for Compressors of Mill Reject Handling System shall be provided with command & feedback interface with DCS (SG-C&I). In addition provision of local operation (START/STOP) from local control panel shall also be provided.
- 5.0** Bidder to include all the instruments (PG, PS, LS, TS and FS etc.) required for the package along with fittings, accessories and valve manifold.
- 6.0** The solenoid operated valves/ damper/gates shall have limit switches for open/ close feedback. Solenoid valve shall be rated for 24 V DC only.
- 7.0** The junction boxes for termination of instruments /actuator limit switches/ solenoid valve limit switches etc. are in bidder's scope.
- 8.0** 24V DC power supply for all instruments including level switches, timer cards and solenoid valve shall be provided from DCS (SG C&I) by BHEL. Separate 230V AC UPS supply shall not be provided for any purpose. Hence, bidders to select coil/measuring instruments voltage accordingly. Also, cable required to power the instruments shall be in bidder's scope.
- 9.0** The make/model of various instruments/items/systems shall be subject to approval of owner/purchaser during detailed engineering stage. No commercial implication in this regard shall be acceptable. In case of any

	2X800 MW STPP Darlipalli	
	SPECIFIC TECHNICAL REQUIREMENTS (C&I) MILL REJECT HANDLING SYSTEM	

conflict and repetition of clauses in the specification, the more stringent requirements among them are to be complied with.

10.0 List of Mandatory spares is attached in Sec-D of the Specification and same is in bidders' scope.

11.0 Editable & pdf copy of Drawings/Documents and data to be furnished after award of the contract:

- Control & operational write-up for the system
- Recommended control scheme/ logic diagram
- Process manuscript for implementation in DCS
- List of Drives (Solenoid valves etc)
- I/O list (DCS)
- GA & wiring diagram of local panel.
- Power requirement.
- Local control panel and field instruments quality plan.
- Local control panel & instruments data sheet.
- JB grouping document.
- Cable schedule and cable interconnection drawing.
- Instrument schedule
- Alarm Schedule
- SOE schedule
- Instrument hook-up diagram.
- Mandatory spare BOQ
- UPS load list
- Any other document decided during detailed engineering.

Notes: -

1. All equipment items shall be of latest design with proven on track record.
2. The above given scope is indicative & minimum. Any item/ equipment not indicated above however required for the completeness of the system is to be supplied by bidder without any technical, commercial and delivery implication to BHEL.
3. Documents of C&I System shall be submitted to end user/owner for approval during detail engineering. Changes, if any, shall be accommodated by the bidder without any price/time implication.



Technical specification for
CONTROL & INSTRUMENTATION
2 X 800 MW DARLIPALI TPP, ODISHA

SECTION D	
REV. NO. 00	DATE : 04.06.2015

SECTION - D

APPLICABLE CONTROL PHILOSOPHY