

CLAUSE NO.	FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES			एनटीपीसी NTPC
1.03.07				
1.03.08				
1.03.09				
1.03.10				
1.03.11	Mill Reject System 1. Continuous effective discharge and conveying at the rated capacity of the mill rejects without spillage or blockage in the system. 2. A) Following shall be demonstrated at shop for compressor • Capacity and discharge pressure of each air compressor B) Following shall be demonstrated at site for compressor • Parallel operation of air compressors, if applicable			
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-A Bidding Doc No CS-9591-101-2	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 27 OF 60

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1.03.12	Vibration and noise level of air compressors			
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	PERFORMANCE REQUIREMENTS FOR CLOSED LOOP CONTROL SYSTEM						
	(TABLE – 1)						
SI.No	Load/Rated of load change	MAXIMUM DEVIATION OF PARAMETERS FROM SET POINT					
	(% of MCR per min.)	Throttle	Flue gas	Furnace	S.H. steam	R.H. Steam	
		Pressure Deviation	Oxygen Deviation	Pressure Deviation	Temp. Deviation	Temp. Deviation	
		(Kg/cm²)	(% O2)	(mmwcl)	(Deg.C)	(Deg. C)	
A.	Steady State Condition						
1	90% to 100%	±2.0	± 0.4	± 8.0	± 5.0	± 5.0	
2	60%	± 2.0	± 0.4	± 8.0	± 5.0	± 5.0	
B.	RAMP Test (Change For Max. Duration of Five Minutes for 3% & 5% ramp and Three minutes for 10% ramp)						
3	± 3%	± 3.0	+0.6/-0.4	± 12.0	± 8.0	± 8.0	
4	± 5%	± 3.0	+0.8/-0.4	± 12.0	± 10.0	± 10.0	
5	± 10%	± 4.0	+1.0/-0.5	± 15.0	± 15.0	± 15.0	
C.	Step Load Changes						
1	From 100% to 80% at the rate of 10% per min.	± 5.0	+1.5/-0.5	± 20.0	± 15.0	± 15.0	
Note	1 Sufficient time shall be allowed as setting period between conducting the tests.						
	2 Plant operating condition, i.e. main equipment status, availability of auxiliaries, operational and equipment constraints, which can influence the test, shall also be recorded.						
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	Annexure-I 1.00.00 Worst Case Loading Conditions for Control System (Definition) The worst case loading conditions shall include the following tasks as a minimum: 1.01.00 All process inputs coming to Control System including SOE/annunciation inputs are being scanned, acquired, conditioned and processed. 1.02.00 All closed loop controls are in operation during a disturbed (non-steady) state of the process. 1.03.00 All open loop controls of DDCMIS are in operation during a disturbed (non-steady) state. 1.04.00 All data being transferred between control system, system bus and HMIPIS. 1.05.00 Three (3) alarms are being generated per second from each of the functional groups of Control System. 1.06.00 Twelve control commands from HMIPIS are being executed in one minute. 1.07.00 All processors (including hot standby) health being monitored. 1.08.00 All standby processors status being updated. 2.00.00 HMIPIS Worst Case Loading Conditions (See note below) The worst case loading conditions shall include the following tasks as a minimum: 2.01.00 Continuous data transfer between System Bus & HMIPIS. 2.02.00 All calculations including performance calculations being performed at the specified rates. 2.03.00 Alarms being reported at the rate of three (3) alarms per second for each of the Control System functional groups. 2.04.00 Two control operator commands for control/ information within a base period of one minute from each OWS & each LVS. 2.05.00 Data collection for all logs/reports in progress. 2.06.00 OWS/LVS displays are in operation as follows: LVS – 1, 4 - Sequence chain display with maximum number of dynamic data items. LVS - 2, 5 - Individual display with maximum number of dynamic data items.			
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	LVS – 3, 6	-	Plant mimic display with one hundred and twenty (120) numbers of dynamic data items.	
	OVS - 1	-	Overview display with max. no. of dynamic data items.	
	OVS - 2	-	Group display (twenty points, current data).	
	OVS - 3	-	Alarm display of twenty (20) points.	
	OVS – 4	-	4 Nos. Windows each running current trend.	
	Unit Incharge	-	Plant overview display	
	OVS			
	All PC Stations	X-T plots are displayed & updated.		
	On Station WAN			
	And unit LAN			
2.07.00	All printers connected to HMIPIS are in operation at rated speed.			
2.08.00	HMIPIS processors and all peripherals health being monitored.			
2.09.00	Data collection for trend function and historical data storage in progress.			
2.10.00	Four alarm acknowledgements within a base period of one minute from each OWS & LVS.			
2.11.00	Calculations for long term storage of data being performed.			
2.12.00	SOE printing in progress.			
2.13.00	Data transfer with other DDCMIS sub-systems, all PLCs and SG/TG C&I Systems in progress for controls (commands) as well as for information.			
3.00.00	<i>The Worst Case Loading Conditions For System Bus</i> The worst case loading condition shall mean continuous data transfer between the distributed modules (Control System/HMIPIS), at their individual worst case loading conditions defined at 1.00.00 & 2.00.00 above respectively. Note : This clause is generally for the unit DDCMIS. This shall be suitably modified for other DDCMIS subsection depending on actual configuration.			
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	APPENDIX-I GENERAL PREREQUISITES TO GUARANTEE TESTS TO BE ENSURED BY NTPC 1. Availability of adequate and uninterrupted supply of coal. Specifications of coal as per N.I.T and as observed during the test shall be recorded as per attached format (Appendix-IA). 2. Sufficiently empty bunkers to facilitate continuous tripper dumping of coal during the test. 3. Uninterrupted power supply within specified parameters for the duration of the test. 4. Belt protection switches, local stop push buttons, hooters, brakes/rail clamps in working order. 5. Adequate and uninterrupted water supply. 6. Plant communication system 7. Proper lubrication and oil level of all equipments. 8. Free rotation of idlers and pulleys. 9. Cleanliness of plant and removal of coal spillage at the start and during Tests. 10. Power supply voltage and frequency shall be as per technical specifications. 11. Availability of dry coal during testing of DS system			
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	APPENDIX-IA COAL PARAMETERS Project : Package : Date : As specified, As observed during the test 1. Size 2. HGI 3. Moisture 4. Shale and sand-stone content NTPC Contractor			
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-A Bidding Doc No CS-9591-101-2	SUB-SECTION-IV FUNCTIONAL GUARANTEES	PAGE 51 OF 60

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	APPENDIX-II PREREQUISITES TO GUARANTEE TESTS TO BE ENSURED BY CONTRACTOR 1. Deputation of team to site to associate with the Guarantee tests, 2. Calibration of belt weigher scales and accuracy of same to be demonstrated to NTPC. 3. Arrangement of wattmeters / energymeters calibrated and sealed from approved Govt. test house or NTPC site laboratory. Arrangement of any other instrument/ accessory for the test. 4. Proper adjustment of skirt boards and belt cleaners prior to the start of tests. 5. Arrangement of calibrated equipments for measurement of vibration & noise levels. 6. Protection Relays of LT/HT switchgears and all motor feeders shall be checked. 7. Belt protection switches, local push buttons, hooters, brakes/rail clamps to be in working order. 8. Free rotation of idlers and pulleys. 9. Protection relays of LT/HT switchgears and all motors/transformer feeders to be checked. 10. Sufficient illumination.			
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	ANNEXURE – IIA			
	FORMAT FOR SUBMISSION OF GUARANTEE TEST PROCEDURE			
	Clause No. as per LOA/ Tech. Specs.	Provision of LOA / Tech. Specs.	Name and Methodology of Test proposed by Vendor	NTPC comments on the tests proposed by vendor
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE				
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	APPENDIX-III GUARANTEE TEST PROFORMA FLOW PATH CAPACITY TEST Project : Package : Date : 1. Composition of Stream i) Conveyor Nos. ii) Reversible Stacker / Reclaimer iii) Traveling Tripper Nos. iv) Dust suppression pumps, service water pumps, Ventilation fan drives. v) 2. Location of Belt Weigher (s) : 3. Plant started (Time) : 4. Material started flowing over belt weigher (Time) : 5. Test period Completed (Time) : 6. Reading taken at three (3) minute intervals :			
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	Sl.No	Time	Flow Rate	Totaliser

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FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES

एनटीपीसी

NTPC

APPENDIX-IV

GUARANTEE TEST PROFORMA

POWER MEASUREMENT

Project :

Package :

Date :

1. Equipment/Stream Composition :

2. Motor Description :

3. Sr. No. of meters used :

4. Date of Calibration of instrument and name of test house :

5. Multiplying factor (M.F.) of the wattmeter :

6. Wattmeter Readings (to be taken at 1 minute intervals) :

Sl. No.	Measurement Terminal Location	Time	Voltage (Volts)	Current (amps)	kw Reading M.F.		Total (W1+W2) MF kw	Remarks
					W1	W2		

TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE

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	APPENDIX-IV							
	7. Energymeter Readings							
	Sl.	Equip- Ment	Time Duration		Energymeter Readings kWhr		Equipment kw (R2-R1)/ (t2-t1)	Remarks*
			Initial	Final	Initial	Final		
*Reason and duration for system trip/stop may be recorded in remarks column.								
NTPC				Contractor				
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE			TECHNICAL SPECIFICATIONS SECTION – VI, PART-A Bidding Doc No CS-9591-101-2		SUB-SECTION-IV FUNCTIONAL GUARANTEES		PAGE 57 OF 60	

CLAUSE NO.	FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES																			
	APPENDIX-V GUARANTEE TEST PROFORMA VIBRATION LEVEL MEASUREMENTS Project : Package : Date : Time : Details of vibration Level Meter 1. Make 2. Model & SI.No. 3. Date of calibration with name of Test House <table border="1"><thead><tr><th rowspan="2">Sl.No.</th><th rowspan="2">Equipment</th><th rowspan="2">Pick *Point</th><th colspan="3">Vibration level Amplitude/Velocity</th></tr><tr><th>Horizontal Micron/ mm/ sec.</th><th>Vertical micron/ mm/sec.</th><th>Axial Micron / mm/sec.</th></tr></thead><tbody><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table> * Reading shall be taken at all the bearings of motor, gear box and driven equipment. In case of conveyor galleries, vibrations shall be measured at min. three locations, at midpoint of stringer between two short supports. NTPC Contractor					Sl.No.	Equipment	Pick *Point	Vibration level Amplitude/Velocity			Horizontal Micron/ mm/ sec.	Vertical micron/ mm/sec.	Axial Micron / mm/sec.						
Sl.No.	Equipment	Pick *Point	Vibration level Amplitude/Velocity																	
			Horizontal Micron/ mm/ sec.	Vertical micron/ mm/sec.	Axial Micron / mm/sec.															
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CLAUSE NO.	FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES																
	APPENDIX-VI GUARANTEE TEST PROFORMA NOISE LEVEL MEASUREMENT Project : Package : Date : Details of Sound Level Meter 1. Make 2. Model 3. Date of calibration with name of Test House <table border="1"><thead><tr><th>Sl.No.</th><th>Equipment with location</th><th>Equipment load/capacity</th><th>Measurement* point no.</th><th>Sound level dBA.</th><th>Remarks</th></tr></thead><tbody><tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr></tbody></table> NTPC Contractor * For each equipment location, a Projected Plan Diagram shall be made and the location of measurement points shall be identified.					Sl.No.	Equipment with location	Equipment load/capacity	Measurement* point no.	Sound level dBA.	Remarks						
Sl.No.	Equipment with location	Equipment load/capacity	Measurement* point no.	Sound level dBA.	Remarks												
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**KARIMNAGAR TELANGANA SUPER
THERMAL POWER PROJECT PHASE I-
(2 X 800 MW) SG PACKAGE
MILL REJECT SYSTEM (PNEUMATIC TYPE)**

SPECIFIC TECHNICAL REQUIREMENT

SPECIFICATION No: PE-TS-424-160-A001

VOLUME: II B

SECTION-I

SUB-SECTION-IA

REV 00

DATE 24.05.17

ANNEXURE VI- DRAWINGS/DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT : The successful bidder shall submit the following drawings / documents during detail engineering for customer's approval /information:

S.No.	BHEL DRG NO	DRG TITLE	CATEGORY	SCHEDULED SUBMISSION (NO. OF DAYS FROM LOA DATE)	REMARKS
1	PE-V0-424-160-A047	TECHNICAL DATA SHEET OF TEMPERATURE SWITCH, TEMPERATURE GAUGE, PRESSURE SWITCH, PRESSURE GAUGE, SOLENOID VALVE , LEVEL SWITCH , AIR FILTER REGULATOR	A	70	
2	PE-V0-424-160-A013	EQPT AND PIPING LAYOUT OF MILL REJECT SYSTEM AND PIPING LAYOUT FROM COMPRESSOR HOUSE	A	56	BASIC DRG.
3	PE-V0-424-160-A002	GA OF WATER AND AIR LINE VALVES	I	84	
4	PE-V0-424-160-A019	G.A OF MRS BUNKER (Capacity calcultion of Mill Reject bunker shall be submitted along with GA of Bunker)	A	42	BASIC DRG.
5	PE-V0-424-160-A008	GA & DS OF SELF MFG. ITEMS (DENSVEYOR, HOPPER, BNKR DIS. GATE, PRV, ACI BEND, PNEU. PANEL, AIR RECVR, TER. BOX, ETC.)	A	42	BASIC DRG.
6	PE-V0-424-160-A025	GA OF KNIFE GATE/PLATE VALVE	A	56	
7	PE-V0-424-160-A059	GA AND TDS OF PNEUMATIC CYLINDER	I	56	
8	PE-V0-424-160-A014	LAYOUT OF COMPRESSOR HOUSE	A	70	BASIC DRG.
9	PE-V0-424-160-A037	GA OF CHAIN PULLEY BLOCK	I	56	
10	PE-V0-424-160-A035	G.A. OF RUPTURE DISC.	I	56	
11	PE-V0-424-160-A034	G.A OF METALLIC EXPANSION BELLOW	I	56	
12	PE-V0-424-160-A027	G.A OF BAG FILTER	I	56	
13	PE-V0-424-160-A022	TRENCH AND INSERT DETAIL OF MRS	A	56	BASIC DRG.
14	PE-V0-424-160-A024	DESIGN CALCULATION AND STRUCTURAL ARRANGEMENT OF BUNKER	A	70	BASIC DRG.
15	PE-V0-424-160-A060	LOAD DATA OF MILL REJECT BUNKER	I	70	BASIC DRG.



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16	PE-V0-424-160-A061	MILL REJECT SILO FOUNDATION PLAN INCLUDING LOADING DATA,BASE PLATE/ FOUNDATION BOLT/ SHEAR KEY DETAILS	I	70	BASIC DRG.
17	PE-V0-424-160-A051	CABLE INTERCONNECTION DIAGRAM	I	98	
18	PE-V0-424-160-A005	INSTRUMENT SCHEDULE	I	70	
19	PE-V0-424-160-A062	GA & Datasheet of Sump Pumps	A	98	
20	PE-V0-424-160-A055	OPERATION AND MAINTENANCE MANUAL	I	168	
21	PE-V0-424-160-A006	P & I DIAGRAM OF MILL REJECT HANDLING SYSTEM	A	28	BASIC DRG.
22	PE-V0-424-160-A053	PIPING AND VALVE SCHEDULE	I	56	
23	PE-V0-424-160-A052	PAINTING SCHEDULE	I	56	
24	PE-V0-424-160-A063	Control Write-up	A	70	BASIC DRG.
25	PE-V0-424-160-A064	Logic for Mill Reject System	A	70	BASIC DRG.
26	PE-V0-424-160-A065	Pneumatic Circuit of Conveying Vessel	A	70	BASIC DRG.
27	PE-V0-424-160-A004	DESIGN PHILOSOPHY AND SYSTEM SIZING CALCULATION OF MILL REJECT SYSTEM	A	28	BASIC DRG.
28	PE-V0-424-160-A054	CABLE SCHEDULE -SIGNAL AND CONTROL	I	84	
29	PE-V0-424-160-A012	WELDING PROCEDURE SPECIFICATION	A	42	
30	PE-V0-424-160-A066	TYPE TEST CERTIFICATE/PROCEDURE FOR MOTORS	A	70	
31	PE-V0-424-160-A067	G.A., TECHNICAL DATA SHEET OF AIRCOMPRESSOR MOTOR	A	70	BASIC DRG.
32	PE-V0-424-160-A011	SUB VENDOR LIST WITH INSPECTION CATEGORY	A	28	BASIC DRG.
33	PE-V0-424-160-A010	P & I DIAGRAM OF MRS COMPRESSOR	A	70	
34	PE-V0-424-160-A043	G.A., TECHNICAL DATA SHEET AND FOUNDATION DETAILS OF AIRCOMPRESSOR, GA AND WIRING DIAGRAM FOR LOCAL PANEL OF CONVEYING AIR COMPRESSOR	A	70	BASIC DRG.
35	PE-V0-424-160-A049	TECHNICAL DATA SHEET OF CABLE TRAY	I	70	
36	PE-V0-424-160-A009	P G TEST PROCEDURE	A	140	
37	PE-V0-424-160-A016	CABLE TRAY, EARTHING LAYOUT	A	70	



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(2 X 800 MW) SG PACKAGE
MILL REJECT SYSTEM (PNEUMATIC TYPE)**

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38	PE-V0-424-160-A056	DATASHEET OF AUTO DRAIN TRAP	I	70	
39	PE-V0-424-160-A057	GA of Junction Box	I	70	
40	PE-V0-424-160-A058	Suggested input and output (I/O) list	I	84	BASIC DRG.
41	PE-V0-424-160-A068	Commissioning Procedure	A	140	
QUALITY ASSURANCE PLAN					
1	PE-V0-424-160-A801	QP for Pyrite hopper	A	84	BASIC DRG.
2	PE-V0-424-160-A803	QP for Air receiver	A	84	BASIC DRG.
3	PE-V0-424-160-A804	QP for Terminal box	A	84	BASIC DRG.
4	PE-V0-424-160-A805	QP for Bunker discharge gate	A	84	BASIC DRG.
5	PE-V0-424-160-A806	QP for Pressure relief valve	A	84	BASIC DRG.
6	PE-V0-424-160-A807	QP for Pneumatic Panel for Denseveyor	A	84	BASIC DRG.
7	PE-V0-424-160-A811	QP for CI / CCS / CSS / Gate / Globe / Check Valves FCS / Copper Alloy – Gate Valve / Globe Valve	A	84	
8	PE-V0-424-160-A814	QP ACI Bend	A	84	BASIC DRG.
9	PE-V0-424-160-A815	MQP of Sump Pump	A	84	
10	PE-V0-424-160-A816	MQP of Temperature Switch	A	84	
11	PE-V0-424-160-A817	QP for Pressure Switch	A	84	
12	PE-V0-424-160-A802	QP for Denseveyor	A	84	BASIC DRG.
13	PE-V0-424-160-A812	QP for Pneumatic Actuator (Air Cylinder for Denseveyor)	A	84	
14	PE-V0-424-160-A813	QP for Level Switch	A	84	
15	PE-V0-424-160-A819	QP for Pipes (MS ERW& GI)	A	84	
16	PE-V0-424-160-A823	QAP for Compressor Panel	A	84	
17	PE-V0-424-160-A827	QAP for Pneumatic Actuator/ Cylinder (for Knife Gate Valve)	A	84	
18	PE-V0-424-160-A820	QP Endorsement Sheet for Air Compressor	A	84	
19	PE-V0-424-160-A825	MQP for LT Motor	A	84	



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(2 X 800 MW) SG PACKAGE
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20	PE-V0-424-160-A836	QP for Junction Box	A	84	
21	PE-V0-424-160-A837	QAP OF Drain Sump pump	A	84	
22	PE-V0-424-160-A038	QP FOR CABLE TRAY	A	84	

Notes:

1. The above drawing list is tentative and shall be finalized with the successful bidder after placement of order. While some of the drawings indicated above may not be applicable, some additional drawings may also be required based on scope of work.
2. Drawings shall be prepared in Auto-Cad latest edition. Required no. of hard and soft copies (editable) of the drawings shall be furnished as per requirement specified elsewhere in the specification.
3. Only manual calculation with authentic supporting literature (e.g. extracts of hand Book/ standard/codes) shall be acceptable. All design calculations and drawings shall be in SI system only.
4. All the drawings and documents including general arrangement drawing, data sheet, calculation etc. to be furnished to the customer during detailed engineering stage shall include / indicate the following details for clarity w.r.t. Inspection, construction, erection and maintenance etc.:-
 - a) All drawings and documents shall indicate the list of all reference drawings including general arrangement.
 - b) All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow - up view; all major self-manufactured and bought out items shall be labeled and included in BOQ / BOM in tabular form.
 - c) Painting schedule shall also be made as a part of general arrangement drawing of each equipment / items indicating at least 3 trade names.
 - d) All the drawings required to be furnished to customer during detailed engineering stage shall include technical parameters, details of paints and lubrication, hardness and BOQ / BOM in tabular form indicating all major components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc.
 - e) Drawings/ documents to be submitted for purchasers review/ approval shall be under Revision A, B, C... etc. while drawings /documents to be submitted thereafter for customer's approval after purchaser's approval shall be under R-0, 1, 2, 3etc.
 - f) Drawings and documents not covered above but required to check safety of machines/ system, shall be submitted during detailed engineering stage without any commercial implication.
 - g) All drawings shall include "B.O.M" and indicate quantity, material of construction, make along with IS/BS No., Technical parameters, dimensions, hardness, machining symbol and tolerance, requirement of radiography and hydraulic tests, painting details, elevation, side view, plan, skin section and blow-up view for clarity.
 - h) All drawings shall be prepared as per BHEL's title block and shall bear BHEL's drawing No.
 - i) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's/



**KARIMNAGAR TELANGANA SUPER
THERMAL POWER PROJECT PHASE I-
(2 X 800 MW) SG PACKAGE
MILL REJECT SYSTEM (PNEUMATIC TYPE)**

SPECIFIC TECHNICAL REQUIREMENT

SPECIFICATION No: PE-TS-424-160-A001

VOLUME: II B

SECTION-I

SUB-SECTION-IA

REV 00

DATE 24.05.17

Customer's/ Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.

- j) Bidder to follow the following the drawing submission schedule:
- k) 1st submission of drawings from date of LOI as per the submission schedule.
- l) Every revised submission incorporating comments – within 7 days.
- m) Bidder to submit revised drawings complete in all respects incorporating all comments. Any incomplete drawing submitted shall be treated as non-submission with delays attributable to bidder's account. For any clarification/ discussion required to complete the drawings, the bidder shall himself depute his personal to BHEL for across the table discussions/ finalizations/ submissions of drawings.
- n) NTPC drawing numbers shall be informed after award of contract and essentially to be incorporated in drawings. The pdf files of all drawings and documents shall be named and submitted with NTPC drawing numbers.
- o) Drawings documents above have been identified as basic drawings in remarks column. During contract engineering stage, approval of these drawings from BHEL/Customer shall be treated as clearance to milestone payment for completion of design & engineering.

Upon review of each drawing, depending on the correctness and completeness of the drawing, the same will be categorized and approval accorded in one of the following categories :

CATEGORY- I : Approved

CATEGORY- II : Approved, subject to incorporation of comments/ modification as noted.
Resubmit revised drawing incorporating the comments.

CATEGORY –III : Not approved. Resubmit revised drawings for approval after incorporating comments/ modification as noted.

CATEGORY -IV : For information and records.

Drawings resubmitted shall show clearly the portions where the same are revised marking the relevant revision numbers and Employer shall review only such revised portion of documents.

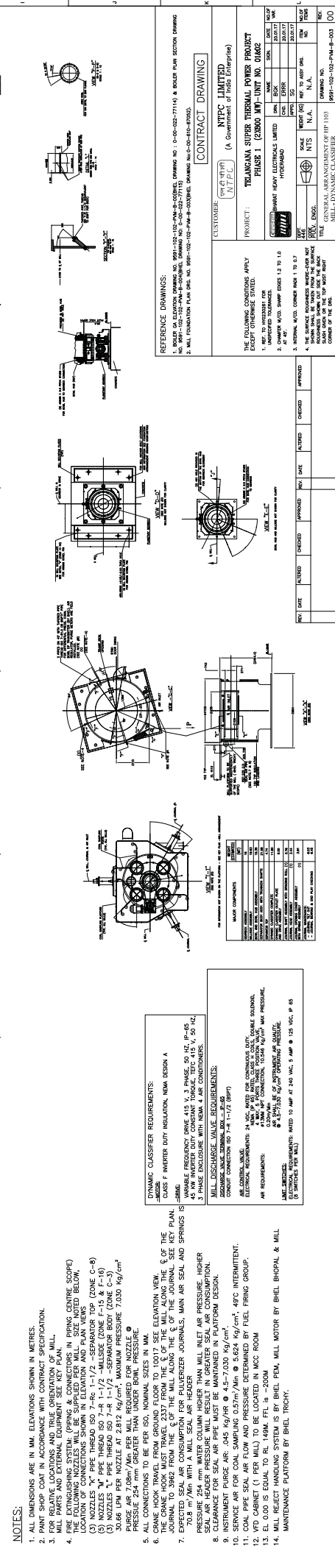
B.0 NO.OF DRAWINGS/DOCUMENTS FOR SUBMISSION

A.	Drawing for Approval	No. of prints/copies (hard prints)
i.	For approval	8
ii.	For final distribution (after the vendor obtains final approval from the customer).	12
B.	Certificate, reports etc. (Material test, inspection report and all other type of tests etc.)	6
C.	O&M Manual	
I.	Draft for approval	2
ii.	For final distribution	12

बी एच ई एल 	KARIMNAGAR TELANGANA SUPER THERMAL POWER PROJECT PHASE I- (2 X 800 MW) SG PACKAGE MILL REJECT SYSTEM (PNEUMATIC TYPE)	SPECIFICATION No: PE-TS-424-160-A001	
		VOLUME: II B	
		SECTION-I	
		SUB-SECTION-IA	
		REV 00	DATE 24.05.17
SPECIFIC TECHNICAL REQUIREMENT			

Annexure VII- Input Drawings & Documents

- 1) Foundation Plan of HP 1103 Dynamic Classifier (With Planetary gear box) – Drg no 9591-102-102-PVC-V-003.
- 2) General Arrangement of HP 1103 Dynamic Classifier (With Planetary gear box)– Drg no 9591-102-102-PVM-B-003.
- 3) BOILER AREA PAVING MILL REJECT SYSTEM (UNIT1 & 2) Drg no 9591-102-315-PVC-C-0423
- 4) Flow diagram



NOTES:

1. ALL DIMENSIONS ARE IN MM. ELAVATIONS SHOWN IN METRES.
2. ALL CONNECTIONS TO BE PER ISO, NOMINAL SIZES IN MM.
3. GROUND LEVEL TRAVEL FROM ROAD TO 10075 TO BE ELAVATION VIEW OF THE JOURNAL TO 3962 FROM THE § OF THE JOURNAL ALONG THE § OF THE JOURNAL.
4. EXPECTED SEAL AIR CONSUMPTION FOR PULVERIZER JOURNALS, MAIN AIR SEAL AND SPRING VALVE SHALL BE 1000 LTR/HOUR.
5. FOR RELATIVE LOCATIONS AND TRUE ORIENTATION OF WELL.
6. THE PUMP SHOP COAT IN ACCORDANCE WITH CONTRACT SPECIFICATION.
7. AIR EXHAUSTING SYSTEM (PIPING & CONNECTORS IN PUMP CENTRE SCOPE)
8. THE PUMPING NOZZLES WILL BE SUPPLIED PER PUMP SIZE NOTED BELOW.
9. (1) NOZZLES "W" PIPE THREAD ISO 7-1/2 - 1/2 - SEPARATOR TOP (C-8)
10. (2) NOZZLES "W" PIPE THREAD ISO 7-1/2 - 1/2 - SEPARATOR BODY (C-8)
11. (3) NOZZLES "W" PIPE THREAD ISO 7-1/2 - 1/2 - MULDROPE JOINT (C-15 & F-16)
12. (4) NOZZLES "W" PIPE THREAD ISO 7-1/2 - 1/2 - SEPARATOR BODY (C-8)
13. 30.66 MM PER NOZZLE AT 2.812 KG/CM² MAXIMUM PRESSURE 7.030 KG/CM²
14. 1.500 KG/CM² MAXIMUM PRESSURE 7.030 KG/CM²
15. PRESSURE 224 mm² GREATER THAN UNDER BLOW PRESSURE.
16. ALL CONNECTIONS TO BE PER ISO, NOMINAL SIZES IN MM.
17. GROUND LEVEL TRAVEL FROM ROAD TO 10075 TO BE ELAVATION VIEW OF THE JOURNAL TO 3962 FROM THE § OF THE JOURNAL ALONG THE § OF THE JOURNAL.
18. EXPECTED SEAL AIR CONSUMPTION FOR PULVERIZER JOURNALS, MAIN AIR SEAL AND SPRING VALVE SHALL BE 1000 LTR/HOUR.
19. 70.8 m³/HR WITH A MAIN SEAL AIR HEADER
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10-100-PWM-003BMS, DRAWING NO. 10-002-002-7711A, & RELAY PWR SECTION DRAWING NO. 10-002-002-7711B 10-100-PWM-003BMS, DRAWING NO. 10-002-002-7711A, & RELAY PWR SECTION DRAWING NO. 10-002-002-7711B		CONTRACT DRAWING	
CUSTOMER		NTPC LIMITED (A Government of India Enterprise)	
PROJECT:		TELANGANA SUPER THERMAL POWER PROJECT PHASE 1 (2x660 MW UNIT NO. 0002)	
DRAWING NO. 10-100-PWM-003BMS DRAWING TITLE: RELAY PWR SECTION DRAWING		DRAWING NO. 10-002-002-7711A DRAWING TITLE: RELAY PWR SECTION DRAWING	
10-100-PWM-003BMS, DRAWING NO. 10-002-002-7711A, & RELAY PWR SECTION DRAWING NO. 10-002-002-7711B		10-100-PWM-003BMS, DRAWING NO. 10-002-002-7711A, & RELAY PWR SECTION DRAWING NO. 10-002-002-7711B	



LIMIT SWITCHES DESCRIPTION (TYPICAL)	
S. No.	VALVE TAG
1	1EUA**A003 1EUA**C0004 (OPEN) 1EUA**C0009 (CLOSE)
2	1EUA**A004 1EUA**C0004 (OPEN) 1EUA**C0048 (CLOSE)
3	1EUA**A005 1EUA**C0004 (OPEN) 1EUA**C0009 (CLOSE)
4	1EUA**A006 1EUA**C0004 (OPEN) 1EUA**C0068 (CLOSE)
5	1EUA**A007 1EUA**C0007A (OPEN) 1EUA**C0007 (CLOSE)

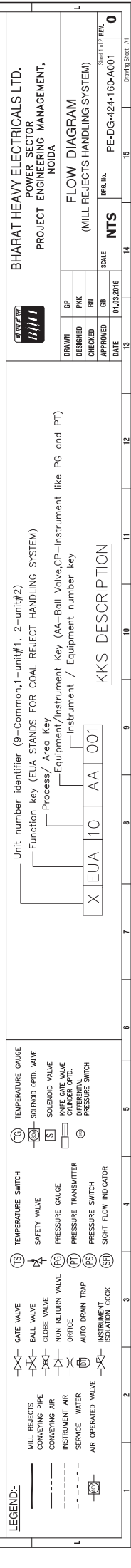
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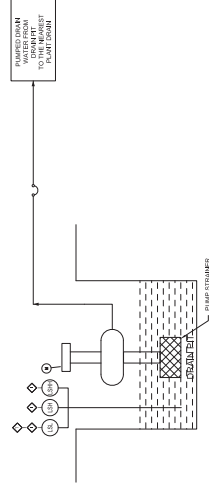
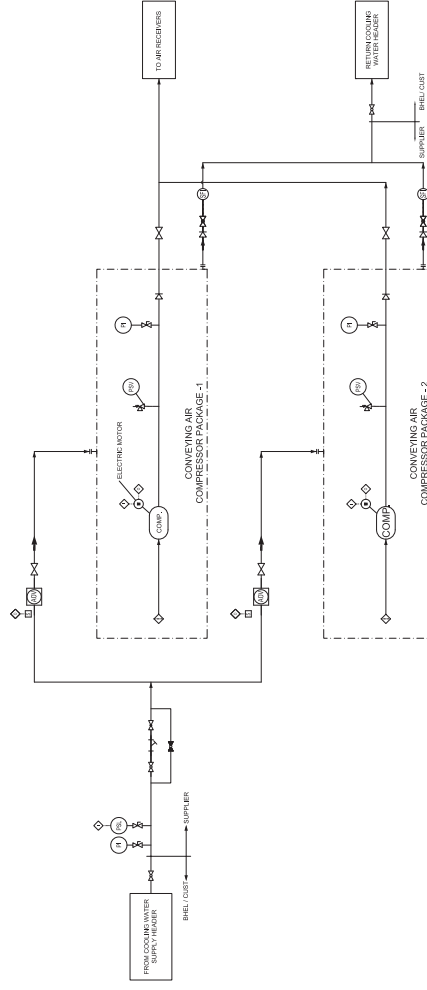
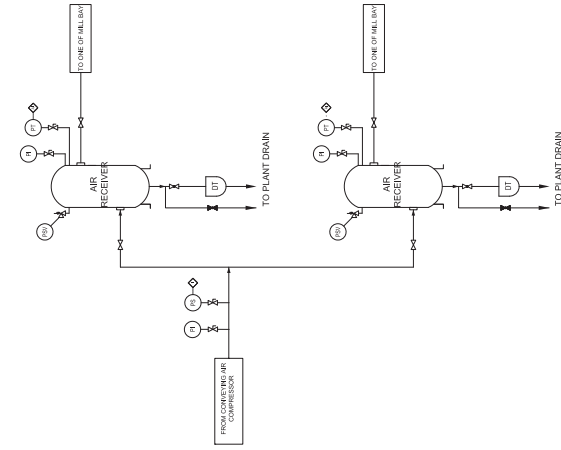
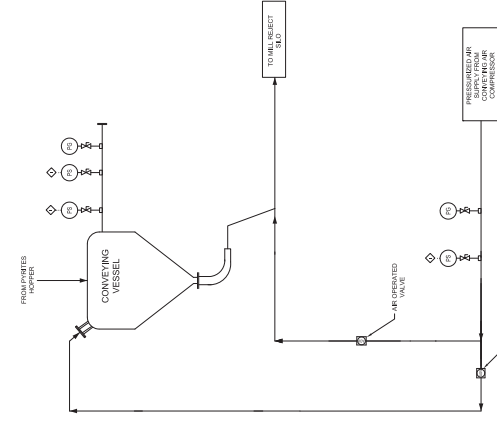
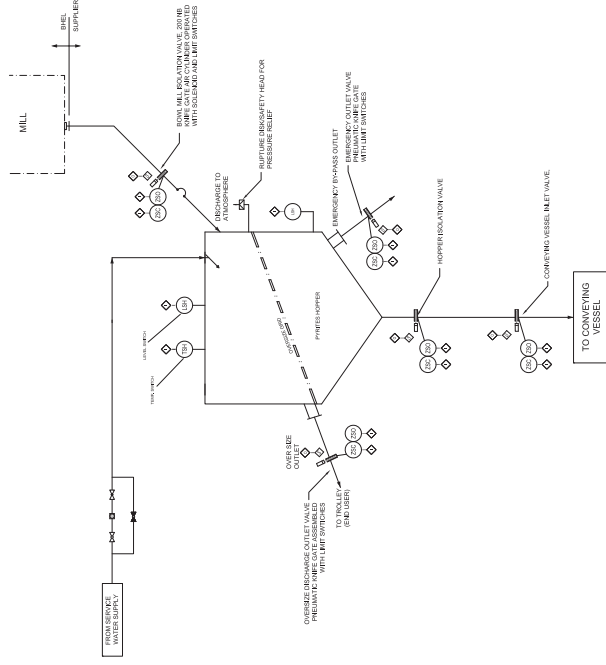
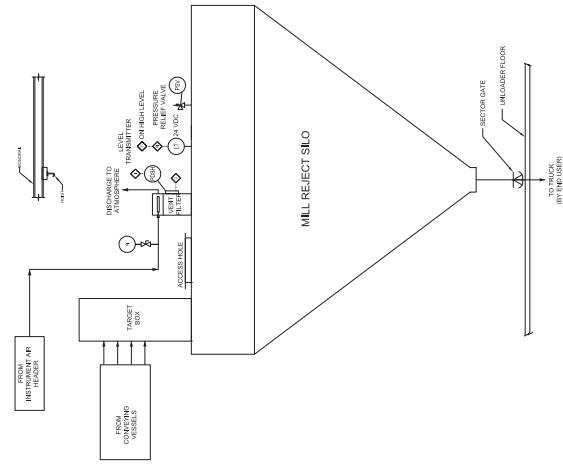
FOR OTHER UNIT/ S

NOTE:

1. * * * – CONVEYING AIR VALVES/ LINES MAY BE TWO OR MORE DEPENDING UPON SUPPLIER'S SPECIFIC DESIGN.
2. + + + – STANDS FOR 10.20.30...FOR MILLS A,B,C... RESPECTIVELY
3. + + + – INSTRUMENTS SHOWN IN THE BOX SHALL BE IN BHEL/ CUSTOMER SCOPE.
4. K/S NOMENCLATURE ARE USED FOR TAGGING VARIOUS COMPONENTS IN THE SYSTEM. SUPPLIER HAS TO FOLLOW SAME SYSTEM.
5. EQUIPMENT & INSTRUMENTS SHOWN IN THIS SCHEME ARE MINIMUM REQUIREMENT FOR THE SYSTEM. ANY ADDITIONAL DEVICE/ EQUIPMENT/ INSTRUMENTS REQUIRED FOR SYSTEM COMPLETION AND SATISFACTORY OPERATION, SHALL BE PROVIDED.
6. ALL SOLENOID VALVES FOR OPERATIONS OF KNIFE/ PLATE VALVES, SHALL BE PLACED INSIDE PANEL.
7. FOR REDUNDANCY OF INSTRUMENTS REFER C&I SPECIFICATION AT SUB SECTION 1C.

CONVEYING AIR COMPRESSOR (TYPICAL ARRANGEMENT)





LEGEND:-

	MILL REJECTS		GATE VALVE		BLOW VALVE
	CONVEYING PIPE		BALL VALVE		TEMPERATURE SWITCH
	CONVEYING AIR		BALL VALVE		SAFETY VALVE
	INSTRUMENT AIR		GLOBE VALVE		PRESSURE GAUGE
	SERVICE WATER		NON RETURN VALVE		PRESSURE SWITCH
	RETURN WATER		ORFICE		SIGHT FLOW INDICATOR
	AIR OPERATED VALVE		DRAIN TRAP		

10	TEMPERATURE GAUGE	STRAINER	1	INPUT TO PLC OR DISCRETE ANALOG	250	DIFF. PRESSURE HIGH	750	PRESSURE HIGH
11	SOLENOID VALVE	FLEXIBLE HOSE	2	OUTPUT FROM PLC ANALOG DISCRETE	750	TEMPERATURE HIGH	80	PRESSURE LOW
12	HYDRAULIC PANEL	EXPANSION JOINT	3		250	LEVEL HIGH	150	LEVEL LOW
13	PNEUMATIC VALVE CYLINDER		4		250	LIMIT SWITCH OPEN	500	LEVEL VERT. HIGH
14	OPTD.		5		250	LIMIT SWITCH CLOSED		

BHARAT HEAVY ELECTRICALS LTD.
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT,

DESIGNED	PA
DRAWN	GR
CHECKED	RI
APPROVED	G

FLOW DIAGRAM
L REJECTS HANDLING SYSTEM)

SCALE	DRG. No.	Sheet
NTS		PE-DG-424-160-A001

PEM-6666-0

	KARIMNAGAR TELANGANA SUPER THERMAL POWER PROJECT PHASE I- (2 X 800 MW) SG PACKAGE MILL REJECT SYSTEM (PNEUMATIC TYPE) SPECIFIC TECHNICAL REQUIREMENT	SPECIFICATION No: PE-TS-424-160-A001	
		VOLUME: II B	
		SECTION-I	
		SUB-SECTION-IB	
		REV 00	DATE 24.05.17

SUB SECTION-IB

SPECIFIC TECHNICAL REQUIREMENT (ELECTRICAL)

REV-0, DATE: 20.04.2017

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

PACKAGES: MILL REJECT SYSTEM

SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT

PROJECT: 2X800MW KARIMNAGAR TPP (SG ISLAND)

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC	BHEL	BHEL	240 V AC (supply feeder)/415 V AC (3 PHASE 4 WIRE) supply shall be provided by BHEL based on load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract. Any other voltage level (AC/DC) required will be derived by the vendor.
2	Local Push Button Station (for motors)	BHEL	BHEL	Located near the motor.
3	Power cables, control cables and screened control cables for a) both end equipment in BHEL's scope b) both end equipment in vendor's scope c) one end equipment in vendor's scope	BHEL BHEL BHEL	BHEL Vendor BHEL	1. For 3.b) & c): Sizes of cables required shall be informed by vendor at contract stage (based on inputs provided by BHEL) in the form of cable listing. Finalisation of cable sizes shall be done by BHEL. Vendor shall provide lugs & glands accordingly. 2. Termination at BHEL equipment terminals by BHEL. 3. Termination at Vendor equipment terminals by Vendor.
4	Junction box for control & instrumentation cable	Vendor	Vendor	Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 10-12 mtrs) and trunk cable.
5	Any special type of cable like compensating, co-axial, prefab, MICC, optical fibre etc.	Vendor	Vendor	Refer C&I portion of specification for scope of fibre Optical cables if used between PLC/ microprocessor & DCS.
6	Cable trays, accessories & cable trays supporting system 100/ 50 mm cable trays/ Conduits/ Galvanised steel cable troughs for local cabling	BHEL Vendor	BHEL Vendor	Local cabling from nearby main route cable tray (BHEL scope) to equipment terminal (vendor's scope) shall be through 100/ 50 mm. cable trays/ conduits/ Galvanised steel cable troughs, as per approved layout drawing during contract stage.
7	Cable glands ,lugs and bimetallic strip for equipment supplied by Vendor	Vendor	Vendor	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power and control cables.
8	Conduit and conduit accessories for cabling between equipment supplied by vendor	Vendor	Vendor	Conduits shall be medium duty, hot dip galvanised cold rolled mild steel rigid conduit as per IS: 9537.
9	Lighting	NTPC	NTPC	
10	Equipment grounding (including electronic earthing) &	BHEL	BHEL	Refer note no. 4 for electronic earthing

REV-0, DATE: 20.04.2017

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR**PACKAGES: MILL REJECT SYSTEM****SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT****PROJECT: 2X800MW KARIMNAGAR TPP (SG ISLAND)**

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
	lightning protection			
11	Below grade grounding	BHEL	BHEL	
12	LT Motors with base plate and foundation hardware	Vendor	Vendor	Makes shall be subject to customer/ BHEL approval at contract stage.
13	Mandatory spares	Vendor	-	Vendor to quote as per specification.
14	Recommended O & M spares	Vendor	-	As specified elsewhere in specification
15	Any other equipment/ material/ service required for completeness of system based on system offered by the vendor (to ensure trouble free and efficient operation of the system).	Vendor	Vendor	
16	a) Input cable schedules (Control & Screened Control Cables) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for Control and Instrumentation Cable and electronic earthing cable in enclosed excel format shall be submitted by vendor during detailed engineering stage.
17	Electrical Equipment & cable tray layout drawings	Vendor	-	For ensuring cabling requirements are met, vendor shall furnish Electrical equipment layout & cable tray layout drawings (both in print form as well as in AUTOCAD) of the complete plant (including electrical area) indicating location and identification of all equipment requiring cabling, and shall incorporate cable trays routing details marked on the drawing as per PEM interface comments. Cabling arrangement of the same (wherever overhead cable trays, trenches, cable ducts, conduits etc.) shall be decided during contract stage. Electrical equipment layout & cable tray layout drawing shall be subjected to BHEL/ customer approval without any commercial implications to BHEL.
18	Electrical Equipment GA drawing	Vendor	-	For necessary interface review.

NOTES:

1. Make of all electrical equipment/ items supplied shall be reputed make & shall be subject to approval of BHEL/customer after award of contract.
2. All QPs shall be subject to approval of BHEL/customer after award of contract without any commercial implication.

REV-0, DATE: 20.04.2017

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR**PACKAGES: MILL REJECT SYSTEM****SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT****PROJECT: 2X800MW KARIMNAGAR TPP (SG ISLAND)**

3. In case the requirement of Junction Box arises on account of Power Cable size mis-match due to vendor engineering at later stage, vendor shall supply the Junction Box for suitable termination.
4. Vendor shall indicate location of Electronic Earth pit in their Civil assignment drawing.

SUB – SECTION – B-01

MOTORS

MOTORS

1.00.00 GENERAL REQUIREMENTS

- 1.01.00 For the purpose of design of equipment/systems, an ambient temperature of 50 deg. Centigrade and relative humidity of 95% (at 40 deg C) shall be considered. The equipment shall operate in a highly polluted environment.
- 1.02.00 All equipment's shall be suitable for rated frequency of 50 Hz with a variation of +3% & -5%, and 10% combined variation of voltage and frequency unless specifically brought out in the specification.
- 1.03.00 Contactor shall provide fully compatible electrical system, equipment's, accessories and services.
- 1.04.00 All the equipment, material and systems shall, in general, conform to the latest edition of relevant National and international Codes & Standards, especially the Indian Statutory Regulations.
- 1.05.00 The auxiliary AC voltage supply arrangement shall have 11kV, 3.3 kV and 415V systems and DC voltage shall be 220 V. It shall be designed to limit voltage variations as given below under worst operating condition :
- | | |
|------------------|---|
| (a) 11kV, 3.3 kV | +/- 6% |
| (b) 415/240V | +/- 10% |
| (c) 220 V DC | -15% to +10%. However the nominal continuous DC power supply shall be 240V. |
- 1.06.00 The voltage level for motors shall be as follows :-
- | | |
|----------------------------------|--|
| a) Upto 0.2KW | : Single phase 240V AC / 3 phase 415V AC |
| b) Above 0.2KW and upto 200KW | : 3 phase 415V AC |
| c) Above 200KW and upto 1500 KW: | 3.3 kV |
| d) Above 1500 KW | : 11 kV |
- 1.07.00 A.C. motors shall be fed from bus at above specified voltage level and fault level of 50 kA RMS (Max.) for 1 second. The 415V system shall be solidly grounded and 220 VDC system shall be isolated type.
- 1.08.00 Paint shade shall be as per RAL 5012 (Blue) for indoor and outdoor equipment.
- 1.09.00 The responsibility of coordination with electrical agencies and obtaining all necessary clearances for Contactors equipment and systems shall be under the Contactor scope.

1.10.00 Degree of Protection

Degree of protection for various enclosures as per IS:4691, IEC60034-05 shall be as follows :-

- | | | | |
|------|------------------------|---|-------|
| i) | Indoor motors | - | IP 54 |
| ii) | Outdoor motors | - | IP 55 |
| iii) | Cable box-indoor area | - | IP 54 |
| iv) | Cable box-Outdoor area | - | IP 55 |

2.00.00 CODES AND STANDARDS

- | | | | |
|----|------------------------------|---|------------------------|
| 1) | Three phase induction motors | : | IS:325, IEC:60034 |
| 2) | Single phase AC motors | : | IS:996, IEC:60034 |
| 3) | Crane duty motors | : | IS:3177, IEC:60034 |
| 4) | DC motors/generators | : | IS:4722, IEC:60034 |
| 5) | Energy Efficient motors | : | IS 12615, IEC:60034-30 |

3.00.00 TYPE

3.01.00 AC Motors:

- a) Squirrel cage induction motor suitable for direct-on-line starting.
- b) Continuous duty LT motors upto 160 KW Output rating (at 50 deg.C ambient temperature), shall be **Premium Efficiency class-IE3**, conforming to IS 12615, or IEC:60034-30.
- c) Crane duty motors shall be slip ring/ squirrel cage Induction motor as per the requirement.

3.02.00 DC Motors Shunt wound.

4.00.00 RATING

- (a) Continuously rated (S1). However, crane motors shall be rated for S4 duty, 40% cyclic duration factor.
- (b) Whenever the basis for motor or driven equipment ratings are not specified in the corresponding mechanical specification sub-sections, maximum continuous motor ratings shall be at least 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations.

5.00.00 TEMPERATURE RISE**Air cooled motors**

70 deg. C by resistance method for both thermal class 130(B) & 155(F) insulation.

Water cooled

80 deg. C over inlet cooling water temperature mentioned elsewhere, by resistance method for both thermal class 130(B) & 155(F) insulation.

41 deg.C over inlet cooling water maximum temperature of 39 deg.C for thermal class Y wet wound Boiler circulation pump motor.

6.00.00 OPERATIONAL REQUIREMENTS**6.01.00 Starting Time**

6.01.01 For motors with starting time upto 20 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 2.5 secs. more than starting time.

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) Up to 85% of rated voltage for ratings below 110 KW
- (b) Up to 80% of rated voltage for ratings from 110 KW to 200 KW
- (c) Up to 85% of rated voltage for ratings from 201 KW to 1000 KW
- (d) Up to 80% of rated voltage for ratings from 1001 KW to 4000 KW

(e) Up to 75 % of rated voltage for ratings above 4000KW

Except AOP & JOP motors running on D.G emergency supply, starting voltage shall be 80%.

7.00.00 DESIGN AND CONSTRUCTIONAL FEATURES

7.01.00 Suitable single phase space heaters shall be provided on motors rated 30KW and above to maintain windings in dry condition when motor is standstill. Separate terminal box for space heaters & RTDs shall be provided. However for flame proof motors , space heater terminals inside the main terminal box may be acceptable.

7.02.00 All motors shall be either Totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or Closed air circuit air cooled (CACA) type. However, motors rated 3000KW or above can be Closed air circuit water cooled (CACW). CW motors can be screen protected drip proof (SPDP) type. Motors and EPB located in hazardous areas shall have flame proof enclosures conforming to IS:2148 as detailed below

- | | | | |
|-----|---------------------|---|---|
| (a) | Fuel oil area | : | Group – IIB |
| (b) | Hydrogen generation | : | Group - IIC or (Group-I, Div-II as per plant area NEC) or (Class-1, Group-B, Div-II as per NEMA /IEC60034) |

7.03.00 Winding and Insulation

- | | | | |
|-----|----------------------------------|---|---|
| (a) | Type | : | Non-hygroscopic, oil resistant, flame resistant |
| (b) | Starting duty | : | Two hot starts in succession, with motor initially at normal running temperature. |
| (c) | 11kV & 3.3 kV AC motors | : | Thermal class 155 (F) insulation.
The winding insulation process shall be total Vacuum Pressure Impregnated i.e resin poor method. The lightning Impulse & interturn insulation surge withstand level shall be as per IEC-60034 part-15. |
| (d) | 240VAC, 415V AC & 220V DC motors | : | Thermal Class (B) or better |

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) except for BFP motor for which the maximum limit shall be 90dB(A). Vibration shall be limited within the limits prescribed in IS:12075 / IEC 60034-14 . Motors shall withstand vibrations

produced by driven equipment. HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads.

- 7.07.00 In HT motors, at least four numbers simplex / two numbers duplex platinum resistance type temperature detectors shall be provided in each phase stator winding. Each bearing of HT motor shall be provided with dial type thermometer with adjustable alarm contact and preferably 2 numbers duplex platinum resistance type temperature detectors.
- 7.08.00 Motor body shall have two earthing points on opposite sides.
- 7.09.00 11 KV motors shall be offered with Separable Insulated Connector (SIC) as per IEEE 386. The offered SIC terminations shall be provided with protective cover and trifurcating sleeves. SIC termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.
- 7.10.00 3.3 KV motors shall be offered with dust tight phase separated double walled (metallic as well as insulated barrier) Terminal box. Employer shall provide termination kit for the offered Terminal box. The offered Terminal Box shall be suitable for fault level of 250 MVA for 0.12 sec. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non magnetic material for single core cables) shall be provided.
- 7.11.00 The spacing between gland plate & centre of terminal stud shall be as per Table-I.
- 7.12.00 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.
- 7.13.00 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.
- 7.14.00 For motors rated 2000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.
- 7.15.00 The size and number of cables (for HT motors) to be intimated to the successful Contactor during detailed engineering and the Contactor shall provide terminal box suitable for the same.
- 8.00.00 The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance) except for BFP motor.
- | | | |
|--------------------------------|---|------|
| (a) Below 110KW | : | 10.0 |
| (b) From 110 KW & upto 200 KW | : | 9.0 |
| (c) Above 200 KW & upto 1000KW | : | 10.0 |
| (d) From 1001KW & upto 4000KW | : | 9.0 |

(e) Above 4000KW : 6 to 6.5

10.00.00 TYPE TEST

10.01.00 HT MOTORS

- 10.01.01 The Contactor shall carry out the type tests as listed in this specification on the equipment to be supplied under this contract. The Contactor shall indicate the charges for each of these type tests separately in the relevant schedule of Section - VII- (BPS) and the same shall be considered for the evaluation of the bids. The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract and upon certification by the Employer's engineer.
- 10.01.02 The type tests shall be carried out in presence of the Employer's representative, for which minimum 15 days notice shall be given by the Contactor. The Contactor shall obtain the Employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set-up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.
- 10.01.03 In case the Contactor 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 Contactor.
- 10.01.04 Further the Contactor 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 Contactor 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 Contactor 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.

10.01.05 LIST OF TYPE TESTS TO BE CONDUCTED

The following type tests shall be conducted on each type and rating of HT motor

- (a) No load saturation and loss curves upto approximately 115% of rated voltage
- (b) Measurement of noise at no load.
- (c) Momentary excess torque test (subject to test bed constraint).
- (d) Full load test(subject to test bed constraint)
- (e) Temperature rise test at rated conditions. During heat run test, bearing temp., winding temp.,coolant flow and its temp. shall also be measured. In case the temperature rise test is carried at load other than rated load, specific approval for the test method and procedure is required to be obtained. Wherever ETD's are provided, the temperature shall be measured by ETD's also for the record purpose.

10.01.06 LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED

The following type test reports shall be submitted for each type and rating of HT motor

- (a) Degree of protection test for the enclosure followed by IR, HV and no load run test.
- (b) Terminal box-fault level withstand test for each type of terminal box of HT motors only.
- (c) Lightning Impulse withstand test on the sample coil shall be as per clause no. 4.3 IEC-60034, part-15
- (d) Surge-withstand test on interturn insulation shall be as per clause no. 4.2 of IEC 60034, part-15

10.02.00 LT Motors

- 10.02.01 LT Motors supplied shall be of type tested design. During detailed engineering, the Contactor 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.

10.02.02 However if the Contactor 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 Contactor 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.

10.02.03 **LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED**

The following type test reports shall be submitted for each type and rating of LT motor of above 50 KW only

1. Measurement of resistance of windings of stator and wound rotor.
2. No load test at rated voltage to determine input current power and speed
3. Open circuit voltage ratio of wound rotor motors (in case of Slip ring motors)
4. Full load test to determine efficiency power factor and slip .
5. Temperature rise test .
6. Momentary excess torque test.
7. High voltage test .
8. Test for vibration severity of motor.
9. Test for noise levels of motor(Shall be limited as per clause no 7.06.00 of this section)
10. Test for degree of protection and
11. Overspeed test.
12. Type test reports for motors located in fuel oil area having flame proof enclosures as per IS 2148 / IEC 60079-1

10.03.00 All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

10.04.00 The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and “No design Change”. Minor changes if any shall be highlighted on the endorsement sheet.

TABLE - I

DIMENSIONS OF TERMINAL BOXES FOR LV MOTORS

Motor MCR in KW of	Minimum distance between centre stud and gland plate in mm As per manufacturer's practice.
UP to 3 KW	
Above 3 KW - upto 7 KW	85
Above 7 KW - upto 13 KW	115
Above 13 KW - upto 24 KW	167
Above 24 KW - upto 37 KW	196
Above 37 KW - upto 55 KW	249
Above 55 KW - upto 90 KW	277
Above 90 KW - upto 125 KW	331
Above 125 KW-upto 200 KW	203

For HT motors the distance between gland plate and the terminal studs shall not be less than 500 mm.

PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE:

NOTE: Minimum inter-phase and phase-earth air clearances for LT motors with lugs installed shall be as follows:

Motor MCR in KW	Clearance
UP to 110 KW	10mm
Above 110 KW and upto 150 KW	12.5mm
Above 150 KW	19mm

CLAUSE NO.	QUALITY ASSURANCE							एनटीपीसी NTPC		
MOTOR										
TESTS/CHECKS TEMS/COMPONENTS		Visual	Dimensional	Make/Type/Rating /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				Y
Shaft		Y	Y	Y	Y	Y	Y			Y
Magnetic Material		Y	Y	Y	Y			Y		
Rotor Copper/Aluminium		Y	Y	Y	Y			Y		Y
Stator copper		Y	Y	Y	Y			Y		Y
SC Ring		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	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, Space heater, antifriction bearing, gaskets etc.		Y	Y	Y						
Complete Motor		Y	Y	Y						
Note: 1. This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed along with relevant supporting documents during QP finalization. However, No QP for LT motor upto 50KW. 2. Additional routine tests for Flame proof motors shall be applicable as per relevant standard 3. Makes of major bought out items for HT motors will be subject to NTPC approval. Y1 = for HT Motor / Machines only.										
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE			TECHNICAL SPECIFICATION SECTION-VI, PART-B BID DOC NO.:CS-9591-101-2			SUB-SECTION-E-21 MOTOR		PAGE 1 OF 2		

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	KARIMNAGAR TELANGANA SUPER THERMAL POWER PROJECT PHASE I- (2 X 800 MW) SG PACKAGE MILL REJECT SYSTEM (PNEUMATIC TYPE) SPECIFIC TECHNICAL REQUIREMENT	SPECIFICATION No: PE-TS-424-160-A001	
		VOLUME: II B	
		SECTION-I	
		SUB-SECTION-IC	
		REV 00	DATE 24.05.17

SUB SECTION-IC

(CONTROL AND INSTRUMENTATION)

	2X800MW NTPC KARIMNAGAR STPP PHASE-1	SECTION: C
	TECHNICAL REQUIREMENTS (C&I) MILL REJECT SYSTEM	

CONTROL AND INSTRUMENTATION
FOR
MILL REJECT SYSTEM

			
	2X800MW NTPC KARIMNAGAR STPP PHASE-1	DESG	AR
	JOB NO: 424	CHKD	MK
	REV. NO. 00	DATE: 21.04.2017	APPD BS



C&I SPECIFICATION FOR
MILL REJECT SYSTEM

SECTION: C
SUB SECTION: C&I

C&I SPECIFICATION FOR
MILL REJECT SYSTEM



C&I SPECIFICATION FOR
MILL REJECT SYSTEM

SECTION: C
SUB SECTION: C&I

INDEX

S. No.	DESCRIPTION
1	TITLE SHEET
2	INDEX SHEET
3	C&I SPECIFIC TECHNICAL REQUIREMENTS
4	GENERAL TECHNICAL SPECIFICATION
5	LIST OF DOCUMENTS/DELIVERABLES
6	MEASURING INSTRUMENTS (PRIMARY & SECONDARY)
7	DATA SHEETS FOR MOTORISED VALVE ACTUATOR
8	INSTRUMENT CABLE INTERCONNECTION AND TERMINATION PHILOSOPHY
9	CABLING AND INSTRUMENT INSTALLATION DIAGRAM
10	DRIVE AND INSTRUMENT INTERFACE DIAGRAM
11	QUALITY ASSURANCE
12	TYPE TEST REQUIREMENT
13	MANDATORY SPARE LIST
14	SUB VENDOR LIST
15	KKS TAGGING PHILOSOPHY



C&I SPECIFICATION FOR
MILL REJECT SYSTEM

SECTION: C
SUB SECTION: C&I

C&I SPECIFIC TECHNICAL REQUIREMENT
FOR DCS BASED
MILL REJECT HANDLING SYSTEM



C&I SPECIFICATION FOR MILL REJECT SYSTEM

SECTION: C
SUB SECTION: C&I

Specific Technical Requirements (C&I):

1. MRHS shall be operated from DDCMIS (in BHEL's scope) through operator work station located in central control room.
2. Interface of MCC, Solenoid valves, etc. with DDCMIS based control system shall be as per Drive Control Philosophy enclosed in specification.
3. Bidder to provide one number local control panel for each pyrite hoppers. This local panel will act as interface between the DCS and the field devices for commands & feedbacks.
4. Instrument installation shall be as per the attached "Standard Hook-up diagram of instrument."
5. The Contractor shall provide complete Instrumentation for control, monitoring and operation of entire MRHS. The requirements given here are to be read in conjunction with detailed Technical specification enclosed in the specification. Further, in case of any discrepancy in the requirement within the same section noted by the bidder in the specification, the same will be brought to the notice of BHEL in the form of pre- bid clarification. In absence of any pre-bid clarification, the more stringent requirement as per interpretation of customer shall prevail without any commercial implication.
6. The quantity of instruments for the system shall be as per tender P & ID wherever provided of the respective system as a minimum, for bidding purpose. However, Bidder shall also include in his proposal all the instruments and devices that are needed for the completeness of the plant auxiliary system/ equipment supplied by the bidder, even if the same is not specifically appearing in the P & ID. During detail engineering if any additional instruments are required for safe & reliable operation of plant, bidder shall supply the same without any price implication.
7. In addition to requirements specified here, all C&I systems/ sub-systems/ equipment/ devices shall also meet other requirements stipulated under other Sub-sections/ parts/ sections of specification.
8. The make/model of various instruments/items/systems shall be as per customer approved vendor list. No commercial and delivery implication in this regard shall be



C&I SPECIFICATION FOR MILL REJECT SYSTEM

SECTION: C
SUB SECTION: C&I

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

9. Redundancy of sensors shall be provided by bidder
 - (i) Triple redundancy for all analog and binary inputs required for protection of system/drives.
 - (ii) For all other control functions dual redundancy of the sensors shall be provided by the bidders.
10. All Temperature sensors shall be Duplex type and temperature transmitter shall be provided for all temperature measurement applications. Bidder to provide temperature transmitter along with compensating cable, JB/Rack & other erection hardware.
11. Use of process actuated switch shall be avoided.
12. All the transmitters supplied by Bidder shall be rack mounted. The transmitter racks shall be in Bidder's scope of supply. All transmitters shall be HART compatible
13. Instrument installation and accessories required for the same shall be in Bidder's scope. However, any instrument/ analyzer installation not covered in the specification, same shall be subject to customer and BHEL approval during detailed engineering. All instruments required for the package shall be supplied, mounted on the gauge board racks, along with accessories like impulse pipe, fittings & valve manifolds etc.
14. All field instruments enclosure shall be IP65. Local panel/cabinet enclosure shall be IP 55, unless otherwise specified.
15. All instruments and control elements shall be terminated on JB/LCP in field and both instrument and JB/LCP are in bidder scope. Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 12-15 mtrs) and trunk cable.
16. Bidder to perform tests of C&I items/instruments/systems as per Quality plans/type test attached in the specification. However, if any test not specified in the quality plan but specified in specification Tests for I&C equipment included elsewhere in specification will have to perform by Bidder without any cost implication. The



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make/model of various instruments/items/systems shall be as per customer/BHEL approved vendor list. No commercial and delivery implication in this regard shall be acceptable. In case of any conflict and repetition of clauses in the specification, the more stringent requirements among them are to be complied with.

17. Local control panel/station if any required for operation shall be in bidder scope.
18. RF Type level switches shall be provided for interlock & monitoring purpose on transport vessels & Bunkers.
19. The solenoid operated valves/Dampers/Gate shall have a limit switch for open/close feedback. Control voltage of Solenoid Valve shall be 24V DC only.
20. Bidder to provide mandatory spares as per mandatory spares list attached elsewhere in the specification
21. For cable scope refer to electrical scope between BHEL and vendor defined in electrical specification.
22. Number of pairs to be selected for Screen /Control cable (Size: 0.5 mm²)
 - a. F-Type: 2P/4P/24P (Size: 0.5sqmm²)
 - b. G-Type: 2P/4P/8P/12P (Size: 0.5sqmm²)
 - c. Core Cable: 3CX2.5sqmm²/ 12CX2.5sqmm²
23. Bidder's presence is required for 3 Man days (Excluding travel time) at EDN Bangalore during FAT of DDCMIS for certifying correctness & completeness of implementation of Control logic. Date and other details of FAT shall be communicated 2 days in advance. All the expenses like boarding, lodging and travel, Air fare etc. shall be in bidder's scope.
24. Bidder's presence is required for 21 Man days (in three visit) at site during commissioning of DDCMIS for assistance related to process correctness. Three visit with total 21 Man days (Excluding travel time) in which one visit shall be of 7 Man days each. All the expenses like boarding, lodging and travel, Air fare etc. shall be in bidder's scope.
25. Contractor's C&I representative shall be present at BHEL-PEM for 3 man-days, for preparation of Control scheme of MRHS. All the expenses like boarding, lodging and travel, Air fare etc. shall be in bidder's scope.



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26. In case of any conflict and repetition of clauses in the specification, BHEL discretion will prevail.
27. The bidders shall specifically mention any deviation taken against any clause of the C&I specification. In absence of any deviation, No deviation certificate is to be furnished.
28. The specifications of instruments mentioned elsewhere in the specification is only minimum requirement. The detailed specification shall be finalized during detail engineering.
29. Bidder to furnish UPS load requirement during detailed engineering
30. 230 V AC UPS Power supply shall be provided by BHEL at a single point, further distribution to various instruments/equipment of the system shall be in bidder scope. Bidder to include necessary power distribution board/change over switch etc. in his scope. Any power supply other than the above, if required by any instrument/equipment has to be derived by the bidder from the above supply & all necessary hardware for the same shall be in bidder scope. Bidder to submit the power requirement along with the bid.
31. Contractor shall furnish Instrument Schedule, I/O list, Drive list, Cable Schedule, Cable interconnection, JB grouping, Annunciation list, Plant schematics, recommended control logics / write-up, SOE list, List of Instruments/devices for HART in BHEL approved format. Also reusable database format like MS Excel, MS Access etc. of these documents shall also be provided by Contractor in BHEL approved format. Soft copy of the formats shall be provided to the successful bidder.
32. Guided wave radar type/ Ultrasonic Type Level transmitter shall be provided at each MRS silo for level measurement.

SECTION – D

GENERAL TECHNICAL SPECIFICATION CONTROL & INSTRUMENTATION

FORM NO. PEM-666-0

	SPECIFICATION FOR CONTROL & INSTRUMENTATION FOR AUX PACKAGES	SPECIFICATION NO.:	
		VOLUME	
		SUB SECTION	
		REV. NO.	DATE :
		SHEET	OF

GENERAL REQUIREMENT

1.0 Bidder shall provide complete and independent control & instrumentation system with all accessories, auxiliaries and associated equipments for the safe, efficient and reliable operation of auxiliary systems.

2.0 The quantity of instruments for auxiliary system shall be as per tender P & ID wherever provided of the respective system as a minimum, for bidding purpose. However, Bidder shall also include in his proposal all the instruments and devices that are needed for the completeness of the plant auxiliary system/ equipment supplied by the bidder, even if the same is not specifically appearing in the P & ID. During detail engineering if any additional instruments are required for safe & reliable operation of plant, bidder shall supply the same without any price implication.

3.0 Measuring instruments/equipment and subsystems offered by the bidder shall be from reputed experienced manufacturers of specified type and range of equipment, whose guaranteed and trouble free operation has been proven. Further all the instruments shall be of proven reliability, accuracy, and acceptable international standards and shall be subject to employer's approval. All instrumentation equipment and accessories under this specification shall be furnished as per technical specification, ranges, makes/ numbers as approved by the employer' during detail engineering.

4.0 The necessary root valves, impulse piping, drain cocks, gauge-zeroing cocks, valve manifold and all the other accessories required for mounting/ erection of these local instruments shall be furnished, even if not specifically asked for, on as required basis. The contacts of equipment mounted instruments; sensors, switches etc for external connection including spare contacts shall be wired out to suitably located junction boxes.

5.0 The customer specification attached as Specific Technical Requirement will supercede the Data sheets, if there is any mismatch.



C&I SPECIFICATION FOR MILL REJECT SYSTEM

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LIST OF DOCUMENTS/DELIVERABLES



C&I SPECIFICATION FOR MILL REJECT SYSTEM

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LIST OF DELIVERABLES OF PEM - C&I DEPARTMENT

Sl.No.	DRAWING NO.	DRAWING/DOCUMENT TITLE	CATEGORY
1	PE-V1-424-145-I901	CONTROL & OPERATIONAL WRITE-UP FOR THE SYSTEM	A
2	PE-V1-424-145-I902	CONTROL SCHEME/LOGIC DIAGRAM (TO BE IMPLEMENTED IN DDCMIS)	A
3	PE-V1-424-145-I903	HMI PICTURES/PLANT SCHEMATICS	A
4	PE-V1-424-145-I904	INSTRUMENT SCHEDULE with set points	A
5	PE-V1-424-145-I905	I/O LIST (ANALOG & BINARY)	A
6	PE-V1-424-145-I906	DRIVE LIST/SOLENOID/ACTUATOR VALVE LIST WITH LOCATION DATA	A
7	PE-V1-424-145-I907	FIELD JB/LIE/LIR,DRIVES TERMINATIONS	A
8	PE-V1-424-145-I908	DATASHEETS FOR INSTRUMENTS, JBs, etc.	A
9	PE-V1-424-145-I909	QUALITY PLANS (INSTRUMENTS, VMS, etc.)	A
10	PE-V1-424-145-I910	INSTRUMENT HOOK-UP DRAWING	A
11	PE-V1-424-145-I911	THERMOWELL SIZING CALCULATION	A
12	PE-V1-424-145-I913	CABLE SCHEDULE & INTERCONNECTION	A
13	PE-V1-424-145-I914	ANNUNCIATION & SOE LIST	A

NOTES:

ANY OTHER DOCUMENT DECIDED DURING DETAILED ENGINEERING SHALL BE PROVIDED BY BIDDER WITHOUT ANY COMMERCIAL/TECHNICAL IMPLICATION.

CONTRACTOR TO SUBMIT REUSABLE DATABASE FORMATS IN BHEL/CUSTOMER APPROVED FORMATS LIKE MS EXCEL, MS ACCESS OF DOCUMENTS LIKE INSTRUMENT SCHEDULE, I/O LIST, DRIVE LIST, FIELD JB TERMINATIONS, CABLE SCHEDULE & INTERCONNECTION, etc. SOFT COPY OF FORMATS SHALL BE PROVIDED TO SUCCESSFUL BIDDERS.



SUB-SECTION – IIIC – 04
MEASURING INSTRUMENTS
(PRIMARY & SECONDARY)

TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC. NO.: CS-9591-101-2
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CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
1.00.00	MEASURING INSTRUMENTS (PRIMARY AND SECONDARY)		
1.01.00	Measuring instruments/equipment and subsystems offered by the Bidder shall be from reputed experienced manufacturers of specified type and range of equipment, whose guaranteed and trouble free operation has been proven. Refer Sub-section Basic Design Criteria. Further, all instruments shall be of proven reliability, accuracy, and repeatability requiring a minimum of maintenance and shall comply with the acceptable international standards and shall be subject to Employer's approval.		
1.02.00	Every panel-mounted instrument requiring power supply shall be provided with easily replaceable glass cartridge fuses of suitable rating. Every instrument shall be provided with a grounding terminal and shall be suitably connected to the panel grounding bus.		
1.03.00	All transmitters, sensors, switches and gauges for parameters like pressure, temperature, level, flow etc. as required for the safe and efficient operation and maintenance as well as for operator and management information (including all computation) of equipment in the system under the scope of specification shall be provided on as required basis with in quoted lump sum price.The Contractor shall furnish all Instrumentation / Control equipment & accessories under this specification as per technical specification, ranges, makes & model as approved by the Employer during detailed engineering.		
1.04.00	The necessary root valves, impulse piping, drain cocks, gauge-zeroing cocks, valve manifolds and all the other accessories required for mounting/erection of these local instruments shall be furnished, even if not specifically asked for, on as required basis. The contacts of equipment mounted instruments, sensors, switches etc. for external connection including spare contacts shall be wired out in flexible/rigid conduits, independently to suitably located common junction boxes. The proposal shall include the necessary cables, flexible conduits, junction boxes and accessories for the above purpose. Double root valves shall be provided for all pressure tapping where the pressure exceeds 40 Kg./sq.cm.		
1.05.00	All instruments envisaged for sea water applications, shall be provided with wetted parts made of Monel/ Hastelloy C or any other material (if provenness experience of the proposed material for such applications is established by contractor).		
1.06.00	For coastal areas, all instruments shall be provided with durable epoxy coating for housings and all exposed surfaces of the instruments.		
2.00.00	SPECIFICATION FOR ELECTRONIC TRANSMITTERS		
2.01.00	SPECIFICATION FOR ELECTRONIC TRANSMITTER FOR PRESSURE, DIFF PRESS AND DP BASED FLOW / LEVEL MEASUREMENTS		
	Sl.No.	Features	Essential/Minimum Requirements
	1.	Type of Transmitter	Microprocessor based 2 wire type, Hart protocol compatible.
	2.	Accuracy	± 0.1% of calibrated span (minimum)
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-9591-101-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)
			PAGE 1 OF 30

CLAUSE NO.	TECHNICAL REQUIREMENTS		
	3.	Output signal range	4-20 mA DC (Analog) along with superimposed digital signal (based on HART protocol)
	4.	Turn down ratio (minimum)	10:1 for vacuum/very low pressure applications. (i.e .pressure <=200mmWC). 5:1 for very high pressure application. (i.e. pressure >=200Kg/cm2). 30:1 for other applications.
	5.	Stability	± 0.1% of calibrated span for six months for Ranges up to and including70 Kg/cm². ± 0.25% of calibrated span for six months for Ranges more than 70 Kg/cm² .
	6.	Zero and span drift	+/- 0.015% per deg.C at max span. +/-0.11% per deg.C at min. Span.
	7.	Load impedance	500 ohm (min.)
	8.	Housing	Weather proof as per IP-65, metallic housing with durable corrosion resistant coating.
	9.	Over Pressure	150% of max. Operating pressure
	10.	Connection (Electrical)	Plug and socket type
	11.	Process connection	1/2 inch NPT (F)
	12.	Span and Zero	Continuous, tamper proof, Remote as well as manual adjustability from instrument with zero suppression and elevation facility.
	13.	Accessories	-Diaphragm seal, pulsation dampeners, syphon etc. as required by service and operating condition. -2 valve manifold for absolute & Gauge pressure transmitters, 3-valve and 5 valve manifold for DP/Level/Flow applications. The valve manifold shall be non integral type (except Fuel Oil area). -For hazardous area, explosions proof enclosure as described in NEC article 500. Mounting: 2 inch pipe mounting.
	14.	Diagnostics & display	Self-Indicating feature and digital display on transmitter
	15.	Power supply	24V DC ± 10%.
	16.	Adjustment/calibration/maintenance	From hand held calibrator/centralized PC based system (as applicable).
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-9591-101-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)
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CLAUSE NO.	TECHNICAL REQUIREMENTS 		
2.02.00	Notes For primary air/ secondary air/flue gas applications, DP type transmitters shall be provided for pressure measurement. LVDT type is not acceptable. Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application. GUIDED WAVE RADAR TYPE LEVEL TRANSMITTER		
	Type	Microprocessor based 2 wire type, HART protocol compatible Guided wave radar transmitter.	
	Principle	TDR (Time domain reflectometry)	
	Probe Type & Material	(i) Coaxial probe of SS316/316L. If required, probe shall be suitable for overfill prevention. (ii) Rod probe, cable probe of SS316/SS316L can be used for applications wherever coaxial probe is not suitable.	
	Output signal	4-20 mA DC along with superimposed digital signal (based on HART protocol), suitable for over fill prevention.	
	Accuracy	+/- 0.5% of calibrated span or minimum 5mm.	
	Power supply	24 VDC +/- 10%.	
	Housing	Weather proof as per IP-65, metallic housing with durable corrosion resistance coating.	
	Adjustment/ calibration	Using hand held HART calibrator/ centralized PC based system (as applicable).	
	Zero & span adjustment	Continuous, temper proof, remote as well as manual adjustability from instrument. It should be possible to calibrate the instrument without	
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-9591-101-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY) PAGE 3 OF 30

CLAUSE NO.	TECHNICAL REQUIREMENTS				
2.03.00			any level in the tank/sump etc.		
	Display		Integral digital display.		
	Load Impedance		500 ohms (minimum).		
	Electromagnetic compatibility		Shall meet EN 61326-1 (1997) and AmdtA1, class A equipment/EN 50081-2 & EN 5008 1-2 & EN 50082-2		
	Mounting		(i) External cage shall be provided where ever side mounting is required. External cage and other mounting accessories to be provided by the contractor. (ii) Where ever top mounting is required, all mounting accessories, stilling well (as required) etc., shall be provided by the contractor. (iii) All weather canopy shall be provided for protection from direct sunlight and direct rain for open locations.		
	Note: Four wire type transmitters can also be provided for applications where 2- wire transmitter has some technical limitations, subject to employer's approval during detailed engineering stage. However, in such cases isolated 4-20 mA DC (analog) output shall be provided. Power supply required for such transmitters shall be 240V AC / 24V DC.				
	Ultrasonic Type level Transmitter				
	S.No.	Features	Essential/Minimum requirement		
	1.	Type of Transmitter	Non-contact Microprocessor based 2 wire type, HART protocol compatible Ultrasonic transmitter.		
	2.	Output signal	4-20 mA DC (Analog) along with superimposed digital signal (based on HART protocol).		
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-9591-101-2		SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 4 OF 30

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	3.	Accuracy	+/- 0.5% of calibrated span or minimum 5mm.	
	4.	Power supply	24 V DC +/- 10%.	
	5.	Temperature compensation	To be provided within transducer.	
	6.	Housing	Weather proof as per IP-65, metallic housing with durable corrosion resistance coating.	
	7.	Adjustment/calibration/ maintenance	Using hand held HART calibrator/ centralized PC based system (as applicable).	
	8.	Zero and Span adjustment	Continuous, tamper proof, remote as well as manual adjustability from instrument. It should be possible to calibrate the instrument without any level in the tank/sump etc.	
	9.	Sensor Material	Corrosion resistant material to suit individual application requirement.	
	10.	False signal tolerance	Transmitter shall be capable of ignoring false echoes from internal tank/sumps obstructions such as pipes, heating coils or agitator blades. Also transmitter shall have adjustable damping circuitry.	
	11.	Range	Range of transmitter shall be capable of covering the complete level span of tank taking care of blocking distance, frequency attenuation due to surface, obstructions, vapors etc.	
	12.	Display	Integral digital display	
	13.	Diagnostics	Loss of echo alarm etc.	
	14.	Load Impedance	500 ohms (minimum).	
	15.	Electrical Connection	Plug and socket	
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-9591-101-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 5 OF 30

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
2.04.00	16.	Accessories	- All weather canopy shall be provided for protection from direct sunlight and direct rain for open locations. - All mounting accessories required for erection and commissioning shall be provided. - For hazardous area, explosion proof enclosure as described in NEC article 500	
	Note: 1) Contractor can also provide Radar type transmitter as per above specification in place of ultrasonic transmitter subject to approval by Employer during detailed Engineering. Sonic frequency based transmitters can also be provided under “ultrasonic transmitters” category for fly ash silo level. 2) Four wire type transmitters can also be provided for applications where 2- wire transmitter has some technical limitations, subject to employer’s approval during detailed engineering stage. However, in such cases isolated 4-20 mA DC (analog) output shall be provided. Power supply required for such transmitters shall be 240V AC / 24V DC. 3) For applications where transmitter location is not accessible, the transmitter shall have separate sensor unit and electronic unit for such applications. It shall be possible to mount the electronic unit at accessible location. HART Hand Held calibrator Hand held calibrator shall be provided for adjustment/calibration/maintenance of the HART compatible transmitters. The hand held calibrator shall be suitable for all types of transmitters supplied in the package. If one type of hand held type calibrator is not suitable for communicating with all types of transmitters then separate hand held calibrator will be provided for that specific type of transmitter.			
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
3.00.00	Temperature Elements and accessories			
3.01.00	Thermocouple			
	Sr. No.	Features	Essential/Minimum Requirements	
	1	Type of Thermocouple.	:	16 AWG wire of Chromel-Alumel (Type K) or 24 AWG wire Pt-Rhodium Pt (Type R) depending on operating temperature Range (ungrounded separate junction type).
	2	No. of element	:	Duplex
	3	Housing/Head	:	IP-65/Diecast Aluminium. Head of TE to be provided with sufficient space and arrangement to mount head mounted temperature transmitter (as applicable). Plug in connectors are to be provided for external signal cable connection. TE terminal head shall be spring loaded for positive contacts with the thermo well.
	4	Insulation and Sheathing of Thermocouple	:	Swaged type mineral (magnesium oxide) insulation and SS316 sheath.
	5	Calibration and accuracy	:	As per IEC-584/ ANSI-MC-96.1 (special limits of errors/ class1) for T/C.
	6	Accessories	:	Thermo well and associated fittings
	7	Standard	:	IEC-584/ ANSI MC 96.1 for Thermocouple and ASME PTC-19.3 for Thermo-well
3.02.00	Resistance Temperature Detector (RTD)			
	Sr. No.	Features	Essential/Minimum Requirements	
	1	Type of RTD.	:	Four wire, Pt-100 (100 Ohms resistance at zero degree Centigrade).
	2	No. of element	:	Duplex
	3	Housing/Head	:	IP-65/Diecast Aluminium. Head of TE to be provided with sufficient space and arrangement to mount head mounted temperature transmitter (as applicable). Plug in connectors are to be
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CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
	b. Single Input DIN-rail mounted Temperature Transmitter These shall be suitable for mounting on DIN-rails in JB's. The specifications of the JB's shall be same as indicated in Subsection INST CABLE with additional DIN-rails and IP 65 Protection class. This temperature transmitter shall be the ones which are especially designed for DIN-rail mounting with IP 20 protection class. These shall have terminals for input/output provided on front side when mounted on DIN-rail. Head mounted temperature transmitter with clamps to make it suitable for DIN-rail mounting shall not be acceptable under this category. c. Dual-input Temperature Transmitter With integral Indicator: These shall be suitable for mounting on pipes/ support. Integral indicator shall be provided with these transmitters. These transmitters shall have bump less change over facility to second sensor in case first sensor fails .This change-over is to be alarmed. Protection class shall be IP65 minimum. d. Common requirements for each of the above type of temperature transmitters. Output : 2-wire (power supply from input card of Control System) with 4-20mA output with superimposed HART protocol signal. Input : Same transmitter shall be capable to handle Pt-100 RTD Thermocouples –K & R types (input type to be selectable at site through HART terminal). Isolation : Min. 500 V AC. EMC compatibility : As per EN 61326. Operating ambient temperature : 0 to 85 deg C (without indicator). 0 to 70 deg C (with indicator). Power supply : 24V DC +/- 10%. Accessories : Mounting arrangements including clamps etc. Composite Accuracy (Refer note 2) (i) For head mounted and DIN-rail mounted types: RTD =<0.4% of 0-250 deg C span T/C-K type =<0.4% of 0-600 deg C span T/C-R type =<0.4% of 0-1000 deg C span CJC accuracy (for thermocouples) shall be =< 1 deg C (ii) For dual-input type: RTD =<0.25% of 0-250 deg C span T/C-K type =<0.2% of 0-600 deg C span CJC accuracy (for thermocouples) shall be =< 1 deg C e. Field bus compatible temperature transmitters Temperature transmitters of this category shall be field mounting type & shall be capable of withstanding operating ambient temperature upto 85 deg C. These modules shall be connected to DDCMIS through field bus such as Profibus,			
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-9591-101-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 10 OF 30	

CLAUSE NO.	TECHNICAL REQUIREMENTS	एनटीपीसी NTPC	
	Foundation Field bus etc directly from the transmitter. Maximum Number of inputs per such temperature transmitter shall be eight. These shall be mounted in cabinets/enclosures/JBs in non-AC areas. As an alternate, these signals from temperature transmitters can be connected to DDCMIS through standard remote I/O modules of the DCS, in which case, the temperature transmitter signals will be acquired through 4-20mA input modules in the remote I/O cabinet for connecting to DDCMIS through remote I/O bus. The no. of such modular systems/ JBs shall be provided as per Appendix-1 to Part-A. Notes (Common for a) to d) above):- 1. In case of failure (open or burn-out) of RTD/thermocouple, temp. Transmitter shall provide low temperature output. 2. Composite Accuracy is to be calculated as summation of all applicable accuracies of temp transmitter, for converting sensor input to output in 4-20 mA (e.g., basic accuracy, digital accuracy, D/A accuracy, etc.) and temperature effect on these accuracies at ambient temperature of 50 deg C, based on the figure/ formula given in the standard product catalogue for span as specified above for various types of Temperature Elements specified. All such accuracy/ temp effect figures in catalogue shall be first converted to deg C, and then percentage of this converted accuracy in specified span shall be calculated to compare with the specified composite accuracy figures. All temperature transmitters are to be interchangeable (i.e. can be used for either RTD or thermocouple) and composite accuracy shall be met for each type of input specified in (i) & (ii).		
4.00.00	ELECTRICAL METERING INSTRUMENTS		
	Electrical metering instruments shall be furnished in accordance with the following general specifications. However, the scope shall be governed by the Contract quantity given in appendix-1 to part-A. Application standard for electrical metering instruments shall be as per IS: 1248- 2003(Revised). The size of each instrument shall be as approved by Employer during detailed engg. All metering instruments shall be flush panel mounting type.		
4.01.00	(a) Frequency meters for Synchronization purposes: Accuracy: ± 1.5% of full scale.		
	(b) Synchroscope: Accuracy class: 0.5 or better		
	(c) Voltmeters: Accuracy: ± 2.0% of full scale or better.		
4.02.00	Synchronizing Relays		
	Synchronizing check relay with necessary ancillary equipment shall be provided which shall permit breakers to close after checking the requirements of synchronizing of incoming and running supply. The phase angle setting shall not exceed 10 Degree and this angle shall be adjustable and shall take the account the circuit breaker closing period. This relay shall have a response time of less than 200 milliseconds when the two system conditions are met within preset limits and with the timer disconnected. The relay shall have a frequency difference setting not exceeding 0.45% at rated value and at the minimum time setting. The relay shall have a continuously adjustable time setting range of 0.5-3 secs. Additionally, a guard relay shall be provided to prevent the closing attempt by means of synchronizing check relay when		
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-9591-101-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)
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CLAUSE NO.	TECHNICAL REQUIREMENTS																					
	functional requirements detailed above shall be met and the system shall be subject to Employer's approval.																					
8.00.00	E-P Converter E-P converters and associated accessories shall be furnished in accordance with the specifications given below : Air supply: 1.5 kg/cm sq., Input signal: 4-20m A dc (as required by the design of control system), Output signal: 0.2 to 1.0 kg/cm sq., Linearity: 0.5% of span or better, Hysteresis: 0.5% of span or better, Ambient Temperature Effect: less than 0.02% of span per deg C between -20 to +60 deg C. Mounting: Close to actuator (but not on the actuator), output capacity-to suit the actuator, protection class IP 55. On loss of control signal, the last set point pressure shall be maintained so that the associated control valve remains in stay put condition without any additional solenoid valve. The allowable drift rate will be $\pm 2\%$ of set point/ hour maximum.																					
9.00.00	NOT USED																					
10.00.00	NOT USED																					
11.00.00	NOT USED																					
12.00.00	SPECIFICATION FOR CORIOLIS FLOW TRANSMITTER <table><tr><td>Type</td><td>Coriolis</td></tr><tr><td>Material of Wetted Parts</td><td>316 SS</td></tr><tr><td>Material of Housing</td><td>304L SS</td></tr><tr><td>Accuracy</td><td>$\pm 0.2\%$ of Rate</td></tr><tr><td>Repeatability</td><td>$\pm 0.1\%$ of Rate</td></tr><tr><td>Output</td><td>4-20 mA DC, HART Compatible</td></tr><tr><td>Power Supply</td><td>230 VAC or 24VDC operated</td></tr><tr><td>Process Temperature range</td><td>0-200 degree Celsius</td></tr><tr><td>Others</td><td>Drain / purging arrangement shall be provided as per standard practice.</td></tr></table> The offered Coriolis type flow transmitter shall be suitable for intended application. Contractor shall submit flow and sizing calculation for Employer's approval. For each type of Coriolis type flow transmitter general arrangement and assembly drawing and cable wiring diagram shall be submitted for Employer's approval.				Type	Coriolis	Material of Wetted Parts	316 SS	Material of Housing	304L SS	Accuracy	$\pm 0.2\%$ of Rate	Repeatability	$\pm 0.1\%$ of Rate	Output	4-20 mA DC, HART Compatible	Power Supply	230 VAC or 24VDC operated	Process Temperature range	0-200 degree Celsius	Others	Drain / purging arrangement shall be provided as per standard practice.
Type	Coriolis																					
Material of Wetted Parts	316 SS																					
Material of Housing	304L SS																					
Accuracy	$\pm 0.2\%$ of Rate																					
Repeatability	$\pm 0.1\%$ of Rate																					
Output	4-20 mA DC, HART Compatible																					
Power Supply	230 VAC or 24VDC operated																					
Process Temperature range	0-200 degree Celsius																					
Others	Drain / purging arrangement shall be provided as per standard practice.																					
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-9591-101-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 23 OF 30																		

CLAUSE NO.	TECHNICAL REQUIREMENTS 			
15.00.0	PROCESS ACTUATED SWITCHES			
	FEATURES	ESSENTIAL / MINIMUM REQUIREMENTS		
		Pressure/ Draft Switches/ DP Switches	Temperature switches	Level switches
	Sensing Element	Piston actuated for high pressure and diaphragm or bellows for low pr./ vacuum	Vapor pressure sensing, liquid filled bellow type with SS bulb and capillary (5 m minimum, to suit application)	Capacitance types, float type, conductivity type, RF type, Ultrasonic type as per suitability to the application. .
	Material	316 SS	Bulb 316 SS/ capillary 304 SS	316 SS
	End connection	½ inch NPT (F)	½ inch NPT (F)	Manufacturer standard
	Over range/ proof pressure	150% of maximum operating pr.	-	150% of maximum operating pr.
	Repeatability	± 0.5% of full range		
	No. of contacts	2 No.+2NC. SPDT snap action dry contact		
	Rating of contacts	60 V DC, 6 VA (or more if required by DDCMIS)		
	Elect. Connection	Plug in socket.		
	Set point adjustment	Provided over full range.		
	Dead band adjustment	Adjustable/ fixed as per requirement of application.		
	Enclosure	Weather and dust proof as per IP-55, metallic housing.		
	Accessories	Siphon, snubber, chemical seal, pulsation dampeners as required by process	Thermo well of 316 SS and packing glands	All mounting accessories
	Mounting	Suitable for enclosure/ rack mounting or direct mounting	Suitable for rack mounting or direct mounting	-
	Power Supply (wherever required)	As per Contractor's Standard practice.		
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-9591-101-2		SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY) PAGE 27 OF 30

CLAUSE NO.	TECHNICAL REQUIREMENTS			
	Notes :- 1) Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application. 2) Pressure/ Diff pressure switches for very low press/ DP measurements can have sensor material other than SS316 in case of any technical limitation and the offered product is standard product of the manufacture for very low pressure applications.. 3) Repeatability can be upto +/-1% of full range in case of switches with diaphragm seals or very low pressure/DP range. 4) The specifications of switches for air conditioning & ventilation system / process can be as per system manufacturer's standards. The manufacturer shall submit the adequate supporting documents for establishing their standard practice.			
16.00.00	NOT USED			
17.00.00	SOLENOID VALVES Solenoid valves shall fulfil the following requirements: a. Type 2/3/4 way SS 316/Forged Brass (depending on the application subject to Employer's approval during detailed Engg.) b. Power supply 24 V DC $\pm$ 10%. c. Plug and socket electrical connection. d. Insulation : Class 'H'			
18.00.00	REVERSE ROTATION INDICATOR (RRI) Reverse rotation indicator comprising of proximity sensors, processing electronics with output of 4-20mA (corresponding to speed) interconnecting cables, speed display in rpm, normal, reverse indication and required channel alarm contact shall be provided. The contact rating shall be 60VDC, 6VA (or more if required by Control system). The exact details of the RRI shall be strictly as approved by Employer during detailed engineering. The power supply of RRI is to be arranged by the Bidder			
19.00.00	NOT USED			
19.05.00	Electronic Flow-Meter The electronic flow meter shall include flow sensor and flow indicator cum integrator / totaliser and shall include all required accessories for satisfactory operation. The flow meter shall be based on full bore ultrasonic / electromagnetic principle and shall be electronic type of proven design, make and model acceptable to the owner.			
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-9591-101-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 28 OF 30

CLAUSE NO.	TECHNICAL REQUIREMENTS			एनटीपीसी NTPC
21.00.00	Mounting : Table Top/ wall mounting. Power supply : 240 V AC, 50 Hz. Output : 4-20 mA signal each for temperature. Qty. : 15 nos. each of temperature & Humidity indicators (combined indicators for Humidity and temperature is also applicable). One Set of output signal is to be connected to respective control system. Apart from displaying the temperature/humidity values on indicator.			
	Limit switches For offsite plant application Limit switches shall be gold plated with high conductivity and non corrosive type. Contact rating shall be sufficient to meet the requirement of DDCMIS subject to a minimum of 60 V, 6 VA rating. Protection class shall be IP 55. For main plant application limit switches are to be provided as per contractor standard and proven practice.			
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2X800 MW) STEAM GENERATOR ISLAND PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-9591-101-2	SUB-SECTION-IIIC-04 MEASURING INSTRUMENTS (PRIMARY & SECONDARY)	PAGE 30 OF 30

SPECIFICATIONS FOR PR. GAUGE, D.P. GAUGE, TEMP. GAUGE AND LEVEL GAUGE.

Sl. No	FEATURES	ESSENTIAL/MINIMUM REQUIREMENTS		
		Pr. Gauge/ DP Gauge/ Draught gauges	Temperature Gauge	Level Gauge
1	Sensing Element and material	Bourdon for high pressure, Diaphragm/Bellow for low pr. Of 316 SS	Mercury in steel for below 450°C and inert gas actuated for above 450°C of SS bulb and capillary.	Tempered * toughened Borosilicate gauge glass steel armoured reflex or transparent type.
2	Body material	Die-cast aluminium	Die-cast aluminium	Forged carbon steel/304 SS
3	Dial size	150mm	150 mm	Tubular covering entire range
4	End connection	1/2 inch NPT (M)	3/4" NPT (M)	Process connection as per ASME PTC and drain/vent 15 NB
5	Accuracy	±1% of span	± 1% of span	± 2%
6	Scale	Linear, 270° arc graduated in metric units	Linear, 270° arc graduated in °C	Linear vertical
7	Range selection	Cover 125% of max. of scale	Cover 125% of max. of scale	Cover 125% of max. of scale
8	Over range test	Test pr. for the assembly shall be 1.5 to the max. Design pr. at 38°C.		
9	Housing	Weather and dust proof as per IP-55	Weather and dust proof as per IP-55	CS/304 SS leak proof
10	Zero/span adjustment	Provided	Provided	--
11	Identification	Engraved with service legend or laminated phenolic name plate		

12	Accessories	Blow out disc, SS Thermowell siphon, snubber, pulsation dampener, chemical seal (if required by process) gauge isolation valve	Gasket for all KEL-F shield for transparent type vent and drain valves of Steel/SS as per CS/Alloy process Requirement.
13	Material of Bourdon/ movement	316 SS / 304 SS	316 SS / 304 SS

Notes:-

*Bicolour type level gauges will be provided for applications involving steam and water except for condensate and feed water services.

Length of gauge glass shall not be more than 1400 mm. If the vessel is higher, multiple gauge glasses with 50 mm overlapping shall be provided.

Where the process fluids are corrosive, viscous, solid bearing or slurry type, diaphragm seals shall be provided. Parts below the diaphragm shall be removable for cleaning. The entire volume above the diaphragm shall be completely filled with an inert liquid suitable for the application.



1.00.00	CONTROL DESK & PANELS
1.01.00	GENERAL
1.01.01	All control desk , panels, LVS panel etc. shall be furnished fully wired with necessary provision for convenience outlets, internal lighting, grounding, ventilation, space heating, anti-vibration pads, internal piping & accessories as required for completeness of the system.
1.01.02	All panels, desks, cabinets shall be free standing type & have bottom / top entry for cables to be finalised application wise during detailed engineering stage. The bottom of desk & cabinets shall be sealed with bottom plate, compression cable glands (double for field and single for inside rooms) and fire proof sealing material to prevent ingress of dust and propagation of fire. Sufficient number of power receptacles with disconnect switches shall be installed within all panels/desk.
1.01.03	Exterior steel surface shall be sand blasted, ground smooth, filled, primed, sanded and smooth enamel painted to give a good finish subject to minimum paint thickness of 65-75 microns for sheet thickness of 3 mm and 50 microns for sheet thickness of 2mm. The exact color shall be finalised during detailed engineering.
1.01.04	The design shall conform to the EN ISO 11064 (Ergonomical design of control room), Part-1,2 and 3.

FORM NO. PEM-6666-0

SPECIFICATION
FOR
MOTORISED VALVE ACTUATOR

SPECIFICATION NO.: PE-SS-999-145-I007

VOLUME

II B

SECTION

D

REV. NO.

01

DATE: 09.02.17

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	2 X 800 MW KARIMNAGAR TPP			
	OFFER REFERENCE				
	* TAG NO. SERVICE				
	* DUTY	☐ ON / OFF ☐ INCHING			
	* LINE SIZE (inlet/outlet): MATERIAL				
	* VALVE TYPE	☐ GLOBE ☐ GATE ☐ REG. GLOBE ☐ 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 SERVICE - 150 STARTS/HR MINIMUM & FOR REGULATING SERVICE - 3000 STARTS/HR MINIMUM.			
HANDWHEEL	* REQUIRED	☒ YES ☐ NO			
	* ORIENTATION	☐ TOP MOUNTED ☐ SIDE MOUNTED			
	*TO DISENGAGE AUTOMATICALLY DURING MOTOR OPERATION.				
ELECTRIC ACTUATOR	ACTUATOR MAKE/MODEL	BIDDER TO SPECIFY			
	MOTOR MAKE / MODEL / TYPE / RATING (KW)	BIDDER TO SPECIFY			
	MOTOR TYPE	SQUIRREL CAGE INDUCTION MOTOR, STARTING CURRENT LIMITED TO SIX TIMES THE RATED CURRENT-INCLUSIVE OF I.S. TOLERANCE			
	ACTUATOR APPLICABLE WIRING DIAGRAM	ENCLOSED (BIDDER TO CONFIRM) A: ☐ DRG. NO. 3-V-MISC-24227 R00 B: ☐ DRG. NO. 3-V-MISC-24550 R00 C: ☒ DRG. NO. 3-V-MISC-24283 R00 D: ☐ DRG. NO. 4-V-MISC-90271 R11 E: ☐ For Thyristor based Integral starter, Bidder/Vendor to furnish wiring diagram			
	COLOUR SHADE	☒ BLUE (RAL 5012) ☐			
	PAINT TYPE (## Refer Notes)	☒ ENAMEL ☐ EPOXY ☐			
	SHAFT RPM	BIDDER TO SPECIFY			
	OLR SET VALUE	BIDDER TO SPECIFY			
	STARTING / FULL LOAD CURRENT	BIDDER TO SPECIFY			
	NO. OF REV FOR FULL TRAVEL	BIDDER TO SPECIFY			
	@ PWR SUPP TO MTR / STARTER	415V,+/- 10% 3PH,3 WIR 50 HZ+/-5%			
	@ CONTROL VOLTAGE REQUIREMENT	TO BE DERIVED FROM THE POWER SUPPLY TO THE STARTER ☐ 230 V ☒ 110 V AC /24V DC			

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FORM NO. PEM-6666-0

	SPECIFICATION FOR MOTORISED VALVE ACTUATOR		SPECIFICATION NO.: PE-SS-999-145-I007		
			VOLUME II B		
			SECTION D		
			REV. NO. 01	DATE: 09.02.17	
			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)	
	@ ENCLOSURE CLASS OF MOTOR	IP 67 FOR OUTDOOR & IP55 FOR INDOOR(TOTALLY ENCLOSED SELF VENTILATED)			
	@ INSULATION CLASS	CLASS-F TEMP. RISE LIMITED TO CLASS-B			
	@ WINDING TEMP PROTECTION	☒ THERMOSTAT (3 Nos.,1 IN EACH PHASE) ☐			
	SINGLE PHASE / WRONG PHASE SEQUENCE PROTECTION	REQUIRED			
INTEGRAL STARTER	INTEGRAL STARTER	☒ REQUIRED ☐ NOT REQUIRED			
	TYPE OF SWITCHING DEVICE	☒ CONTACTORS ☐ THYRISTORS			
	TYPE	☒ CONVENTIONAL ☐ SMART (NON-INTRUSIVE)			
	IF SMART	NOT APPLICABLE			
	a) SERIAL LINK INTERFACE	☐ INTEGRAL ☐ FIELD MOUNTED			
	b) SERIAL LINK PROTOCOL	☐ FOUNDATION FIELD-BUS ☐ PROFI-BUS ☐ DEVICE NET ☐			
	c) SERIAL LINK MEDIA	☐ TWISTED PAIR Cu-CBL ☐ CO-AXIAL Cu-CBL ☐ OFC			
	d) HAND HELD PROGRAMMER	☐ REQUIRED ☐ NOT REQUIRED			
	e) TYPE OF HAND HELD PROGRAMMER	☐ BLUETOOTH ☐ INFRARED ☐			
	f) MASTER STATION	☐ REQUIRED ☐ NOT REQUIRED			
	g) MASTER STN INTRFACE WITH DCS	☐ MODBUS ☐ TCP/IP			
	h) DETAILS OF SPECIAL CABLE	☐ ENCLOSED ☐ NOT REQUIRED			
	STEP DOWN CONT. TRANSFORMER	☒ REQUIRED			
	OPEN / CLOSE PB	☒ REQUIRED ☐ NOT REQUIRED			
	STOP PB	☒ REQUIRED ☐ NOT REQUIRED			
	INDICATING LAMPS	☒ REQUIRED ☐ NOT REQUIRED			
	LOCAL REMOTE S/S	☒ REQUIRED ☐ NOT REQUIRED			
	STATUS CONTACTS FOR MONITORING	☒ REQUIRED ☐ NOT REQUIRED			
	INTEGRAL STARTER DISTURBED SIGNAL	REQUIRED (O/L RELAY OPERATED, CONT./POWER SUPPLY FAILED, S/S IN LOCAL, TORQUE SWITCH OPTD. MID WAY)			
INTERPOSING RELAY/OPTO COUPLER (Applicable for integral Starter)	TYPE OF ISOLATING DEVICE	☒ INTERPOSING RELAY ☐ OPTO COUPLER ☐ EITHER		Also refer note no. 8	
	QUANTITY	☒ 2 Nos. ☐ 3 Nos.			
	DRIVING VOLTAGE	☒ 20.5 – 24V DC ☐ _____ V DC			
	DRIVING CURRENT	☒ 125mA MAX ☐ _____ mA MAX			
	LOAD RESISTANCE	☒ > 192 ohms - <25 k ohms ☐ > _____ ohms - < _____ ohms			
TORQUE SWITCH (Not Applicable for Smart Actuator) (\$\$ Refer Notes)	MFR & MODEL NO.	BIDDER TO SPECIFY			
	OPEN / CLOSE	☒ 1 No. ☐ 2Nos. / ☒ 1 No. ☐ 2Nos			
	CONTACT TYPE	2 NO + 2 NC			
	RATING	5A 240V AC AND 0.5A 220V DC			
	CALIBRATED KNOBS(OPEN&CLOSE TS)	REQUIRED FOR SETTING DESIRED TORQUE			
	ACCURACY	+3% OF SET VALUE			
LIMIT SWITCH (Not Applicable for Smart Actuator) (\$\$ Refer Notes)	MFR & MODEL NO.	BIDDER TO SPECIFY			
	OPEN : INT : CLOSE	☒ 1 No ☐ 2 Nos.	2 Nos. (ADJ.)	☒ 1 No ☐ 2Nos.	
	CONTACT TYPE	2 NO + 2 NC			
	RATING (AC / DC)	5A 240V AC AND 0.5A 220V DC			

FORM NO. PEM-6666-0

	SPECIFICATION FOR MOTORISED VALVE ACTUATOR	SPECIFICATION NO.: PE-SS-999-145-I007	
		VOLUME II B	
		SECTION D	
		REV. NO. 01	DATE: 09.02.17
		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)	

Limit switched shall be silver plated with high conductivity and non-corrosive type. Contact rating shall be sufficient to meet the requirement of control system subject to minimum of 60 V, 6 A rating .protection class shall be IP 55

POSITION TRANSMITTER	POSITION TRANSMITTER (For inching duty & other specific applications)	☒ REQUIRED ☐ NOT REQUIRED	
	MFR & MODEL NO.	BIDDER TO SPECIFY	
	TYPE	☐ ELECTRONIC (2 WIRE) R/I CONVERTER ☒ ELECTRONIC (2 WIRE) CONTACTLESS	
	SUPPLY	☒ 24V DC ☐	
	OUTPUT	☒ 4-20mA	
	ACCURACY	± 1% FS	
SPACE HEATER	@SPACE HEATER	REQUIRED	
	@ POWER SUPPLY (NON INTEGRAL)	230V AC,1 PH, 50 Hz	
	@ POWER SUPPLY (INTEGRAL)	BIDDER TO SPECIFY	
	@ RATING		
TERMINAL BOX	ACTUATOR/MOTOR TERMINAL BOX	REQUIRED	
	ENCL CLASS ACTUATOR/MOTOR T.B.	@ ☒ IP 68 @ ☐	
	@ EARTHING TERMINAL	REQUIRED	
	PLUG & SOCKET(9 PIN) (FOR COMM, LS/TS FEED BACK, PoT)	☒ REQUIRED ☐ NOT REQUIRED ☒ 2 NOS. ☐	
CABLE GLANDS	@ POWER CABLE GLAND	SIZE:-----	
	@ SPACE HEATER CABLE GLAND	SIZE:-----	
	OTHER CONTROL CABLE GLANDS-1	☐ 1No. for BFV of CW PUMP(Cable size 2Px1.5mm2)	
	OTHER CONTROL CABLE GLANDS-2	2 nos. 4 P x .5 mm2	
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 INTERNATION 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 OPERATE SATISFACTORILY UNDER THE +/- 10% SUPPLY VOLTAGE VARIATION AT RATED FREQUENCY, -5% TO +3% VARIATION IN FREQUENCY AT RATED SUPPLY VOLTAGE, SIMULTANEOUS VARIATION IN VOLTAGE & FREQUENCY THE SUM OF ABSOLUTE PERCENTAGE NOT EXCEEDING 10%.
 - THE MOTOR SHALL BE SUITABLE FOR DIRECT ON LINE STARTING.
 - TORQUE SWITCH & LIMIT SWITCH SHALL ACT INDEPENDENT OF EACH OTHER. TANDEM OPERATION IS NOT ACCEPTABLE.
 - EPOXY PAINT IS RECOMMENDED FOR COASTAL AREAS.
 - In case suppliers standard control voltage for open/close contactor is 110 V AC, the same is acceptable if suitable opto isolation circuit is provided with coupling relays for 24 V DC command inputs.
 - It shall be possible to operate actuator locally. Lockable remote/local selection shall be provided on actuator.
 - Position indicator shall be provided for 0-100 % travel.
 - Wiring shall be suitable voltage grade copper wire.

NAME SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY	VENDOR COMPANY SEAL
	ANUJ WADHWA	CHETAN MALIK	M.A.MANSOORI	NAME
				SIGNATURE
	20.06.2013	20.06.2013	20.06.2013	DATE

NOTES* = TO BE FILLED BY MPL (LEAD AGENCY). @= TO BE FILLED BY ES



**INSTRUMENT CABLE INTERCONNECTION
AND TERMINATION PHILOSOPHY**

CLAUSE NO.	TECHNICAL REQUIREMENTS						
	Specification Requirements	Type-A cable	Type-B cable	Type F & G cable	Type-C cable		
		applied to entire drum) or steel drum.					
	Length	1000 m $\pm$ 5% for up to & including 12 pairs 500 m $\pm$ 5% for above12 pairs					
3.00.00	SPECIFICATION OF OPTICAL FIBER CABLES (OFC)						
3.01.00	Optic Fiber cable shall be 4/8/12 core, Electrolytically chrome plated corrugated steel taped (ECCST), fully water blocked with dielectric central member for outdoor/indoor application so as to prevent any physical damage. The cable shall have multiple single-mode or multi mode fibers on as required basis so as to avoid the usage of any repeaters. The outer sheath shall have Flame Retardant, UV resistant properties and are to be identified with the manufacturer's name, year of manufacture, progressive automatic sequential on-line marking of length in meters at every meter on outer sheath.						
3.02.00	The cable core shall have suitable characteristics and strengthening for prevention of damage during pulling viz. Dielectric central member, Loose buffer tube design, 4 fibers per buffer tube (minimum), Interstices and buffer tubes duly filled with Thixotropic jelly etc. The cable shall be suitable for a maximum tensile force of 2000 N during installation, and once installed, a tensile force of 1000 N minimum. The compressive strength of cable shall be 3000 N minimum & crush resistance 4000 N minimum. The operating temperature shall be – 20 Deg. C to 70 Deg.C						
3.03.00	All testing of the fiber optic cable being supplied shall be as per the relevant IEC, EIA and other international standards.						
3.04.00	Bidder to ensure that minimum 100% cores are kept as spares in all types of optical fiber cables.						
3.05.00	Cables shall be suitable for laying in conduits, ducts, trenches, racks and under ground buried installation.						
3.06.00	Spliced / Repaired cables are not acceptable.						
3.07.00	Penetration of water resistance and impact resistance shall be as per IEC standard.						
4.00.00	SPCIFICATION OF CONTROL & POWER SUPPLY CABLES						
	Refer Electrical sub-sections.						
5.00.00	INSTRUMENTATION CABLE INTERCONNECTION AND TERMINATION PHILOSOPHY						
	The cable interconnection philosophy to be adopted shall be such that extensive grouping of signals by large scale use of field mounted Group Junction Boxes (JBs) at strategic locations (where large concentration of signals are available, e.g. valves limit & torque switches, switchgear) is done and consequently cable with higher number of pairs are extensively used. The details of termination to be followed are mentioned in the given Table A.						
TELANGANA SUPER THERMAL POWER PROJECT PHASE-I (2 X 800 MW) STEAM GENERATOR ISLAND PACKAGE		TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC. NO.: CS-9591-101-2		SUB-SECTION-IIIC-07 INSTRUMENTATION & POWER SUPPLY CABLES		PAGE 6 OF 14	

CLAUSE NO.	TECHNICAL REQUIREMENTS				
	TABLE A: CABLE TERMINATION TO BE FOLLOWED				
	Application		Type Of Termination		Type Of Cable
	FROM (A)	TO (B)	END A	END B	
	Valves/dampers drives (Integral Junction box)	Marshalling / Marshalling – cum Termination Cubicle / local group JB	Plug in connector	Post mount cage clamp type.	G
	Transmitters, Process Actuated switches mounted in LIE/LIR	Integral Junction box of LIE/LIR	Plug in connector	Cage clamp (Rail mount) type.	F,G
	RTD heads	Local junction box	Plug in connector	Cage clamp (Rail mount) type.	F
	Thermocouple	Local junction box / CJC box (if applicable)	Plug in connector	Cage clamp (Rail mount) type.	A, B, C*
	Other Field mounted Instrument	Local JB / Group JB	Plug in connector	Cage clamp (Rail mount) type.	F,G
	RTD	Temperature transmitter	Plug in connector	Screwed, Cage clamp type	F
	Thermocouple	Temperature transmitter	Plug in connector	Screwed, Cage clamp type	A, B, C*
	Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/ MCC/SWGR	Group JB	Cage clamp (Rail mount) type.	Cage clamp (Rail mount) type.	F,G
	Local Junction box, Temperature Transmitter, Int. Junction box of LIE/ LIR/ Group JB / MCC/SWGR	Marshalling / Marshalling – cum Termination Cubicle	Cage clamp (Rail mount) type.	Cage clamp (Post mounted) type.	F,G
	Marshalling cubicle/ Termination Cabinet	Electronic system cabinet	Cage clamp (Post mounted) type.	Plug-in connector / other system as per Mfr.'s Standard	Internal wiring
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CLAUSE NO.	TECHNICAL REQUIREMENTS				एनटीपीसी NTPC
	Application		Type Of Termination		Type Of Cable
	FROM (A)	TO (B)	END A	END B	
	Marshalling/ Termination System Cabinets	UCD mounted equipments	Cage clamp (Post mounted) type.	Plug in connector / Cage clamp type (rail mounted).	F,G (with plug-in connect or at one end)
	DDCMIS/PLC cabinets	PC, Printers etc.	Plug in connector	Plug in connector	Mfr.'s Standard
	Notes 1 Normally 10% spare cores shall be provided when the numbers of pairs of cables are more than four pairs, except for pre-fabricated cables which shall be as per manufacturer's standard. 2 For analog signals, individual pair shielding & overall shielding & for Binary signals, only overall shielding of instrumentation cables shall be provided. 3 * For high temperature applications only.				
6.00.00	TERMINAL BLOCKS				
6.01.00	All terminal blocks shall be rail mounted/post mounted, cage clamp type with high quality non-flammable insulating material of melamine suitable for working temperature of 105 deg. C. The terminal blocks in field mounted junction boxes, temperature transmitters, instrument enclosures/racks, etc., shall be suitable for cage clamp connections. The terminal blocks in Control Equipment Room logic/termination/marshalling cubicles shall be suitable for post mounted cage clamp connection at the field input end. The exact type of terminal blocks to be provided by the Bidder and the technical details of the same including width etc. shall be subject to Employer's approval.				
6.02.00	All the terminal blocks shall be provided complete with all required accessories including assembly rail, locking pin and section, end brackets, partitions, small partitions, transparent covers, support brackets, distance sleeves, warning label, marking, etc.				
6.03.00	The marking on terminal strips shall correspond to the terminal numbering on wiring diagrams. At least 20% spare unused terminals shall be provided everywhere including local junction boxes, instrument racks/enclosures, termination/marshalling cabinets, etc. All terminal blocks shall be numbered for identification and grouped according to the function. Engraved labels shall be provided on the terminal blocks.				
6.04.00	For terminating each process actuated switches, drive actuators, control valves, Thermocouple, RTD, etc. in Local Junction Boxes, etc, refer Drg no. 0000-999-POI-A-065.				
6.05.00	The terminal blocks shall be arranged with at least 100 mm clearance between two sets of terminal blocks and between terminal blocks and junction box walls.				
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
7.00.00	INTERNAL PANELS/ SYSTEM CABINETS WIRING		
7.01.00	Internal panel/cabinet wiring shall be of multi-stranded copper conductor with FRLS PVC insulation without shield and outer sheath meeting the requirements of VDE 0815.		
7.02.00	All internal wires shall be provided with tag and identification nos. etched on tightly fitted ferules at both ends. All wires directly connected to trip devices shall be distinguished by one additional red colour ferrule.		
7.03.00	All external connection shall be made with one wire per termination point. Wires shall not be tapped or spliced between terminal points.		
7.04.00	All floor slots of desk/panels/cabinets used for cable entrance shall be provided with removable gasketed gland plates and sealing material. Split type grommets shall be used for prefabricated cables.		
7.05.00	All the special tools as may be required for solder less connections shall be provided by Bidder.		
7.06.00	Wire sizes to be utilised for internal wiring.		
	(i)	Current (4-20 mA), low voltage signals (48V); Ammeter/Voltmeter circuit, control switches etc. for electrical system.	0.5 Sq.mm.
	(ii)	Power supply and internal illumination.	2.5Sq.mm. minimum (shall be as per load requirement.)
8.00.00	INSTRUMENTATION CABLE INSTALLATION AND ROUTING		
8.01.00	All cables assigned to a particular duct/conduit shall be grouped and pulled in simultaneously using cable grips and suitable lubricants. Cables removed from one duct/conduit shall not be reused without approval of Employer.		
8.02.00	Cables shall be segregated as per IEEE Std.-422. In vertically stacked trays, the higher voltage cable shall be in higher position and instrumentation cable shall be in bottom tier of the tray stack. The distance between instrumentation cables and those of other system shall be as follows:		
	From 11 kV/6.6 kV/3.3 kV tray system	-	914 mm
	From 415V tray system	-	610 mm
	From control cable tray system	-	305 mm
8.03.00	Cables shall terminate in the enclosure through cable glands. All cable glands shall be properly gasketed. Sealing (to prevent ingress of dust entry and propagation of fire) shall be provided for all floor slots used for cable entrance. Compression cable glands (double for armoured and single for other cables) shall be provided.		
8.04.00	Not in use		
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
8.05.00	The cables emanating from redundant equipment/devices shall be routed through different paths. The above segregation of cables & wiring for redundant equipments/devices shall be in accordance with IEEE-Std-422.			
9.00.00	CABLE LAYING AND ACCESSORIES			
9.01.00	CABLE LAYING			
	1	Cables shall be laid strictly in line with cable schedule.		
	2	Identification tags for cables.		
		Indelible tags to be provided at all terminations, on both sides of wall or floor crossing, on each conduit/duct/pipe entry/exit, and at every 20 m in cable trench/tray.		
	3	Cable tray numbering and marking.		
		To be provided at every 10m and at each end of cable way & branch connection.		
	4	No jointing is permissible for Instrumentation cables. For other cables Jointing for more than 250 Meters run of cable shall be permitted.		
	5	Buried cable protection		
		With concrete slabs; Route markers at every 20 Meters along the route & at every bend.		
	6	Road Crossings		
		Cables to pass through buried high density PE pipes encased in PCC. At least 300 mm clearance shall be provided between		
		- HT power & LT power cables, - LT power & LT control/instrumentation cables,		
		Spacing between cables of same voltage grade shall be in accordance with the derating criteria adopted for cable sizing.		
	7	Segregation (physical isolation to prevent fire jumping)		
	a	All cable associated with the unit shall be segregated from cables of other Units.		
	b	Interplant cables of station auxiliaries and unit critical drives shall be segregated in such a way that not more than half of the drives are lost in case of single incident of fire.		
	8	Cable clamping		
		All cables laid on trays shall be neatly dressed up & suitably clamped/tied to the tray. For cables in trefoil formation, trefoil clamps shall be provided.		
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CLAUSE NO.	TECHNICAL REQUIREMENTS			
	9 Optical fiber cables (OFCs) : Outside Building Area - to be laid necessarily inside GI conduit with support from cable tray/Trestle structure Inside Building Area – to be laid on separate cable sub-trays While buried- in separate buried trench approx.1.0 meter depth, to be laid in 2” rodent proof HDPE conduits covered with sand, brick, laid breadth-wise and soil along the pipe line route by contractor; While crossing roads - to be laid in GI/rodent proof HDPE conduits with sand filling at bottom and sand, soil filling at top with cement concrete; While crossing canals/river- to be laid in rodent proof HDPE conduits within hume pipe. 10 Laying of Network Cable (UTP/STP) : Out side Building Area- to be laid necessarily inside GI conduits with support from cable tray / Tressle structure. Inside Building Area- to be laid necessarily inside GI conduits on separate cable sub-trays.			
9.02.00	Bidder shall supply and install all cable accessories and fittings like Light Interface Units, Surge suppressors, Opto isolators, Interface Converters, Fiber Optic Card Cage, Fiber Optic Line Driver, Repeater / Modem (for Optical Fiber Cables), cable glands, grommets, lugs, termination kits etc. on as required basis.			
9.03.00	Bidder shall furnish two completely new sets of cable termination kits like Crimping tools, etc., which are required for maintenance of the system as per the type of termination used.			
9.04.00	Cables, which terminate in cabinets of draw out sections shall have sufficient cable coiled in the bottom of the cabinet to permit full withdrawal of draw out sections without disconnecting the cables. When prefabricated cables with factory connectors on both ends are longer than required, the excess cable shall be coiled in the bottom of one or both termination cabinets.			
9.05.00	No splices shall be made in conductors for instrument and control circuits except where required at connections to devices equipped with factory installed pigtails. Such splices shall be made only in approved splicing boxes of fitting with removable cover. The splices shall be made with sufficient slack left in the wires to permit withdrawal of the splice from the splicing box for ease of future disconnection of the splices. All exposed conductor or connector surfaces shall be covered with a minimum of three half-lapped layers of all-weather vinyl plastic electrical tape. Taping shall extend a minimum of two cable diameters over the cable jacket and a similar distance over the other insulation or connections requiring insulation.			
9.06.00	The Bidder shall be responsible for proper grounding of all equipment under this package. Further, proper termination of cable shields shall be verified and the grounding of the same shall be coordinated so as to achieve grounding of all instrumentation cable shields at same potential. This shall be completed prior to system tests. All the cables etc. required for grounding of all equipments supplied under this package are to be supplied by the Bidder.			
9.07.00	The Contractor shall take full care while laying / installing cables as recommended by cable manufacturers regarding pulling tensions and cable bends. Cables damaged in any way during installation shall be replaced at the expense of the Contractor.			
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CLAUSE NO.	TECHNICAL REQUIREMENTS		
10.00.00	FIELD MOUNTED LOCAL JUNCTION BOXES		
	(i)	No. of ways	12/24/36/48/64/72/96/128 with 20% spares terminals.
	(ii)	Material & Thickness	4mm thick Fiberglass Reinforced Polyester (FRP).
	(iii)	Type	Screwed at all four corners for door. Door gasket shall be of synthetic rubber.
	(iv)	Mounting clamps and accessories	Suitable for mounting on walls, columns, structures etc. The brackets, bolts, nuts, screws, glands required for erection shall be of SS, included in Bidders scope of supply.
	(v)	Type of terminal blocks	Rail mounted cage-clamp type suitable for conductor size upto 2.5 mm ² . An M6 earthing stud shall be provided.
	(vi)	Protection Class	IP-55 minimum for indoor & IP-65 minimum for outdoor applications.
	(vii)	Grounding	To be provided.
	(viii)	Color	7035
11.00.00	CONDUITS		
11.01.00	Conduits shall be generally used for interconnecting cables from field instruments to Local JB's. All rigid conduits, couplings and elbows shall be hot dipped galvanized rigid mild steel in accordance with IS: 9537 Part-I (1980) and Part-II (1981). The conduit interior and exterior surfaces shall have continuous zinc coating with an overcoat of transparent enamel lacker or zinc chromate. Flexible conduit shall be heat resistant lead coated steel, The temperature rating of flexible conduit shall be suitable for the following areas: (i) Mills (ii) Drum (iii) Main steam, RH steam (iv) Air Heaters (v) Furnace, BFPDTs For the remaining applications, water leak, fire and rust proof flexible GI conduits shall be provided. And for remaining applications, water leak, fire and rust proof flexible GI conduits shall be provided. The temperature rating of flexible conduit shall be suitable for actual application.		
11.02.00	The Bidder shall install conduits according to the general routing as approved by Employer and shall coordinate conduit locations with other works.		
11.03.00	All grounding bushings within all enclosures shall be wired together and connected internally to the enclosure grounding lug or grounding bus with 8 AWG bare copper conductor. Conduit runs to individually mounted equipment shall be grounded to the Employer's cable tray grounding conductor with 12 AEG bare copper conductor. All grounding bushings, clamps and connectors shall be subject to approval of the Employer.		
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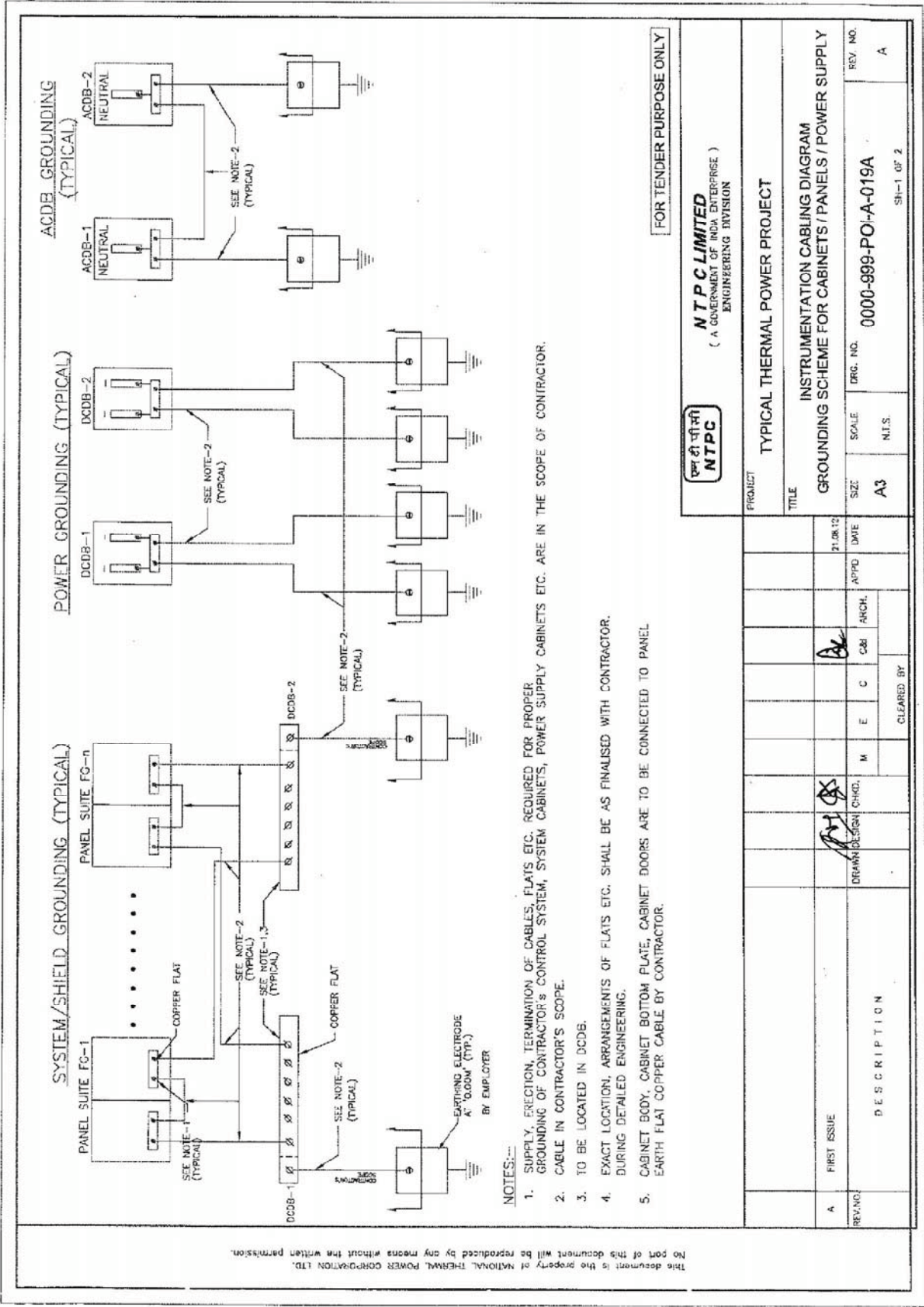
CLAUSE NO.	TECHNICAL REQUIREMENTS			
11.04.00	All rigid conduit fittings shall conform to the requirements of IS: 2667, 1976. Galvanized steel fitting shall be used with steel conduit. All flexible conduit fittings shall be liquid tight, galvanized steel. The end fittings shall be compatible with the flexible conduit supplied.			
11.05.00	All individually mounted equipment and devices shall be connected to the supply conduit, using not more than one meter of flexible conduit adjacent to the equipment or device. Flexible conduit shall be installed in all conduit runs, which are supported by both building steel and structures subject to vibration or thermal expansion. This shall include locations where conduit supported by building steel enters or becomes supported by the turbine generator foundation and where conduit supported by building steel or foundation becomes supported by steam generator framing.			
11.06.00	Special areas, such as control rooms in which external noise is to be minimized, shall have flexible conduit in conduit runs where the runs cross from the main building framing to the control room framing.			
11.07.00	Conduit supports shall be furnished and installed in accordance with these specifications. Support material shall comply with the following requirements. i) Hanger rods shall be 12 mm diameter galvanized threaded steel rods. ii) Single conduit supports shall be one-hole cast metal straps and clamp backs unless other types are acceptable to the Employer. Multiple conduit bank supports shall be constructed of special galvanized support channels with associated conduit clips.			
11.08.00	Conduit sealing, explosion proof, dust proof and other types of special fittings shall be provided as required by these specifications and shall be consistent with the area and equipment with which they are installed. Fittings installed outdoors and in damp locations shall be sealed and gasketed. Hazardous area fittings and conduits sealing shall conform to NEC requirements for the area classification.			
11.09.00	Contractor shall provide double locknuts on all conduit terminations not provided with threaded hubs and couplings. Water tight conduit unions and rain tight conduit hubs shall be utilized for all the application which shall be exposed to weather. Moisture pockets shall be eliminated from conduits.			
11.10.00	Conduits shall be securely fastened to all boxes and cabinets.			
12.00.00	CABLE SUB-TRAY & SUPPORT			
12.01.00	The cable sub-trays and the supporting system, to be generally used between Local/Group JB's and the main cable trays and the same shall be furnished and installed by the Contractor. It is the assembly of sections and associated fittings forming a rigid structural system used to support the cable from the equipment or instrument enclosure upto the main cable trays (trunk route).			
12.02.00	The covers on the cable sub-trays shall be used for protection of cables in areas where damage may occur from falling objects, welding spark, corrosive environment, etc. & shall be electrically continuous and solidly grounded. The cable trays shall not have sharp edges, burrs or projections injurious to the insulation or outer sheath of the cables.			
12.03.00	The supporting arrangement of cable tray system shall be able to withstand the weight of the cable and cable tray system. The supporting interval shall not be more than the recommended span for the above loading for the type of cable tray selected. The tray shall not overhang by more than one meter from the support at the dead end. As far as practicable			
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12.04.00	the cable sub-tray system shall be supported from one side only, in order to facilitate installation and maintenance of cables. The Bidder shall furnish and install the estimated quantities and sizes of sub trays/troughs including all required fittings and adaptors on as required basis.		
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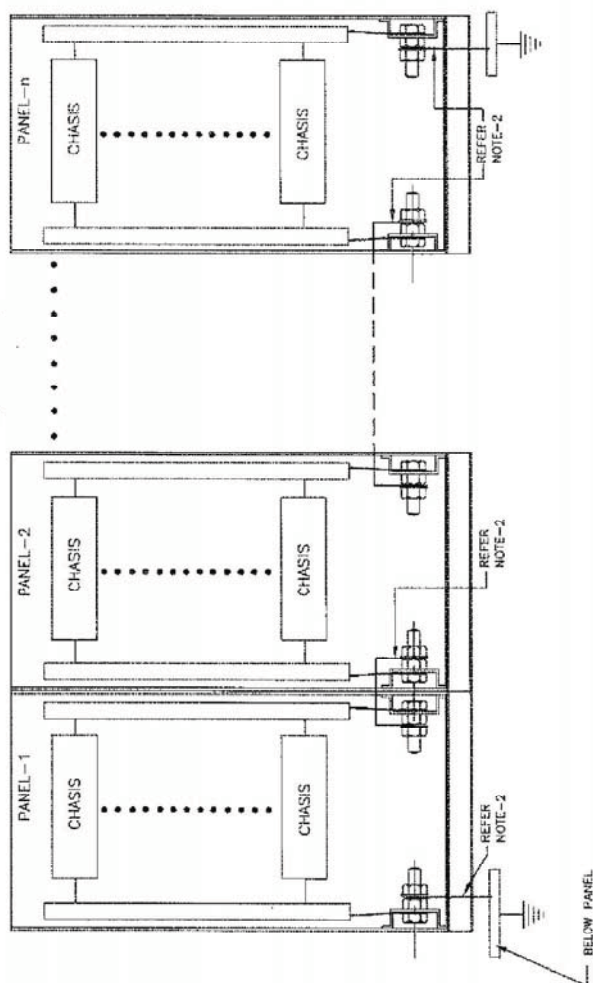
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5.00.00	SHOP AND SITE TESTS			
5.01.00	General Requirements			
5.01.01	The equipment and work performed as per this Sub-section shall be subject to shop and site test as per requirements of Sub-section-Q (Quality Assurance & Inspection) other applicable clauses of this Sub-section and Employer approved quality assurance plan.			
5.01.02	Hydrostatic and pneumatic tests shall be performed on all pipes, tubing and systems and shall conform to ANSI B31.1.			
5.02.00	Hydrostatic Testing			
5.02.01	All instrument piping/ tubing shall be hydrostatically tested upon completion of erection. The test pressure shall be 1.5 times the maximum process pressure. The test shall be performed either with the testing of associated process piping or without the associated process piping (by closing the root valve). In both the cases the instrument shall be isolated by closing the shut-off valve.			
5.03.00	Air Testing			
5.03.01	All air headers & branch pipes shall be air tested by pressure decay method as per ANSI B31.1. Flexible hoses and short signal tubing shall be tested at normal pressure for leakage. Long signal tubing shall be tested by charging each tube with air at 2 kg/ sq. cm. through a bubbler sight glass. The boiler draft and vacuum piping shall be air tested by the same method as long signal tubing.			
6.00.00	LOCAL INSTRUMENT ENCLOSURE AND RACKS			
	Transmitters, switches, devices ,temperature transmitters etc. (except for all fuel oil applications which shall be mounted close to be tapping points) mounted in the field shall be suitably grouped together and mounted (i) local instruments enclosure in case of open areas of the plant like boiler area, etc. and (ii) In local instrument racks in case of covered areas. Gauges are to be mounted on a channel or a frame or a rack (Gauges shall not be mounted directly on process pipe). These local instrument enclosures and racks shall be furnished as per the actual requirements finalized during detailed engineering stage. The exact grouping of instruments in a particular instrument enclosure/instrument rack shall be as finalized during detailed engineering stage subject to Employer's approval. For mounting of PT/DPT/LT/FT, LIEs / LIRs shall be of three types depending on the number of transmitters located in it as elaborated in the typical GA of the LIE/LIR, drawing no. 0000-999-POI-A-064 (Sh Nos. 1 to 3 of 5). These dimensions and number of instruments indicated therein are only indicative and the exact dimensions along with the number of instruments shall be as finalized during detailed engineering stage without any price repercussions. The internal layout shall be such that the impulse piping/ blow down lines are accessible from back side of the enclosure / rack and the transmitters etc. are accessible from front side for easy maintenance. Bulkheads, especially designed to provide isolation from process line vibration shall be installed on instrument enclosures/racks to meet the process sensing line connection requirement. Vibration dampeners shall be installed for each enclosure / rack.			
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	The enclosures shall be constructed of 3 mm sheet plate and shall be of modular construction with one or more modules and two end assemblies bolted together to form an enclosure. Double inter locking doors shall be provided. The doors shall be the three-point locking type constructed of not less than 1.6 mm thick steel. Doors shall have concealed quick removal type pinned hinges and locking handles. Door locks shall accept the same key. Gaskets shall be used between all mating sections to achieve protection class of IP-55. The instrument racks shall be free standing type constructed of suitable 5 mm thick channel frame of steel and shall be provided with a canopy to protect the equipment mounted in racks from falling objects, water etc. The canopy shall not be less than 3 mm thick steel, and extended beyond the ends of the rack. Bulk heads, especially designed to provide isolation from process line vibration shall be provided. Exact fabrication details shall be as finalized during detailed engineering stage. The junction box for racks also shall conform to IP 55 protection class. Enclosures/racks shall be reinforced as required to ensure true surface and to provide adequate support for instruments and equipment mounted therein. Centre posts or any member which would reduce access shall not be provided. Each transmitter enclosure housing instruments requiring purge air for continuous air purging, shall be provided with common purge air header, redundant air filter regulators of sufficient capacity, required pressure gauges, valves, fittings, SS tubing and individual purge meters for each purge line etc. as required and indicated in Instrument Installation drawings enclosed herewith. A 15 mm NB service air header shall be furnished in each instrument enclosure housing air & flue gas and coal mill instruments. The header shall be furnished complete with a pressure regulating valve, pressure gauge, and quick disconnect connections. A hose for connecting each header to the draft instrument line four-way valves shall be furnished. The hose shall be self-storing nylon tubing having a burst pressure of 15 kg/sq. cm. The size of the hose shall be 1/2" minimum. The service air header shall originate at a bulkhead penetration or fitting located on one of the bulkhead plates. The contractor shall prepare the piping drawings and the general arrangement layout drawings for each of the enclosures and racks. Special attention shall be given in the piping layout to avoid air traps in liquid filled piping or water pockets in piping intended to be dry. Drawings shall indicate the arrangement of all equipment, piping, valves and fittings within, the enclosure/racks and shall be subject to Employer's approval. All liquid filled blow down lines, except those measuring vacuum shall be connected to a two inch header which is extended through one end of the enclosure and turned downward for directing the blow down into a drain. The material of the blow down header shall be carbon steel as per ASTM A 106 Gr. C. The Contractor shall submit to the Employer with his proposal a copy of his welding procedure specification together with proof of his compliance with the latest applicable welding ANSI code. Prior to any welding being performed, the Contractor shall submit the qualifications of the craftsmen who will perform the work.		
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CABLING & INST. INSTALLATION
DIAGRAM



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4. EXACT LOCATION, ARRANGEMENTS OF FLATS ETC. SHALL BE AS FINALISED WITH CONTRACTOR. DURING DETAILED ENGINEERING.
5. CABINET BODY, CABINET BOTTOM PLATE, CABINET DOORS ARE TO BE CONNECTED TO PANEL EARTH FLAT COPPER CABLE BY CONTRACTOR

FOR TENDER PURPOSE ONLY

NTPC LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

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