


Manufacturer's Name & Address		STANDARD QUALITY PLAN					BHEL Doc No.: PE-QP-999-165-N008	
P.O. No.		Item : Ball Separator		Vendor Q.P. NO: PACKAGE : COLTCS		PROJECT:		
Characteristics Checked		Quantum of Check		Reference Documents		CUSTOMER:		
Class		Type of Check		Date : Page 05 of 15		PURCHASER:		
3		5		7		CONSULTANT:		
4		6		8		M C O		
1		2		3		D* 10		
Remarks		Format of Record		9		11		
1.3.0	Rubber Lining for ball Separator Shell, V-Piece & skid IC Pipe.							
1.3.1	Rubber formulation	Tensile elongation and hardness	Physical test	One per lot	Manufacturer's procedure	BS 6374E equivalent	Manufacturer's test certificate	
		Polymer Identification	Flame test	One per lot	For Semi Ebonite	For Semi Ebonite	Inspection report	
		% Change in weight after 24 hrs immersion in sea water at 70 degrees	Immersion test	One per lot	Ebonite Polymer catches fire, catches fire and quenches from fire it continues to burn	For Semi Ebonite	Inspection report	
1.3.2	Surface preparation of items to be fired	Free from rust, scale, dust and grease	Visual	100%	SA 2.5	SA 2.5	Manufacturer's inspection	
1.3.3	Vulcanising	Temperature, Pressure and time	Process monitoring	100%	Manufacturer's procedure	Manufacturer's procedure	Process Procedure	
1.3.4	Vulcanised rubber fired items	a) Chip test b) Adhesion, Visual defects, thickness and hardness c) Spark test for Pin holes at 5 kV/mm	Chip test	One per lot	Approved drawing and drawing BS 6374E equivalent	BS 6374E equivalent	Inspection report	
			Measurement/visual inspection	100%	Approved drawing and drawing BS 6374E equivalent	BS 6374E equivalent	Inspection report	
			Spark test for Pin holes	100%	Approved drawing and drawing BS 6374E equivalent	BS 6374E equivalent	Inspection report	
LEGEND * Records identified with "STAR" shall be essentially included by contractor in QA Documentation. ** M - Manufacturer / Manufacturer's Sub-contractor C - Contractor J - Joint P - Perform, W - Witness and V - Verification								
Manufacturer / Sub-Contractor Signature	Contractor Signature	Reviewed By		Name & Sign. Of approving authority & Seal				

Manufacturer's Name & Address		STANDARD QUALITY PLAN										BHEL Doc No.: PE-QP-999-165-N008	
P.O. No.		Item : WORM GEAR & ACTUATORS		Vendor Q.P. NO:		PACKAGE : COLTCS		PROJECT:		CUSTOMER:			
Characteristics Checked		Class		Type of Check		Quantum of Check		Reference Documents		Date of Approval			
3		4		5		6		7		8			
1		2								11			
1.4.0	Complete Unit of Worm gear	Reduction Ratio	Critical	Functional Test	100%	Approved Sheet	Data	Approved Data Sheet					
		Angle of Rotation											
		Input Torque											
		Output Torque											
		Degree of protection	Critical	Water & Dust Ingress tests	Type test	Approved Data Sheet		Approved Data Sheet	Type test certificate				
1.5.0	Actuators	Routine Test	Major	Electrical test	100%	Supplier catalogue	Supplier catalogue	Supplier catalogue	Manufacturer TC				
		Make, Range, Model	Major	Visual	100%								
		Assembly check alongwith bell valves	Major	Visual	100%	Supplier catalogue	Supplier catalogue	Supplier catalogue	Inspection Report				
		Functional check alongwith setting/auxiliary contacts	Major	Visual	100%								
<div style="display: flex; justify-content: space-between;"> <div> <p>Signature</p> <p>Manufacturer / Sub-Contractor</p> </div> <div> <p>Signature</p> <p>Contractor</p> </div> <div> <p>Signature</p> <p>Inspector</p> </div> <div> <p>Signature</p> <p>Reviewed By</p> </div> </div>													

Manufacturer's Name & Address				STANDARD QUALITY PLAN				BHEL Doc No.: PE-QP-999-165-N008			
P.O. No.				Vendor Q.P. NO:				PROJECT:			
Item : Ball Vessel & Ball Injection Pipe				PACKAGE : COLTCS				CUSTOMER:			
Date :				PURCHASER:				CONSULTANT:			
Page 08 of 15				Format of Record				Agency			
Reference Documents				Norms				M C O			
Sl. No.	Component / Operation	Class	Type of Check	Quantum of Check	Reference Documents	Norms	Format of Record	Agency	Remarks		
1	2	4	5	6	7	8	9	10	11		
2.2.5	Fit-up of butt weld	Major	Measurement	100%	Manufacturing Drawing	ASME Sec. VIII Div. 1	Log book		P	WV	BHEL to witness > 20mm thick butt joint.
2.2.6	Fit-up of shell flange and nozzle assembly to shell	Major	Template, Visual	100%	Manufacturing Drawing	ASME Sec. VIII Div. 1	Log book		P		
2.2.7	Weld quality for Pressure Parts										
	(a) Root run	Major	Penetrant test / Visual	100%	ASME Sec. VIII Div. 1	ASME Sec. VIII Div. 1	Operation Process Sheet		P	V	
2.2.8	(a) Completed butt welds	Major	Penetrant test	100%	ASME Sec. VIII Div. 1	ASME Sec. VIII Div. 1	Inspection report		P	V	
	2 Sub-surface defects	Critical	Radiography test	10% of total weld length & 100% T Joints	ASME Sec. VIII Div. 1	ASME Sec. VIII Div. 1	Radiographs and Inspection report		P	V	RT firms will be reviewed by BHEL
	(b) Completed fillet welds	Major	Penetrant test	100%	ASME Sec. VIII Div. 1	ASME Sec. VIII Div. 1	Inspection report		P	V	
2.2.9	Fabricated Shell	Major	Measurement	100%	Manufacturing Drawing	ASME Sec. VIII Div. 1	Inspection report		P	V	
	2. Hydro test for Ball Vessel	Critical	Hydrostatic Test @ 1.5 times design pr. (positive) (Duration 30 minutes)	100%	ASME Sec. VIII Div. 1	ASME Sec. VIII Div. 1	Inspection report		P	W	Hydrostatic test shall be conducted along with Recirculating and Alloy for Ball Vessel.
2.2.10	Pickling and Passivation	Major	Visual	100%	IS - 10117	IS - 10117	Log Book		P		
2.2.11	Ball Injection Pipe	Major	Chemical & Physical properties	One sample/test	Approved dtp/Data sheet	Approved dtp/Data sheet	MTI Test Certificate / Lab test report / msw material flow sheet		P	V	
	Surface defects	Minor	Visual	100%	Approved dtp/Data sheet	Approved dtp/Data sheet	MTI / Inspection report		P	V	
	Leak Tightness	Major	Hydrostatic test	100%	Approved dtp/Data sheet	Approved dtp/Data sheet	Manufacturer's Certificate		P	V	
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Manufacturer / Sub-Contractor Signature								Reviewed By			
Name & Sign. Of approving authority & Seal											


Manufacturer's Name & Address			STANDARD QUALITY PLAN				BHEL Doc No.: PE-QP-889-165-N008	
P.O. No.			Vendor Q.P. NO:				PROJECT:	
Item : RECIRCULATING PUMP			PACKAGE : COLTCS				CUSTOMER:	
Date :			Page 9 of 15				PURCHASER:	
Reference Documents			Acceptance Norms				CONSULTANT:	
Quantum of Check			Format of Record				Agency	
8			9				M C O	
5			8				D* ** 10	
2.3.0	Raw material control	3	4	5	6	7	8	11
2.3.1	Casing	Chemical & Physical properties	Major	Chemical & Physical analysis	One Sample/Cast/Heat	Approved dng/ sheet	Data sheet	Test Certificate
2.3.2	Impeller, Sleeve	Surfaces defects	Minor	Visual	100%	Approved dng/ sheet	Data sheet	MTC / Inspection report
2.3.3	Shaft	Physical and Chemical properties	Major	Physical and Chemical analysis	One Sample/Cast/Heat	Approved dng/ sheet	Data sheet	Test Certificate
2.3.4	In-process control	Sub-Surface defects	Major	Ultrasonic Test	100%	ASME SA 745	ASME SA 745	MTC / Inspection report
2.3.5	Casing	Leak tightness	Critical	Hydro test @ 1.5 times design pr. (cooling) (Duration 30 minutes)	100%	Manufacturing Standards	None	Inspection report
2.3.6	Shaft	Surfaces defects	Critical	Pendant test	100%	ASME Sec. VIII Div.1	ASME Sec. VIII Div.1 Appendix 8	Inspection report
2.3.7	Impeller	Residual static/dynamic unbalance	Major	Static/dynamic balancing	100%	ISO 1940, Gr 6.3	ISO 1940, Gr 6.3	Inspection report
2.3.8	All components	Workmanship, finish and dimensions	Major	Measurement, visual examination	100%	Manufacturing drawing	Manufacturing drawing	Log book / Job card
2.3.9	Assembly, control, final inspection / test	a) Q Vs. Head, Q Vs. Pump efficiency / Overall efficiency, Q Vs. Power, Vibration and Noise	Critical	Performance test	100%	Approved curve, approved data sheet, IS:5120	Approved data sheet	Inspection report, plotted curves
2.3.10	Complete pump	b) Dimensions, workmanship and finish	Major	Measurement, visual	100%	Data sheet	Data sheet	Inspection report, plotted curves
		c) Noise level	Major	--	--	--	85 db at 1 meter distance	
		Completeness, correctness, cleanliness	Major	Visual examination	100%	Approved data sheet / Mfg. Dwg.	Approved data sheet / Mfg. Dwg.	Check list / Inspection report
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Manufacturer / Sub-Contractor Signature			Contractor Signature			Reviewed By		
Name & Sign. Of approving authority & Seal								


		Manufacturer's Name & Address		STANDARD QUALITY PLAN		BHEL Doc No.: PE-QP-999-165-N008	
		P.O. No.		Vendor C.P. No.		PROJECT:	
		Item : BALL VALVES		PACKAGE : COLTCS		CUSTOMER:	
				Date :		PURCHASER:	
				Page 10 of 15		CONSULTANT:	
Sl. No.	Component / Operation	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Noms	Format of Record
1	2	4	3	6	7	8	9
2.4.0	Ball valves						
2.4.1	Materials						
	Body and Tail end pieces	Chemical/Physical properties	Major	One Sample/Cast / heat	Approved sheet	Approved sheet	Manufacturer's T.C.
2.4.2	Ball	Chemical/Physical properties	Major	One Sample/Cast / heat	Approved sheet	Approved sheet	Manufacturer's T.C.
2.4.3	Stem	Chemical/Physical properties	Major	One Sample/Cast / heat	Approved sheet	Approved sheet	Manufacturer's T.C.
2.4.4	In-process inspection						
2.4.5	Machining of body, end, pieces, ball	Dimension	Major	100%	Approved sheet	Approved sheet	Log book
2.4.6	Ball	a) Surface defects	Critical	100%	ASME Sec. VIII Div. 1	ASME Sec. VIII Div. 1	Inspection report
		b) Hardness	Major	Random	Approved sheet	Approved sheet	Inspection report
2.4.7	Assembly	a) Dimensions	Major	100%	EN ISO 17292	EN ISO 17292	Manufacturer's T.C.
		b) Opening / Closing	Major	100%	As per approved data sheet	As per approved data sheet	Test at works for opening / closing time of actuator operated valves.
2.4.8	Testing						
	a) Body	Leakage	Critical	100%	EN 12266-1 & 2/API 598	EN 12266-1 & 2/API 598	Manufacturer's T.C.
	b) Seat test	Leakage	Critical	100%	EN 12266-1 & 2/API 598	EN 12266-1 & 2/API 598	Manufacturer's T.C.
	c) Seat	Leakage	Critical	100%	EN 12266-1 & 2/API 598	EN 12266-1 & 2/API 598	Manufacturer's T.C.
		LEGEND					
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		** M: Manufacturer / Manufacturer's Sub-contractor					
		C: Contractor					
		O: Owner					
		Indicate : *p - Perform, *w - Witness and *v - Verification					
Manufacturer / Sub-Contractor Signature		Contractor Signature		Reviewed By		Name & Sign. Of approving authority & Seal	

Manufacturer's Name & Address		STANDARD QUALITY PLAN				BHEL Doc No.:		PE-QP-999-165-N008				
P.O. No.		Item : RECIRCULATING PUMP MOTOR				PROJECT:						
		V PIECE				CUSTOMER:						
		Date :				PURCHASER:						
		Page 11 of 15				CONSULTANT:						
Sl. No.	Component / Operation	Characteristics	Class	Type of	Quantum of	Reference	Acceptance	Format of	Agency	Remarks		
		Checked		Check	Check	Documenta	Noms	Record	M	C	O	
1	2	3	4	5	6	7	8	9	10	11		
2.5.0	Motor	Routine test, Load test & IR	Major	Electrical test	100% test	IS:325	IS:325	Manufacturer test certificate	*	P	V	Review of supplier TC
		Make, Rating	Major	Verification	100%	Appd dtp/Data sheet	Appd dtp/Data sheet	Inspection report	*	V	V	
		Degree of Protection	Critical	Verification	Type test	IP 55	IP 55	Manufacturer's test Certificate	*	V	V	
3.1.0	V - Piece											
	Raw material inspection	Chemical & Physical properties	Major	Chemical mechanical tests	One sample/test	Approved dtp/Data sheet	Approved dtp/Data sheet	MIT Test Certificate / lab test report / raw material flow sheet	*	P	V	
	In process inspection	b) Surface defects	Major	Visual	100%	Approved dtp/Data sheet	Approved dtp/Data sheet	MITC / Inspection report	*	P	V	
		c) Sub-surface defects	Critical	Radiography test	10% of total butt weld length	ASME Sec VIII Div.1 Appendix 4	ASME Sec VIII Div.1 Appendix 4	Radiographs and inspection report	*	P	V	
		d) Hydro Static Test	Critical	Hydrostatic Pr. @ 1.5 times design pr. (positive) (Duration 30 minutes)	100%	ASME Sec VIII Div.1	No leakage	Inspection report	*	P	V	
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Manufacturer / Sub-Contractor Signature												
Reviewed By												
Name & Sign. Of approving authority & Seal												

STANDARD QUALITY PLAN											
Manufacturer's Name & Address					BHEL Doc No.: PE-OP-999-165-N008						
P.O. No.					PROJECT:						
Item : Ball Monitoring System (Ball Oversize Monitor)					CUSTOMER:						
Date :					PURCHASER:						
Page 12 of 15					CONSULTANT:						
Reference Documents					Format of Record						
Quantum of Check					Agency						
Type of Check					M C O						
Class					D*						
Characteristics Checked					Remarks						
1	2	3	4	5	6	7	8	9	10	11	
4.1.0	Raw Material Housing shell, Flanges	Chemical properties	Major	Chemical Analysis	One sample/heat	Approved sheet	drg/Data	Approved sheet	Mill Test Certificate / 1st test report/raw material flow sheet	* P V V	If fabricated type
		Physical properties	Major	Physical test	One sample / heat/batch	Approved sheet	drg/Data	Approved sheet	Mill test Certificate / 1st test report/raw material flow sheet	* P V V	
		Surface defects	Minor	Visual	100%	Approved sheet	drg/Data	Approved sheet	Mill Test Certificate/Inspection report	* P V V	
		Sub-surface defects	Major	Ultrasonic test	100%	ASME SA 435	ASME SA 435	ASME SA 435	Mill Test Certificate	* P V V	Plates > 20mm Thk only (UT - Full Volume)
4.2.0	Inprocess Quality Control										
4.2.1	Welding procedure specification	Correctness	Critical	Soudy	100%	ASME Sec.IX	ASME Sec.IX	ASME Sec.IX	QW 482 of ASME Sec.IX	* P V V	
4.2.2	Welding procedure qualification	Weld soundness	Critical	Physical test	100%	ASME Sec.IX	ASME Sec.IX	ASME Sec.IX	QW 483 of ASME Sec.IX	* P V V	Welding procedure already approved by BHEL/RQAGLONV/TUV shall be employed for this job.
4.2.3	Welder performance qualification	Weld soundness	Critical	Radiography	100%	ASME Sec.IX	ASME Sec.IX	ASME Sec.IX	QW 484 of ASME Sec.IX	* P V V	Welders already qualified by BHEL/RQAGLONV/TUV shall be employed for this job.
4.2.4	Fabricated Shell	1.Surface defects (filler welds)	Major	Penetrant test	100%	ASME Sec.VIII Div.1 Appendix 8	ASME Sec.VIII Div.1 Appendix 8	ASME Sec.VIII Div.1 Appendix 8	Inspection report	* P V V	
		2.Dimensions, Orientation	Major	Measurement by Visual	100%	Approved doc./ Data	Approved documents	Approved documents	Inspection report	* P V V	
		3. Hydro test	Critical	Hydrostatic Pr. @ 1.5 times design pr. (soakw) (Duration 30 minutes)	100%	ASME Sec.VIII Div.1	No leakage	ASME Sec.VIII Div.1	Inspection report	* P W V	Hydrostatic test shall be conducted alongwith Rectrulating sold assembly
		4. Functional Test	Major	Functional	100%	Approved procedure	Approved procedure	Approved procedure	--	* P V V	Functional test to be done at site
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Manufacturer / Sub-Contractor Signature										Reviewed By	
										Name & Sign. Of approving authority & Seal	


Manufacturer's Name & Address		STANDARD QUALITY PLAN				BHEL Doc No.: PEOP-999-165-N008					
Item : Starter Panel		Vendor QIP NO:		PROJECT:		CUSTOMER:					
P.O. No.		Date :		PACKAGE : COLTCS		PURCHASER:					
		Page 14 of 15		CONSULTANT:							
Sl. No.	Component / Operation	Characteristics Checked	Class	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Record	Agency	Remarks	
1	2	3	4	5	6	7	8	9	10	11	
8.0.0	Starter panel										
8.0.1.0	Incoming Material										
8.0.1.1	Fabricated & Painted Panel	Dimension	Major	Measurement	100%	Approved Drgs.	Approved Drgs.	Inspection report	P		
		Panel G.A.	Major	Measurement	100%	Approved Drgs.	Approved Drgs.	Inspection report	P		
		Paint colour	Major	Visual	100%	Approved Drgs.	Approved Drgs.	Inspection report	P		
		Paint thickness	Major	Measurement	100%	Approved Drgs.	Approved Drgs.	Inspection report	P		
		Paint Shade,	Major	Visual	Sample	Approved Drgs.	Approved Drgs.	Inspection report	P		
		Adhesion	Major	Visual	Sample	Approved Drgs.	Approved Drgs.	Inspection report	P		
8.0.1.2	Wire	Size / Colour / Rating / Surface Defects	Major	Visual / Dimension	Sample	IS 694	Specification drawings	Inspection report	P	SI Method 4th	
8.0.1.3	Panel Mounting	Make, Functional, Type & Rating	Major	Visual / Electrical	100%	Approved BOM	Approved BOM	Inspection report	P	V V	
8.0.2.0	In Process Inspection										
10.2.1	Name, Plate, Component Mounting, Etc.	Workmanship, Finish, Correctness	Major	Visual	100%	Approved Drgs.	Approved drawings	Inspection report	P		
8.0.2.2	Electrical Wiring of Panels	Continuity, Colour of wires, Bundling and Grouping	Major	Visual	100%	Approved Drgs.	Approved drawings	Inspection report	P		
8.0.2.3	Terminology of Cables	Start & End	Major	Visual	100%	Manufacturer's drawing	Manufacturer's drawing	Inspection report	P		
8.0.3.0	Final Inspection										
8.0.3.1	Workmanship, Finish & Paint shade / Thickness	Visual	Major	Visual	100%	G.A Drawing	Approved drgs.	Inspection report	P	W V	
8.0.3.2	Overall Dimension, G.A of starter panel	Measurement	Major	Visual	100%	G.A Drawing	Approved drgs.	Test Certificate	P	W V	
8.0.3.3	Component Identification	Visual	Major	Visual	100%	G.A Drawing	Approved drgs.	Inspection report	P	W V	
8.0.3.4	Degree of Protection	Ingress Protection IP55	Critical	Environmental	Verification	Approved drgs.	IS 2147	Inspection Report	P	V V for enclosure	
8.0.3.5	IR - HV - IR	Electrical	Critical	Electrical	100%	Approved Procedure	Approved Procedure	Inspection report	P	V V	
8.0.3.6	Functional & Continuity	Functional	Major	Functional	100%	Appd Drawing	Appd Drawing	Inspection report	P	W W	
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<p>Manufacturer / Sub-Contractor Signature</p>										<p>Name & Sign. Of approving authority & Seal</p>	


		TITLE : STANDARD TECHNICAL SPECIFICATION DATA SHEET-A CONDENSER ON - LOAD TUBE CLEANING SYSTEM (Sponge Rubber Ball Type)		SPEC. NO. PE-TS- 387/388-165-N001 VOLUME : II B SECTION-D REV. NO. 0	DATE: 04.02.2013 2X660 MW RAGHUNATHPUR TPP PH-II STG
SLNO	PROJECT				
1	GENERAL				
1.1	Nos. of tube cleaning systems sets required for station	NOS.			
1.2	Liquid handled				
1.3	Size of COLTCS	Nb			
2.0	DESIGN				
2.1	Operating pressure at Condenser inlet flange	kg/cm2 (g)			
2.2	Design Pressure for ball separator	kg/cm2 (g)			
2.3	Design Mechanical Temperature	Deg. C			
2.4	Condenser Details				
	a) Type of condenser				
	b) No. of Condenser sections	Nos.			
	c) No. of passes per condenser section (viz. condenser half)	Nos.			
	d) No. of tubes per condenser	Nos.			
	• Top two rows				
	• Remaining				
	e) Tube Dia. OD x Thickness				
	• Top two rows	mm x mm			
	• Remaining	mm x mm			
	f) Length of tubes between ends.	mm			
	g) Tube material				
	h) Pressure drop across condenser - At Normal flow (between Inlet and Outlet flanges of condenser)	MWC			
2.5	CW flow rate through each ball separator				
	- Normal	cu.m/hr			
	- Maximum	cu.m/hr			
2.6	Design differential pressure for ball separator strainer/screen	Kg/cm ² (g)			
2.7	Pressure drop across ball separator i.e. between inlet & outlet flanges in clean condition at normal flow.	MWC			
2.8	Pressure drop across ball separator in choked condition when strainer backwashing starts	MWC			
2.9	No. of balls required for COLTCS per condenser section	Nos.			
3	CONNECTING PIPE DETAILS				
3.1	Condenser inlet pipe				
	a) Material				
	b) O.D. X Thickness				
3.2	Condenser outlet pipe				
		mm x mm			
		Four (04) Nos. for two Unit viz. One independent set for each half of condenser Clarified Water as per Analysis Attached along with project information in section B. 2300 NB Approx 1.5 to 2.0 5.0 kg/cm ² (g) & vacuum 0.1 kg/cm ² (abs) 60 Single Pass 2 (Two) 1 (One) 29668 2080 27588 22.225X0.889, 22.225X0.7112, 17900 SS: ASTM A 249 TP 304 (Welded) 4.15 MWC (However the actual value can vary +/-10% of the design value) 33350 40020 0.2 0.15 Not to exceed 0.30 Minimum 10% of number of condenser tubes Carbon Steel to IS – 2062 Gr. B 2340x20			

<div>  </div>		TITLE : STANDARD TECHNICAL SPECIFICATION DATA SHEET-A CONDENSER ON - LOAD TUBE CLEANING SYSTEM (Sponge Rubber Ball Type)		SPEC. NO. PE-TS-387/388-165-N001 VOLUME : II B SECTION-D REV. NO. 0 DATE: 04.02.2013 2X660 MW RAGHUNATHPUR TPP PH-II STG	
SL NO	PROJECT				
	a) Material				Carbon Steel to IS - 2062 Gr. B
	b) O.D. X Thickness				2340x20
3.3	Manhole				Manhole : Yes, 600 NB size Drain : 150NB drain stub inside the body of COLTCS
4.0	MATERIALS OF CONSTRUCTION				
4.1	BALL SEPARATOR				
	a) Body / housing				Carbon Steel to IS-2062 Gr.B. with epoxy painted inside (with minimum housing thickness same as connecting pipe thickness) Provision for future installation of cathodic protection with sacrificial anodes shall be provided.
	b) Screen / Strainer				SS-316
	c) Strainer shaft				SS-316
	e) Internal Hardware including nuts, bolts , etc.				SS-316
	f) Site Glass provision				Yes
4.2	BALL RECIRCULATING PUMP				Non Clog type
	a) Casing				2.5% Ni; CI to IS 210 FG 260
	b) Impeller				SS-316
	c) Shaft				SS-316
4.3	BALL COLLECTOR				
	a) Body / housing				Carbon steel-IS 2062 Gr. B with epoxy painted inside
	b) Screen / Strainer				SS-316
	c) Site Glass Provision				Yes
4.4	Differential pressure measuring system				SS-316
4.5	Injection nozzle				
4.6	Valves				
4.6.1	Check Valves (all sizes)				
	a) Body & Bonnet				For size 50 NB and below-Piston type For sizes 65 NB and above-Swing check type or dual plate type.
	b) Seating surface & rings				Cl, IS 210, Gr.FG 260 / BS 1452 Gr. 14, Flanged Ends 13% Chromium Steel
	c) Disc for Check Valve				
	d) Hinge Pin for Check Valve				Cl, IS 210 Gr. FG 260/ BS 1452 Gr. 14 AISI-316
	e) Backseat for check valve				13% Chromium Steel

<div><div><div>Uthmaniyah Water Treatment Plant</div><div></div></div></div>		TITLE : STANDARD TECHNICAL SPECIFICATION DATA SHEET-A CONDENSER ON - LOAD TUBE CLEANING SYSTEM (Sponge Rubber Ball Type)		SPEC. NO. PE-TS- 387/388-165-N001 VOLUME : II B SECTION-D REV. NO. 0		DATE: 04.02.2013 2X660 MW RAGHUNATHPUR TPP PH-II STG	
SL NO	PROJECT						
4.6.2	Globe Valves 50 Nb & Below Body, Bonnet & trim						
4.6.3	> BF/Gate Valves (65 Nb & above)						
	> Body & Disc						
	> Shaft						
	> Seal						
	> Sealing, Retaining segment & internals						
	> Bearings						
	> Companion Flange						
	C) Ball valves						
	i) Body						
	ii) Ball						
	iii) Stem						
4.7	Interconnecting Piping Material						
5	COUNTER FLANGES for Ball Separator						
	a) Flanges						
	b) Fasteners						
	c) Gaskets						
6	OTHER COUNTER FLANGES (for interconnecting piping)						
6.1	MATERIALS						
	a) Flanges						
	b) Fasteners						
	c) Gaskets						

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		TITLE : STANDARD TECHNICAL SPECIFICATION DATA SHEET-A CONDENSER ON - LOAD TUBE CLEANING SYSTEM (Sponge Rubber Ball Type)		SPEC. NO. PE-TS- 387/388-165-N001 VOLUME : II B SECTION-D REV. NO. 0 DATE: 04.02.2013 2X660 MW RAGHUNATHPUR TPP PH-II STG	
SL NO	PROJECT				
7.0	Material of Other components not specified above				Suitable for intended duty and shall be subject to Purchasers approval during detailed engg. In the event of order.
8.0	PAINTING				
8.1	INTERNAL SURFACE				SA - 2.5 of Swedish Specn. SIS-05-59-00-1967
	a) Surface preparation				Two coat of Epoxy Resin based Zinc Phosphate primer
	b) Primer				Adequate no. of coats of coal tar epoxy paint to achieve total dry film thickness of 200 to 250 microns
	c) Final paint				
8.2	EXTERNAL SURFACE				SA-2.5 of Swedish Specn. SIS-05-5900-1967
	a) Surface preparation				Two coat of Epoxy resin based zinc phosphate primer
	b) Primer				Epoxy based TiO2 pigmented coat
	a) Intermediate d) Final paint				Synthetic enamel paint to achieve total DFT of 175 to 200 microns. Colour- code shall be as per IS 9404 (Appendix - A)
9.0	Adequate provision for future installation of cathodic protection (Sacrificial type anodic protection by Purchaser)				YES
10.0	Flow straightner for streamlining the CW flow in ball collecting strainer				If required as per bidder's design – the same to be incorporated by bidder in its constructional feature.
11.0	Performance Guarantee & Bid Evaluation				
11.1	Performance Parameters to be Guaranteed				
	❖ Pressure drop in ball separator in clean condition				As per Guarantee schedule of bidder
	❖ Percentage recovery of balls				Min. 90 % recovery
	❖ Life of sponge Rubber Balls				Min. 3 weeks
11.2	Bid evaluation Criteria & Liquidated damages				As per clause no 8.00.00 of Section C1
11.3	Bid evaluation rate				
11.4	Liquidated damages				@ Rs.11.0 Lacs per 0.05 MWC pr. drop across each balls collecting strainer
12.0	The tube cleaning system shall be designed for following operation modes				Twice the bid evaluation rate
	a) Automatic start up initiated by push button				YES

		TITLE : STANDARD TECHNICAL SPECIFICATION DATA SHEET-A CONDENSER ON - LOAD TUBE CLEANING SYSTEM (Sponge Rubber Ball Type)		SPEC. NO. PE-TS- 387/388-165-N001	
				VOLUME : II B	
				SECTION-D	
				REV. NO. 0	
				DATE: 04.02.2013	
SL NO		PROJECT		2X660 MW RAGHUNATHPUR TPP PH-II STG	
13.0		Mandatory Spares to be supplied under this specification.			
14.0		Documents enclosed for bidder's reference			
		❖ Water Analysis			
		❖ GA of CW piping in TG hall		1. Sponge rubber balls for condenser on-load tube cleaning system (a. 20% -Abrasive Balls- 10000 Nos). (b. 80%- Normal Balls – 40000 No). 2. Ball Recirculating Pump (Set Consisting of Shaft, Rotor, , Seals, Gland Package shafts sleeves for Complete replacement in one Pump)--- 1 No.	
				Indicated in project information in Section B. Attached in Annexure-III	



**TITLE : TECHNICAL SPECIFICATION
FOR
CONDENSER ON LOAD TUBE CLEANING
SYSTEMS (COLTCS)**

SPEC. NO. PE-TS-390-165-N001

VOLUME : IIB

SECTION : D

REV. NO. 0

DATE : 17.07.13

SHEET 1 of 1

SECTION D2

STANDARD TECHNICAL SPECIFICATION FOR ELECTRICAL SYSTEMS



TITLE :
GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS


SPECIFICATION NO.
PE-SS-999-506-E101
VOLUME NO. : **II-B**
SECTION : **D**
REV NO. : **00** DATE : 29/08/2005
SHEET : 1 OF 1

GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

SPECIFICATION NO.: PE-SS-999-506-E101 Rev 00

	TITLE : GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : II-B
		SECTION : D
		REV NO. : 00 DATE : 29/08/2005
		SHEET : 1 OF 4

1.0

INTENT OF SPECIFICATION

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 for 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.



TITLE :
GENERAL TECHNICAL REQUIREMENTS

FOR
LV MOTORS

SPECIFICATION NO.
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SHEET : 2 OF 4

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.

	TITLE : GENERAL TECHNICAL REQUIREMENTS FOR LV MOTORS	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : II-B
		SECTION : D
		REV NO. : 00 DATE : 29/08/2005 SHEET : 3 OF 4
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 U 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.	
4.9	General	



TITLE :
GENERAL TECHNICAL REQUIREMENTS

FOR

LV MOTORS

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- 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.


[illegible]

CLAUSE NO.	TECHNICAL REQUIREMENTS	<div>एनटीपीसी</div> <div>NTPC</div>	
	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.		
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% upto 1500KW		
	(d) 80% from 1501 KW to 4000KW		
	(e) 75% > 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 located in hazardous areas shall have flame proof enclosures conforming to IS:2148 as detailed below		
	(a) Fuel oil area : Group - IIB		
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2	PART-B SUB SECTION-III: E1 (MOTORS)
			PAGE 3 OF 8

CLAUSE NO.	TECHNICAL REQUIREMENTS
7.03.00	<p>Winding and Insulation</p> <p>(a) Type : Non-hygroscopic, oil resistant, flame resistant</p> <p>(b) Starting duty : Two hot starts in succession, with motor initially at normal running temperature</p> <p>(c) 11kV, 3.3 kV AC motors : Thermal Class 155(F) insulation with winding temperature rise limited to thermal class 130(B). The winding insulation process shall be total Vacuum Pressure Impregnated i.e. resin pour method. The lightning impulse & interturn insulation surge withstand level shall be as per IEC-60034 Part-15.</p> <p>(d) 415V AC & 220V DC motors : Thermal Class 130(B) or better</p>
7.04.00	Motors rated above 1000KW shall have insulated bearings to prevent flow of shaft currents.
7.05.00	Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.
7.06.00	Noise level for all the motors shall be limited to 85dB (A). Bearing housing vibration shall be limited within the limits prescribed in IEC 60034-14/IS:12075 . 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.
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 duplex platinum resistance type temperature detectors preferably 2 numbers.
7.08.00	Motor body shall have two earthing points on opposite sides.
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 terminal boxes. In case elastimould terminations are offered, then protective cover and trifurcating sleeves shall also be provided. In case cable terminal box is offered, then Employer shall provide termination kit. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel for three core cables) or 4 mm (non magnetic material for single core cables) shall be provided in case of cable terminal boxes.
7.10.00	The spacing between gland plate & centre of terminal stud shall be as per Table-I.
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.
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.
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.

MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x 660MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2	PART-B SUB SECTION-III: E1 (MOTORS)	PAGE 4 OF 8
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
7.14.00	11kV and 3.3 kV motors Cable 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.			
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, cable glands & lugs suitable for the same.			
7.16.00	The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance).			
	(a) Upto 110KW:	11.0		
	(b) Above 110KW & upto 1500KW:	10.0		
	(c) Above 1500KW & upto 4000KW:	9.0		
	(d) Above 4000KW:	6 to 6.5		
8.00.00	TYPE TEST			
8.01.00	HT MOTORS			
8.01.01	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.			
8.01.02	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.			
8.01.03	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 Employer 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 Employer 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.			
8.01.04	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 this contract at no additional cost to the Employer either at third party lab or in presence of client/Employers representative and submit the reports for approval.			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2		PART-B SUB SECTION-III: E1 (MOTORS)
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
8.01.05	<p>LIST OF 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 overload 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 5.1.3.2, IEC-60034, Part-15.(g) Surge withstand voltage test on interturn insulation as per IEC 60034-15			
8.01.06	<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) Fault level withstand test for each type of cable terminal box of HT motors.			
8.02.00	<p>LT Motors</p>			
8.02.01	<p>LT Motors supplied shall be of type tested design. During detailed engineering, the contractor shall submit for Employer'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>			
8.02.02	<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 Employer either at third party lab or in presence of client/Employers representative and submit the reports for approval.</p>			
8.02.03	<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>			
MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9575/ 9571/ 0370/ 0360/ 9586-102-2	PART-B SUB SECTION-III: E1 (MOTORS)	PAGE 6 OF 8

CLAUSE NO.	TECHNICAL REQUIREMENTS		<div>एन टी पी सी</div> <div>NTPC</div>																													
	<div>TABLE - I</div> <div>DIMENSIONS OF TERMINAL BOXES</div> <div>FOR LV MOTORS:</div> <table><tr><th>Motor MCR in KW</th><th>Minimum distance between centre of stud and gland plate in mm</th></tr><tr><td>UP to 3 KW</td><td>As per manufacturer's practice.</td></tr><tr><td>Above 3 KW - upto 7 KW</td><td>85</td></tr><tr><td>Above 7 KW - upto 13 KW</td><td>115</td></tr><tr><td>Above 13 KW - upto 24 KW</td><td>167</td></tr><tr><td>Above 24 KW - upto 37 KW</td><td>196</td></tr><tr><td>Above 37 KW - upto 55 KW</td><td>249</td></tr><tr><td>Above 55 KW - upto 90 KW</td><td>277</td></tr><tr><td>Above 90 KW - upto 125 KW</td><td>331</td></tr><tr><td>Above 125 KW-upto 200 KW</td><td>203</td></tr></table> <div>FOR HT MOTORS:</div> <p>The distance between gland plate and the terminal studs shall not be less than 500 mm.</p> <div>PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE:</div> <p>NOTE: Minimum inter-phase and phase-earth air clearances for LT motors with lugs installed shall be as follows:</p> <table><tr><th>Motor MCR in KW</th><th>Clearance</th></tr><tr><td>UP to 110 KW</td><td>10mm</td></tr><tr><td>Above 110 KW and upto 150 KW</td><td>12.5mm</td></tr><tr><td>Above 150 KW</td><td>19mm</td></tr></table>				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	Motor MCR in KW	Clearance	UP to 110 KW	10mm	Above 110 KW and upto 150 KW	12.5mm	Above 150 KW	19mm
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CLAUSE NO.	LT SWITCHGEAR (Starters Panel)
1.00.00	<p>CODES AND STANDARDS</p> <p>IEC : 947, IS : 13947</p>
2.00.00	<p>TYPE</p> <p>Circuit Breakers Shall be air break, three pole, spring charged, horizontal drawout type, suitable for electrical operation.</p> <p>Switchgear Fully drawout type single front</p> <p>MCC Fully drawout type single front/Double front.</p> <p>ACDB/DCDB Fixed type single front</p>
3.00.00	<p>SYSTEM PARAMETERS</p> <p>415VAC +/- 10 % (SOLIDLY GROUNDED)</p> <p>50 Hz +3%/-5%</p> <p>45KA RMS / 1 SEC (FAULT LEVEL)</p> <p>220V DC NOMINAL (190V DC-240V DC) ISOLATED TYPE</p>
4.00.00	<p>TEMPERATURE RISE</p> <p>The temperature rise of the horizontal and vertical busbars and main bus link including all power drawout contacts when carrying 90% of the rated current along the full run shall in no case exceed 55 deg. C with silver plated joints and 40 deg. C with all other types of joints over an ambient of 50 deg C.</p>
5.00.00	<p>OPERATIONAL REQUIREMENTS</p>
5.01.00	<p>Breakers</p>
5.01.01	<p>Breakers shall have anti-pumping feature.</p>
5.01.02	<p>The incomer and bus coupler breakers for switchgear shall be electrically operated with over current releases or relays.</p>
5.01.03	<p>Breakers shall have inherent fault making and breaking capacities. They shall have shunt trip coils. In case releases are offered, the same shall have contact for energisation of lockout relay. All breakers shall have built in interlocks for equipment and personnel safety.</p>
5.01.04	<p>Paralleling of two supplies shall be avoided by interlocking except for switchgear where auto-changerover is provided. Breaker contact multiplication, if required, shall be through latch relay.</p>


CLAUSE NO.	LT SWITCHGEAR
01.05	Mechanical tripping shall be through red 'Trip' push button outside the panels for breakers, and through control switches for other circuits.
01.06	Provision of mechanical closing of breaker only in 'Test' and 'Withdrawn' position shall be made. Alternatively, mechanical closing facility should be normally inaccessible, accessibility rendered only after deliberate removal of shrouds. It shall be possible to close the door with breaker in test position.
01.07	Clear status indication for each circuit shall be provided through lamps, switch positions or other mechanical means.
01.08	Supervision relay shall be provided for trip coil monitoring.
02.00	Switches, Contactors and Fuses
02.01	Incomers for MCCs and DBs rated upto 630A could be load break isolators.
02.02	Motor starter contactors shall be of air break, electromagnetic type suitable for DOL starting of motor, and shall be of utilisation category AC-3 for ordinary and AC-4 for reversing starters. DC contactor shall be of DC-3 utilisation category.
02.03	Fuses shall be HRC type with operation indicator. Isolating switches shall be of AC 23A category when used in motor circuit, and AC 22A category for other applications. Fuse switch combination shall be provided wherever possible.
02.04	Isolating switches and MCCBs shall have door interlocks and padlocking facility.
02.05	Panels
02.06	All switchgears, MCCs, DBs, panels, modules, local starters and push buttons shall have prominent engraved identification plates.
02.07	Local push button stations shall have metal enclosure of die cast aluminium or rolled sheet steel of 1.6mm thickness & shall have DOP of IP-55. Push buttons shall be of latch type with mushroom knobs.
02.08	Where breaker/starter module front serves as compartment cover, suitable blanking covers, one for each size of modules per switchboard shall be supplied for use when carriage is withdrawn.
02.09	All non-current carrying metal work of boards/panels shall be effectively bonded to earth bus of galvanised steel, extending throughout the switchboard/MCC/DB. Positive earthing shall be maintained for all positions of chassis and breaker frame.
02.10	Suitable trolley arrangement shall be provided for breaker/starter modules. Two trolleys per switchgear room shall be provided so that top most breaker module of all types, sizes and rating can be withdrawn on trolley and lowered for maintenance purpose.
02.11	The incoming connection to transformer of more than 1000KVA and inter-connecting sections between switchboards shall preferably be of busducts. The busduct enclosure

CLAUSE NO.	LT SWITCHGEAR
	<p>shall be made of minimum 3mm thick aluminium alloy. The section of the busduct should have adequate strength to withstand internal and external forces resulting from the various operating conditions. Aluminium sheet hood shall be provided for outdoor busduct enclosure joints to provide additional protection against water ingress. The busduct top shall be sloped to prevent retention of water. The busduct shall have DOP of IP55.</p>
5.03.07	<p>It should be possible to carryout maintenance on a feeder with adjacent feeders alive.</p>
5.04.09	<p>Control, Protection & Metering Requirements</p>
5.04.01	<p>Control circuits shall operate at suitable voltage of 110V AC or 220V DC. Necessary control supply transformers having primary and secondary fuses shall be provided for each MCC, 2 x 100% per section. However the breakers shall operate on 220V DC. The auxiliary bus bars for control supply shall be segregated from main bus bars. The control supplies shall be monitored.</p>
5.04.02	<p>Contractor shall fully co-ordinate overload and short circuit tripping of breaker with up-stream and down stream breakers/fuses/MCCBs motor starters. Various equipments shall meet requirement of Type-II class of coordination as per IEC.</p>
5.04.03	<p>All relays and timers shall operate on available DC supply and not have any inbuilt batteries. They shall be provided with hand-reset operation indicator (flags) or LEDs with pushbuttons for resetting.</p>
5.04.04	<p>All equipments shall have necessary protections. However, following minimum protections shall be provided:</p>
	<ol style="list-style-type: none"> 1) Contactor controlled motor feeders (Motors up to 150 kW) <ol style="list-style-type: none"> a) Instantaneous short circuit protection on all phases through HRC cartridge type fuses rated for 80 kA rms (prospective breaking capacity at 415V). b) Thermal overload protection. c) Single phasing protection for motors protected by fuses. 2) Breaker controlled motors feeders (motors rated above 160kW) <ol style="list-style-type: none"> a) Instantaneous short circuit protection on all phases b) Overload protection on two phases c) Over load alarm on third phase d) Earth fault protection e) Under voltage protection

CLAUSE NO.	LT SWITCHGEAR
	<ul style="list-style-type: none"> f) hand reset lockout relay with a blue lamp for monitoring 3) Incomers/bus coupler/outgoing breaker feeders other than motor feeders <ul style="list-style-type: none"> a) Definite time delay short circuit protection b) Hand reset lockout relay with a blue lamp 4) Incomer From DG Set. <ul style="list-style-type: none"> a) Differential Protection (87) - Three Pole b) Reverse Power Protection. c) Overload Alarm on one phase d) Earth Fault Detection Relay (64) e) Voltage controlled overcurrent relay e) Generator under/over voltage Protection f) Hand Reset/Lockout Relay with a blue lamp. g) 3 Phase Energy Meter having accuracy of 1.0 class.
5.04.05	<p>Meters / instruments</p> <p>All meters/ instrument shall be flush mounted on front panel, at least 96 sq.mm. size with 90 degree linear scales and accuracy class of 2.0.</p>
5.04.06	<p>All motors of 30kW and above shall have an Ammeter. Bus-section shall have bus VT, voltmeter with selector switch, and other relay and timers required for protection. Adequate control and selector switches, push buttons and indicating lamps shall be provided. Thermostatically controlled space heaters with switches shall be provided to prevent condensation.</p>
5.04.07	<p>In case of remote controlled breaker panels, following shall be ensured.</p> <p>Each feeder shall have local/remote selector switch. Closing from local shall be possible only in test position whereas closing from remote shall be possible in either service or test position. Tripping from local shall be possible only when local/remote selector switch is in local position. Tripping from remote shall be either breaker in service position or selector switch being in remote position.</p>
05.00	<p>Control from Remote</p> <p>Necessary hardware shall be provided in the switchgear panel like coupling relays(24V DC, with max burden 2.5VA), auxiliary relays, current & voltage transducers(4-20 mA, dual output) etc. to effect interlocks, exchange information / status and exercise control from remote.</p>

CLAUSE NO.	LT SWITCHGEAR
6.00.00	DESIGN AND CONSTRUCTIONAL FEATURES
6.01.00	<p data-bbox="321 464 1256 516">All 415V switch gear motor control centers (MCCs), AC & DC distribution boards (DBs), etc shall have following features :</p> <ol style="list-style-type: none"> <li data-bbox="321 541 1203 569">1) Shall be of metal enclosed, indoor, floor mounted and free standing type. <li data-bbox="321 596 1256 674">2) All frames and load bearing members shall be fabricated using mild steel structural sections or pressed and shaped cold rolled sheet steel of thickness not less than 2mm. <li data-bbox="321 701 1256 835">3) Frame shall be enclosed in cold rolled sheet steel of thickness not less than 1.6mm. Doors and covers shall also be of cold rolled sheet steel of thickness not less than 1.6 mm. Stiffeners shall be provided wherever necessary. Removable gland plates of thickness 3mm (hot/cold rolled sheet steel) or 4 mm (non-magnetic material) shall be provided for all panels. <li data-bbox="321 863 1256 915">4) All switchboards/panels shall be of dust and vermin proof. All cutouts shall have synthetic rubber gaskets. <li data-bbox="321 942 1256 1020">5) For motors above 160kW, remote controlled electrical circuit breakers, and for smaller motors, switch-fuse contactor feeders shall be provided. The other outgoing feeders would be switch-fuse units or moulded case circuit breakers. <li data-bbox="321 1047 1256 1703">6) All switchboards, MCCs and DBs shall have following distinct vertical sections. <ol style="list-style-type: none"> <li data-bbox="407 1129 1256 1182">a) Completely enclosed bus bar compartment for horizontal and vertical bus bars. <li data-bbox="407 1209 1256 1262">b) Completely enclosed switchgear compartments (one for each circuit housing circuit breakers, motor starter or switch-fuse feeder). <li data-bbox="407 1289 1256 1398">c) Compartment for cable alley or cable box for power and control cables In case of cable box, they shall be segregated with complete shrouding for individual feeders at the rear for direct termination of cables. <li data-bbox="407 1425 1256 1478">d) For cable connection to circuit breaker, a separately enclosed cable compartment shall also be acceptable. <li data-bbox="407 1505 1256 1558">e) Compartment for relays and other control devices associated with a circuit breaker, wherever necessary. <li data-bbox="407 1585 1256 1638">f) The switchboards/MCC/DBs of 1600A & above rating shall be of DOP IP42 & of IP52 for less than 1600A rating <li data-bbox="407 1665 1256 1703">g) All 415V switchgears, MCC's, AC & DC distribution boards etc. shall be painted by powder coating process. Paint shade shall be as follows.

CLAUSE NO.	LT SWITCHGEAR	
	(i) Front & Back	RAL 9002
	(ii) Extreme end covers	RAL 5012
7)	Busbars shall be of high conductivity aluminium alloy or copper.	
8)	Minimum air clearance in air between phases and phase-earth shall be 25 mm for busbars and cable terminations. For all other components, the Clearances shall be at least 10mm. Wherever above is not possible except for horizontal and vertical busbars, insulation shall be provided by anti tracking sleeving or barriers. However for horizontal and vertical busbars, clearances specified above shall be maintained even when busbars are insulated/sleeved. In case of DC DBs/ fuse boards, the busbar system shall be insulated or physically segregated with barriers to prevent interpole short circuit.	
9)	Busbar insulators shall be of track-resistant high strength non-hygro-scoptic, non-combustible type and suitable to withstand stresses due to over-voltages and short circuit current. Insulators and barrier of inflammable material such as Hylam shall not be accepted.	
10)	All types of relays and timer shall be subject to Employer's approval. They shall be flush mounted with connections from inside, and shall have transparent & dust tight cover, removable from front, drawout construction for easy replacement and testing facility. The auxiliary relays and timer may be provided in fixed cases.	
11)	Maxi terminal /cage clamp type terminal blocks shall be provided for signals to be interfaced with DDCMIS/PLC.	
12)	The switchgears/MCC shall be designed to offer adequate level of safety to operating/maintenance personnel. Means shall be provided to prevent access to the live part to avoid accidents during service as well as maintenance period. Bidder shall bring out the safety means provided to achieve above. A detailed instruction plate suitable for wall mounting shall be provided for each switchgear/MCC room describing various safe operating procedure/safety precautions for safe operation and maintenance of switchgear/MCC.	
13)	All current and voltage transformers as required for metering & protection specified shall be completely encapsulated, cast resin insulated type. Incomers from transformers shall have CTs for transformer REF protection. All current and voltage transformers as required for metering and protection specified shall be completely encapsulated, cast resin insulated type. Incomers from transformers shall have CTs for transformer restricted earth fault protection. The accuracy shall be as follows:	
	CTs	PTs
Protection	5P20	3P
Metering	10	10
REF	PS	

	TITLE	SPECIFICATION NO.
	<p align="center">MOTOR</p> <p align="center">DATA SHEET - C</p>	VOLUME II B
		SECTION D
		REV NO. 00 DATE 29/08/2005
		SHEET 1 OF 2

S. No.	Description	Data to be filled by successful bidder
A.	General	
1	Manufacturer & country of origin	
2	Motor type	
3	Type of starting	
4	Name of the equipment driven by motor & Quantity	
5	Maximum Power requirement of driven equipment	
6	Rated speed of Driven Equipment	
7	Design ambient temperature	
B.	Design and Performance Data	
1	Frame size & type designation	
2	Type of duty	
3	Rated Voltage	
4	Permissible variation for	
5	a) Voltage	
6	b) Frequency	
7	c) Combined voltage & frequency	
8	Rated output at design ambient temp (by resistance method)	
9	Synchronous speed & Rated slip	
10	Minimum permissible starting voltage	
11	Starting time in sec with mechanism coupled	
12	a) At rated voltage	
13	b) At min starting voltage	
14	Locked rotor current as percentage of FLC (including IS tolerance)	
15	Torque	
	a) Starting	
	b) Maximum	
16	Permissible temp rise at rated output over ambient temp & method	
17	Noise level at 1.0 m (dB)	
18	Amplitude of vibration	
19	Efficiency & P.F. at rated voltage & frequency	
	a) At 100% load	
	c) At 75% load	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TITLE	SPECIFICATION NO.
	<p align="center">MOTOR</p> <p align="center">DATA SHEET - C</p>	VOLUME II B
		SECTION D
		REV NO. 00 DATE 29/08/2005
		SHEET 2 OF 2

S. No.	Description	Data to be filled by successful bidder
	c) At starting	
C.	Constructional Features	
1	Method of connection of motor driven equipment	
2	Applicable Standard	
3	DOP of Enclosure	
4	Method of cooling	
5	Class of insulation	
6	Main terminal box	
	a) Type	
	b) Power Cable details (Conductor, size, armour/unarmour)	
	c) Cable Gland & lugs details (Size, type & material)	
	d) Permissible Fault level (kArms & duration in sec)	
7	Space heater details (Voltage & watts)	
8	Flame proof motor details (if applicable)	
	a) Enclosure	
	b) suitability for hazardous area	
	i Zone	O / I / II
	ii Group	IIA / IIB / IIC
9	No. of Stator winding	
10	Winding connection	
11	Kind of rotor winding	
12	Kind of bearings	
13	Direction of rotation when viewed from NDE	
14	Paint Shade & type	
15	Net weight of motor	
16	Outline mounting drawing No (To be enclosed as annexure)	
D.	Characteristic curves/ drawings (To be enclosed for motors of rating $\geq 55KW$)	
	a) Torque speed characteristic	
	b) Thermal withstand characteristic	
	c) Current vs time	
	d) Speed vs time	

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

CLAUSE NO.

QUALITY ASSURANCE



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
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						

MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW)
STEAM GENERATOR PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
BID DOC NO.: CS-9575/ 9571/ 0370/
0360/ 9586-102-2

PART-B
SUB-SECTION-VII:QE1
MOTOR

PAGE 1 OF 2

CLAUSE NO.

QUALITY ASSURANCE



INDUCTION MOTOR & SYNCHRONOUS MACHINE


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 60079-1	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 60079-1)						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 finalisation. However, No QP for LT motor upto 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>									


MOUDA STPP-II (2x660MW) / SOLAPUR STPP (2 x 660MW) / NABINAGAR STPP (3x 660MW) / MEJA TPP-I (2 x 660MW) / RAGHUNATHPUR TPP PHASE-II (2 x660MW)
STEAM GENERATOR PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
BID DOC NO.: CS-9575/ 9571/ 0370/
0360/ 9586-102-2

PART-B
SUB-SECTION-VII:QE1
MOTOR

PAGE 2 OF 2

		CUSTOMER :			PROJECT TITLE			SPECIFICATION :			
QUALITY PLAN		BIDDER/ VENDOR :			QUALITY PLAN			NUMBER :			
SHEET 1 OF 2		SYSTEM			ITEM AC ELECT. MOTORS BELOW 75KW (LV)			TITLE			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION AGENCY	VOLUME III REMARKS	
1	2	3	4	5	6	7	8	9	P W V	10	
1.0	PAINTING	1. SHADE	MA	VISUAL	SAMPLE	MANUF'S SPEC/BHEL SPEC./RELEVANT STANDARD	BHEL SPEC. SAME AS COL.7	LOG BOOK	3	-	-
2.0	ASSEMBLY	1. WORKMANSHIP	MA	VISUAL	100%	MANUF'S SPEC	MANUF'S SPEC	-DO-	3	-	-
		2. DIMENSIONS	MA	-DO-	-DO-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	-DO-	3	-	-
		3. CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOUR CODE	MA	VISUAL	100%	MFG. SPEC./ RELEVANT IS	MFG. SPEC. RELEVANT IS	-DO-	3	-	-
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	3	2.1	2.1 NOTE -1
		2. OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPN. REPORT	2	1	-
BHEL		PARTICULARS			BIDDER/VENDOR						
		NAME									
		SIGNATURE									
		DATE									
BIDDER'S/VENDORS COMPANY SEAL											

		QUALITY PLAN		CUSTOMER :		PROJECT TITLE		SPECIFICATION : NUMBER :		
		SHEET 2 OF 2		BIDDER/ : VENDOR :		QUALITY PLAN NUMBER PED-508-00-Q-008/0		SPECIFICATION : TITLE :		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION AGENCY	VOLUME III
1	2	3	4	5	6	7	8	9	P W V	REMARKS
		3.NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPN. REPORT	3 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>										
BHEL		PARTICULARS		BIDDER/VENDOR						
		NAME								
		SIGNATURE								
		DATE								
BIDDER'S/VENDORS COMPANY SEAL										



**TITLE : TECHNICAL SPECIFICATION
FOR
CONDENSER ON LOAD TUBE CLEANING
SYSTEMS (COLTCS)**

SPEC. NO. PE-TS-390-165-N001

VOLUME : IIB

SECTION : D

REV. NO. 0

DATE : 17.07.13

SHEET 1 of 1

SECTION D3
**STANDARD TECHNICAL SPECIFICATION
FOR
C&I SYSTEMS**



SPECIFICATION FOR MOTORISED VALVE ACTUATOR

SPECIFICATION NO.:

VOLUME

SECTION

REV. NO.

DATE:

SHEET 1 OF 3

Data Sheet A & B

DATA SHEET-A
(TO BE FILLED BY PURCHASER)

DATA SHEET-B
(TO BE FILLED-UP BY BIDDER)

GENERAL*	* PROJECT	2x660 MW MOUDA STPP, 1X500 MW VINDHYACHAL STPP	
	OFFER REFERENCE		
	* TAG NO. SERVICE		
	* DUTY	<input type="checkbox"/> ON / OFF	<input type="checkbox"/> INCHING
	* LINE SIZE (inlet/outlet): MATERIAL		
	* VALVE TYPE	<input type="checkbox"/> GLOBE <input type="checkbox"/> GATE <input type="checkbox"/> REG. GLOBE <input type="checkbox"/> BUTTERFLY	
	* OPENING / CLOSING TIME		
	* WORKING PRESSURE		
	AMBIENT CONDITION	SHALL BE SUITABLE FOR CONTINUOUS OPERATION UNDER AN AMBIENT TEMP. OF 0-55 DEG C AND RELATIVE HUMIDITY OF 0-95%	
	VALVE SEAT TEST PRESS	BIDDER TO SPECIFY	
	REQUIRED VALVE TORQUE	BIDDER TO SPECIFY	
	ACTUATOR RATED TORQUE	BIDDER TO SPECIFY	
CONSTRUCTION AND SIZING	CONSTRUCTION	TOTALLY ENCLOSED, WEATHER PROOF, IP:55	
	MECHANICAL POSITION INDICATOR	TO BE PROVIDED FOR 0-100% TRAVEL	
	BEARINGS	DOUBLE SHIELDED, GREASE LUBRICATED ANTI-FRICTION.	
	GEAR TRAIN FOR LIMIT SWITCH/TORQUE SWITCH OPERATION	METAL (NOT FIBRE GEARS). SELF-LOCKING TO PREVENT DRIFT UNDER TORQUE SWITCH SPRING PRESSURE WHEN MOTOR IS DE-ENERGIZED.	
	SIZING	OPEN/CLOSE AT RATED SPEED AGAINST DESIGNED DIFFERENTIAL PRESSURE AT 90% OF RATED VOLTAGE. FOR ISOLATING SERVICE THREE SUCCESSIVE OPEN-CLOSE OPERATIONS OR 15 MINS. WHICHEVER IS HIGHER. FOR INCHING(REGULATING) SERVICE 150 STARTS/HR MINIMUM	
HANDWHEEL	* REQUIRED	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
	* ORIENTATION	<input type="checkbox"/> TOP MOUNTED <input type="checkbox"/> SIDE MOUNTED	
	TO DISENGAGE AUTOMATICALLY DURING MOTOR OPERATION.		
ELECTRIC ACTUATOR	ACTUATOR MAKE/MODEL	BIDDER TO SPECIFY	
	MOTOR MAKE / MODEL / TYPE / RATING (KW)	BIDDER TO SPECIFY	
	MOTOR TYPE	SQUIRREL CAGE INDUCTION MOTOR, STARTING CURRENT LIMITED TO SIX TIMES THE RATED CURRENT.	
	ACTUATOR APPLICABLE WIRING DIAGRAM	<input checked="" type="checkbox"/> ENCLOSED (BIDDER TO CONFIRM) A: <input type="checkbox"/> DRG. NO. 3-V-MISC-24227 R00 B: <input type="checkbox"/> DRG. NO. 3-V-MISC-24550 R00 C: <input checked="" type="checkbox"/> DRG. NO. 3-V-MISC-24283 R00 D: <input type="checkbox"/> DRG. NO. 4-V-MISC-90271 R11	
	COLOUR SHADE	<input checked="" type="checkbox"/> BLUE (RAL 5012) ENAMEL <input type="checkbox"/>	
	SHAFT RPM	BIDDER TO SPECIFY	
	OLR SET VALUE	BIDDER TO SPECIFY	
	STARTING / FULL LOAD CURRENT	BIDDER TO SPECIFY	
	NO. OF REV FOR FULL TRAVEL	BIDDER TO SPECIFY	
	Ⓜ PWR SUPP TO MTR / STARTER	415 VAC±10%, 3PH, 50Hz±5%, 3 wire, 10 % (ABSOLUTE) COMBINED VOLTAGE & FREQUENCY VARIATIONS	
	Ⓜ CONTROL VOLTAGE REQUIREMENT	TO BE DERIVED FROM THE POWER SUPPLY TO THE STARTER <input type="checkbox"/> 230 V AC <input checked="" type="checkbox"/> 110 V AC	
	Ⓜ ENCLOSURE CLASS OF MOTOR	<input type="checkbox"/> IP 65 <input checked="" type="checkbox"/> IP 67 FOR OUTDOOR <input type="checkbox"/> FLAME PROOF <input checked="" type="checkbox"/> IP 55 FOR INDOOR, TOTALLY ENCL, SELF VENTILATED.	
	Ⓜ INSULATION CLASS	<input type="checkbox"/> CLASS-B <input checked="" type="checkbox"/> CLASS-F WITH TEMPERATURE RISE LIMITED TO CLASS-B	



SPECIFICATION FOR MOTORISED VALVE ACTUATOR

SPECIFICATION NO.:

VOLUME

SECTION

REV. NO.

DATE:


SHEET 2 OF 3

Data Sheet A & B

DATA SHEET-A
(TO BE FILLED BY PURCHASER)

DATA SHEET-B
(TO BE FILLED-UP BY BIDDER)

	@ WINDING TEMP PROTECTION	■ THERMOSTAT (3 Nos., 1 IN EACH PHASE) <input type="checkbox"/>	
	SINGLE PHASE / WRONG PHASE SEQUENCE PROTECTION	REQUIRED	
INTEGRAL STARTER	INTEGRAL STARTER	■ REQUIRED <input type="checkbox"/> NOT REQUIRED	
	TYPE OF SWITCHING DEVICE	■ CONTACTORS <input type="checkbox"/> THYRISTORS	
	TYPE	■ CONVENTIONAL <input type="checkbox"/> SMART (NON-INTRUSIVE)	
	IF SMART		
	a) SERIAL LINK INTERFACE	<input type="checkbox"/> INTEGRAL <input type="checkbox"/> FIELD MOUNTED	
	b) SERIAL LINK PROTOCOL	<input type="checkbox"/> FOUNDATION FIELD-BUS <input type="checkbox"/> PROFI-BUS <input type="checkbox"/> TCP/IP <input type="checkbox"/>	
	c) SERIAL LINK MEDIA	<input type="checkbox"/> TWISTED PAIR Cu-CBL <input type="checkbox"/> CO-AXIAL Cu-CBL <input type="checkbox"/> OFC	
	d) HAND HELD PROGRAMMER	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	e) MASTER STATION	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	f) MASTER STN INTERFACE WITH DCS	<input type="checkbox"/> MODBUS <input type="checkbox"/> TCP/IP	
	g) DETAILS OF SPECIAL CABLE	<input type="checkbox"/> ENCLOSED <input type="checkbox"/> NOT REQUIRED	
	STEP DOWN CONT. TRANSFORMER	■ REQUIRED	
	OPEN / CLOSE PB	■ REQUIRED <input type="checkbox"/> NOT REQUIRED	
	STOP PB	■ REQUIRED <input type="checkbox"/> NOT REQUIRED	
	INDICATING LAMPS	■ REQUIRED <input type="checkbox"/> NOT REQUIRED	
	LOCAL REMOTE S/S	■ REQUIRED <input type="checkbox"/> NOT REQUIRED	
	STATUS CONTACTS FOR MONITORING	■ REQUIRED <input type="checkbox"/> NOT REQUIRED	
	INTEGRAL STARTER DISTURBED SIGNAL	REQUIRED (O/L RELAY OPERATED, THERMOSTAT OPERATED, CONT./POWER SUPPLY FAILED, S/S IN LOCAL, TORQUE SWITCH OPTD. MID WAY)	
INTERPOSING RELAY (Applicable for integral Starter)	INTERPOSING RELAYS	REQUIRED	
	INTERPOSING RELAY (QUANTITY)	■ 2 NOs. <input type="checkbox"/> 3 NOs.	
	DRIVING VOLTAGE	<input type="checkbox"/> 20.5 – 24V DC ■ 24 V DC	
	DRIVING CURRENT	<input type="checkbox"/> 125mA MAX <input type="checkbox"/> _____ mA MAX	
	LOAD RESISTANCE	<input type="checkbox"/> > 192 ohms - <25 k ohms <input type="checkbox"/> > _____ ohms - < _____ ohms	
	COIL BURDEN	2.5 VA	
TORQUE SWITCH (Not Applicable for Smart Actuator)	MECHANICAL LATCHING DEVICE	REQUIRED(REFER NOTE-5)	
	MFR & MODEL NO.	BIDDER TO SPECIFY	
	OPEN / CLOSE	■ 1 No. <input type="checkbox"/> 2Nos. / ■ 1 No. <input type="checkbox"/> 2Nos	
	CONTACT TYPE	2 NO + 2 NC	
	RATING	5A 240V AC AND 0.5A 220V DC	
	ENCLOSURE	IP 55	
	CALIBRATED KNOBS(OPEN&CLOSE TS)	REQUIRED FOR SETTING DESIRED TORQUE	
	ACCURACY	+3% OF SET VALUE	
LIMIT SWITCH (Not Applicable for Smart Actuator)	MFR & MODEL NO.	BIDDER TO SPECIFY	
	OPEN : INT : CLOSE	<input type="checkbox"/> 1 No. <input checked="" type="checkbox"/> 2 Nos. (ADJ.) <input type="checkbox"/> 1 No. <input checked="" type="checkbox"/> 2Nos.	
	CONTACT TYPE	2 NO + 2 NC	
	RATING (AC / DC)	5A ,240V AC AND 0.5A,220V DC	
	ENCLOSURE CLASS	IP 55	


	SPECIFICATION FOR MOTORISED VALVE ACTUATOR	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE:
		SHEET	3 OF 3
Data Sheet A & B			
DATA SHEET-A (TO BE FILLED BY PURCHASER)		DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	


POSITION TRANSMITTER	POSITION TRANSMITTER (For inching duty)	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED	
	MFR & MODEL NO.	BIDDER TO SPECIFY	
	TYPE	<input type="checkbox"/> ELECTRONIC (2 WIRE) R/I CONVERTER <input checked="" type="checkbox"/> ELECTRONIC (2 WIRE) CONTACTLESS	
	SUPPLY	<input checked="" type="checkbox"/> 24V DC <input type="checkbox"/>	
	OUTPUT	<input checked="" type="checkbox"/> 4-20mA	
	ACCURACY	$\pm 1\%$ FS	
SPACE HEATER	@SPACE HEATER	REQUIRED	
	@ POWER SUPPLY		
	@ RATING		
TERMINAL BOX	MOTOR TERMINAL BOX	REQUIRED	
	ACTUATOR TERMINAL BOX	REQUIRED	
	ENCL CLASS MTR T.B. / ACTUATOR T.B.	<input type="checkbox"/> IP 65 <input checked="" type="checkbox"/> IP-67..... <input type="checkbox"/> IP65 <input checked="" type="checkbox"/> IP-67.....	
	@ EARTHING TERMINAL	REQUIRED	
	PLUG & SOCKET(9 PIN) (ADDITIONAL 1 NO. FOR PoT)	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED <input checked="" type="checkbox"/> 1 NO. <input checked="" type="checkbox"/> 1 NO. ADDITIONAL FOR PoT	
CABLE GLANDS	@ POWER CABLE GLAND	SIZE: _____	
	@ SPACE HEATER CABLE GLAND	SIZE: _____	
	OTHER CONTROL CABLE GLANDS-1	<input type="checkbox"/> 1No. for BFV of CW PUMP(Cable size 2Px1.5mm2)	
	OTHER CONTROL CABLE GLANDS-2	QUANTITY & SIZE : _____	
WEIGHT	TOTAL WEIGHT (ACTUATOR + ACCESSORIES)	BIDDER TO SPECIFY _____ Kg.	

NOTES:

- SCOPE: DESIGN, MANUFACTURE, INSPECTION, TESTING AND DELIVERY TO SITE OF ELECTRIC ACTUATOR FOR INCHING OR OPEN / CLOSE DUTY.
- CODES & STANDARDS: DESIGN AND MATERIALS USED SHALL COMPLY WITH THE RELEVANT LATEST NATIONAL AND INTERNATIONAL STANDARD. AS A MINIMUM, THE FOLLOWING STANDARDS SHALL BE COMPLIED WITH:
IS-9334, IS-2147, IS-2148, IS-325, IS-2959, IS-4691 AND IS-4722
- TEMPERATURE RISE SHALL BE RESTRICTED TO 70 DEG. C FOR AMBIENT TEMPERATURE OF 50 DEG C.
- CABLE GLANDS OF DOUBLE COMPRESSION TYPE, BRASS MATERIAL SHALL BE PROVIDED.
- THE TORQUE SWITCHES SHALL BE PROVIDED WITH MECHANICAL LATCHING DEVICE TO PREVENT OPERATION WHEN UNSEATING FROM THE END POSITIONS. THE LATCHING DEVICE SHALL UNLATCH AS SOON AS THE VALVE LEAVES THE END POSITION. IF SUCH PROVISION IS NOT POSSIBLE, THE TORQUE SWITCHES SHALL BE BYPASSED BY END-POSITION LIMIT SWITCHES WHICH OPENS ON VALVE LEAVING END POSITION. THESE LIMIT SWITCHES ARE ADDITIONAL TO THE NUMBER OF LIMIT SWITCHES SPECIFIED ELSEWHERE.
- THE MOTOR SHALL BE SUITABLE FOR DIRECT ON LINE STARTING.

NAME SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY	VENDOR COMPANY SEAL
				NAME
				SIGNATURE
				DATE
NOTES* = TO BE FILLED BY MPL (LEAD AGENCY). @= TO BE FILLED BY ES				

	DATA SHEET FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE		SPECIFICATION NO.:	
			VOLUME	
			SECTION	
			REV. NO.	DATE:
			SHEET 1 OF 2	
Data Sheet No.: PE-DC-999-145-1026-A				
TECHNICAL REQUIREMENTS FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE (TO BE FILLED BY PURCHASER)				
TO BE FILLED-UP / CONFIRMED BY BIDDER				
GENERAL	MANUFACTURER			
	MODEL NUMBER			
TECHNICAL	SENSING ELEMENT	<input type="checkbox"/> BOURDON <input type="checkbox"/> DIAPHRAGM (BOURDON FOR HIGH PRESS AND DIAPHRAGM FOR LOW PRESS APPLICATION)		
	MATERIAL	SENSING ELEMENT – AISI 316 SS MOVEMENT – AISI 304 SS CASING – <input checked="" type="checkbox"/> DIE CAST AL <input type="checkbox"/> SS		
	ENCLOSURE	CLASS: <input checked="" type="checkbox"/> IP-55 <input type="checkbox"/> IP-65 <input type="checkbox"/> EXPL PROOF PAINT: <input checked="" type="checkbox"/> ENAMEL <input type="checkbox"/> EPOXY		
	DIAL	SIZE: 150 MM COLOR: WHITE NUMERALS: BLACK SCALE: LINEAR, 270° ARC GRADUATED IN METRIC UNITS		
	CASE	COLOUR : BLACK		
	SPAN/ ZERO ADJUSTMENT	INT. MICRO SCREW		
	RANGE SELECTION	SHOULD COVER 125% OF OPERATING PARAMETER		
	OVER RANGE PROTECTION	1.5 TIMES OF FSD		
	BLOW OUT DISC	REQUIRED		
	SWITCHING FACILITY (IF APPLICABLE)	NOT REQUIRED		
	TYPE	<input type="checkbox"/> MICRO SWITCH <input type="checkbox"/> OTHER		
	NO. / TYPE OF CONTACTS	2 NOS. SPDT		
CONTACT RATING	5A 230V AC, 0.25A 220V DC			
SETTING RANGE	FIELD ADJUSTABLE OVER FULL RANGE			
REPEATABILITY	± 1% OF FSR			
POWER SUPPLY	<input type="checkbox"/> 230V AC <input type="checkbox"/> 110V AC			
PERFORMANCE	ACCURACY	± 1% OR BETTER OF FULL SCALE DEFLECTION		
CONNECTION	PROCESS	<input type="checkbox"/> M20 x 1.5 (M) <input checked="" type="checkbox"/> ½" NPT (M) <input type="checkbox"/> ½" NPT (F) <input type="checkbox"/> OTHER		
	LOCATION	BOTTOM		
ACCESSORIES	NAME PLATE / METAL TAG	SS		
	OTHER	SIPHON FOR STEAM, SNUBBER FOR PUMP DISCHARGE, CHEMICAL SEAL DIAPHRAGM FOR CORROSSIVE, OIL SERVICES and SLURRY APPLICATION TO BE PROVIDED		
OTHER REQUIREMENT	INSTRUMENT LIST	INSTRUMENT LIST COMPRISING OF TAG NO., SERVICE, DESIGN/OPERATING PRESSURE & TEMPERATURE TO BE ATTACHED		
QUALITY REQUIREMENT	CHECK LIST FOR PG/DPG	REFER CHECK LIST NO PE-CL-999-145-1 026-0		

		CHECK LIST FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE (Mechanical Auxiliary Packages)		SPECIFICATION NO.: VOLUME SECTION REV. NO. DATE: SHEET 2 OF 2			
						Data Sheet No.: PE-CL-999-145-1026-0	
SL NO	TESTS/CHECKS	QUANTM OF CHECK	REFERENCE DOC. ACCEPTANCE NORMS	AGENCY			REMARKS
				P	W	V	
1.0	CHECK FOR		APPROVED TECHINCAL REQUIREMENT/ DATA SHEET				MFR TO CARRY OUT ROUTINE TEST ON 100%. WHEN MATL CORELATION ARE NOT AVAILABLE MFR'S COMPLIANCE TO BE PROVIDED
	1.1 DIAL SIZE	100%		M	C	C	
	1.2 MODEL NO/TAG NO	100%		M	C	C	
	1.3 RANGE/SCALE	100%		M	C	C	
	1.4 END CONNECTION	100%		M	C	C	
	1.5 SWITCH CONTACT RATING & NOS	100%		M	C	C	
2.0	CALIBRATION						
	2.1 ACCURACY	100%		M	C	B	
	2.2 REPEATABILITY (FOR SWITCH)	100%		M	C	B	
	2.3 SET POINT ADJUSTMENT FOR SWITCH	100%		M	C	C	
3.0	OVER PRESSURE & LEAK TEST	100%		M	C	C	
4.0	OPERATION OF PR. RELEIF DEVICE	ONE PER TYPE		M	C	C	
5.0	REVIEW OF T.C. FOR MATERIAL OF-						
	5.1 SENSOR	FOR LOT		-	-	B	
	5.2 MOVEMENT			-	-	B	
	5.3 PROCESS CONNECTION			-	-	B	
	5.4 HOUSING		-	-	B		
6.0	REVIEW OF T.C. FOR DEGREE OF PROTECTION	TYPE TEST	-	-	B		
7.0	REVIEW OF T.C. FOR CONTACT RATING OF SWITCH	ONE PER TYPE	-	-	B		
8.0	ACCESSORIES AS APPLICABLE	100%	M	C	C		
LEGEND: M: MANUFACTURER/ SUB CONTRACTOR, C: CONTRACTOR/ NOMINATED INSP AGENCY, B: BHEL. P: PERFORM, W: WITNESS, V: VERIFICATION.							
NOTE: CONTRACTOR TO PROVIDE COMPLIANCE CERTIFICATE FOR TESTS/CHECKS VERIFIED BY CONTRACTOR AND SUBMIT THE SAME ALONGWITH TEST CERTIFICATES TO BE VERIFIED BY BHEL.							



DATA SHEET FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER

SPECIFICATION NO.:

VOLUME

SECTION

REV. NO.

DATE:

SHEET 1 OF 3

TAG No. Qty.....


Data Sheet No.: PES-145-01-DS1- A

Data Sheet A & B

DATA SHEET-A FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER
(TO BE FILLED BY PURCHASER)

DATA SHEET-B
(TO BE FILLED-UP BY BIDDER)

GENERAL	MANUFACTURER		
	MODEL NUMBER		
TECHNICAL	TYPE	TRANSMITTER OF MICROPROCESSOR BASED 2 WIRE TYPE ,HART PROTOCOL COMPATIBLE	
	TRANSMITTER MEASUREMENT	<input type="checkbox"/> PRESSURE <input checked="" type="checkbox"/> DIFF. PRESSURE	
	OUTPUT RANGE	SIGNAL 4-20MA DC (ANALOG) along WITH SUPERIMPOSED DIGITAL SIGNAL (BASED ON HART PROTOCOL)	
	TURN DOWN RATIO	10:1 FOR VACUUM /VERY LOW PRESSURE APPLICATION 30:1 FOR OTHER APPLICATION	
	ACCURACY	± 0.1% OF CALIBRATED SPAN(MINIMUM)	
	STABILITY	± 0.1% OF CALIBRATED SPAN FOR 8 MONTHS FOR RANGE UPTO AND INCLUDING 70 Kg/cm ² ± 0.25% OF CALIBRATED SPAN FOR 8 MONTHS FOR RANGE MORE THAN 70 Kg/cm ²	
	LOAD IMPEDANCE	500 OHM (MIN)	
	RESPONSE TIME (TIME TAKEN FROM CHANGE IN PHYSICAL PARAMETER INPUT CHANGE TO TRANSMITTER , OUTPUT REACHING 63.2 % OF IT'S TOTAL CHANGE INCLUDING THAT TIME)	100 ms OR BETTER	
	HOUSING	IP 55(with corrosion resistance epoxy coating)	
	OVER PRESSURE	150 % OF MAX OPERATING PRESSURE	
	CONNECTION (ELECTRICAL)	PLUG & SOCKET TYPE	
	PROCESS CONNECTION	1" , 150# RF	
	ZERO DRIFT & SPAN DRIFT	+/- 0.015 PER DEG C AT AT MAX SPAN +/- 0.11 PER DEG C AT AT MAX SPAN	
	SPAN & ZERO	CONTINUOUS TEMPER PROOF,REMOTE AS WELL AS ADJUSTABLY MANUAL FROM INSTRUMENT WITH ZERO SUPPRESSION & ELEVATION FACILITY	
	DAIGNOSTICS	SELF INDICATING FEATURE	
POWER SUPPLY	24 V DC ± 10%		

	DATA SHEET FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER		SPECIFICATION NO.:	
			VOLUME	
			SECTION	
			REV. NO.	DATE:
			SHEET 2	OF 3
TAG No. Qty.....			Data Sheet No.: PES-145-01-DS1-A	
Data Sheet A & B				
DATA SHEET-A FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
	ADJUSTMENT/CALIBRATION/MAINTENANCE	HAND HELD CALIBRATOR/HART		
	ACCESSORIES	DIAPHRAGM SEAL,PULSATIONS DAMPENERS,SYPHON ETC AS REQUIRED BY SERVICE & OPERATING CONDITION, 2 VALVE MANIFOLD FOR ABSOLUTE PRESSURE TRANSMITTER (3 -VALVE MANIFOLD FOR GAUGE /VACUUM PRESSURE TRANSMITTER)AND 5 VALVE MANIFOLD FOR DP /LEVEL/FLOW TRANSMITTER		



**CHECK LIST FOR
PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER
(Mechanical Auxiliary Packages)**

SPECIFICATION NO.:

VOLUME

SECTION

REV. NO.

DATE:

SHEET 3 OF 3

Data Sheet No.: PE-CL-999-145-1026-0

SL NO	TESTS/CHECKS	QUANTM OF CHECK	REFERENCE DOC. ACCEPTANCE NORMS	AGENCY			REMARKS
				M	C	B	
1.0	CHECKS FOR VISULA, MODEL TAG NO.	SEE NOTE-1 BELOW	APPROVED TECHINCAL REQUIREMENT/ DATA SHEET	P	W	V	MFR TO CARRY OUT ROUTINE TEST ON 100%. WHEN MATERIAL CORELATION ARE NOT AVAILABLE MFR'S COMPLIANCE TO BE PROVIDED
2.0	PROCESS CONNECTION	-do-		P	W	V	
3.0	ACCURACY	-do-		P	W	V	
4.0	REPEATEABILITY	-do-		P	W	V	
5.0	HYSTERISIS	-do-		P	W	V	
6.0	EFFECT OF TEMP VARIATION ON ACCURACY	-do-		P	W	V	
7.0	SPAN /ZERO ADJUSTMENT	ONE/TYPE		P	W	V	
8.0	EFFECT OF SUPPLY VOLTAGE VARIATION	ONE/TYPE		P	W	V	
9.0	HIGH PRESSURE TEST	SEE NOTE-1 BELOW		P	W	V	
10.0	BURN IN TEST	ONE/TYPE		P	W	V	
11.0	DEGREE OF PROTECTION	ONE/TYPE		P	W	V	

LEGEND:

M: MANUFACTURER/ SUB CONTRACTOR, C: CONTRACTOR/ NOMINATED INSP AGENCY, B: BHEL. P: PERFORM, W: WITNESS, V: VERIFICATION.

NOTE:

1. QUANTUM OF CHECK SHALL BE AS BELOW
100 % - BY MANUFACTURER
RANDOM FOR EACH TYPE - BY BHEL & CUSTOMER
2. MANUFACTURER TO MAINTAIN CALIBRATED INSTRUMENT HAVING BETTER ACCURACY THAN THE ITEM UNDER TEST. INSPECTING ENGINEER SHALL CHECK THE SAME.
3. IN CASE OF IMPORTED ITEMS CONTRACTORS SHALL REVIEW TC's AND NOT INSPECT.

CONTRACTOR TO PROVIDE COMPLIANCE CERTIFICATE FOR TESTS/CHECKS VERIFIED BY CONTRACTOR AND SUBMIT THE SAME ALONGWITH TEST CERTIFICATES TO BE VERIFIED BY BHEL.



**TITLE : TECHNICAL SPECIFICATION
FOR
CONDENSER ON LOAD TUBE CLEANING
SYSTEMS (COLTCS)**

SPEC. NO. PE-TS- 387/388-165-N001

VOLUME : IIB

SECTION : D

REV. NO. 0

DATE : 04.02.2013

SHEET 1 of 1

LIST OF SUBVENDORS




<div style="border: 1px solid black; padding: 5px; text-align: center;">NTPC</div>		PROJECT :					LIST OF ITEMS REQUIRING QP			REF. NO :	
		PACKAGE : TG PACKAGE					APPROVAL & ACCEPTABLE			REVISION NO : 00	
		CONTRACTOR : BHEL - PEM, HYD, EDN, BHOPAL, Trichy					VENDOR AS APPROVED BY			DATE : 11/11/2010	
		CONTRACT NO : 9575-110 and 9586-110									
No.	Major Equipment	QP Inspection Category	QP No. 9575-110/9586-110-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
9	Electronic transmitters (pressure, DP & flow)	III				EMERSON (Rosemount)	USA/Daman	A			
		III				FUJI ELECTRIC YOKOGAWA	JAPAN	A			Testing and Calibration at M/s YIL, Bangalore is also acceptable.
		III				ABB	FARIDABAD	A			Model - 2600 T
		III				ABB	GERMANY	A			Model - 2800 T



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<div style="border: 1px solid black; padding: 5px; text-align: center;">NTPC</div>		PROJECT :				LIST OF ITEMS & QUERING QP				REF. NO :	
		PACKAGE : TG PACKAGE				APPROVAL & ACCEPTABLE				REVISION NO : 00	
		CONTRACTOR : BHEL - PEM, HYD, EDN, BHOPAL, Trichy				VENDOR AS APPROVED BY				DATE : 11/11/2010	
		CONTRACT NO : 9575-110 and 9586-110									
No.	Major Equipment	QP Inspection Category	QP No. 9575-110/ 9586-110- QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
13	Pressure, DP Gauge	III				BALIGA BUDENBERG ASHCROFT	CHENNAI UK USA/Germany	DR A A			

NTPC		PROJECT :					LIST OF ITEMS R. AJIRING QP			REF. NO :	
		PACKAGE : TG PACKAGE					APPROVAL & ACCEPTABLE			REVISION NO : 00	
		CONTRACTOR : BHEL - PEM, HYD, EDN, BHOPAL, Trichy					VENDOR AS APPROVED BY			DATE : 11/11/2010	
		CONTRACT NO : 9575-110 and 9586-110									
No.	Major Equipment	QP Inspection Category	QP No. 9575-110/9586-110-QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub SCH	SS Approval SCH	Remark
		I				ECIL	Hyderabad	DR*			Record updation - See footnotes
		I				Prammen	Pudukottai	A			
		I				Chemin	Pondicherry	A			
29	Instrument Cables	I				Paramount	Khushkhera	A			PVC,FRLS type,RQP
		I				Polycab	Daman	A			PVC,FRLS type,RQP
		I				Delton	Faridabad	A			PVC,FRLS type,RQP
		I				KEI	Bhiwadi	A			PVC,FRLS type
		I				Elkey Teelinks	Faridabad	A			PVC,FRLS type
		I				CORDS	Bhiwadi	A			PVC,FRLS type,RQP
		I				RELIANCE	Bangalore	DR*			PVC,FRLS type,RQP
		I									Record updation - See footnotes
		I				Nicco	Kolkata	A			PVC,FRLS type
		II				TEW & C	USA	A			
		II				Habia cables	Sweeden	A			
		II				Kerpen cables	Germany	A			
		II				Lapp cables	Germany	A			
		II				Thermo electra Bv	Netherland	A			
		I				Universal Cable	Satna	A			PVC,FRLS type
30	Electrical actuator	II				Auma	Germany	A			
		II				Limitorque	USA	A			
		II				Rotorq	UK	A			
		I				Limitorque	Faridabad	A			
		II / I				Rotork	Chennai/ Bangalore	A			For Bangalore - CAT - I
		II				Nippon gear	Japan	A			
		II				Auma	Bangalore	A			
31	Flow nozzle assembly	II				Microprecision	Faridabad	A			Except P-91 Material
		II				SEKO	Austria	A			
		II				TECHNOMATIC	Italy	A			
		II				ABB/ H&B	UK	A			



NTPC

PROJECT :

LIST OF ITEMS PURCHASING QP

REF. NO :

PACKAGE : TG PACKAGE

APPROVAL & ACCEPTABLE

REVISION NO : 00

CONTRACTOR : BHEL - PEM, HYD, EDN, BHOPAL, Trlchy

VENDOR AS APPROVED BY

DATE : 11/11/2010

CONTRACT NO : 9575-110 and 9586-110

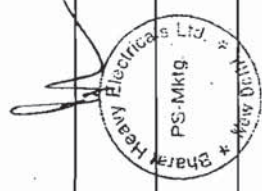
No.	Major Equipment	QP Inspection Category	QP No. 9575-110/ 9586-110- QVI-Q	QP Submission SCH	QP Approval SCH	Proposed Sub Supplier	Country	SS Approval Status	SS Detail Sub.SCH	SS Approval SCH	Remark
		II				IL	Palghat	A			
		II				Daniel	USA	A			
		II				Starmech	Pune	A			
		*				MINCO	GOA	DR			Except P-91 Material * - Inspection category to be decided during vendor evaluation.
		*				Engg. Specialities	Kolkata	DR			
32	HIGH Temp. cable (PTFE/FEP)	III				Habla cables	Sweden	A			
		III				Lapp cables	Germany	A			
		III				Karpen cables	Germany	A			
		III				TEW & C	USA	A			
		III				Thermo-Electra Bv	Netherland	A			
		II				HFCL	Goa	A			
		II				R&M	Switzerland	A			
		II				Aksh Fibre	Bhiwadi	A			
		II				Finolex	Pune/Goa	A			
		II				Birla Ericson	Rewa	A			

33

Fiber optic cable



PROJECTS		CONTRACTOR		CONTRACT NO:- 9575-110-2		LIST OF ITEMS REQUIRED FOR QUALITY PLAN AND SUB-CONTRACTOR'S APPROVAL		Ref. No.		Revision No.	
NTPC								DATE:			
SR NO	ITEM	QP /INS-PN CAT	QP NUMBER	QP SUBMISSION SCH	QP APPL SCH	PROPOSED SUB-SUPPLIER	PLACE	SS APPL L STA TUS/ CAT	SS DE TAI L SU B SC H	SS APPL SCH EDUL E	REMARK
2	MISC PUMPS -HORIZONTAL CENTRIFUGAL	1				WPIL	GAZIABAD	A			CAPACITY REF NTPC LTR DTD 03.03.08
		1				JYOTI PUMPS	VADODRA	A			CAP UPTO 2350 M3/HR
		1				SULZER PUMPS INDIA	MUMBAI	A			CAP UPTO 1900 M3/HR
		1				BEST & CROMPTON (BEACON WEAR)	CHANNAI	A			
		1				VOLTAS	MUMBAI	A			
		1				SAM	COIMBATORE	A			CAPACITY UPTO 1350 M3/HR
		1				KBL	PUNE	A			



Suodh Mand
SV DAM/VD/PEM

ENDORSE
LIST

NTPC		PROJECTS CONTRACTOR		LIST OF ITEMS REQUIRED FOR QUALITY PLAN AND SUB-CONTRACTOR'S APPROVAL				Ref. No. Revision No.			
		CONTRACT NO:- 9675-110-2				DATE :					
SR NO	ITEM	QP /INS- PN CAT	QP NUMB ER	QP SUB MISS ION SCH	QP APPL SCH	PROPOSED SUB-SUPPLIER	PLACE	SS /APP L STA TUS/ CAT	SS DE TAI L SU B SC H	SS APPL SCH EDUL E	REMARK
2	MISC PUMPS -HORIZONTAL CENTRIFUGAL	I				BDK MARKETING	HUBLI	DR			
		I				FLOWMORE	GAZIABAD	A			CAPACITY UPTO 2000 M3/HR
		I				KSB	PUNE	A			
		I				MATHER & PLATT	PUNE	A			

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NTPC

CONTRACTOR

CONTRACT NO:- 9575-110-2

PROJECT

QUALITY PLAN
AND SUB-CONTRACTORS APPROVAL

Revision No.

DATE:

SR NO	ITEM	QP /INS-PN CAT	QP NUMB ER	QP SUB MISSION SCH	QP APPL SCH	PROPOSED SUB-SUPPLIER	PLACE	SS APP L STA TUS/ CAT	SS DE TAL SU B SC H	SS APPL SCH EDUL E	REMARK
13	CCS VALVES OTHER THAN BHEL TRICHY	I				BDK	HUBLI	A			REFER NTPC LETTER DATED 24/02/00 :01/CQA/3520-001/C-04
		I				AUDCO(L&T)	CHENNAI	A			
		I				KSB	COIMBATO RE	A			UPTO 250 NB -600CL : & 400NB -300 CL.; 600NB -150 CL
		I				FOURESS ENGG.	AURANGAB AD	A			
		I				KBL	PUNE	A			GATE /GLOBE UPTO 300 NB - 600 CL; 600 NB-150 CL; CH
		I				PETROL VALVE	ITALY	A			REFER NTPC LETTER DATED 24/02/00 :01/CQA/3520-001/C-04
14	GM VALVES (UPTO 100 NB)	II									VENDOR APPROVAL BY NTPC NOT ENVISAGED.
	CI VALVES (GATE UPTO 500 NB, GLOBE UPTO 250 NB, NR V UPTO 650 NB)	I				BANKIM	KOLKATTA	A			UPTO 350 NB -PN1.0
		I				KBL	KONDHAPU RI	A			ONLY GATE UPTO 600 NB -PN1.0
		I				H SARKAR	KOLKATTA	A			UPTO 350 NB -PN1.0
		I				LEADER ENGG. WORKS	JULLUNDH ER	A			GATE UPTO 600 NB ; GLOBE /CHECK UPTO 300 NB



Encl. 1

NTPC		PROJECTS CONTRACTOR		LIST OF ITEMS REQUIRED FOR QUALITY PLAN AND SUB-CONTRACTORS APPROVAL					Ref. No. Revision No.	
		CONTRACT NO:- 9575-110-2							DATE:	
SR NO	ITEM	QP /INS- PN CAT	QP NUMB ER	QP SUB MISS ION SCH	QP APPL SCH	PROPOSED SUB-SUPPLIER	PLACE	SS APP L STA TUS/ CAT	SS DE TAI L SU B SC H	REMARK
15	BALL VALVES (NON FIRE SAFE TYPE)	I				FLOWCHEM	AHMEDABA D	A		UPTO 350 NBX150#
		I				AUDCO(L&T)	CHANNAI / KANCHIPU RAM	A		
		I				BDK	HUBLI	A		UPTO 400 NBX150#
		I				PEC	NASIK	A		UPTO 400 NBX150#
		I				VAAS AUTOMATION	CHENNAI	DR		
		I				AKAY INDUSTRIES	HUBLI	A		UPTO 50 NB.
		I				LEADER	JALANDHA R	A		UPTO 50 NB.
		I				MICROFINISH VALVES	HUBLI	A		UPTO 400NB, #300



Signature

Signature

NTPC

PROJECT IS

CONTRACTOR

CONTRACT NO:- 9575-110-2

LIST OF ITEMS REQUIRED FOR QUALITY PLAN
AND SUB-CONTRACTOR'S APPROVAL

Revision No.

Ref. No.

SR NO	ITEM	QP /INS- PN CAT	QP NUMB ER	QP SUB MISS ION SCH	QP APPL SCH	PROPOSED SUB-SUPPLIER	PLACE	SS APP L STA TUS/ CAT	SS DE TAI L SU B SC H	SS APPL SCH EDUL E	REMARK
18	CRH-7.8.9, DEAEERATOR PEGGING VALVES	I				PETROL VALVES	ITALY	A			
19	ANGLE VALVES	I				IL	PALGHAT	A			UP TO 2 INCH SIZE
		I				VELAN INC	CANADA	A			UP TO 2 INCH SIZE
		I				SAMPELL AG	GERMANY	A			
		I				REINEKE	GERMANY	A			
20	BUTTERFLY VALVES IN CI / CCS / CSS CONST(UPTO PN 10 & SUBJECT TO LIFE CYCLE TEST).	I				KBL	KONDHAPURI	A			CI/CCS UPTO 1400 MM SIZE
		I				FOURESS ENGG.	BANGALORE	A			
		I				AUDCO	CHANNAI	A			
		I				BDK PROCESS CONTROL	HUBLI	A			CI/CCS UPTO 1050 MM SIZE
		I				INTERVALVE	PUNE	A			UPTO 500 NB
		I				TYCO	HALOL	A			UPTO 500NB PN16 & UPTO 900NB PN10, /2200NB PN 08



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NTPC		PROJECTS CONTRACTOR		CONTRACT NO:- 8575-110-2		LIST OF ITEMS REQUIRED AND SUB-CONTRACTORS APPROVAL				IG QUALITY PLAN		Ref. No. Revision No.	
SR NO	ITEM	QP /INS- PN CAT	QP NUMB ER	QP SUB MISS ION SCH	QP APPL SCH	PROPOSED SUB-SUPPLIER	PLACE	SS APP L STA TUS/ CAT	SS DE TAI L SU B SC H	SS APPL SCH EDUL E	REMARK	DATE :	
20	BUTTERFLY VALVES IN CI / CCS / CSS CONST (UPTO PN 10 & SUBJECT TO LIFE CYCLE TEST)	I				IL	PALGHAT	A					
		I				STAFFORD CONTROLS	PUNE	DR					
21	AIR RELEASE VALVES	III									BHEL APPROVED SOURCES		



- 1 MOTORS LV E1027 BHARAT BIJLEE LTD. PB NO 7011,MILAP NIKETAN 4th FLR 8-A
BAHADUR SHAH ZAFAR MARG,N.DELHI-110002 3354613,3319694
- 2 MOTORS LV C02 CROMPTON GREAVES VANDHANA BUILDING 11, TOLSTOY MARG
NEW DELHI-110001 3730445,3721534
- 3 MOTORS LV A24 ASEA BROWN BOVERI IST FLOOR,QUTUB HOTEL SHAHID JEET
SINGH MARG NEW DELHI-110016 6856205,206,208
- 4 MOTORS LV K01 KIRLOSKAR ELECTRIC CO LTD. P.O. BOX 5555 MALLESWARAM WEST
BANGALORE 560055 3322111,3322771
- 5 MOTORS LV A35 NGEF BANK OF BARODA BDG PBNO.633,16,SANSAD MARG NEW
DELHI-110001 3320893,3328983
- 7 MOTORS LV S01 SIEMENS 4A, RING ROAD I.P. ESTATE NEW DELHI 110002
3318144,3317152
- 8 MOTORS LV M01 MARATHON 708, EROS APARTMENT 56, NEHRU PLACE NEW DELHI-
110019 1146519440
- 9 MOTORS LV A35 GE-POWER 150 AIRPORT ROAD BANGALORE-560017
5263671,5268413
- 10 MOTORS LV E1115 RAJINDRA ELECT INDUSTRIES 14 SHAH IND.ESTATE VEERA DESAI
RD,ANDHERI(W) MUMBAI-400053 6367943,6367944
- 11 MOTORS LV L04 LAXMI HYDRAULICS PVT. LTD 129/130, INDUSTRIAL ESTATE PATIL
NAGAR, HOTGI ROAD SOLAPUR-413003, MAHARASHTRA