

 PEM :: C&I		QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)						QUALITY PLAN NO.: PE-QP-415-145-I 006				
								VOLUME IIB				
								SECTION C				
								ISSUE NO. 2		REV. NO. 3		DATE: 06.12.18
								SHEET 3		OF 7		
Sl. No.	Component / operation	Characteristics Checked	* Cate gory	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
									P	W	V	
		2. Hardness	MA	Measurement	100%	Mfr. standard	Mfr. standard	Test Certificate	3/2	---	2,1	
		3. Endurance / Life cycle	MA	Cyclic test 10,000 cycles	One / Type	10,000 cycles/ Mfr. standard.	No damage	Test Certificate	3/2	---	2,1	
1.3	Spring	1. Composition	MA	Chemical-Analysis	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1	1
		2. Mech. Properties	MA	Mech. Test	One sample/ Heat	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1	
		3. Performance	MA	1. Stiffness ratio	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1	
				2. Scragging	100%	Material spec. / Mfr. standard	Material spec. / Mfr. standard	Test Certificate	3	---	2,1	
				3. Cyclic test (Endurance)	One / type	10,000 cycles	Material spec. / Mfr. standard	Test Certificate	3	---	2,1	
				4. Dimension (Measurement)	One sample/ Lot	Mfr. standard	Mfr. standard	Record	3	---	2,1	1
1.4	Electrical items [Limit switches, Solenoids, Position Transmitter(if provided externally)]	1. Routine Test	MA	HV, IR, Continuity function	100%	Relevant Standards	Relevant Standards	Test Certificate	3	---	2,1	
		2. Degree of protection	MA	IP/NEMA Tests	One sample / type	Approved Data sheet	Approved Data sheet	Test Certificate	3	---	2,1	

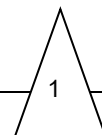
LEGEND: * CR - Critical characteristics
 MA - Major characteristics
 MI - Minor characteristics

RT- Radiographic Test
 UT – Ultrasonic Test

PT – Dye penetrant Test
 MT- Magnetic Test

\$ P - Agency Performing the Test.
 W - Agency Witnessing the Test.
 V - Agency Verifying the Test.

1 - BHEL 4-MAHAGENCO
 2 - Vendor
 3 - Sub-vendor

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									P	W	V		
1.5	Pressure Gauges	1. Performance	MA	Review of calibration certificates	100%	Mfr. Standard	Mfr. Standard	Test Certificate	3	---	2,1		
		2. Marking	MA	Visual	100%	Mfr. standard	Mfr. standard	Records	3	---	2,1		
2.0 IN PROCESS INSPECTION													
2.1	After machining, i Body ii Bonnet iii Plug iv Valve Stem v seat ring/cage	1. Surface flaws	MA	Visual & MT/PT	100% (on accessible surfaces)	ASME B 16.34	ASME B 16.34	Test Records	2	---	1	Butt weld ends shall be included.	
		2. Dimensional checks	MA	Measurement	100%	Mfr. Standard	Mfr. Standard	Records	2	---	1		
		3. Hard facing (wherever applicable)	MA	Hardness Measurement	One sample/Lot	Mfr. Standard	Mfr. Standard	Records	2	---	1		
3.0 TESTS ON COMPLETED VALVE													
3.1	Actuator Chamber	Leakage & Strength	MA	Pneumatic test	100%	Mfr. Standard	No Leakage	Test Certificate	2	1	1	Refer Note-4	
3.2	Body	Leakage and Pressure test (Body Mount Leakage)	MA	Hydro test	100%	ISA - S-75.19/ ASME B16.34	No Leakage	Test Certificate	2	1,4	1	Refer Note-4	
3.3	Seat leakage test for completed valve	Seat Leakage	MA	Pneumatic Test	100%	FCI-70.2	FCI-70.2	Test Certificate	2	1,4	1	Refer Note-4	
4.0	OPERATION TEST ON COMPLETED VALVE (Final inspection)	1. Valve Travel	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1,4	1	Refer Note-4	
		2. Opening/Closing time	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1,4	1	Refer Note-4	
		3. Linearity/cam characteristic	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1,4	1	Refer Note-4	
LEGEND: * CR - Critical characteristics RT- Radiographic Test PT – Dye penetrant Test \$ P - Agency Performing the Test. 1 - BHEL 4-MAHAGENCO MA - Major characteristics UT – Ultrasonic Test MT- Magnetic Test W - Agency Witnessing the Test. 2 - Vendor MI - Minor characteristics V - Agency Verifying the Test. 3 - Sub-vendor													

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									P	W	V	
		4. Repeatability	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1,4	1	Refer Note-4
		5. Hysteresis	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1,4	1	Refer Note-4
		6. Sensitivity	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1,4	1	Refer Note-4
		7. Accuracy (Overall)	MA	Measurement	100%	Mfr. Procedure	Approved drg. / data sheet	Test Report	2	1,4	1	Refer Note-4
		8. Control Valve characteristics / CV Test	MA	♦ Measurement (Press. vs. discharge and discharge vs. opening 0-100% in steps of 10%)	100%	Mfr. Procedure	Approved drg. / data sheet	Test Certificate	2	1,4	1	♦ Size = Body & port size Or Body size & CV for non std port. Refer Note 1.
		9. Operation of limit switch & solenoids and other accessories	MA	Function	100%	Mfr. Procedure	Approved drg./ data sheet	Test Report	2	1,4	1	On assembled valve Refer Note-4
		10. Overall dimensions	MI	Visual and dimensional	100%	Approved drg. / data sheet	Approved drg./ data sheet	Records	2	1,4	1	Refer Note-4
		11. Pre defined valve position in case of air failure	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	1,4	1	
		12. Cleanliness, painting, stamping (for direction of flow), Tag No.	MA	Visual and dimensional, paint thickness	100%	Mfr. Procedure	Approved drg./ data sheet	Test Certificate	2	1,4	1	
		13. Surface Quality	MA	Visual	100%	MSS-SP-55	MSS-SP-55	Test Certificate	3/2	---	2,1	

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									P	W	V	
5.0	AUXILIARY ITEMS (Performance test of auxiliary items shall be performed on the completely assembled valve)											
5.1	Positioner	Overall leakage after assembly including Nozzles leakage	MA	Leak Test (in the steady state input signal)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	1	Certificate of Conformance (C.O.C)
5.2	Air filter regulator	1. Normal air consumption	MA	Measurement	Each type	Mfr. Standard	No leakage	Test Certificate	3/2	---	1	(C.O.C)
		2. Overall leakage	MA	Visual (soap solution)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	1	(C.O.C)
5.3	Air lock relay	Performance Test	MA	Leakage test	100%	Mfr. Standard	No leakage	Test Certificate	3/2	---	1	(C.O.C)
5.4	Electronic position transmitter(not applicable if provided integral to smart positioner)	1. Accuracy	MA	Operation	100%	Approved data sheet /	Approved data sheet /	Test Certificate	2	1	1	(C.O.C)
5.5	Current to Pneumatic converter(not applicable for smart positioner)	1. Physical Verification Make/Model	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	---	1	(C.O.C)
		2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3	---	1	(C.O.C)
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	1	(C.O.C)
		4. Hysteresis	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	1	(C.O.C)
5.6	Smart Positioner	1. Physical Verification Make/Model	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	---	1	(C.O.C)

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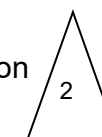
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									P	W	V	
	(As Applicable)	2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3	---	1	(C.O.C)
		3. Linearity	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	1	(C.O.C)
		4. Hysterisis	CR	Measurement	100%	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection Report	2	---	1	(C.O.C)
		5. Calibration with Hand Held Communicator	MA	Measurement	Each type	Mfr. Standard	Mfr. Standard	Test Certificate	2	---	1	(C.O.C)
6.0	PAINTING	Soundness of Painting	MA	Visual and Measurement	100%	Mfr. Standard	Mfr. Standard	Inspection Report	2	---	---	Refer Note-2
7.0	PACKING	Soundness of Packing against transit damage	MA	Visual	100%	Mfr. Standard	Mfr. Standard	Inspection Report	2	---	---	Refer Note-3

NOTES:

1. In case valid CV test certificate for a similar control valve (same size, same CV, same trim characteristics) is not submitted to BHEL by the vendor, CV test shall be conducted at FCRI/Any govt. approved laboratory/ BHEL approved Laboratory.
2. In the absence of BHEL spec. for painting, vendor to obtain BHEL's approval on their painting specification / procedure.
3. Sea worthy packing shall be provided, if called for in the Data sheets.
4. The quantum of check shall be 100% for manufacturer and 100% for Customer/BHEL/BHEL nominated inspection agency.
5. IBR certificates in Form III-C shall be submitted if called for in the specification/datasheet.
6. Copies of all TC's (Test Certificates) for materials duly correlated with Heat Nos., TC's for electrical items and mechanical tests (Leak/Operation), C.O.C's (Certificates of Conformance) shall be submitted to BHEL for verification and acceptance.



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 PEM :: C&I		QUALITY PLAN FOR FLOW ORIFICE PLATE ASSEMBLY						QUALITY PLAN NO.: PE-QP-415-145-I005					
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									P	W	V		
1.0	MATERIAL Orifice Plate	1. Physical, Chemical properties	MA	Physical, Chemical Tests	One / Plate OR One/ Heat	AP / DS / SP	AP / DS / SP	Lab Report	3/2	---	2,1	IBR certification (if applicable) to be verified by BHEL	
1.1		2. Dimensions	MA	Measurement	100%	AP	AP	IR	3/2		1		
1.2	Flanges A. Forgings	Chemical,Mech Properties, UT & Heat Treatment	MA	Chem & Mech UT test	Sample	Material Spec as per ASTM A 388 for UT	ANSI B 16.34	MTC,UT cert,HT cert	3/2	---	1		
	B. Machining	Dimensions	MA	Measurement	100 %	AP / DS	AP / DS	IR	3/2	----	1		
2.0	IN PROCESS Machine	1. Dimension	MA	Measurement	100%	AP	AP	IR	3/2	2	2		
		2. Surface finish	MA	Visual	100%	-----	Mirror Finish	-----	3/2	2	---		
		3. Surface flaw on machined surface	MA	Penetrant test	100%	ASTM 165 / IS:3658	No surface flaw	IR / TC	3/2	2	1		
3.0	ASSEMBLY and FINAL INSPECTION	1. Overall dimensions	MA	Measurement	100%	AP	AP	IR	3/2	2,1	----		
		2. Marking, Tag no. Direction of flow	MA	Visual	100%	AP / DS	AP / DS	IR	3/2	2	1		
		3. Calibration	MA	Performance Test	100%	-----	SP	TC	3/2	-----	1,4		
		4. Painting	MA	Visual	100%	SP / MS	SP / MS	IR / MR	3/2	-----	1		
		5. Root valve BOQ	MA	Measurement	100%	AP / DS	AP / DS	IR	2		1		

LEGEND:

* CR

- Critical characteristics

MA

- Major characteristics

MI

- Minor characteristics

IR - Inspection Reports

TC - Test Certificates

AP – Approved Drawings/doc

DS – Data Sheet

SP – Tech. Spec.

MR- Manufacturer records

MS- Manufacturer standards

\$ P

- Agency Performing the Test.

1- BHEL4-MAHAGENCO

W

- Agency Witnessing the Test.

2

- Vendor

V

- Agency Verifying the Test.

3

- Sub-vendor

 PEM :: C&I		QUALITY PLAN FOR FLOW ORIFICE PLATE ASSEMBLY						QUALITY PLAN NO.: PE-QP-415-145-I005					
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Sl. No.	Component / operation	Characteristics Checked	* Cate gory	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^{\$}			Remarks	
									P	W	V		
4.0	PACKING	Soundness of Packing against transit damage	MA	Visual	100%	SP / MS	SP / MS	----	3/2	----	----	Refer Note 4	

NOTE:

1. All test reports & dimension reports shall be verified by BHEL wherever verification is by BHEL at the time of Final Inspection. Positive material identification testing shall be performed by vendor and the same shall be witnessed by BHEL.
2. Minimum 2 coats of primer paint to be applied before dispatch.
3. CALIBRATION Test to be carried out at IIT-DELHI / FCRI or BHEL approved laboratory.
4. Sea Worthy packing, if applicable.

LEGEND: * CR - Critical characteristics IR - Inspection Reports DS – Data Sheet
 MA - Major characteristics TC - Test Certificates SP – Tech. Spec.
 MI - Minor characteristics AP – Approved Drawings/doc

MR- Manufacturer records
 MS- Manufacturer standards

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 PEM :: C&I		STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL						STD QUALITY PLAN NO.: PE-QP-999-145-I056				
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Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^s			Remarks
									P	W	V	
1.0	INCOMING Sheet Steel (CRCA & HR)	1. Chemical Composition 2. Bend Test 3. Surface finish 4. Waviness 5. Thickness 6. Mill marking	MA CR MA MA MA MA	Chemical analysis Mech. test Visual Visual Measurement Visual	Sample IS:1079 IS:513 Sample IS:1079 IS:513 100% 100% 100% 100%	IS:1079 IS:513 IS:1079 IS:513 Factory Standard / Sample Factory Standard BHEL Spec. Factory Standard	IS:1079 IS:513 IS:1079 IS:513 Factory Standard / Sample No Waviness BHEL Spec. Log Factory Standard	Test Certificate Log Book Log Book Log Book Book Log Book	3 --- 2 2 2 2 2	--- --- --- --- --- ---	2 --- --- --- --- 1	
2.0	Flats / Angles / Channels	1. Dimensions 2. Surface Defects 3. Straightness 4. Mill marking	MA MA MA MA	Measurement Visual Measurement Visual	Sample 100% 100% 100%	IS:2062 Factory Standard / Sample Factory Std. IS:2062	IS:2062 Log Factory Standard / Sample Factory Std. IS:2062 Log	Book Log Book Log Book Book	2 2 2 2	--- --- --- ---	--- --- --- 1	
3.0	Cables / Wires	1. Visual / Surface defects 2. IR and HV	MA MA	Visual Electrical	100% 100%	BHEL Spec. and IS:1554 or IS:694 BHEL Spec. and IS:1554 or IS:694	BHEL Spec. and IS:1554 or IS:694 BHEL Spec. and IS:1554 or IS:694	Log Book Log Book	2 2	--- ---	--- ---	
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									P	W	V	
		3. Conductor a) Resistance b) Size c) Sheath colour	MA MA MA	Electrical Measurement Visual	100% 100% 100%	BHEL Spec. and IS:1554 or IS:694	BHEL Spec. and IS:1554 or IS:694	Log Book	2	---	---	
		4. Type / Routine Test Certificates	MA Verification		100% BHEL Spec. and IS:1554 or IS:694	BHEL Spec. and IS:1554 or IS:694	BHEL Spec. and IS:1554 or IS:694	Log Book	3	---	2	
4.0	Electrical Components like	1. Verification at make and Type	CR Visual		Sample	BHEL Spec. and BOM	BHEL Spec. and BOM	Log Book	2	---	---	
2	Annunciator	. Verification of Test Certificates	CR Scrutiny of Type / Routine T.Cs.		100%	Relevant IS	Relevant IS	Log Book	2	---	---	
3.	Transformers	Operation / Functional check	CR Electrical		Sample+ 100% @	Relevant Indian Std & Catalogue	Relevant Indian Std & Catalogue	Log Book	2	---	---	+ for relay & contactors only
4	Lamps	. I.R.	MA	Electrical	100%	Relevant Indian Std & Catalogue	Relevant Indian Std & Catalogue	Log Book	2	---	---	@ for all components except relays & contactors.
5	Switches	. H.V.	MA	Electrical	100%	Relevant Indian Std & Catalogue	Relevant Indian Std & Catalogue	Log Book	2	---	---	
	PBs	6. Calibration	MA	Electrical	100%	Relevant Indian Std & Catalogue	Relevant Indian Std & Catalogue	Log Book	2	---	1	
	Contactors	7. Pick up / Drop off Voltage	MA	Electrical	100%	Relevant Indian Std & Catalogue	Relevant Indian Std & Catalogue	Log Book	2	---	---	
	Relays											
	Timers											
	Space Heaters											
	Thermostat											
	Indicating meters etc.											

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									P	W	V		
5.0 M	isc. Components like Gaskets, Terminal Blocks etc.	1. Verification of Type / Make	MA	Visual	Sample	BHEL Spec. & Mfrs. Catalogue	BHEL Spec. & Mfrs. Catalogue	Log Book	2	---	---		
2.		Surface defects	MA	Visual	Sample	BHEL Spec. & Mfrs. Catalogue	BHEL Spec. & Mfrs. Catalogue	Log Book	2	---	---		
		3. IR / HV on Terminal Blocks	MA	Electrical	Sample	BHEL Spec. & Mfrs. Catalogue	BHEL Spec. & Mfrs. Catalogue	Log Book	2	---	---		
6.0	IN PROCESS Blanking / Bending / Forming	1. Di mensions	MI	Measurement	100%	Approved Mfr. drgs.	Approved Mfr. drgs.	Log Book	2	---	---		
		2. Surface defects after bending	MA Vi	sual	100%	Factory Standard	Factory Standard	Log Book	2	---	---		
7.0	Nibbling / Punching	1. Cutout Sizes	MI	Measurement	100%	Approved Mfr. drgs.	Approved Mfr. drgs.	Log Book	2	---	---		
		2. Deburring	MA	Visual	100%	Approved Mfr. drgs.	Approved Mfr. drgs.	Log Book	2	---	---		
8.0 F	ASSEMBLY Frame Assembly & Sheet fixing	1. Di mensions	MA	Measurement	100%	Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards	Log Book	2	---	2		
		2. Alignment	MA	Measurement	100%	Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards	Log Book	2	---	2		
		3. Welding Quality	MA	Visual	100%	Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards	Log Book	2	---	2		
		4. Surface defects	MA	Visual	100%	Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards	Log Book	2	---	2		
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बीएसडीएल BHEL PEM :: C&I		STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL						STD QUALITY PLAN NO.: PE-QP-999-145-1056					
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									P	W	V		
9.0	Pre-treatment and Painting	1. Pre treatment Process	MA	Visual	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1		
		2. Process parameters like bath temp. concentration etc.	MA M	Measurement	Periodic	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1		
		3. Dipping / Removal Time	MA	Measurement	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1		
		4. Surface quality after every dip	MA Vi	Visual	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1		
		5. Primer after phosphating	MA	Visual, Thickness	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1		
		6. Putty Application & Rubbing after primer	MA Vi	Visual	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1		
		7. Paint first coat	MA	Visual, Thickness	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1		
		8. Putty Application and Rubbing after first coat of paint	MA Vi	Visual	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1		
		9. Paint second coat	MA	Visual, Thickness, Scratch test Colour adhesion	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1		
LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics ^s P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test. 1 - BHEL 2 - Vendor 3 - Sub-vendor													

 PEM :: C&I		STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL						STD QUALITY PLAN NO.: PE-QP-999-145-I056				
								VOLUME I IB				
								SECTION D				
								REV. NO. 01 DATE: 22-02-2008				
								SHEET 5 OF 7				
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^s			Remarks
									P	W	V	
10.	Panel Wiring	1. Wiring Layout	MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	---	
		2. Wiring Termination (Crimped Lugs)	MA Visual	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	---	
		3. Ferrule numbers	MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	---	
		4. Colour of wiring	MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	1	
		5. Size of Conductor MA		Measurement 1	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	1	
11.	Component Mounting	1. Correct components MA		Visual	100%	Approved drgs., Specs. & BOM	Approved drgs., Specs. & BOM	Log Book	2	---	---	
		2. Fixing MA		Visual	100%	Approved drgs., Specs. & BOM	Approved drgs., Specs. & BOM	Log Book	2	---	---	
12.	FINAL Inspection	1. Workmanship	MA	Visual	100%	Factory Standard	Factory Standard	Inspection Report	2 1		1	At Random by BHEL, based on 100 % internal test reports by Mfr.
		2. Component layout (neatness, accessibility & safety) Mounting / Proper fixing of all components	MA Visual	Visual	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2 1		1	
		3. Components identification Marking / Name plates	MA Visual	Visual	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2 1		1	

LEGEND: * CR - Critical characteristics
MA - Major characteristics
MI - Minor characteristics

^s P - Agency Performing the Test.
W - Agency Witnessing the Test.
V - Agency Verifying the Test.

1 - BHEL
2 - Vendor
3 - Sub-vendor

 PEM :: C&I		STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL						STD QUALITY PLAN NO.: PE-QP-999-145-I056				
								VOLUME I IB				
								SECTION D				
								REV. NO. 01 DATE: 22-02-2008				
								SHEET 6 OF 7				
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^s			Remarks
									P	W	V	
		5. Dimensions	MA	Measurement	100%	BHEL approved drg. / Spec., BOM	BHEL approved drg. / Spec., BOM	Inspection Report	2 1		1	At Random by BHEL, based on 100 % internal test reports by Mfr.
		6. Door functioning	MA	Functional	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2 1		1	
		7. Paint Shade	CR	Visual	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2 1		1	
		8. Paint Thickness	CR	Measurement	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2 1		1	
		9. Workmanship of Gaskets	MA	Visual	100%	Factory Standard	Factory Standard	Inspection Report	2 1		1	
		10. Wiring Layout MA		Visual 1	00%	BHEL approved drg.	BHEL approved drg.	Inspection Report	2 1		1	
		11. Wire Termination	MA Pu	Wiring manually	Sample ----		Firm termination	Inspection Report	2 1		1	
		12. Continuity	MA	Electrical	100%	-----	Continuity OK	Inspection Report	2 1		1	

LEGEND: * CR - Critical characteristics
 MA - Major characteristics
 MI - Minor characteristics

^s P - Agency Performing the Test.
 W - Agency Witnessing the Test.
 V - Agency Verifying the Test.

1 - BHEL
 2 - Vendor
 3 - Sub-vendor

 PEM :: C&I		STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL						STD QUALITY PLAN NO.: PE-QP-999-145-I056				
								VOLUME I IB				
								SECTION D				
								REV. NO. 01 DATE: 22-02-2008				
								SHEET 7 OF 7				
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^s			Remarks
									P	W	V	
13. T	TYPE TEST	Degree of Protection	CR	Mech. Protection	Sample	BHEL approved spec., drg relevant IS-13947 Part-1, IS-2148.	BHEL approved spec., drg relevant IS-13947 Part-1, IS-2148.	Type Test Certificate	3 ---		1	
14	ROUTINE TEST	IR before & after HV Test	CR	Electrical	100%	BHEL approved spec., drg., BOM & relevant IS.	BHEL approved spec., drg., BOM & relevant IS.	Test Report	2	1	1	
15	FUNCTIONAL TEST	1. Control Logic Operation	CR	Electrical	100%	BHEL approved spec. / drg.	BHEL approved spec. / drg.	Inspection Report	2	1	1	
		2. Instrument Calibration	CR	Electrical	10%	BHEL approved spec. / drg.	BHEL approved spec. / drg.	Inspection Report	2	1	1	
		3. Temperature rise	CR	Electrical	100%	BHEL approved spec/drg. & relevant IS.	BHEL approved spec/drg & relevant IS.	Inspection Report	2	1	1	

LEGEND: * CR - Critical characteristics
MA - Major characteristics
MI - Minor characteristics

^s P - Agency Performing the Test.
W - Agency Witnessing the Test.
V - Agency Verifying the Test.

1 - BHEL
2 - Vendor
3 - Sub-vendor

	Technical specification for CONTROL & INSTRUMENTATION		
	SECTION D		
	REV. NO.	00	DATE : 13.07.2018

INSTRUMENT CHECK LISTS



STANDARD CHECK LIST FOR C&I INSTRUMENTS (for Maux Pkgs)

CHECK LIST FOR TRANSMITTER

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECKS FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS	P	W	V	
	VISUAL.						
	MODEL/TAG No						
2	PROCESS CONNECTION			P	W	V	
3	ACCURACY			P	W	V	
4	REPEATABILITY			P	W	V	
5	HYSTERESIS			P	W	V	
6	EFFECT OF TEMP VARIATION ON ACCURACY			P	W	V	
7	SPAN / ZERO ADJUSTMENT	ONE / TYPE		P	W	V	
8	EFFECT OF SUPPLY VOLTAGE VARIATION			P	W	V	
9	EFFECT OF LOADING (500 OHM METERS)			P	W	V	
10	HIGH PRESSURE TEST	SEE NOTE-1 BELOW		P	W	V	
11	BURN-IN TEST	ONE / TYPE		P	W	V	
12	DEGREE OF PROTECTION			P	W	V	
13	ACCESSORIES AS APPLICABLE	SEE NOTE-1 BELOW		V	V	V	

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL,
P = Perform, W = Witness, V = Verification

Note :

1. Quantum of check shall be as below :
100 % - By Manufacturer
2. Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
3. When material correlation are not available manufacturer's compliance to be provided.
4. Contractor to provide compliance certificate for tests/checks verified by contractor and submit the same alongwith test certificates to be verified by BHEL.



STANDARD CHECK LIST FOR C&I INSTRUMENTS (for Maux Pkgs)

CHECK LIST FOR TEMPERATURE ELEMENT

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECK FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS	P	W	V	
	TYPE						
	MODEL No./TAG No.						
	PROCESS CONNECTION						
2	STABILITY			P	W	V	
3	INSULATION RESISTANCE			P	W	V	
4	ENCLOSURE CLASS			P	W	V	
5	RESPONSE TIME			P	W	V	
7	ACCURACY			P	W	V	
8	HYDROSTATIC TEST			P	W	V	
9	ELECTRICAL CHARACTERISTIC OF SENSOR (CONTINUITY OF T/C WIRES & INSULATION RESISTANCE OF RTD LEADS w.r.t. BODY			P	W	V	
10	TEMP CURVES / CHARTS			P	V	V	
11	AMBIENT TEMP. EFFECT CHECK			P	W	V	
12	HV TEST			P	W	V	

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL,
P = Perform, W = Witness, V = Verification

Note :

- Quantum of check shall be as below :
100 % - By Manufacturer
- Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
- Contractor to provide compliance certificate for tests/checks verified by contractor and submit the same alongwith test certificates to be verified by BHEL.
- IBR certificate to be provided, if applicable



STANDARD CHECK LIST FOR C&I INSTRUMENTS (for Maux Pkgs)

CHECK LIST FOR TEMPERATURE GAUGE

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECK FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS	P	W	V	
	DIAL SIZE						
	MODEL NO./TAG NO./TYPE						
	RANGE/SCALE						
	END CONNECTION						
2	CALIBRATION			P	W	V	
	ACCURACY						
	REPEATABILITY						
	HYSTERESIS						
3	OVER TEMP. TEST			P	W	V	
4	AMBIENT TEMP. COMPENSATION CHECK	1 OF TYPE	P	V	V		
5	REVIEW OF TC FOR MATERIALS OF	FOR LOT	V	V	V		
	SENSOR						
	MOVEMENT						
	PROCESS CONNECTION						
	THERMOWELL						
	HOUSING						
6	REVIEW OF TC FOR DEGREE OF PROTECTION	TYPE TEST	V	V	V		
7	THERMOWELL	SEE NOTE-1 BELOW	AS PER APPD DWG		V	V	
	MATERIAL TC & DIMN. CHECK						
	HYD.TEST						
	OVER RANGE TEST						

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL, P = Perform, W = Witness, V = Verification

Note :

- Quantum of check shall be as below :
100 % - By Manufacturer
- Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
- Manufacturer to carry out ROUTINE TEST on 100 %.
- IBR certificate to be provided if called for in specn.
- Contractor to provide compliance certificate for tests/checks verified by contractor and submit the same alongwith test certificates to be verified by BHEL.



STANDARD CHECK LIST FOR C&I INSTRUMENTS (for Maux Pkgs)

CHECK LIST FOR PRESSURE & DP GAUGE

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECK FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS	P	W	V	
	SENSOR TYPE						
	DIAL SIZE						
	MODEL NO/TAG NO						
	RANGE/SCALE						
	SWITCH CONTACT RATING & NOS.						
	END CONNECTION						
2	CALIBRATION			P	W	V	
	ACCURACY						
	REPEATABILITY						
	SET POINT ADJUSTMENT						
3	OVER PRESSURE & LEAK TEST		P	W	V		
4	OPERATION OF PRESSURE. RELIEF DEVICE	ONE		P	W	V	
5	REVIEW OF TC FOR	FOR OT		V	V	LV	
	MATERIALS OF SENSOR						
	MOVEMENT						
	PROCESS CONNECTION						
	HOUSING						
6	REVIEW OF TC FOR DEGREE OF PROTECTION	TYPE TEST		V	V	V	
7	ACCESSORIES AS APPLICABLE	SEE NOTE-1 BELOW		V	V	V	

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL, P = Perform, W = Witness, V = Verification

Note :

- Quantum of check shall be as below :
100 % - By Manufacturer
- Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
- Manufacturer to carry out ROUTINE TEST on 100 %.
- When material correlation is not available, MFR's compliance to be provided
- Contractor to provide compliance certificate for tests/checks verified by contractor and submit the same alongwith test certificates to be verified by BHEL.



STANDARD CHECK LIST FOR C&I INSTRUMENTS (for Maux Pkgs)

CHECK LIST FOR LEVEL GAUGE

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECK FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS / DRWGS	P	W	V	
	TYPE						
	MODEL/ TAG NO.						
	DAIL SIZE						
	RANGE/SCALE						
	END CONNECTION						
2	DIMENSIONS, PROCESS CONNECTION	ONE / LOT		P	W	V	
3	ACCURACY			P	W	V	
4	MATERIAL TC FOR			P	V	V	
	BODY ISO.						
	VALVE						
	GAUGE GLASS						
5	HYD. TEST	SEE NOTE-1 BELOW		P	W	V	
6	ACCESSORIES AS APPLICABLE			P	W	V	

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL,
P = Perform, W = Witness, V = Verification

Note :

- Quantum of check shall be as below :
100 % - By Manufacturer
- Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
- Manufacturer to carry out ROUTINE TEST on 100 %.
- Contractor to provide compliance certificate for tests/checks verified by contractor and submit the same alongwith test certificates to be verified by BHEL.

FORM NO. PEM-6666-0

	CHECK LIST FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER (Mechanical Auxiliary Packages)	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE:
		SHEET 1 OF 1	
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 VISUAL, 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	

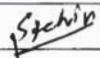
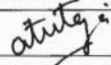
LEGEND:

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.

	PREPARED BY	CHECKED BY	APPROVED BY
NAME	SACHIN SRIVASTAVA	DILIP JEJURIKAR	ALKA TUTEJA
SIGNATURE			
DATE	30.09.08	30.09.08	30.09.08

5177/2020/PS-PEM-MAX

FORM NO. PEM-6666-0



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

SPECIFICATION NO.:

VOLUME

SECTION

REV. NO.

DATE:

SHEET 2 OF

2

Data Sheet No.: PE-CL-999-145-I031-0

SL NO	TESTS/CHECKS	QUANTUM OF CHECK	REFERENCE DOC. ACCEPTANCE NORMS	AGENCY			REMARKS	
				P	W	V		
1.0	CHECK FOR		APPROVED TECHINCAL REQUIREMENT/ DATA SHEET/ RELEVANT STANDARD / MANUFACTURER CATALOGUE				MFR TO CARRY OUT ROUTINE TEST ON 100%.	
	1.1 MODEL NO/TAG NO	100%		M	C	C		
	1.2 RANGE/SCALE	100%		M	C	C		
	1.3 END CONNECTION	100%		M	C	C		
	1.4 SWITCH CONTACT RATING & NOS	100% M			C	C		
2.0	CALIBRATION						WHEN TC FOR MATERIAL FOR THE PROJECT NOT AVAILABLE , COMPLIANCE CERTIFICATE TO BE PROVIDED BY THE MANUFACTUR ER.	
	2.1 REPEATABILITY	100%		M	C	B		
	2.2 DIFFERENTIAL	100%		M	C	B		
	2.3 SET POINT ADJUSTMENT	100% M			C	B		
3.0	OVER PRESSURE & LEAK TEST	100% M			C	C		
4.0	REVIEW OF T.C. FOR MATERIAL OF--							
	5.1 SENSOR	FOR LOT		--		B		
	5.2 MOVEMENT			-	-	B		
	5.3 HOUSING			-	-	B		
5.0	REVIEW OF T.C. FOR DEGREE OF PROTECTION	TYPE TEST		-	-	B		
6.0	REVIEW OF T.C. FOR MICRO SWITCH	FOR LOT	-	-	B			
7.0	ACCESSORIE S 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.



STANDARD CHECK LIST FOR C&I INSTRUMENTS (for Maux Pkgs)

CHECK LIST FOR LEVEL GAUGE

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECK FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS / DRWGS	P	W	V	
	TYPE						
	MODEL/ TAG NO.						
	DAIL SIZE						
	RANGE/SCALE						
	END CONNECTION						
2	DIMENSIONS, PROCESS CONNECTION	ONE / LOT		P	W	V	
3	ACCURACY			P	W	V	
4	MATERIAL TC FOR			P	V	V	
	BODY ISO.						
	VALVE						
	GAUGE GLASS						
5	HYD. TEST	SEE NOTE-1 BELOW		P	W	V	
6	ACCESSORIES AS APPLICABLE			P	W	V	

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL,
P = Perform, W = Witness, V = Verification

Note :

1. Quantum of check shall be as below :
100 % - By Manufacturer
2. Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
3. Manufacturer to carry out ROUTINE TEST on 100 %.
4. Contractor to provide compliance certificate for tests/checks verified by contractor and submit the same alongwith test certificates to be verified by BHEL.



STANDARD CHECK LIST FOR C&I INSTRUMENTS (for Maux Pkgs)

CHECK LIST FOR ANNUNCIATORS

Sl. No.	Test / Checks	Quantum of check	Reference Doc. / Acceptance Norms	Agency **			Remarks
				M	C	B	
1	CHECK FOR	SEE NOTE-1 BELOW	APPROVED SPEC./ DATA SHEETS	P	W	V	
	TYPE/ MODEL						
	DIMENSIONS OF HARDWARE						
	MODULARITY						
	SEQUENCE						
	FACIA DETAILS						
2	FUNCTIONAL TEST	100%		P	W	V	
3	IMMUNE TO STEP VARIATIONS IN THE POWER SUPPLY	SEE NOTE-1 BELOW		P	W	V	
4	DEGREE OF PROTECTION FOR ENCLOSURE	TYPE TEST		P	W	V	
5	I/R CHECK	SEE NOTE-1 BELOW		P	W	V	
6	RESPONSE			P	W	V	

Legend :

** M = Manufacturer / Sub-contractor, C = Contractor / Nominated Inspecting Agency, B = BHEL,
P = Perform, W = Witness, V = Verification

Note :

- Quantum of check shall be as below :
100 % - By Manufacturer
- Manufacturer to maintain calibrated instrument having better accuracy than the item under test. Inspecting engineer shall check the same.
- Manufacturer to carry out ROUTINE TEST on 100 %.
- Contractor to provide compliance certificate for tests/checks verified by contractor and submit the same alongwith test certificates to be verified by BHEL.

51.77/2020/PS-PEM-MAX.



TITLE :

**1X660 MW BHUSAWAL THERMAL
POWER STATION UNIT -6**

SPECIFICATION NO. PE-TS-415-673-
A001

SECTION : I

**TECHNICAL SPECIFICATION FOR SEWAGE
TREATMENT PLANT**

SUB-SECTION: IA

REV. NO. 00

DATE :

ANNEXURE II**LIST OF MAKES OF SUB-VENDOR ITEMS**

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
1.	PRESSURE VESSELS	GLOBAL STRUCTURES & COMPOSITE LTD	-	
		JASMINO POLYMERTECH	TALOJA	
		SYSCON ENGINEERS	AMBERNATH	
		S.V. FABRICATORS	NAVI MUMBAI	
		SPARK FABRICATORS / STEELCON	-	
		ANUP ENGINEERING	AHMEDABAD	
		MURTHAL TANKS & VESSELS	SONEPAT	
		TITAN ENGG.	DURGAPUR	
		RISHI INDUSTRIES	BAHALGARH	
		UNIVERSAL HEAT EXCHANGERS	-	
		ATS CHEM	SALEM/HOSUR	
		CHEM PROCESS SYSTEM	SANAND	
		PROGEN	CHENNAI	
		CRYSTAL ENGINEERING	HOSUR	
		ISHAN EQUIPMENTS	VADODARA	
2.	ATMOSPHERIC/ STORAGE TANKS	GLOBAL STRUCTURES & COMPOSITE LTD	-	
		JASMINO POLYMERTECH	TALOJA	
		SYSCON ENGINEERS	AMBERNATH	
		S.V. FABRICATORS	NAVI MUMBAI	
		SPARK FABRICATORS / STEELCON	-	
		ANUP ENGINEERING	AHMEDABAD	
		MURTHAL TANKS & VESSELS	SONEPAT	
		TITAN ENGG.	DURGAPUR	
		RISHI INDUSTRIES	BAHALGARH	
		UNIVERSAL HEAT EXCHANGERS	-	
		ATS CHEM	SALEM/HOSUR	
		CHEM PROCESS SYSTEM	SANAND	
		PROGEN	CHENNAI	
		CRYSTAL ENGINEERING	HOSUR	
		ISHAN EQUIPMENTS	VADODARA	
3.	RUBBER LINING (AT SHOP)	TEMSEC	KOLKATA	
		RISHI INDUSTRIES	SONEPAT	
		CORI ENGINEERS	CHENNAI	

51.77/2020/PS-PEM-MAX.



TITLE :

1X660 MW BHUSAWAL THERMAL
POWER STATION UNIT -6TECHNICAL SPECIFICATION FOR SEWAGE
TREATMENT PLANTSPECIFICATION NO. PE-TS-415-673-
A001

SECTION : I

SUB-SECTION: IA

REV. NO. 00

DATE :

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		POLY RUBBER	MUMBAI	
		INDUSTRIAL LINING	VADODARA	
		ARUL RUBBERS	CHENNAI	
		JASMINO POLYMERTECH	TALOJA	
		WESTERN RUBBER	NAVI MUMBAI	
		ELASTOMER LINNING	AMBERNATH	
		EMKAY RUBBER	MUMBAI	
4.	AGITATOR	REMI PEOCESS PLANT & M/C	MUMBAI	
		FIBRE & FIBRE	MUMBAI / SILVASA	
		CEECONS	CHENNAI	
		STANDARD ENGINEERS	MUMBAI	
5.	VERTICAL CENTRIFUGAL PUMPS	BHARAT PUMPS & COMPRESSORS LTD	ALLAHABAD	
		FLOWMORE LTD.	GURGAON	
		FLOWERVE INDIA CONTROLS PVT. LTD.	COIMBATORE	
		JYOTI LTD.	VADODARA	
		WILO MATHER & PLATT PUMPS PVT. LTD.	PUNE	
		SULZER PUMPS INDIA LTD.	THANE	
		WPIL LIMITED	KOLKATA	
6.	NON METALLIC (PP/FRP) HORIZONTAL CENTRIFUGAL PUMPS	ENGINEERS COMBINE	THANE	
		ANTICORROSIVE	VALSAD	
		LEAK PROOF PUMPS PVT. LTD. (RAJEDIA)	-	
7.	MISC. PUMP VERTICAL TURBINE TYPE	KBL	PUNE	
		M&P	PUNE	
		WPIL	GHAZIABAD	
		KISHORE PUMPS	PUNE	
		FLOWMORE	SAHIBABAD	
8.	UNDER BED NOZZLE	JONSONS SCREEN	AUSTRALIA/ IRELAND	
9.	COATING & WRAPPING MATERIAL TAPE	IWL LTD.	CHENNAI	
		MP TAR PRODUCT	BHILAI	
		PORWAL INDUSTRIES	RAIPUR	
		RUSTECH	KOLKATA	
		STP	JAMSHEDPUR	
10.	HIGH PRESSURE BUTTERFLY VALVE	DeZURICK (Upto 400 NB)	USA	
		TYCO VALVES (UPTO 450 NB)	USA	
		BRAY	-	
11.	BALL VALVE (HIGH	VELAN	CANADA	

51.77/2020/PS-PEM-MAX.



TITLE :

1X660 MW BHUSAWAL THERMAL
POWER STATION UNIT -6TECHNICAL SPECIFICATION FOR SEWAGE
TREATMENT PLANTSPECIFICATION NO. PE-TS-415-673-
A001

SECTION : I

SUB-SECTION: IA

REV. NO. 00

DATE :

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
	PRESSURE) SIZE 100 NB	BRAY	USA	
12.	BALL VALVE (MANUAL /PNEUMATIC/ ELECTRIC) CLASS 150	A.V. VALVES LTD	AGRA	
		AKAY INDUSTRIES PVT.LTD.	DHARWAD	
		BELGAUM AQUA VALVES PVT. LTD.	BELGAUN	
		ASIAN INDUSTRIAL VALVES & INSTRUMENTS.	CHENNAI	
		ATAM VALVES PVT. LTD.	JALANDHAR	
		DEMBLA VALVES LTD.	THANE	
		M/S GM ENGINEERING	RAJKOT	
		HAWA VALVES (INDIA) PVT. LTD.	NAVI MUMBAI	
		INTERVALVE (INDIA) LTD.	PUNE	
		LEADER VALVES LTD.	JALANDHAR	
		MICROFINISH VALVES PVT LTD.	HUBLI	
		NILON VALVES PRIVATE LIMITED	AHMEDABAD	
		SURYA VALVES AND INSTRUMENTS MFG CO.	CHENNAI	
		UNIFLOW	CHENNAI	
		VALTECH INDUSTRIES	MUMBAI	
		VAAS AUTOMATION PVT. LTD.	NEW DELHI	
		WEIR BDK VALVES- A UNIT OF WEIR INDIA PVT. LTD.	NEW DELHI	
13.	ELECTRIC MOTOR	CROMPTON GREAVES	NEW DELHI	
		LAXMI HYDRAULICS PVT. LTD	MAHARASHTRA	
		RAJINDRA ELECT INDUSTRIES	MUMBAI	
		GE-POWER	CHENNAI	
		BHARAT BIJLEE LTD.	NEW DELHI	
		SIEMENS	GURGAON	
		NGEF	NEW DELHI	
		KIRLOSKAR ELECTRIC CO LTD.	BANGALORE	
		ASEA BROWN BOVERI (ABB)	HARYANA	
		MARATHON	FARIDABAD	
14.	DIAPHRAGM VALVE (MANUAL / PNEUMATIC) CLASS 150	WEIR BDK	HUBLI	
		CRANE FLOW PROCESS	SATARA	
		PROCON	MUMBAI	
		MAJESTIC VALVES (	-	

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TREATMENT PLANTSPECIFICATION NO. PE-TS-415-673-
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		LABLINE)		
		HAWA ENGINEERS	AHMEDABAD	
15.	DUAL PLATE CHECK VALVES	ADVANCE VALVES PVT. LTD.	NOIDA	
		FLUIDLINE VALVES COMPANY PVT.LTD.	GHAZIABAD	1. DUAL PLATE CHECK VALVE CI - CLASS 150 & UP TO 600NB, 2. DUAL PLATE CHECK VALVE CCS - CLASS 150 & UP TO 500NB
		R AND D MULTIPLES (METAL CAST) PVT LTD	MUMBAI	
		VENUS PUMPS AND ENGG. WORKS	KOLKATA	CI, CCS & STAINLESS STEEL SPRING ASSISTED DUAL PLATE CHECK VALVES UPTO 700 NB AND 150 CLASS RATING.
16.	RUBBER FLAP TYPE CHECK VALVES	ASHVIK VALVES	-	
		FLOW WAY VALVES	-	
		BDK	-	
		MAJESTIC VALVES (LABLINE INST)	-	
		ADVANCE VALVES	-	
17.	CABLE GLAND	ALLIED TRADERS & EXPORTERS	NOIDA (U.P.)	
		ARUP ENGG & FOUNDRY WORKS	CALCUTTA	
		BALIGA LIGHTING EQPT.PVT.LTD.	CHENNAI	
		COMMET BRASS PRODUCTS	MUMBAI	
		DOWELLS	MUMBAI	
		ELECTROMAC INDUSTRIES	MUMBAI	
		INCAB	KOLKATA	
18.	CABLE LUGS	DOWELLS	MUMBAI	
		UNIVERSAL MACHINES LTD.	CALCUTTA	
19.	MS PLATES	SAIL		
		ESSAR STEEL		
		TISCO		
		RINL		
		JINDAL		

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		LLOYD		
		ISPAT		
		INDIAN IRON & STEEL CO. LTD		
20.	CS PIPE (ASTM A 106 GR. B)	INDIAN SEAMLESS METAL TUBES	AHMEDABAD	UPTO 150 NB
		MAHARASHTRA SEAMLESS	RAIGAD	UPTO 350 NB
21.	SAFETY SHOWER	UNICARE	-	
		MOHAN INDUSTRIES	-	
		SUPER SAFETY SERVICES	-	
22.	FRP TANKS & FITTINGS	GLOBAL COMPOSITE	-	
		EPP	-	
		DEEPA COMPOSITE	-	
		COROSEAL INDUSTRIES	-	
		CHEMICAL PROCESS & EQUIPMENT PVT LTD	-	
		J.R FIBRE INDUSTRIES PVT LTD	-	
		POLYPLAST	-	
23.	EJECTOR	ESSEM TECHNOLOGIES	-	
		RATNA PRASAD	-	
24.	TANK (FRP)	INDUSTRIAL SERVICE	KOLKATA	
		SUNRISE	BARODA	
		GANDHI & ASSOCIATES	AHMEDABAD	
		MODERN EQUIPMENTS	CHENNAI	
		EAGLE PLAST	PUNE	
		OMEGA PLAST	MUMBAI	
25.	STROKE CONTROLLER	V K PUMPS	NASIK	
		METACHEM	MUMBAI	
		SWELORE	AHMEDABAD	
		MILTON ROY INDIA	CHENNAI	
26.	DUPLEX STRAINER	JAYPEE INDUSTRIES PVT. LTD.	NEW DELHI	
		MULTITEX FILTRATION ENGINEERS LIMITED,	NEW DELHI	
		OTOKLIN GLOBAL BUSINESS LIMITED	MUMBAI	
		SUNGOV ENGINEERING PVT. LTD.	CHENNAI	
27.	SLUICE GATE	H SARKAR	KOLKATA	
		JASH ENGINEERING	-	
		YASHWANT INDUSTRIES	-	
28.	3 WAY VALVE	HI TECH	AHMEDABAD	

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SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		ADVANCE VALVES PVT.LTD	NOIDA	
		BDK	HUBLI	
		FOURESS ENGG.INDIA LTD.	MUMBAI	
		FLUIDLINEVALVES COMPANY PRIVATE LTD.,	MUMBAI	
		INSTRUMENTATION LTD.	PALAKAD	
		KIRLOSKAR BROTHERS LTD.	PUNE	
		VENUS PUMP & ENGG. WORKS	KOLKATA	
		SURYA VALVES AND INSTRUMENTS MANUFACTURING COMPANY	CHENNAI	
		STAFFORD CONTROLS LIMITED	PUNE	
		MICON VALVES (INDIA) PVT.LTD	MUMBAI	
29.	PIPE & FITTING (PP,HDPE,PVC & CPVC)	GEROGE FISHCHER	DELHI	
		ASTROL PLYTECHINC LTD	AHMEDABAD	
		JAIN IRRIGATION	-	
		ORIPLAST	-	
30.	VALVES (GATE/GLOBE/NRV/B A LL)- (PP,HDPE,PVC & CPVC)	GEROGE FISHCHER IPING SYSTEMS PVT LTD	DELHI	
		ASTROL PLYTECHINC LTD	AHMEDABAD	
		JAIN IRRIGATION	-	
		ORIPLAST	-	
31.	FILTER MEDIA	GLOBAL ABSORBENT	KOLKATA	
		BHARAT MINERALS		
32.	PNEUMATIC ACTUATOR	PROCON ENGINEERS	-	
		TYCO	-	
		CRANE PROCESS	-	
		BDK	-	
		INTERVALVE	-	
		BRAY CONTROL	-	
33.	FRP CABLE TRAYS & ACCESSORIES	EPP COMPOSITES PRIVATE LIMITED	Rajkot-Gujarat	
		SUMIP COMPOSITES PVT.LTD.	Ahmedabad- Gujarat	
34.	MBR MEMBRANE	GE	Banglore	
		TOREY	JAPAN	
		KOCH MEMBRANE-FLUID SYSTEM	USA	

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			REV. NO. 00	DATE :

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		ION EXCHANGE (INDIA) LTD.	Goa/Housur	

ANNEXURE-I

SUB-VENDOR LIST

The list of approved make of the LT Motors are as mentioned below:

S.No.	LIST OF LT MOTORS
1.	BHARAT BIJLEE LTD.
2.	CROMPTON GREAVES
3.	ASEA BROWN BOVERI
4.	KIRLOSKAR ELECTRIC CO LTD.
5.	NGEF
6.	SIEMENS
7.	MARATHON
8.	GE-POWER
9.	RAJINDRA ELECT INDUSTRIES
10.	LAXMI HYDRAULICS PVT. LTD

However, the final list of makes for the LT Motors is subjected to BHEL/Customer approval, during contract stage, without any commercial implications.

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1.0 GENERAL NOTE

- 1.0 “FOR APPROVAL OF ANY VENDOR, OTHER THAN AS INDICATED IN ENCLOSED LIST, THE BIDDER HAS TO SUBMIT CREDENTIALS FOR SCRUTINY AND APPROVAL OF MAHAGENCO. THE CONTRACTOR SHALL NOTE THAT THE EQUIPMENT SHALL BE IN SUCCESSFUL OPERATION FOR SIMILAR DUTY CONDITION AND SIMILAR APPLICATION FOR MINIMUM ONE YEAR FROM THE DATE SET FOR BID OPENING. THE BIDDER SHALL NOTE THAT IT IS THE “SOLE DISCRETION” OF MAHAGENCO TO APPROVE THE VENDORS.”

CONSULTANT : PROCON ENGINEERS

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2.0 <u>LIST OF APPROVED VENDORS – MECHANICAL</u>			
<u>SR. NO.</u>	<u>ITEM</u>		<u>VENDORS</u>
1.0	<u>BOILER, TURBINE, GENERATOR (BTG)</u>		
1.1	CONDENSOR ON LINE TUBE CLEANING SYSTEM	(a)	GEA-BGR
		(b)	TAPROGGE GMBH
1.2	CARBON STEEL PIPE FITTING	(a)	ALLIED INTERNATIONAL S.P.A. ITALY
1.3	PAINTINGS	(a)	ASIAN PAINTS
		(b)	BURGER PAINTS
		(c)	SHALIMAR PAINTS
		(d)	NEROLAC PAINTS
		(e)	JOHNSON & NICHOLSON
1.4	SPRING SUPPORT AND SPRING HANGERS	(a)	SARATHI
1.5	BOILER FEED PUMP	(a)	WEIR PUMPS
		(b)	KSB AKTIENGESELLSCHAFT
		(c)	SULZER PUMPS
		(d)	TORISHIMA PUMPS
1.6	CONCRETE VOLUTE PUMPS	(a)	KBL
		(b)	FLOWERVE INDIA CONTROL PVT LTD, INDIA
1.7	STEAM TRAPS	(a)	SPIRAX MARSHALL PVT LTD
		(b)	GREAVES LTD
		(c)	PENNANT ENGINEERING PVT LTD
		(d)	LEADER VALVES LTD
		(e)	CRESCENT VALVES MFG CO PVT LTD
1.8	VACCUM PUMPS	(a)	SIEMENS

CONSULTANT : PROCON ENGINEERS

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		(b)	UNIQUE SYSTEM, NEW JERSY, USA		
1.9	RAPH	(a)	L & T HOWDEN PVT LTD		
1.10	ID/FD/PA FANS	(a)	L & T HOWDEN PVT LTD		
1.11	SEAL AIR FANS	(a)	TLT ENGINEERING INDIA PVT LTD, GUJARAT		
1.12	SCANNER COOLING AIR FAN	(a)	C. DOCTOR		
1.13	MILLS	(a)	L & T-MHI		
		(b)	BHEL		
1.14	GEAR BOX (COAL MILL)	(a)	FLENDER		
1.15	SOOT BLOWERS	(a)	CLYDE BERGEMANN INDIA, NOIDA		
1.16	BOILER CIRCULATION PUMP	(a)	M/S HAYWARD TYLER LIMITED, UK		
1.17	METALLIC EXPANSION JOINTS	(a)	MILLAR FITTINGS, UK		
1.18	NON-METALLIC EXPANSION JOINTS	(a)	KE – BURGMANN FLEXIBLE INDIA PVT. LTD.		
1.19	SCREW PUMPS	(a)	TUSHACO PUMPS PVT. LTD.		
1.20	INSULATION	(a)	LLYODS INSULATION (INDIA) LTD.		
		(b)	ROCKWOOL INDIA LTD.		
		(c)	HYDERABAD INDUSTRIES LTD.		
		(d)	MINWOOL ROCK FABRICS LTD.		
1.21	PLATES (BOILER)	(a)	SAIL		
		(b)	TATA STEEL		
		(c)	JINDAL STEEL		
1.22	SECONDARY STRUCTURE & BUCKSTAY FOR BOILER	(a)	METALFAB HIGHTECH PVT. LTD., NAGPUR		

CONSULTANT : PROCON ENGINEERS

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1.23	BOILER DUCTS & SECONDARY STRUCTURE	(a)	SEAM INDUSTRIES NAGPUR
		(b)	ENESTEE ENGINEERING LTD, NAGPUR
1.24	HANDRAILS & GRATING	(a)	INDIANA GRATING PVT. LTD., MUMBAI
1.25	COAL MILL COMPONENT	(a)	M/S AIA ENGINEERING LTD., AHMEDABAD
1.26	COAL PIPES	(a)	M/S PRATIBHA INDUSTRIES LTD., MUMBAI
1.27	MISC. TANK FABRICATION	(a)	SEAM INDUSTRIES NAGPUR
		(b)	ENESTEE ENGINEERING LTD, NAGPUR
		(c)	ERA BUILDING SYSTEM
		(d)	RATNAMANI TUBES & METAL
1.28	GASKETS (METALLIC & RUBBER)	(a)	IGP (MADRAS)
1.29	BOLTS & NUTS (FASTENERS)	(a)	DEEPAK FASTENERS LTD. LUDHIYANA
		(b)	POINEER NUT & BOLTS PVT. LTD. LUDHIYANA
1.30	SAFETY VALVE	(a)	DRESSER
		(b)	FISCHER CONTROLS
1.31	SAFETY RELIEF VALVE	(a)	SPIRAX MARSHALL
		(b)	LEADER VALVES
1.32	CERAMIC LINED BENDS	(a)	CARBORUNDUM UNIVERSAL LTD. TAMILNADU
1.33	FAB/CAST/FORGED STRAINERS/ Y TYPE STRAINERS	(a)	SPIRAX MARSHALL
		(b)	GUJARAT OTOFILT
		(c)	MULTITEX FILTRATION
		(d)	GRAND PRIX FAB
		(e)	MICON VALVES (I) PVT. LTD

CONSULTANT : PROCON ENGINEERS

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		(f)	FLOWTECH ENGINEERS		
1.34	STEEL CASTINGS FOR COAL MILL	(a)	SYNERGY STEELS LTD, NEW DELHI		
		(b)	SRINATHJI ISPAT LTD., GAZIABAD		
		(c)	G.S. ALLOY CASTINGS LTD., ANDHRA PRADESH		
		(d)	N.S. ENGINEERING COMPANY PVT. LTD., YDERABAD		
1.35	FUEL OIL HEATING & PRESSURISING SYSTEM	(a)	TECHNOFAB ENGINEERING LTD., NEW DELHI		
		(b)	THERMOSYSTEM PVT. LTD., HYDERABAD		
1.36	BFP DRIVE TURBINE	(a)	HTC, CHINA		
1.37	FORGED STEEL VALVE (UP TO 50 NB SIZE)	(a)	FOURESS LIMITED		
		(b)	KSB LIMITED		
		(c)	L & T		
		(d)	BANKIM		
		(e)	BDK VALVES		
		(f)	LEADER		
1.38	FORGED CARBON STEEL VALVE	(a)	FOURESS LIMITED		
		(b)	CRESCENT		
		(c)	TECHNO VALVES		
		(d)	R & D MULTIPLES		
		(e)	BHEL		
		(f)	LEADER		
		(g)	A.V. ENGG.		
1.39	RUBBER EXPANSION JOINT	(a)	D'WAREN & CO.		
		(b)	S.L. MANEKLAL		

CONSULTANT : PROCON ENGINEERS

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		(c)	CORI ENGG. PVT. LTD		
1.40	CONDENSATE EXTRACTION PUMPS	(a)	WEIR PUMPS		
		(b)	KIRLOSKAR BROS. LTD., PUNE		
1.41	GEAR BOX FOR BFP	(a)	TRIVENI ENGG. & IND. PVT. LTD., MYSORE		
1.42	CONDENSER TUBES	(a)	PLYMOUTH, USA		
		(b)	SHIN HAN METAL CO. LTD., KOREA		
		(c)	REMI EDELSTAL TUBULARS LTD.		
1.43	FABRICATION & SUPPLY OF STEEL STRUCTURE	(a)	DIAMOND ENGG. , TAMILNADU		
		(b)	VASAN INDUSTRIES., TAMILNADU		
		(c)	ERA BUILDING SYSTEM LTD., RUDRAPUR		
1.44	WINDBOX	(a)	GK SONS ENGG. ENTERPRISES PVT. LTD., TRICHY		
1.45	STRUCTURAL STEEL FABRICATED COMPONENTS FOR ESP	(a)	VRINDA ENGG. PVT. LTD., KOLKATA		
		(b)	S.S. FABRICATORS & MANUFACTURERS, NAGPUR		
		(c)	DYNAMECH DESIGNER COMPANY , JABALPUR		
		(d)	JAS EQUIPMENT & ENGINEERS PVT. LTD., DURGAPUR		
		(e)	THE UNITED ENGINEERS, KOLKATA		
		(f)	UNI PROFILES PVT. LTD., ORISSA		
		(g)	FRIENDS ENGG. CORPORATION. BHILAI		
		(h)	ENCORE PROJECTS PVT. LTD., BHILAI		
		(i)	QUALITY ENGG. WORKS, KOLKATA		
		(j)	EASTERN ENGINEER & ASSOCIATES, KOLKATA		

CONSULTANT : PROCON ENGINEERS

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2.0	<u>WATER TREATMENT PLANT</u>		
		(a)	DRIPLEX, NEW DELHI
		(b)	ION EXCHANGE , MUMBAI
		(c)	THERMAX, PUNE
		(d)	VA-TECH WABAG, CHENNAI
		(e)	DOSHION
3.0	<u>WATER TREATMENT PLANT EQUIPMENT</u>		
3.1	CHEMICAL DOSING SYSTEM (FOR STORAGE TANKS – HOT WATER, ACID & ALKALI)	(a)	ATS. CHEM. EQUIPMENTS PVT. LTD. HOSUR , TAMILNADU
3.2	CHEMICAL DOSING SYSTEM	(a)	S.J. INDUSTRIES, CHENNAI
		(b)	PSI ENGINEERING, CHENNAI
		(c)	XL FLOW SYSTEM, CHENNAI
		(d)	POSITIVE METERING SYSTEM, NASIK
3.3	CONDENSATE POLISHING UNIT	(a)	DRIPLEX, NEW DELHI
		(b)	ION EXCHANGE, MUMBAI
		(c)	BGR ENERGY SYSTEMS LTD., CHENNAI
3.4	RESIN	(a)	DOW
		(b)	LANXESS
3.5	CONDENSER ON-LINE TUBE CLEANING SYSTEM	(a)	M/S. TECHNOS, FRANCE
		(b)	M/S. EIMCO WATER TECHNOLOGIES, USA
		(c)	M/S. CLUMPS & KOLLER, GERMANY
		(d)	M/S. BGR ENERGY LTD., CHENNAI
3.6	OZONISATION SYSTEM	(a)	OZONE RESEARCH & APPLICATION (I) PVT LTD. NAGPUR

CONSULTANT : PROCON ENGINEERS

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		(b)	FLUID TECHNOLOGIES, NAGPUR
3.7	DEBRIS FILTER	(a)	M/S. TAPROGGE, GERMANY
		(b)	M/S. EIMCO WATER TECHNOLOGIES, USA
		(c)	M/S. CLUMPS & KOLLER, GERMANY
		(d)	M/S. BGR ENERGY LTD., CHENNAI
4.0	ETP ITEMS, a. TPI & API Separators, b. Filter Press	(a)	K-PACK SYSTEMS
		(b)	ISHA ENGINEERS & CO.
5.0	OIL HANDLING PLANT	(a)	RAUNAK INTERNATIONAL
		(b)	TECHNO ELECTRIC
		(c)	UNITECH MACHINES
		(d)	BRIDGE & ROOF
6.0	VERTICAL TURBINE PUMPS	(a)	KIRLOSKAR BROTHERS LTD. (KBL)
		(b)	MATHER & PLATT
		(c)	WPIL
		(d)	JYOTI PUMPS
		(e)	FLOWMORE
		(f)	SAM
7.0	HORIZONTAL CENTRIFUGAL PUMPS	(a)	KBL
		(b)	KSB PUMPS
		(c)	MATHER & PLATT
		(d)	SAM TURBO
		(e)	WPIL
		(f)	JYOTI PUMPS
		(g)	FLOWMORE

CONSULTANT : PROCON ENGINEERS

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		(h)	SULZER
		(i)	KISHOR PUMPS
8.0	METERING/DOSING PUMPS	(a)	MILTON ROY INDIA (P) LTD.
		(b)	V.K. PUMPS
		(c)	SHAPO TOOLS
9.0	SUMP PUMP	(a)	KIRLOSKAR BROTHERS LTD. (KBL)
		(b)	SAM
		(c)	KISHOR PUMPS
		(d)	FLOW MORE
		(e)	KSB
		(f)	VARTAK PUMPS
		(g)	MAXFLOW
10.0	FUEL OIL PUMPS	(a)	TUSHACO
		(b)	ALKETON, MADRAS
		(c)	PSI ENGINEERING
		(d)	ROTO PUMPS
		(e)	BOURNMEN, GERMANY
		(f)	DELTA CORPORATION
		(g)	ALL WEILER, GERMANY
		(h)	TMO, SWEDEN
11.0	AIR BLOWER (LOBE TYPE)	(a)	EVEREST TRANSMISSION
		(b)	KAY ENGG. WORKS
		(c)	SWAM PNEUMATICS
		(d)	ROOTS
12.0	BUTTERFLY VALVES	(a)	KIRLOSKAR BROTHERS LTD.

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	(MANUAL/PNEUMATIC)	(b)	FOURESS		
		(c)	L & T		
		(d)	INTERVALVE (INDIA) LTD		
		(e)	R&D MULTIPLES		
		(f)	AUDCO		
		(g)	INSTRUMENTATION LTD		
		(h)	HAWA VALVES		
		(i)	VENUS PUMPS & ENGINEERING WORKS		
		(j)	BHEL		
		(k)	FLOW VEL		
		(l)	LEADER VALVES		
		13.0	RUBBER EXPANSION JOINT	(a)	D'WAREN & CO
(b)	S.L. MANEKLAL				
(c)	SRM EXOFLEX PVT LTD				
(d)	CORI ENGINEERS				
14.0	STRAINERS	(a)	SPIRAX MARSHALL		
		(b)	MICON VALVES (I) PVT. LTD.		
		(c)	FLOWTECH ENGINEERS		
		(d)	FOURESS LTD.		
		(e)	KSB LTD.		
		(f)	L & T		
		(g)	LEADER		
		(h)	PROCEDYNE ENGINEERS		
15.0	CAST IRON VALVE (GATE /GLOBE/CHECK/AIR RELEASE VALVE)	(a)	LEADER VALVE		
		(b)	VENUS PUMP		

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		(c)	FOURESS	
		(d)	LEVCON	
		(e)	DURGA ENGG CO.	
		(f)	L & T	
		(g)	R & D MULTIPLES	
		(h)	FLUIDLINE VALVES CO PVT LTD	
		(i)	INTER VALVE (INDIA) LTD	
		(j)	NSSL LIMITED	
16.0	CAST STEEL VALVES (GATE/GLOBE/CHECK/ BALL VALVE)	(a)	L & T	
		(b)	KIRLOSKAR BROS. LTD	
		(c)	CRESENT VALVES	
		(d)	AUDCO	
		(e)	KSB	
		(f)	LEVCON	
		(g)	FOURESS	
		(h)	R & D MULTIPLES	
		(i)	FLUIDLINE VALVES	
		(j)	NSSL LIMITED	
		(k)	VENUS PUMP	
		(l)	DURGA ENGG CO.	
		(m)	HAWA VALVES	
		(n)	A.V.VALVES	
17.0	STAINLESS STEEL (GATE/GLOBE/CHECK VALVE)	(a)	CRESCENT	
		(b)	FOURESS	
		(c)	R & D MULTIPLES	

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18.0	GUN METAL/BRASS/ BRONZE VALVES	(a)	LEADER VALVES		
		(b)	SARKAR		
		(c)	LEVCON		
		(d)	BOMBAY METAL & ALLOYS		
		(e)	SANT ENGG		
		(f)	BANKIM & COMP.		
		(g)	BDK		
19.0	FORGED STEEL VALVE	(a)	FOURESS LIMITED		
		(b)	KSB LIMITED		
		(c)	L & T		
		(d)	BANKIM		
		(e)	BDK VALVES		
		(f)	LEADER		
		(g)	A.V.ENGG		
		(h)	CRESCENT		
		(i)	BHEL		
20.0	L.D. PIPING	(a)	SETH & SURA ENGG. CO. LTD.		
		(b)	IVCRL		
		(c)	RAUNAQ		
		(d)	ZUBERI		
		(e)	INDIAN HUME PIPES LTD		
		(f)	DYNAMIC SS ENGG PVT LTD		
21.0	L.P.PIPING	(a)	UNITECH MACHINES, NEW DELHI		
		(b)	AARTI INFRASTRUCTURE, NAGPUR		
		(c)	ZUBERI, JAIPUR		

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		(d)	SETH & SURA ENGG CO. LTD	
22.0	DIESEL ENGINES	(a)	KIRLOSKAR CUMMINS	
		(b)	GREAVES COTTON	
		(c)	ASHOK LEYLAND	
23.0	FLANGES & FITTINGS	(a)	ALLIANCE	
		(b)	JYOTI	
		(c)	EBY	
24.0	AIR DRYING UNIT (Refrigerant Type)	(a)	DONALDSON	
		(b)	SABRO	
25.0	EOT CRANE			
25.1	EOT CRANE (More than 100 Ton)	(a)	UNIQUE IND. HANDLERS	
		(b)	ANUPAM INDUSTRIES	
		(c)	MUKAND	
		(d)	WMI	
		(e)	FAFECO	
		(f)	CENTURY CRANE ENGINEERS (P) LTD.	
25.2	EOT CRANE (Less than 100 T)	(a)	UNIQUE INDUSTRIAL HANDLERS	
		(b)	ANUPAM INDUSTRIES	
		(c)	MUKAND	
		(d)	FAFECO	
		(e)	TURBO FUEGUSON	
		(f)	WMI	
		(g)	CONSOLIDATED HOIST	
		(h)	HERCULES	
		(i)	ELECON	

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		(j)	HASK ENGINEERS
		(k)	BRADY & MORRIS ENGG. CO. LTD.
		(l)	McNALLY BHARAT KOLKATA
		(m)	SHREE ENGINEERS
		(n)	CENTURY CRANE ENGINEERS (P) LTD.
26.0	MANUAL HOIST & CHAIN PULLEY BLOCK	(a)	TRACTEL TRIFOR INDIA (P) LTD.
		(b)	LIFTING EQUIPMENT & ACCESSORIES
		(c)	INDEF (HERCULES)
		(d)	BATLIBOI
		(e)	UNIVERSAL
		(f)	ABHAY INDUSTRIES
27.0	ELECTRICAL HOIST	(a)	BATLIBOI
		(b)	PBL
		(c)	GREAVES
		(d)	HOISTOMECH
		(e)	SHREE ENGINEERS
		(f)	ABHAY INDUSTRIES
		(g)	INDEF
		(h)	UNIVERSAL
		(i)	SWIFT
		(j)	TRACTEL TRIFOR INDIA (P) LTD.
		(k)	CENTURY CRANE ENGINEERS (P) LTD.
		(l)	HERCULES HOISTS LIMITED
28.0	PAINTINGS	(a)	ASIAN PAINTS (I) LTD.
		(b)	BERGER PAINTS INDIA LTD.

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		(c)	SHALIMAR PAINTS LTD.		
		(d)	NEROLAC		
		(e)	JHONSON & NICHOLSON		
29.0	ANTI CORROSSIVE COAL TAR COATING	(a)	IWL LTD		
		(b)	A.R.LAMINATORS		
30.0	FABRICATED MS STEEL TANK	(a)	SEAM INDUSTRIES		
		(b)	ENESTEE ENGG LTD		
		(c)	ERA BUILDING SYSTEM		
		(d)	DIAMOND FABRICATORS (I) PVT LTD		
		(e)	THERMO SYSTEMS PVT LTD		
		(f)	TECHNOFAB ENGG LTD		
		(g)	RATANMANI TUBES AND METALS		
31.0	WELDING FLUX & FILLER WIRE	(a)	PRECISION WELD ARC LTD		
		(b)	S. CHEM & ALLIED PRODUCTS PVT LTD.		
32.0	<u>FIRE DETECTION & PROTECTION SYSTEM</u>				
		(a)	TYCO		
		(b)	HITECH ENGINEERING SERVICES		
33.0	<u>FIRE DETECTION & PROTECTION SYSTEM EQUIPMENTS</u>				
33.1	PUMPS	(a)	KBL		
		(b)	MATHER & PLATT		
		(c)	FLOW MORE		
33.2	HIGH VELOCITY NOZZLES	(a)	PREUSSAGE (WEST JRMANY)		
		(b)	H D FIRE		
33.3	MEDIUM VELOCITY NOZZLES	(a)	PREUSSAGE (WEST JRMANY)		
		(b)	GEM, USA		

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		(c)	DC INDUSTRIAL PLANT SERVICES (P) LTD.		
		(d)	ABB		
		(e)	BATLIBOI		
		(f)	SHAVO NORGREN		
		(g)	WALKER		
		(h)	ULTRA FILTER		
39.15	VACUUM PUMP	(a)	VACUUM AIR		
		(b)	PPI		
		(c)	GARUDA		
		(d)	NASH		
		(e)	SIEMENS		
		(f)	INDIAN MAKE		
		(g)	KAKATI		
39.16	AIR HEATER	(a)	ESCORT		
		(b)	RAYCOLT		
		(c)	SPHERE HOT		
		(d)	HEATCO		
		(e)	LAMDA INDUSTRIES		
		(f)	INELLCON		
39.17	CONVENTIONAL CLARIFIER	(a)	DRIPLEX		
		(b)	ION EXCHANGE		
		(c)	HIND DORR		
		(d)	OLIVA		
		(e)	THERMAX		

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39.18	MS ERW PIPE (BLACK & GALVANISED)	(a)	JINDAL	
		(b)	TISCO	
		(c)	SURYA ROSHINI /	
		(d)	INDUS TUBES LTD	
		(e)	RATNAMANI METALS & TUBES	
		(f)	GOOLUCK STEEL TUBES LTD.	
		(g)	PSL HOLDING	
		(h)	SAW PIPES LTD.	
		(i)	DADU PIPES PVT. LTD.	
		(j)	ASIAN MILLS PVT. LTD.	
		(k)	MAHARASHTRA SEAMLESS PIPE	
39.19	MS PIPE SEAMLESS	(a)	MAHARASHTRA SEAMLESS PIPE	
		(b)	BHEL	
		(c)	INDIA SEAMLESS	
		(d)	TISCO	
39.20	CAST IRON PIPES	(a)	ELECTRO STEEL CASTINGS	
		(b)	SAIL	
		(c)	KUSHLAVA	
39.21	G.I PIPES & FITTINGS	(a)	PRAKASH TUBES	
		(b)	NAVKAR FITTINGS & FORGING PVT. LTD	
		(c)	GOOD LUCK STEEL TUBES LTD.	
		(d)	INDUS TUBES LTD.	
39.22	SS TUBES & PIPES	(a)	APEX TUBES PVT.LTD	
		(b)	REMI EDELSTAHL TUBULARS PVT.LTD	
		(c)	PRAKASH STEELAGE PVT. LTD	

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39.23	FLUID COUPLING	(a)	PEMBRIL
		(b)	VOITH
		(c)	FLUIDOMAT
		(d)	GREAVES LTD.
		(e)	HYDRO DYNAMIC
		(f)	FLANDER MACNEILL GEARS LTD.
		(g)	DAVID BROWN
39.24	GEAR BOX	(a)	ELECON
		(b)	SHANTHI
		(c)	RADICON
		(d)	NEW ALLENBURY WORKS
39.25	DOUBLE DISK SWING VALVE	(a)	EVERLASTING
39.26	BUTTERFLY VALVE	(a)	AUDCO
		(b)	FOURESS
		(c)	BDK
		(d)	ELOMATIC
		(e)	KEY STONE
39.27	VERTICAL DRAIN PUMP	(a)	SAM
		(b)	MBIL
		(c)	WEIR MINERAL (I) PVT. LTD.
39.28	AIR DRYING PLANT (REFRIGERANT TYPE)	(a)	DONALDSON
39.29	BALL VALVE	(a)	SHANCO
		(b)	BDK
		(c)	OSCAR

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		(d)	LEGRIS
		(e)	R B (ITALIAN)
		(f)	FLOWCON
39.30	ASH WATER PUMPS	(a)	KIRLOSKAR
		(b)	KSB
		(c)	BEACON WEIR
		(d)	MATHER & PLATT
		(e)	SAM
39.31	FLUSHING PUMP	(a)	UT PUMPS & SYSTEMS LTD.
39.32	VENTILATION FAN	(a)	FLAKT
		(b)	C.B. DOCTOR
		(c)	GEC
		(d)	ALSTOM
		(e)	CG
		(f)	BATLIBOI
		(g)	BAJAJ
		(h)	USHA
39.33	AGITATOR WITH GEAR BOX / ACCESSORIES	(a)	RATHI VESSELS & SYSTEMS PVT.LTD.
40.0	<u>VENTILATION EQUIPMENT</u>		
40.1	VENTILATION SYSTEM	(a)	BLUE STAR Ltd.
		(b)	Hyderabad Pollution Controls Ltd.
		(c)	VOLTAS LIMITED
		(d)	AEROVENT PROJECTS LIMITED
		(e)	WRC ENGINEERING COMPANY PVT LIMITED

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40.2	AIR FILTER	(a)	PUROLATOR		
		(b)	TENACITY		
		(c)	UCCO		
		(d)	JOHN FLOWER		
		(e)	AIR TECH		
		(f)	DYNAFILTERS		
40.3	FRESH AIR FANS	(a)	GEC		
		(b)	KAITAN		
		(c)	FLAKT		
40.4	V.BELTS & PULLEY	(a)	DUNLOP		
		(b)	FENNER		
40.5	FIRE DAMPAR	(a)	TSC		
		(b)	AIR TECH		
		(c)	GEORGE RAO		
		(d)	RAVISTAR INDIA PVT LIMITED.		
40.6	BEARINGS	(a)	SKF		
		(b)	NORMAN		
		(c)	NBC		
		(d)	FAG		
41.0	<u>AIR CONDITIONING</u>				
41.1	REFRIGERATION RECIPROCATING COMPRESSOR	(a)	ACCL,KOLKATA		
		(b)	KIRLOSKAR,PUNE		
		(c)	VOLTAS,MUMBAI		
		(d)	CARRIER,MUMBAI		
		(e)	TRANE (INDIA) PVT.LTD.,MUMBAI		

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4.0 <u>LIST OF APPROVED VENDORS – CONTROL & INSTRUMENTATION</u>			
<u>SR. NO.</u>	<u>NAME OF EQUIPMENT / ITEM</u>		<u>APPROVED VENDORS</u>
1.0	<u>FIELD / PRIMARY INSTRUMENTS:</u>		
1.1	RTD & THERMOCOUPLES	(a)	PYRO ELECTRIC INSTRUMENTS GOA PVT. LTD.
		(b)	GENERAL INSTRUMENTS CONSORTIUM, MUMBAI
		(c)	DETRIVE, MUMBAI
		(d)	TEMSSENS INSTRUMENTS(I) PVT. LTD, UDAIPU
1.2	SMART ELECTRONIC TRANSMITTERS (PRESSURE, DIFF. PRESSURE)	(a)	EMERSON PROCESS MANAGEMENT (I) LTD
		(b)	FUJI, JAPAN
		(c)	YOKOGAWA, JAPAN/ YOKOGAWA INDIA
		(d)	ABB, GERMANY / FARIDABAD
		(e)	HONEYWELL, USA / PUNE
1.3	DISPLACER TYPE LEVEL TRANSMITTER	(a)	CHEMTROL MIL
		(b)	DRESSER, COIMBTORE
		(c)	V-AUTOMAT, DELHI
		(d)	ECKARDT, GERMANY
1.4	LEVEL TRANSMITTERS (DISPLACEMENT TYPE)	(a)	DRESSER MASONIELAN, FRANCE (DRESSER VALVES INDIA LTD. COIMBATORE)
		(b)	CHEMTROLS, MUMBAI (ECKARDT, GERMANY)
		(c)	ECKARDT, GERMANY

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1.5	LEVEL TRANSMITTERS (ULTRASONIC TYPE)	(d)	ENDRESS+HAUSER, GERMANY/INDIA
		(e)	KROHNE, FRANCE
		(f)	PEPPERL+FUCHS, GERMANY/INDIA
		(g)	VEGA, GERMANY
		(h)	KAB INSTRUMENTS LTD.
1.6	RADAR TYPE LEVEL TRANSMITTERS	(a)	SIEMENS MILLTRONICS
		(b)	ENDRESS & HAUSER
		(c)	SBEM
		(d)	EMERSON
		(e)	AMETEKEDREXELBRROK (CHEMTROLS)
1.7	TEMPERATURE TRANSMITTERS	(a)	EMERSON PROCESS (FORMERLY FISHER ROSEMOUNT), USA/DAMAN
		(b)	ABB, GERMANY / FARIDABAD
		(c)	FUJI, JAPAN
		(d)	HONEYWELL, USA / PUNE
		(e)	YOKOGAWA, JAPAN/ YOKOGAWA INDIA
		(f)	MOORE, USA
1.8	MAGNETIC LEVEL SWITCHES	(a)	LEVCON INSTRUMENTS PVT. LTD., KOLKATA
		(b)	V.AUTOMAT, NEW DELHI
		(c)	ASIAN INDUSTRIAL VALVES, CHENNAI
1.9	LEVEL SWITCHES CONDUCTIVITY TYPE	(a)	BHARAT HEAVY ELECTRICALS LTD.
		(b)	YARWAY, USA

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		(c)	LEVELSTATE, UK
		(d)	SOLARTON, UK (PRESENTLY CALLED AS MOBREY)
		(e)	CHEMTROL
		(f)	LEVEL STATE (HITECH SYSTEMS)
		(g)	MOBREY
1.10	FLOW SWITCHES	(a)	SWITZER, CHENNAI
		(b)	KRONHE MARSHALL
		(c)	GENERAL INSTRUMENTS MUMBAI
		(d)	CHEMTROL
1.11	BYPASS ROTAMETER	(a)	IEPL, HYDERABAD
		(b)	PLACKA INSTRUMENTS INDIA PVT. LTD., CHENNAI
		(c)	TRAC, HYDERABAD
		(d)	EUREKA, PUNE
1.12	ROTAMETER	(a)	INSTRUMENTATION ENGINEERS PVT. LTD.
		(b)	SIGMA INSTRUMENTS CO.
		(c)	EUREKA INDUSTRIAL EQPT. PVT. LTD.
		(d)	TELACE EQUIPMENT PVT. LTD.
1.13	FLOW INTEGRATOR (ELECTRONIC TYPE)	(a)	ABB, GERMANY / FARIDABAD
		(b)	MASIBUS, GANDHINAGAR
		(c)	YOKOGAWA, JAPAN/ YOKOGAWA INDIA
		(d)	LEKKTROTEK, PUNE
		(e)	EMERSON

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		(f)	ENDRESS & HAUSER
		(g)	FORBES MARSHALL
1.14	GAUGES (PRESSURE, DIFF. PRESSURE)	(a)	A N INSTRUMENTS PVT. LTD., KOLKATA
		(b)	GENERAL INSTRUMENTS CONSORTIUM, GOA/ MUMBAI
		(c)	GOA THERMOSTATIC INSTRUMENTS, GOA
		(d)	FORBES MARSHALL LTD., HYDERABAD
		(e)	WAAREE INDUSTRIES, MUMBAI
		(f)	H.GURU INSTRUMENTS (SOUTH INDIA), BANGALORE
		(g)	WIKI INSTRUMENTS INDIA PVT. LTD., PUNE
		(h)	GOA INSTRUMENTS PVT. LTD.,
		(i)	MONOMETER, MUMBAI
		(j)	BELLS CONTROLS LTD., KOLKATA
		(k)	SWITZER INSTRUMENTS LTD., CHENNAI
		(l)	WIKI ALEXANDER WIEGAND GMBH&CO., GERMANY
		(m)	BUDENBURG GUAGE CO. LTD
		(n)	INSTRUMENTATION PVT. LTD., BANGALORE
		(o)	INDOSONIC INSTRUMENT, MUMBAI
		(p)	PRECISION
		(q)	ASHCROFT

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1.15	TEMPERATURE GAUGE	(a)	GOA THERMOSTATIC INSTRUMENTS, GOA
		(b)	GENERAL INSTRUMENTS CONSORTIUM,
		(c)	A.N. INSTRUMENTS PVT. LTD., KOLKATA
		(d)	H. GURU INSTRUMENTS (SOUTH INDIA), BANGALORE
		(e)	FORBES MARSHALL, HYDERABAD
		(f)	WIKI INSTRUMENTS INDIA PVT. LTD., PUNE
		(g)	WAREE, DADRA GOA INSTRUMENTS PVT. LTD.,
		(h)	BELLS CONTROLS LTD., KOLKATA
		(i)	SWITZER INSTRUMENTS LTD., CHENNAI
		(j)	WIKI ALEXANDER WIEGAND GMBH&CO., GERMANY
		(k)	BUDENBURG GUAGE CO. LTD.
		(l)	INDOSONIC INSTRUMENT, MUMBAI
1.16	SWITCHES (PRESSURE, DIFF. PRESSURE)	(a)	INDFOSS INDUSTRIES LTD., GHAZIABAD
		(b)	SWITZER INSTRUMENTS COMPANY, CHENNAI
		(c)	SOR INC., USA
		(d)	PYROELECTRIC, GOA
		(e)	DRESSER INDUSTRIES INC, USA
		(f)	REGULATEURS GEORGIN, FRANCE

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		(g)	DELTA CONTROLS LTD., U.K.
		(h)	KDG INSTRUMENTS LTD. U.K.
		(i)	ASHCROFT
		(j)	DWAYER, USA
		(k)	GENERAL INSTRUMENTS CONSORTIUM
1.17	TEMPERATURE SWITCH	(a)	INDFOSS INDUSTRIES LTD., GHAZIABAD
		(b)	SWITZER INSTRUMENTS COMPANY, CHENNAI
		(c)	GENERAL INSTRUMENTS CONSORTIUM, MUMBAI
		(d)	SOR INC., USA
		(e)	PYROELECTRIC, GOA DRESSER INDUSTRIES INC, USA
		(f)	REGULATEURS GEORGIN, FRANCE
		(g)	DELTA CONTROLS LTD., U.K.
		(h)	KDG INSTRUMENTS LTD. U.K.
1.18	AIR FILTER REGULATOR	(a)	PLACKA, CHENNAI
		(b)	SHAVO NORGREN, INDIA
1.19	MASS FLOW METER (CORROLIOUS PRINCIPLE)	(a)	EMERSON PROCESS MANAGEMENT (I) LTD
		(b)	ABB
		(c)	YOKOGAWA
		(d)	ENDRESS+ HAUESER
		(e)	GE SENSING & INSPECTION TECHNOLOGIES
		(f)	FORBES MARSHALL

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1.20	I/P CONVERTER	(a)	ECKHARDT, GERMANY
		(b)	MTL, CHENNAI
		(c)	ABB
		(d)	WATSON SMITH (PRESENTLY NORGREN)
		(e)	EMERSON PROCESS MGMT ASIA PACIFIC LTD.
		(f)	MOORE CONTROLS
1.21	FLOW ELEMENTS	(a)	INSTRUMENTATION LTD.
		(b)	MICRO PRECISION PRODUCTS
		(c)	ENGINEERING SPECIALITIES PVT. LTD.
		(d)	GENERAL INSTRUMENTS
1.22	LEVEL GAUGES (FLOAT TYPE)	(a)	SB ELECTRO
		(b)	SIGMA
		(c)	V AUTOMAT
		(d)	LEVCON
		(e)	CHEMTROLS
		(f)	ASIAN INDUSTRIAL VALVES
1.23	ORP TRANSMITTERS	(a)	FORBES MARSHALL
1.24	DENSITY METER (NUCLEONIC TYPE)	(a)	ENDRESS + HAUSER
		(b)	THERMO MEASURE TECH.
		(c)	CHEMTROL (THERMO FISHER)
1.25	DENSITY METER (NON-NUCLEONIC TYPE)	(a)	ENDRESS + HAUSER
		(b)	THERMO MEASURE TECH.
		(c)	CHEMTROL (THERMO FISHER)

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1.26	SOLID MASS FLOW METER	(a)	SIEMENS MILLTRONICS
		(b)	CHEMTROL (THERMO FISHER)
		(c)	SIEMENS INSTRUMENTS, CANADA
1.27	PULL CORD SWITCH	(a)	JAYASHREE ELECTRODEVICES PVT. LTD.
		(b)	A.G. SYSTEM CONTROLS, MUMBAI
1.28	BELT SWAY SWITCH	(a)	JAYASHREE ELECTRODEVICES PVT. LTD.
		(b)	A.G. SYSTEM CONTROLS, MUMBAI
1.29	ZERO SPEED SWITCH	(a)	A.G. ELECTRONICS
		(b)	JAYASHREE ELECTRODEVICES PVT. LTD.
1.30	PROXIMITY SWITCH	(a)	AW
		(b)	JAYASHREE ELECTRODEVICES PVT. LTD.
1.31	LEVEL SWITCH (RF TYPE)	(a)	EIP ENVIRO LEVEL CONTROLS
2.0	<u>DCS, HMI, MONITORING AND PLC SYSTEMS:</u>		
2.1	DDCMIS	(a)	ABB.
		(b)	YOKOGAWA
		(c)	SIEMENS.
		(d)	BHEL
		(e)	EMERSON PROCESS MANAGEMENT
		(f)	MHI
2.2	PLC	(a)	ALLEN BRADLEY.
		(b)	SCHNEIDER
		(c)	ROCKWELL

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		(d)	GE FANUC
2.3	MASTER SLAVE CLOCK	(a)	SYMMETRICOM INC., USA
		(b)	HOPF, GERMANY
		(c)	HATHWAY, USA
		(d)	SERTEL ELECTRONICS, CHENNAI
		(e)	ADVANCE MICRONIC
2.4	DOT MATRIX PRINTER	(a)	HP / EPSON / WIPRO / TVS / SAMSUNG
2.5	LASER & COLOUR INKJET PRINTERS	(b)	HP / EPSON / CANON / IBM / XEROX / SAMSUNG
2.6	COMPUTERS FOR OPERATOR / ENGINEER / HISTORY STATION, SHIFT SUPERVISOR, STORIAN, SOFT LINK STATION FOR INTERFACING WITH OTHER SYSTEMS, PERFORMANCE CALCULATION AND SER STATION	(a)	IBM
		(b)	DELL
		(c)	HP/COMPAQ
2.7	TFT MONITOR	(a)	LG / SAMSUNG / HP / COMPAQ / IBM / DELL
2.8	VIBRATION MONITORING SYSTEM & TURBO-SUPERVISORY INSTRUMENTS	(a)	ROCKWELL AUTOMATION, USA
		(b)	BENTLEY NEVADA, USA / INDIA
		(c)	SHINKAWA, JAPAN / FORBES MARSHALL,
		(d)	VIBROMETER, SWITZERLAND
2.9	LARGE VIDEO SCREENS	(a)	BARCO BELGIUM / BARCO, INDIA
		(b)	PLANAR, USA / PYROTECH, INDIA
		(c)	CHRISTIE, USA / CHRISTIE, INDIA

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		(d)	SYNELEC
		(e)	DELTA, THAILAND / DELTA POWER SYSTEMS, INDIA
2.10	HART COMMUNICATOR	(a)	HONEYWELL, USA/PUNE
		(b)	EMERSON PROCESS (FORMERLY FISHER ROSEMOUNT), USA / DAMAN
		(c)	YOKOGAWA, JAPAN / YOKOGAWA, INDIA
		(d)	MERIAM, USA / CHEMTROLS, MUMBAI
		(e)	ABB, GERMANY / INDIA
		(f)	FUJI, JAPAN
2.11	HART MANAGEMENT SYSTEM	(a)	PEPPERL+FUCKS, GERMANY / INDIA
		(b)	MTL, UK / INDIA
		(c)	EMERSON PROCESS, USA / DAMAN
2.12	ALARM ANNUNCIATION SYSTEM	(a)	PROCON, CHENNAI
		(b)	I I C, HYDERABAD
		(c)	MINILEC, PUNE
		(d)	IIC, MUMBAI
		(e)	PIRIE, MUMBAI
		(f)	PECON, VADODARA
		(g)	POSITRONICS
2.13	RMCMS (ROTATING MACHINE CONDITION MONITORING SYSTEM)	(a)	VIBROTECH (M/S MEGITT INDIA PVT. LTD.)
		(b)	M/S SKF INDIA LTD.
2.14	ACOUSTIC PYROMETER	(a)	BONNENBERG + DRESCHER GMBH, GERMANY

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2.15	ACOUSTIC STEAM LEAK DETECTION SYSTEM (ASLD)	(a)	HI-TECH SYSTEM & SERVICES LTD, NEW DELHI (AMI MAKE)
		(b)	SARTECH INTL, CHENNAI (INSTROTECH MAKE INSPECTA FFT
2.16	EPABX SYSTEM	(a)	SIEMENS
		(b)	BPL
2.17	FURNACE TV CAMERA SYSTEM	(c)	HITECH SYSTEM & SERVICES LTD. (M/S LENOX INSTRUMENT COMPANY INC., USA
3.0	<u>ELECTRICAL & SECONDARY INSTRUMENTS:</u>		
3.1	DIGITAL INDICATOR	(a)	ABB, GERMANY / FARIDABAD
		(b)	MASSIBUS, GANDHINAGAR PYROTECH, UDAIPUR
		(c)	LEKTROTEK, PUNE
		(d)	GOSEN / CAMILLE BAUER / METRAWATT YOKOGAWA, JAPAN / INDIA
		(e)	SIEMENS
3.2	BARGRAPH INDICATORS	(a)	ABB, GERMANY / FARIDABAD
		(b)	MASSIBUS, GANDHINAGAR
		(c)	PYROTECH, UDAIPUR
		(d)	LEKTROTEK, PUNE
		(e)	GOSEN / CAMILLE BAUER / METRAWATT
		(f)	M-SYSTEM, JAPAN (CHINO LAXSONS DAMAN)
		(g)	SIEMENS

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3.3	PEN, POINT AND CHARTLESS RECORDERS	(a)	EUROTHERM, UK
		(b)	TATA HONEYWELL
		(c)	YOKOGAWA, JAPAN (YOKOGAWA, INDIA)
		(d)	CHINO (LAXSON), JAPAN
		(e)	ABB, UK / GERMANY
		(f)	FUJI ELECTRIC, JAPAN
3.4	TRANSDUCERS	(a)	SEIMENS
		(b)	AUTOMATIC ELECTRIC LTD., MUMBAI
		(c)	PYROTECH, UDAIPUR
		(d)	SOUTHERN TRANSDUCERS, CHENNAI
		(e)	ACCORD, PUNE MECO, MUMBAI
		(f)	ABB
		(g)	SITU, MUMBAI
		(h)	RISHABH
		(i)	ADEPT, PUNE
3.5	ELECTRICAL ANALOG (PANEL) METERS	(a)	AUTOMATIC ELECTRIC LTD., MUMBAI
		(b)	MECO, MUMBAI
		(c)	RISHAB, NASIK
3.6	SELECTOR SWITCHES AND CONTROL SWITCHES	(a)	KAYCEE
		(b)	ALSTOM
		(c)	L & T
		(d)	SIEMENS

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3.7	MOSAIC ANALOG (MOVING COIL) INDICATORS	(a)	GOSSEN, GERMANY
		(b)	WEIGEL, GERMANY
3.8	MOSAIC DIGITAL INDICATORS	(a)	GOSSEN, GERMANY
		(b)	WEIGEL, GERMANY
3.9	INTERPOSING RELAYS FOR COMMAND OUTPUT TO MCC	(a)	JYOTI
		(b)	H&B
		(c)	ALSTOM
		(d)	ELASTA
		(e)	OEN SIEMENS
		(f)	ABB
3.10	RELAYS / AUX. CONTACTORS	(a)	TELEMECANIQUE & CTRLS
		(b)	ABB
		(c)	SIEMENS
		(d)	GEC – ALSTOM
		(e)	L & T
3.11	LIMIT SWITCHES	(a)	BHARTIYA CUTLER & HAMMER, FARIDABAD
3.12	MINIATURIZED PUSH BUTTONS / ILPB (24X48MM) MOSAIC GRID COMPATIBLE	(a)	SIEMENS
		(b)	TEW, GERMANY (OLD NAME SUBKLEW)
4.0	<u>CONTROL DESKS & PANELS:</u>		
4.1	UNIT CONTROL PANELS (UCP)/ ELECTRICAL CONTROL PANEL (ECP)/ CONTROL DESK (MOSAIC GRID BASED)	(a)	BHEL EDN
		(b)	PYRO TECH, UDAIPUR
		(c)	INSTRUMENTATION LTD. KOTA
		(d)	KHODAY CONTROL SYSTEMS, BANGALORE

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		(e)	CHEMIN CONTROLS, PONDICHERRY
4.2	CRT DESK / OPERATOR DESK	(a)	PYRO TECH, UDAIPUR
		(b)	INSTRUMENTATION LTD. KOTA
		(c)	KHODAY CONTROL SYSTEMS, BANGALORE
		(d)	CHEMIN CONTROLS, PONDICHERRY
4.3	MOSAIC GRID/ MOSAIC TILES & OTHER MOSAIC ITEMS	(a)	SYMO, SWITZERLAND
		(b)	TEW, GERMANY (OLD NAME SUBKLEW)
		(c)	PYROTECH
4.4	LOCAL CONTROL PANEL / DISTRIBUTION BOARDS	(a)	CONTROL & SCHEMATICS
		(b)	PYROTECH
		(c)	RITTAL
		(d)	L&T
4.5	TERMINAL BLOCKS	(e)	ELMEX
		(f)	PHOENIX
		(g)	WAGO
5.0	ANALYSERS:		
5.1	SWAS ANALYSERS	(a)	POLYMETRON / ZELLWEGGER – ANALYTICALS
		(b)	ABB
		(c)	ORION, USA
		(d)	ROSEMOUNT ANALYTICAL-CHEMPURE,
		(e)	HACH ULTRA FRANCE,
		(f)	HACH USA

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		(g)	YOKOGAWA
		(h)	AMETECH
		(i)	FORBES MARSHALL
		(j)	EMERSON
5.2	SWAS (STEAM AND WATER ANALYSIS SYSTEM) PANELS	(a)	ABB KENT, U.K.
		(b)	ABB LTD. FARIDABAD
		(c)	FORBES MARSHAL
		(d)	EMERSON PROCESS MANAGEMENT INSTRUMENTATION LTD., KOTA
		(e)	YOKOGAWA
5.3	CO ANALYSER (IN SITU TYPE)	(a)	AMETEK, USA / SINGAPORE
		(b)	CODEL INTERNATIONAL LTD. UK
		(c)	LAND COMBUSTION UK
5.4	OXYGEN IN FLUE GAS ANALYSER (ZIRCONIA PROBE TYPE)	(a)	AMETEK, USA / SINGAPORE
		(b)	LAND INSTRUMENTS, UK
		(c)	EMERSON PROCESS MANAGEMENT (I) LTD
		(d)	YOKOGAWA, JAPAN
		(e)	ENOTECH, GERMANY
		(f)	ABB, UK
		(g)	TELEDYNE, USA
		(h)	FUJI (AIC)
5.5	SMOKE DENSITY ANALYSER / PARTICULATE EMISSION ANALYSER / OPACITY ANALYSER	(a)	DURAG, GERMANY
		(b)	CODEL, UK
		(c)	LAND COMBUSTION UK

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		(d)	EMERSON
		(e)	ABB
		(f)	FUJI (AIC)
5.6	NOX / SO2 ANALYSER (IN SITU)	(a)	CODEL, UK
		(b)	FORBES MARSHALL
		(c)	LAND COMBUSTION, UK
5.7	OZONE ANALYSER	(a)	BMT MESSTECHNIK, GMBH
5.8	RESIDUAL OZONE ANALYSER	(a)	ECO SENSORS / KAUFFMANN UMWITTECHNIK .EK
5.9	OZONE LEAK DETECTOR	(a)	OTTPL
6.0	<u>CONTROL VALVES / ACTUATORS / SOLENOID VALVES:</u>		
6.1	ELECTRICAL ACTUATORS FOR REGULATING & OPEN / CLOSE VALVES	(a)	ROTORK CONTROL (INDIA) LTD.,
		(b)	AUMA (INDIA) LTD.,
		(c)	LIMITORQUE INDIA LTD.
6.2	PNEUMATIC ACTUATORS-REGULATING & OPEN / CLOSE	(d)	INSTRUMENTATION LTD., PALGHAT
		(e)	KELTRON CONTROLS, KERALA
6.3	SH/RH SPRAY CONTROL VALVES	(a)	MIL CONTROLS LTD.
	SH/RH SPRAY BLOCK VALVES	(b)	INSTRUMENTATION LTD. PALGHAT
	FEED CONTROL VALVES	(c)	FISHER SANMAR LTD.
		(d)	CONTROL COMPONENT INC., USA
		(e)	HORA (HOLTER REGELARMATUREN GMBH & CO.)
6.4	LFO/HFO CONTROL, AND TRIP VALVES, FLOW CONTROL, PRESSURE	(a)	MIL CONTROLS LTD.
		(b)	INSTRUMENTATION LTD. PALGHAT

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	CONTROL, TEMP. CONTROL, AND BURNER TRIP VALVES, BALL VALVES	(c)	FOURESS ENGG (I) LTD, BANGALORE
		(d)	SAMSON CONTROLS , PUNE
6.5	SOOT BLOWER PRESSURE REDUCING VALVE	(a)	MIL CONTROLS LTD.
		(b)	INSTRUMENTATION LTD., PALGHAT
		(c)	FISHER SANMAR LTD.
		(d)	CONTROL COMPONENT INC., USA
		(e)	HORA (HOLTER REGELARMATUREN GMBH & CO.)
6.6	APRDS CONTROL VALVES	(a)	INSTRUMENTATION LTD.
		(b)	CONTROL COMPONENT INC., USA
		(c)	HORA (HOLTER REGELARMATUREN GMBH & CO.)
6.7	CONTROL VALVES- NON CRITICAL	(a)	DEZURIK COPES VULCAN LTD., U.K.
		(b)	CONTROL COMPONENT INC., USA
		(c)	FISHER SANMAR LIMITED
		(d)	INSTRUMENTATION LTD
		(e)	MIL CONTROL LTD.
		(f)	FISHER XOMOS SANMAR LTD.
		(g)	HORA (HOLTER REGELARMATUREN GMBH & CO.)
6.8	SOLENOID VALVE	(a)	ASCO, CHENNAI
		(b)	ROTEX AUTOMATION LTD., GUJRAT
		(c)	AVCON CONTROLS, MUMBAI
6.9	HP/LP BYPASS VALVES	(a)	BOPP & REUTHER SR GMBH CONTROL COMPONENTS INC (CCI)

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6.10	ELECTRO-HYDRAULIC ACTUATOR	(a)	LEONARDO AUTOMATION (INDIA) PVT. LTD.
7.0	<u>ERECTION HARDWARES:</u>		
7.1	LOCAL INSTRUMENT RACK (LIR) AND LOCAL INSTRUMENT ENCLOSURES (LIE)	(a)	PYROTECH, UDAIPUR
		(b)	INSTRUMENTATION LTD., KOTA
		(c)	ELECTRONICS CORPORATION OF INDIA LTD., HYDERABAD
		(d)	CHEMIN CONTROLS, PONDICHERRY
		(e)	PRAMMEN INDUSTRIES
7.2	INSTRUMENT VALVES	(a)	EXCEL HYDRO PNEUMATICS PVT. LTD., MUMBAI
		(b)	BHEL
		(c)	METPRESS ENGINEERING WORKS, KOLKATA
		(d)	BALDOTA VALVE & FITTING CO. PVT. LTD., MUMBAI
		(e)	AURA INC., NEW DELHI
		(f)	INSTRUMENTATION LTD. PALGHAT
		(g)	PRECISION ENGG. INDUSTRIES, MUMBAI
		(h)	VIKAS INDUSTRIAL PRODUCTS, NEW DELHI
7.3	VALVE MANIFOLDS	(a)	EXCEL HYDRO PNEUMATICS PVT. LTD., MUMBAI
		(b)	METPRESS ENGINEERING WORKS, KOLKATA

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		(c)	BALDOTA VALVE & FITTING CO. PVT. LTD., MUMBAI
		(d)	AURA INC., NEW DELHI
		(e)	PRECISSION ENGG. INDUSTRIES, MUMBAI
		(f)	HP VALVES AND FITTINGS, CHENNAI
7.4	COMPRESSION FITTINGS / SOCKET WELD FITTINGS	(a)	SWAGELOCK, USA
		(b)	ASTEC VALVES & FITTINGS PVT. LTD.
		(c)	MET-LOK HYDRO PNEUMATICS PVT. LTD.
7.5	CONDENSATE POTS	(a)	EXCEL HYDRO-PNEUMATICS PVT. LTD., MUMBAI
		(b)	MICROPRECISION, FARIDABAD
		(c)	INSTRUMENTATION LTD. PALGHAT
		(d)	METPRESS ENGINEERING WORKS, KOLKATA
		(e)	BALDOTA VALVES & FITTINGS CO. PVT. LTD., MUMBAI
		(f)	PRECISSION ENGG. INDUSTRIES, MUMBAI
7.6	IMPULSE & SAMPLE PIPINGS	(a)	TPS TECHNITUBE ROHREN WERKE GMBH, GERMANY
		(b)	MAHARASHTRA SEAMLESS LTD.
		(c)	BHEL
		(d)	CHOKSI TUBE COMPANY LTD., INDIA
		(e)	INDIAN SEAMLESS METAL TUBES LTD., INDIA
		(f)	MANNESMANN AG, GERMANY

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		(g)	TOUVAY AND CAUVIN GULF EC, DUBAI
		(h)	JINDAL SAW PIPES LTD., INDIA
		(i)	SUMITOMO CORPORATION, JAPAN / KAWASAKI
		(j)	RATNAMANI METALS & TUBES LTD., AHMEDABAD
7.7	JUNCTION BOX (FRP)	(a)	DEVI POLYMERS, CHENNAI
		(b)	SUCHITRA INDUSTRIES, BANGALORE
		(c)	RITTAL
		(d)	PYROTECH
		(e)	L&T
		(f)	HENSEL ELECTRIC INDIA PVT. LTD., SRIPERUMBUDUR
7.8	AIR CYLINDER	(a)	VELJAN HYDRAIR, HYDERABAD
		(b)	NUCON INDUSTRIES, HYDERABAD
		(c)	PRECISION ENGG. (PREAC), BANAGALORE
		(d)	ASCO, CHENNAI
8.0	<u>CABLES:</u>		
8.1	CONTROL CABLES	(a)	DELTON CABLES, FARIDABAD
		(b)	UNIVERSAL CABLES, SATNA
		(c)	NICCO CABLE, KOLKATA
		(d)	POLYCAB, DAMAN
		(e)	GAYOLENE, MUMBAI
		(f)	RELIANCE ENGRS, BANGALORE
		(g)	CORDS CABLES, RAJASTHAN

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		(h)	PARAMOUNT CABLES, ALWAR
		(i)	THERMOCABLES, BANGALORE,
		(j)	KEI INDUSTRIES LTD., CHENNAI
8.2	INSTRUMENTATION CABLE	(a)	DELTON CABLES, FARIDABAD
		(b)	UNIVERSAL CABLES, SATNA
		(c)	NICCO CABLE, KOLKATA
		(d)	POLYCAB, DAMAN
		(e)	GAYOLENE, MUMBAI
		(f)	RELIANCE ENGRS, BANGALORE
		(g)	CORDS CABLES, RAJASTHAN
		(h)	PARAMOUNT CABLES, ALWAR
		(i)	THERMOCABLES, BANGALORE / HYDERABAD
		(j)	KEI INDUSTRIES LTD., CHENNAI
		(k)	CABLE CORPRN OF (I) LTD., CHENNAI
		(l)	RPG CABLES LTD., CHENNAI
		(m)	FORT GLOSTER INDUSTRIES LTD. KOLKATA
		(n)	DECO CABLES, DELHI
		(o)	KRISHNA CABLES, GWALIOR
		(p)	THERMAPADS (P) LTD
		(q)	ELKAY TELELINKS LTD.
		(r)	INCAB INDUSTRIES LTD
		(s)	TORRENT CABLE LTD.
8.3	COMPENSATING CABLES	(a)	DELTON CABLE

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		(b)	TOSHNIWAL, MUMBAI RELIANCE, BANGALORE
		(c)	LAPP INDIA, MUMBAI/ BANGALORE
		(d)	CORDS CABLES, RAJASTHAN
		(e)	PARAMOUNT CABLE
8.4	SPECIAL CABLES (PTFE /FEP INSULATED CABLES)	(a)	TOSHNIWAL CABLE
		(b)	RELIANCE CABLES
		(c)	LAPP INDIA, MUMBAI
		(d)	PARAMOUNT CABLES
		(e)	FINOLEX, PUNE
8.5	POWER CABLES (LT)	(a)	DELTON CABLES, FARIDABAD
		(b)	UNIVERSAL CABLES, SATNA
		(c)	NICCO CABLE, KOLKATA
		(d)	CORDS CABLES, RAJASTHAN
		(e)	FORTGLASTER INDUSTRIES
		(f)	INCAB, PUNE
		(g)	CCIL, BANGALORE
		(h)	KEI INDUSTRIES LTD., CHENNAI
		(i)	POLYCAB, DAMAN PARAMOUNT CABLES, ALWAR
9.0	<u>UPS / DC SYSTEM:</u>		
9.1	UPS WITH ACDB	(a)	HI-REL ELECTRONICS
		(b)	EMERSON NETWORK (FORMERLY TATA LIEBERT)
		(c)	DB POWER ELECTRONICS
9.2	24 VDC BATTERY CHARGER	(a)	CALDYNE, KOLKATA

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	WITH DCDB	(b)	AMARARAJA, TIRUPATI
		(c)	CHHABI ELECTRICALS, JALGAON
		(d)	HBL POWER SYSTEMS, HYDERABAD
		(e)	MASS TECH CONTROLS
9.3	BATTERY (TUBULAR/PLANTE) (TUBULAR) (TUBULAR)	(a)	EXIDE, KOLKATA
		(b)	HBL NIFE, HYDERABAD UNION BATTERY (BUI PUNE)
9.4	BATTERY (NICKEL- CADMIUM)	(a)	HBL POWER SYSTEMS, HYDERABAD
		(b)	AMCO, BANGALORE
Laboratory Instruments:			
Bidder shall submit the vendor list with credentials for Mahagenco’s approval.			

CONSULTANT : PROCON ENGINEERS

51.77/2020/PS-PEM-MAX.

	TITLE : 1X660 MW BHUSAWAL THERMAL POWER STATION UNIT -6		SPECIFICATION NO. PE-TS-415-673-A001	
			SECTION : I	
	TECHNICAL SPECIFICATION FOR SEWAGE TREATMENT PLANT		SUB-SECTION: IA	
			REV. NO. 00	DATE :

NOTE:

1. THE SUB VENDOR LIST ABOVE IS INDICATIVE ONLY AND IS SUBJECT TO BHEL AND CUSTOMER APPROVAL DURING DETAILED ENGINEERING STAGE WITHOUT ANY COMMERCIAL & DELIVERY IMPLICATION TO BHEL.

BIDDER TO PROPOSE SUB VENDOR WITHIN 4 WEEKS OF PLACEMENT OF LOI. THEREAFTER NO REQUEST FOR ADDITIONAL SUB-VENDOR SHALL BE ENTERTAINED.

2. THE INSPECTION CATEGORY WILL BE INTIMATED AFTER AWARD OF CONTRACT BY BHEL/CUSTOMER. HOWEVER THE SAME WILL BE ADHERED BY THE BIDDER WITHOUT ANY COMMERCIAL AND DELIVERY IMPLICATION TO BHEL/ CUSTOMER.

5.1.77/2020/PS-PEM-MAX

	TITLE:		SPECIFICATION NO. PE-TS-415-673-A001	
	1X660 MW BHUSAWAL THERMAL POWER STATION UNIT -6		SECTION : I	
	TECHNICAL SPECIFICATION FOR SEWAGE TREATMENT PLANT		SUB-SECTION: IA	
			REV. NO. 00	DATE :

ANNEXURE III

FUNCTIONAL GUARANTEE AND LIQUIDATED DAMAGES

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1.0 <u>PERFORMANCE GUARANTEES</u>		
1.1 <u>GENERAL REQUIREMENTS</u>		
1.1.1	The equipment shall meet the ratings and performance requirements stipulated for various equipments. The guaranteed performance parameters shall be without any tolerance values and all margins required for instrument inaccuracies and other uncertainties shall be deemed to have been included in the guaranteed figures.	
1.1.2	All the guarantees shall be demonstrated during functional guarantee/ acceptance test. The various tests which are to be carried out during performance guarantee/ acceptance test are listed in this Sub-section. The guarantee tests shall be conducted at site.	
1.1.3	All instruments required for performance testing shall be of the type and accuracy required by the code and prior to the test, these shall be calibrated in an independent test Institute. The protecting tubes, pressure connections and other test connections required for conducting guarantee test shall conform to the relevant codes.	
1.1.4	Tools and tackles, thermowell (both screwed and welded) instruments/ devices including flow devices, matching flanges, impulse piping & valves etc and any special equipment, required for the successful completion of the tests, shall be provided by the bidder.	
1.1.5	All cost associated with the tests shall be included in the bid price.	
1.1.6	Detailed Performance/Capability Test procedures containing the following shall be furnished: (a) Objective of the test. (b) Various guaranteed parameters & tests as per contract. (c) Method of conductance of test and test code. (d) Duration of test, frequency of readings & number of test runs.	

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(e) Method of calculation. (f) Correction curves (g) Instrument list consisting of range, accuracy, least count and location of instruments. (h) Scheme showing measurement points. (i) Sample calculation. (j) Acceptance criteria. (k) Any other information required for conducting the test. 1.1.7 The test procedure for all conditions shall be furnished one year before the scheduled commissioning date. Heat balance diagram shall be furnished for all test conditions. 1.1.8 In case during performance guarantee test(s), it is found that the equipment/ system has failed to meet the guarantees, all necessary modifications and/or replacements shall be carried out to make the equipment/system comply with the guaranteed requirements & the same shall be demonstrated by conducting another performance guarantee test. However, if the specified performance guarantee(s) are still not met but are achieved within the Acceptable Shortfall Limit specified, the equipment will be accepted after levying liquidated damages. If, however, the demonstrated guarantee(s) continue to be more than the stipulated Acceptable Shortfall Limit, even after the above modifications/replacements within ninety (90) days or a reasonable period allowed, after the tests have been completed, the Owner will have the right to either of the following : (I) For Category-I Guarantees Reject the equipment/system/plant and recover from the contractor. OR		

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Accept the equipment/system/plant after levying Liquidated Damages (II) For Category-II Guarantees Reject the equipment/system/plant and recover from the Contractor the payments already made. The performance guarantees under this category shall be called 'Category II' Guarantees. Conformance to the performance requirements under Category-II is mandatory. (III) For Category-III Guarantees Reject the equipment/system/plant and recover from the Contractor. OR Accept the equipment/system after assessing the deficiency in respect of the various ratings, performance parameters and capabilities and recover from the contract price an amount equivalent to the damages as determined by the Owner. Such damages shall however be limited to the cost of replacement of the equipment(s)/system(s), replacement of which shall remove the deficiency so as to achieve the guaranteed performance. The P. G. test shall be carried out within four (4) months after first synchronisation. If the P.G. test is conducted beyond four (4) months from first synchronisation due to any reason attributable to Owner, the deterioration in performance shall be increased by the following amount for each month or part of the month by which the period between the first synchronisation and PG test exceeds four (4) months. (i) 0.1 % for the following eight (8) months (ii) 0.06 % for the period following thereafter.		

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