

1 700 MW BELLARY TPS UNIT 3
KARNATAKA POWER CORPORATION LIMITED

VOLUME - II B

**TECHNICAL SPECIFICATION
FOR
MILL REJECT HANDLING SYSTEM**

SPECIFICATION NO.: PE-TS-367-160-A001



BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA, INDIA.



PREAMBLE

SPECN. NO.:

PE-TS-367-160-A001

REV. NO.

0

DATE:

07-19-2012

1.0 The tender document contains three (3) volumes. The bidder shall meet the requirements of all the three volumes.

1.1 Volume I - CONDITIONS OF CONTRACT

This consists of four parts as below:

Volume - I A : This part contains instructions to bidders for making bids to BHEL.

Volume - I B : This part contains general commercial conditions of the tender and include provision that vendor shall be responsible for the quality of item supplied by their sub-vendors.

Volume - I C : This part contains special conditions of contract.

Volume - I D : This part contains commercial conditions for erection and commissioning site work, as applicable.

1.2 Volume II - TECHNICAL SPECIFICATIONS

Technical requirements are stipulated in Volume II which comprises of:

Volume - II A : General Technical Conditions

Volume - II B : Technical specification including drawings, if any

1.2.1 Volume - II B :

This volume is sub-divided into following sections:

Section - A : This section outlines the scope of enquiry.

Section - B : This section provides "Project Information"

Section - C : This section indicates technical requirements specific to the contract, not covered in Section-D.

Section - D : This section comprises of General Technical Requirement.

1.2.2 Volume - III TECHNICAL SCHEDULES

This volume contains technical schedules which is to be duly filled by the bidder and the same shall be furnished with the technical bid.

2.0 The requirements mentioned in Section C/Data Sheets-A of Section-C shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section -D.



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MILL REJECT HANDLING SYSTEM**
**1 700 MW BELLARY TPS UNIT 3
KARNATAKA POWER CORPORATION LIMITED**

BHEL DOCUMENTS NO.: PE-TS-367-160-A001

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SECTION - A
SCOPE OF ENQUIRY

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1.0 INTENT OF SPECIFICATION


- 1.1 The specification is intended to cover design, engineering, manufacture, inspection and testing at vendor's/ sub-vendor's works, painting, forwarding, proper packing and shipment and delivery at site, unloading, handling & transportation at site, Erection & Commissioning, minor civil works as required Performance and guarantee testing and handing over of **Mill Reject Handling System** as per details in different sections of this specification for **1x700 MW BELLARY TPS UNIT 3**.
- 1.2 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which in his judgment is not in full accordance herewith.
- 1.3 The extent of work under the contract includes all items shown in the flow diagram, notwithstanding the fact that such items may have been omitted from the specification or schedules. Similarly extent of work also includes all items mentioned in the specification and/or schedules, notwithstanding the fact that such items may have been omitted in the drawing.
- 1.4 The general term and conditions, instructions to tendered and other attachment referred to elsewhere are made part of the tender specification. The equipment materials and works covered by this specification is subject to compliance to all attachments referred to in the specification. The bidder shall be responsible for and governed by all requirements stipulated herein.
- 1.5 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Vol-III of the specification **within 10 days of receipt of tender documents**. In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of Purchaser/Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the same. Normally, in case of any contradiction in requirements between section-C and section-D, the requirements in Sec-C shall govern. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by Purchaser/Customer as and when brought to their notice either by the bidder or by purchaser/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.
- 1.6 Deviations, if any, should be very clearly brought out clause by clause in the enclosed schedule; otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification.


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SECTION - B


PRO ECT INFORMATION

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KPCL/BTPS/03/EPC		KARNATAKA POWER CORPORATION LIMITED		SECTION: B
		BELLARY TPS.UNIT-3 OF 700 MW		VOLUME-II
TITLE		PROJECT INFORMATION		SHEET 1 OF 2
1.0	Owner	:	Karnataka Power Corporation Ltd Shakthi Bhavan No.82, Race Course Road Bangalore-560 001 Karnataka, India	
2.0	Project Title	:	1x700 MW Bellary Thermal Power Station Unit No3, Stage-3	
3.0	Location	:	Kudatini Village Bellary Dist Karnataka state	INDIA
4.0	Latitude and Longitude	:	15° 11' 58" N Latitude 76° 43' 23" E Longitude	
5.0	Elevation above mean sea level	:	478 meters	
6.0	<u>Climatic Conditions</u>			
	(a) <u>Temperature</u>			
	i. <u>Monthly basis</u>			
	Mean of daily maximum temperature	:	42.5° C (in the month of April)	
	Mean of daily minimum temperature	:	19.5° C (in the month of Dec)	
	ii. <u>Monthly basis</u>			
	Mean of daily maximum	:	37.5° C	
	Mean of daily minimum	:	19.5° C	
	iii Highest temperature recorded	:	42.5° C	
	iv Lowest temperature recorded	:	14.6° C	
	(b) Relative Humidity	:	Varies between 11% and 70%	
	(c) <u>Rainfall</u>			
	Annual average rain	:	492 to 846 mm most of which occurs during August to October	
	(d) <u>Wind Speed</u>			
	i. Annual mean wind speed	:	8.4 km / hr	
	ii. Maximum mean wind speed	:	19 km / hr in the month of July.	
8.0	Wind Load			
	(a) Basic wind speed of 39 m/sec as given in Fig.1 of the code.			
	(b) Factor K1 shall be taken as 1.06			
	(c) Terrain category shall be 2 and corresponding values shall be taken for K2			
	(d) Factor K3 shall be taken as 1.0			
9.0	Wind Loading for Stack			
	(a) For wind pressure as per clause 8.0 above			
	(b) For RC stacks as per IS: 4998			
10.0	Seismic data (as per IS:1893 latest issue)			
	(a) Zone	:	Zone III	
	(b) Importance factor (I)	:	2.5 for electrical equipment 1.5 for others.	
11.0	Auxiliary power supply	:	Auxiliary electrical equipment to be supplied against this specification shall be suitable for operation on the following supply system.	


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	TITLE	SHEET 2 OF 2	
PROJECT INFORMATION			
(a)	For motors rated above 175 kW	: 11000V, 3 phase, 3 wire, 50Hz medium earthed AC 3300V, 3 phase, 3 wire, 50Hz medium earthed AC	
(b)	For motor control centre	: 415V, 3 phase, 3 wire solidly earthed AC	
(c)	For motor rated 175 kW and below	: 415, 3 phase, 3 wire solidly earthed AC	
(d)	DC. motor starters, DC solenoids, DC alarm, control and protections	: 220 V DC, 2 wire, unearthed DC	
(e)	AC control & protective devices	: 110 V 1 phase, 50Hz, 2 wire AC supply. The single-phase 110V AC supply shall be derived by Contractor by providing 415V/110V control transformers of adequate rating with MCCB /MCB on both the primary and secondary sides.	
(f)	Uninterrupted power supply	: 110 V, 1 phase, 50Hz, 2 wire AC supply from UPS system for I&C (including indicator recorders) and UCMS only	
(g)	AC solenoids, indicators/recorders,space heaters (for motors rated 30KW and above)	: 240V 1 phase, 2 wire, 50Hz AC system with effectively earthed neutral. The power supply shall be derived by Contractor by providing 415V/ 240V transformer of adequate rating with MCCB/MCB on primary/secondary sides.	
(h)	Winding heating of motors below 30kW	: 24 V 1 phase, 50Hz, AC with one point earthed. This shall be derived by Contractor by providing 415V 3 phase, 3 wire, AC supply through an adequately rated step-down transformer of adequate rating with MCCB / MCB on primary/secondary sides.	
(i)	Solid state controls (including solenoid valves)	: 24 V DC, 2 wire, supply from Battery chargers for instrumentation system only.	
(j)	Lighting fixtures	: 240 V, 1 phase, 2 wire, 50Hz system.	
(k)	Lighting fixtures and space heaters in panels	: 240 V, 1 phase, 2 wire, 50Hz system.	
(l)	Construction supply	: 415 V, 3 phase, 4 wire, 50 Hz AC supply with neutral lead solidly earthed. .	
(m)	The above voltages may vary as follows:		
	All devices shall be suitable for continuous operation over the entire range of voltage and frequency indicated below without any change in their performance.		
	i. AC supply	: Voltage variation $\pm 10\%$ Frequency variation $\pm 5\%$ Combined voltage & frequency variation $\pm 10\%$	
	ii. DC supply	: Voltage variation $+10\%$ -20%	

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SECTION C

SPECIFIC TECHNICAL REQUIREMENTS

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SECTION C1

SPECIFIC TECHNICAL REQUIREMENTS FOR MECHANICAL



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Sno.	Items/Description	BELLARY-3
1	No of mills/Unit	7 (6W+1S)
2	Reject generation rate/Design rate	1.0 TPH
3	Mill layout	Side Mill Arrangement
4	Project Information & Mill Details	Refer Specs elsewhere
5*	Silo Location (Tentative)	Refer Layout
6	Compressor Location	Refer Layout, Main Compressor house
7	Temp Normal/Design	180/200 Deg C
8	Bunker Plate thickness	10 mm (Min)
9	Bunker liner	3 mm thk SS 304 at conical & cylindrical portion
10	Pyrite Hopper Thickness	8 mm/ As per supplier's std practice, whichever is higher
11	Air Receiver	One per mill bay, As per IS 2825
12	Water spray system (Pyrite quenching)	Required
13	No of compressors	2 Nos (1W+1S), non lubricated reciprocating type air compressor
14	Sump Pump (Fixed type/ Trolley type)	2 Nos.
15	Bunker Capacity	55 T of each bunker. (Total 2 nos. Bunker)
16	Type of control/ Main control panel location	PLC based control system
17	Mandatory spares	Not Applicable
	<u>Si ing Criteria</u>	
18	Compressor	Refer Annexure-B
19	Air Receiver	Refer Annexure-B
20	Bag filter	Air to cloth ratio 1.5.
21	Pipe Size	Minimum 125 NB
22		
23		
NOT E	* Silo location marked in layout is tentative and same shall be finalised during detail Engg.	



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1.1 EQUIPMENT DESIGN/SELECTION CRITERIA

S. No.	Equipment	Design/Selection/Sizing Criteria
01	Conveying Air Compressor	<p>Each compressor shall be selected to meet the following requirements:</p> <ol style="list-style-type: none"> Compressors shall be suitable to convey total mill reject generated from all working mills as specified. A margin of 50 % shall be considered over and above the required/ calculated/ minimum compressor capacity arrived for conveying of total reject generated. The selected capacity of compressor along with receiver shall be suitable to fire one vessel from each mill bay of the unit/s and one additional emergency cycle. Guaranteed reject conveying rate 1000 kg/hr per unit. RH – As per project information. Air Temperature - As per project information. Height above MSL- As per project information. Noise level- Shall be limited to 85dBA at a distance of 1.0 m in horizontal direction from the nearest surface of the machine and at a height of 1.5 m from the floor level in elevation. Noise level measurement shall be carried out using applicable and internationally acceptable standards. The measurement shall be carried out with calibrated integrating sound level meter meeting the requirement of IEC 651 or BS:5969 or IS 9779.
02	Air Receiver Capacity	<p>Capacity: The air receiver capacity shall be selected to convey one complete cycle from one vessel without taking into consideration any air supply from the compressor. A margin of 25% shall be provided over and above the arrived air receiver capacity.</p>
03	Pyrite Hopper & Accessories	<ol style="list-style-type: none"> Capacity – 2-3 times denseveyor / transporter vessel capacity. MOC – MS to IS 2062 Gr. A (min), min 8 mm thk. Rupture Disc Bursting Pressure – 0.5 kg /cm² (g) Grid Details – Shall be made from minimum 10 mm dia./thk MS bars/flats with opening suitable for entrapping reject larger than 50 mm in size. Surface Temperature – The surface temperature of the equipment shall be maintained within 60 °C. Insulation, if required, to achieve the same shall be provided by the bidder without any commercial implication.
04	<p>System Sizing Basis</p> <p>a Reject size to be handled</p> <p>b Conveying vessel</p>	<p>System shall be sized for two normal cycles (i.e. one cycle for each bay) and one in emergency.</p> <p>Max. size of rejects to be handled – up to 50 mm (5% of total reject) rest 25 mm & below</p> <p>To suit the conveying rate with 85% (max) filling</p>



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05	Bunker & its Accessories	<p>a) <i>Quantity</i> – One (1) per bay (Two nos. per unit). b) <i>Effective Storage Capacity</i> – 55 T c) <i>Minimum free board</i> – 500 mm d) <i>Bunker Plate</i> – 10 mm thk. MS Plate conforming to IS 2062 Gr A e) <i>Liner</i> – 3 mm SS 304 on conical & cylindrical portion of bunker f) <i>Discharge Gate</i> i. Size – 400 mm x 400 mm (clear open) ii. Type – Twin Sector, lever operated iii. MOC – CI to IS 210/ MS 10 mm thick (min) to IS 2062 (Gr. A min) with 10 mm thick SAILHARD/TISCRA L LINER on inner surface g) <i>Staircase on Silo</i>: Complete staircase to be provided up to top of silo with operating/ maintenance platform at all levels having any equipment requiring operation & maintenance.</p> <p>Bag Filter</p> <p>Each Bag filter shall be sized considering simultaneous firing of one normal and one emergency cycles.</p> <p>a) <i>Material of Filter Cloth</i> – Polyester felt needle suitable for prolonged operation up to a temperature of 180°C without losing its collection efficiency & durability. b) <i>Air to Cloth Ratio</i> – 1.5 (Further 10 % additional bags shall be provided) c) <i>Bag</i> – MS, IS 2062, Gr. A (min), 3.0 mm thick (min) d) <i>Bag Cage</i> – MS, IS 2062, Gr. A galvanized. e) <i>Outlet Air Quality</i> – 50 mg/nm³ (max) (To be demonstrated during PG test) f) <i>Bag Cleaning Mechanism</i> – Automatic and shall comprise of solenoid valves, air nozzles, adjustable solid state timer, pressure switches, piping and fittings etc. g) <i>Test on bag filter casin</i> : In case bag filter is assembled in casing at site, smoke/ bubble test shall be carried out on the bag filter casing to ensure that the casing is free of welding defect. However, if assembly of bag filter & casing is done at shop, relevant NDT shall be carried out as per approved MQP for checking the soundness of weld. h) <i>Chain Pulley Block over bag filter</i> : Shall have 25% margin over weight of bag filter, but in no case the capacity shall be lower than 1.0 T.</p>																								
06	Lines for Various Ser ices	<table border="1"> <thead> <tr> <th>Ser ice</th> <th colspan="3">Velocity in m/sec</th> </tr> <tr> <td></td> <th>Pipe size below 50 mm</th> <th>Pipe size from 50 mm to 150 mm</th> <th>Pipe size 200 mm & above</th> </tr> </thead> <tbody> <tr> <td>Compressed Air</td> <td>15</td> <td>18</td> <td>20</td> </tr> <tr> <td>Water toward pump suction</td> <td>0.9</td> <td>1.5</td> <td>1.5</td> </tr> <tr> <td>Water toward pump Discharge</td> <td>1.8</td> <td>2.4</td> <td>2.5</td> </tr> <tr> <td>Mill Reject conveying</td> <td colspan="3">3.5 to 5.7 m/s</td> </tr> </tbody> </table>	Ser ice	Velocity in m/sec				Pipe size below 50 mm	Pipe size from 50 mm to 150 mm	Pipe size 200 mm & above	Compressed Air	15	18	20	Water toward pump suction	0.9	1.5	1.5	Water toward pump Discharge	1.8	2.4	2.5	Mill Reject conveying	3.5 to 5.7 m/s		
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		Service	Material of Construction & other details																		
07	Knife Gate/Plate Valve pyrite hopper inlet, oversize discharge, emergency discharge, hopper isolation/maintenance		Material of Construction <i>Body</i> – CI to IS 210 Gr FG 260 <i>Gate/Plate</i> – SS (ASTM A 240 type 304) with wearing parts provided with abrasion resistant material of hardness 350-400 BHN <i>Size</i> – 200 NB (min) for all valves Deflection cone : Required before the pyrite hopper inlet knife gate valve																		
08	Dome Valve/ Swing Disk Inlet Valve		Material of construction <i>Body</i> – CI to IS 210 Gr. FG 260 <i>Dome</i> – Alloy CI with hardness as 225 BHN with leak proof seat. <i>Shaft</i> – SS 316 <i>Disk</i> – SS 304/ Alloy CI, hardness of 500 BHN (min)																		
09	Conveying pipe bend		MOC & Hardness – Alloy CI, 400 BHN min with min 2% Ni End connection- Flanged																		
10	Fittings, Flanges, Fasteners & Gaskets		Fittings Elbow, Tees and Reducers <table border="1"> <thead> <tr> <th>Service</th> <th>Requirements</th> </tr> </thead> <tbody> <tr> <td>Instrument Air</td> <td>IS 1239, Part-2 (Galvanized)</td> </tr> <tr> <td>Water and conveying air</td> <td>IS 1239, Part -2</td> </tr> </tbody> </table> Flanges <table border="1"> <thead> <tr> <th>Service</th> <th>Requirement</th> </tr> </thead> <tbody> <tr> <td>All services</td> <td>Fabricated out of IS 2062 Gr.B Plates/ Equivalent as per ASME B 16.5</td> </tr> </tbody> </table> Fasteners <table border="1"> <thead> <tr> <th>Service</th> <th>Requirement</th> </tr> </thead> <tbody> <tr> <td>All services</td> <td>SA 193 Gr B7 or equivalent/SA 194 Gr 2H or equivalent</td> </tr> </tbody> </table> Gaskets <table border="1"> <thead> <tr> <th>Service</th> <th>Requirement</th> </tr> </thead> <tbody> <tr> <td>All services</td> <td>TEFLON suitable for service temperatures , min 3 mm thick.</td> </tr> </tbody> </table>	Service	Requirements	Instrument Air	IS 1239, Part-2 (Galvanized)	Water and conveying air	IS 1239, Part -2	Service	Requirement	All services	Fabricated out of IS 2062 Gr.B Plates/ Equivalent as per ASME B 16.5	Service	Requirement	All services	SA 193 Gr B7 or equivalent/SA 194 Gr 2H or equivalent	Service	Requirement	All services	TEFLON suitable for service temperatures , min 3 mm thick.
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11	Val es for Air & Water Lines	<p>Instrument air line Type : Ball Valve full bore, screwed end. MOC : Body – CS, Internals- 13% chrome SS-304</p> <p>ECW DM Water line for Compressor cooling Type : Gate/Globe valve. Flat faced with flanged end for size 65 NB & above and SW end for size 50 NB & below. MOC : Body – SS, Internals & Stem - SS</p> <p>Ser ice Water line for Quenching & Dome seal cooling Type : Gate/Globe valve. Flat faced with flanged end for size 65 NB & above and SW end for size 50 NB & below. MOC : For size 65 NB & above -Body – CI , Internals & Stem – Gun Metal For size 50 NB & below -Body– Gun Metal, Internals & Stem – Gun Metal</p>
12	Sump Pumps	<p>Two (2) nos. of sump pump (Fixed type/ submersible type) for plant. Capacity – To meet system requirement but not less than 5 m³/hr flow and 10MWC haed. MOC i. Casing & suction bell – 2.5 % Ni-CI to IS 210, FG260 ii. Impeller – 2.5 % Ni-CI to IS 210 , FG260 iii. Shaft/Sleeves – EN-8</p>
13.	Density of material	<p>1600 kg/m³ for volumetric calculation 2400 kg/m³ for civil & structural design calculation</p>

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1.0 SCOPE OF WORK


Design, engineering, manufacture, inspection and testing at vendor's/ sub-vendor's works, painting, forwarding, proper packing, shipment and delivery at site, unloading, handling & transportation at site, Erection & Commissioning, minor civil works as required, Performance and guarantee testing and handing over of **Mill Reject Handling System** as per details in different sections of this specification.

Detailed system write-up & control philosophy shall be furnished by the successful bidder during detail engineering & the same shall be subject to customer approval during detail engineering.

1.1 SCOPE OF SUPPLY

Scope of supply shall comprise of but not necessarily limited to the following:

- a) 07 nos of pneumatic Cylinder operated plate/ knife gate valve with open and close limit switches at mill outlet/pyrite hopper inlet.
- b) 07 nos. of pyrite hoppers complete with sizing grid , flexible/expansion joint at its inlet , rupture disc, by pass chute, oversize material chute , water spray nozzles & supporting structures.
- c) 14 nos. (2 Nos. per pyrite hopper) of Level probes for pyrite hoppers.
- d) 07 nos. of Temperature Switches for pyrite hoppers.
- e) 07 nos. of hand wheel operated plate/knife gate valve at pyrite hopper outlet for pyrite hopper isolation .
- f) 07 nos. of hand wheel operated plate/knife gate valve at oversize discharge chute of pyrite hopper provided with open & close limit switches for interlock with pyrite hopper inlet knife gate valve.
- g) 07 nos. of pneumatic Cylinder operated plate/knife gate valve at by pass chute of pyrite hopper provided with open & close limit switches for interlock with pyrite hopper inlet knife gate valve.
- h) 07 nos. of transporter vessel / Denseveyor complete with pneumatically operated dome/ material handling valve, Alloy CI outlet bend, local control panel etc.
- i) 07 sets of MS ERW Heavy grade pipe for mill reject conveying from Denseveyor/ transporter vessel to Mill Reject Storage bunker.
- j) One lot of Alloy CI bends.
- k) 1 sets of terminal boxes with up stand on bunker top for terminating the reject conveying pipes.
- l) Two (2) nos. mill reject bunker along with structure, complete with lining on conical & cylindrical portion and lever operated bunker discharge gate with canvas chute at bunker outlet , staircase, operating & maintenance platform, hand railing , bag filter, level probe, pressure relieve valve, chain pulley block with traveling trolley and monorail arrangement etc.
- m) 2 nos.(1W+1S) non lubricated reciprocating type air compressor with drive motor, local control panel, instruments and all other accessories.
- n) Two nos. air receivers (i.e. one per bay) complete with drain traps, safety relief valve, instruments and all accessories.
- o) 2 No. fixed type sump pump complete with suction (min 5 m long) & discharge hose (min 10 m long) for pumping out water drains from local pit to nearest plant drain, control panel , instruments and all other accessories (Air/water piping shall be of GI as per IS-1239 Heavy grade).


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- p) 1 lot of piping , fittings, valves & instruments for conveying air, instrument air, cooling water for dome valve top plate (if applicable), cooling water quenching in the pyrite hopper, cooling water for air compressor etc.
- q) The knife gate isolation valve provided at pyrite inlet shall be pneumatically operated. Maintenance valve, bypass and oversize chute shall be manually operated. Further for safety purpose oversize discharge, bypass and isolation valves shall be provided with limit switches for interlock with pyrite hopper inlet knife gate valve. All KGVs valves and chutes shall be 200 NB i.e. 8 Inches.
- r) 1 lot of Local Control Panel/ pneumatic panels/JBs (supplier's scope) properly mounted on rack.
- s) 1 lot of insulation & cladding, if required, to maintain surface temperature of pyrite hopper within 60° C .
- t) All structures including pipe cum cable rack required for supporting of various pipes in bidder's scope. Bidder may take support from existing mill bunker bay structures wherever possible (All supporting structure shall be hot dipped galvanized).
- u) All insert plates, foundation bolts/ Anchor bolts etc. required for bidder's equipment.
- v) Initial charge of all lubricants and fluids.
- w) Electrical and C&I scope as per enclosure elsewhere in the specification.
- x) One set of Erection & commissioning spares as required for the complete system.
- y) One set of special maintenance tools & tackles, if any. These tools shall not be used for erection/ commissioning purposes and shall be in an unused and new condition when they are handed over to the customer at site. Each tool shall be stamped so as to be identified easily for its use. The tools shall be supplied in a steel toolbox.
- z) All counter- flanges with nuts, bolts and gaskets at all the terminal points
- aa) Relevant scope of supply as per GTR, GCC & SCC.
- bb) Any other instrument, item required for making the installation complete in all respect within battery limits and for satisfactory operation of the system, unless specifically EXCLUDED from scope under Clause No. 2.0 below.
- cc) PLC based control system as specified in C&I specification.

1.2 SCOPE OF SERVICES

Scope of services shall include but not necessarily limited to the following:

- a) Unloading, Storage, handling and transportation at site.
- b) Minor civil work like pinning, chipping of foundation, grouting supply of EPs/ insert plates etc.
- c) Pre-Commissioning work such as flushing, hydraulic testing etc. Necessary instrumentation for pre-commissioning activities shall be arranged by the successful bidder at their own cost.
- d) Erection & Commissioning of Mill Reject Handling System.
- e) Inspection & testing, PG test/Functional Guarantee (FG) test.
- f) Painting of all equipment within the battery limit.
- g) Electrical scope of services as per enclosure elsewhere in the specification.
- h) Preparation of Civil input drawings & documents for foundation details (including load data, GA, foundation pocket details etc.) of storage bunkers/silos, compressors, air receivers, pipe rack and pit / trench details for denseveyor / transporter vessel and reject conveying pipes.

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- i) Review of Civil drawings prepared by BHEL based on Civil input drawing furnished by the successful bidder.
- j) Preparation of all necessary drawings/data/ documents for obtaining necessary approval of statutory authorities on behalf of the customer. Necessary fee for obtaining such approval shall also be born by the bidder.
- k) Relevant scope of services as per GTR, GCC, ECC & SCC.
- l) Any other service required for making the installation complete in all respect within battery limits and for satisfactory erection & commissioning of the system, **unless specifically E CLUDED from scope under Clause .No. 2.0 below.**

2.0 E CLUSION

- a) Civil work for Mill Reject Handling system including
 - i) Road approach for various facilities related to Mill Reject Handling System.
 - ii) Denseveyor/ Transporter vessel foundation
 - iii) Pit & Trench as required in mill bay
 - iv) Mill Reject compressor & Air receiver foundation
 - v) Mill Reject bunker foundation
 - vi) Various cable trenches, pipe pedestals & pipe rack foundation.

However, location, sizing and loads and any other input related to above as applicable for above shall be given by the successful bidder within 8 weeks of placement of LOI.


- b) Fire Protection system for compressor house
- c) Lighting of Mill bay, Compressor house & bunker area
- d) Electrical exclusion as per Electrical scope sheet enclosed elsewhere in the specification
- e) Relevant exclusion as per GTR, GCC, SCC & ECC.

3.0 SERVICES TO BE PROVIDED BY THE CUSTOMER

- (A) **Instrument air:** Tapping terminated with an isolation valve for Instrument air shall be provided at first column of each bunker bay and a pressure of 5-7 Kg/Sq cm tapping shall be provided on each.
- (B) **Service water:** Tapping terminated with an isolation valve for service water shall be provided at first column of bunker bay and a pressure of 2-2.5 Kg/Sq cm tapping shall be provided on each.
- (C) **DM/EC Water:** Supply and return water Tapping terminated with an isolation valve for ECW circuit. Equipment water shall be provided near to compressor at a pressure of 4-5 Kg/Sq cm (Approx). Return water line pressure shall be informed later.
- (D) **Civil work:** Equipment Foundations for compressors, Mill Reject bunkers, and Air receivers shall be provided by customer/civil contractor.

4.0 TERMINAL POINT

Mill Reject inlet towards pyrite : Mill reject spout (tramp iron) as per details indicated
hopper side in enclosed GA of Mills. Work downstream up to mill reject bunker outlet with canvas chute and discharge gate is by bidder.

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Mill Reject outlet towards : Mill reject bunker outlet with canvas chute. Bidder shall terminate his work with the canvas chute and lever operated discharge gate.

Cooling water (ECW) : At Inlet & Outlet header of compressor.

Service Water : At First Col of mill bay/One tapping at D row column

Instrument Air : At First Col of each mill bay.

5.0 PERFORMANCE /FUNCTIONAL GUARANTEES & LIQUIDATED DAMAGES

PG /FG test shall comprise of

- i) Continuous effective discharge and conveying at the rated capacity of Mill rejects without spillage or blockage in the system.
- ii) Guarantees of all equipment as per approved data sheet & quality plan.
- iii) Particulate emission rate from bag filters less than 50 mg/nm³ of air shall be demonstrated at site

In case during test it is found that the equipment/system has failed to meet the guarantees, the contractor shall carry out all necessary modifications and/or replacements to make the equipment/system comply with the guaranteed requirements at no extra cost to the Employer. However, if the contractor is not able to demonstrate the guarantees, even after the above modifications/replacements within a reasonable period allowed by BHEL, after the tests have been completed, BHEL will have the right to Reject the equipment / system / plant and recover the payments already made or accept the equipment / system after assessing the deficiency in respect of the various ratings, performance parameters and capabilities and recover from the contract price an amount equivalent to the damages as determined by BHEL.

6.0 ERECTION, PRE-OPERATIONAL TESTING/STARTUP & COMMISSIONING PROCEDURE


This shall be as furnished by the successful bidder during detail engineering for customer's review and acceptance.

7.0 PAINTING/CORROSION PROTECTION REQUIREMENT

Successful bidder shall furnish Painting Schedule for Mill Reject System for customer / client approval during detail engineering.

8.0 LAYOUT REQUIREMENTS

- 9.0.1 Piping and equipment installation shall be according to the regulations and recommendations of recognized Indian / International Standards, Codes and Statutes, as and where applicable, practice in vogue (to be supported with back up document to the satisfaction of customer)
- 9.0.2 The mill reject compressors will be located in Main Plant Compressor room. Area required for

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locating the same shall be indicated by the bidder in their bid.

9.0 EQUIPMENT DESIGN CRITERIA

9.0.1 The minimum design criteria to be followed for various equipment shall be as per requirements indicated under **Annexure-II** and standard technical specifications & Data Sheet-A for various equipment placed under Section-D. In case of **any contradictory requirement** in specification of particular equipment, the requirement given in section C shall prevail over those indicated in Section-D. Further in case of any contradictory requirement within the same section and clarifications not having been sought by the bidders with respect to the same within the stipulated period, the most stringent requirement as per interpretation of the customer will prevail. Successful bidder will furnish detailed data sheets/ specifications / design calculations for various equipment for customer's/ consultant's approval during detail engineering. All comments made by customer/ consultant shall be incorporated by the successful bidder without any commercial and delivery implication.

9.0.2 Technical details (constructional features, MOC etc) of oil injected screw compressor, if being offered by any of the bidders, shall be finalized during detail engineering and the same shall be subject to customer's /client's acceptance without any commercial implication.

9.0.3 Properties of Mill Rejects to be considered for sizing /selection /design of various equipment shall be as follows:

Normal size	:	20-25 mm (about 90-95% of total reject)
Maximum size	:	50 mm (about 5-10% of total reject)
Temperature °C (Normal/Design)	:	180/200
Bulk density	:	1.6 T/m ³ for volumetric calculation
	:	2.4 T/m ³ for structural calculation

9.0.4 Tentative major process/ equipment related details shall be furnished with the bid, which shall be firmed up during detail engineering without any commercial implication.

Note: All pipe sizing and equipment sizing, capacity of pyrite hopper and pyrite vessel shall be subject to customer's approval during detail engineering without any cost implication to the customer.

10.0 QUALITY PLANS, INSPECTION & TESTING PROCEDURE


All QPs / CLs shall be submitted by the bidder for Customer/Consultant's review and approval. All comments made by customer/ consultant shall be incorporated by the successful bidder without any commercial and delivery implication.

11.0 DRAWINGS/ DOCUMENTS REQUIRED WITH THE BID

The drawings and documents to be submitted with the bid shall strictly be as per clause 15.0.1 below. Any documents other than those indicated therein will not be reviewed and will not form part of contract.

12.0 DRAWINGS/ DOCUMENTS REQUIRED DURING DETAIL ENGINEERING

The tentative list of drawings and documents required during detail engineering shall be minimum as per clause 15.0.2 below. The list, however, will be finalized with the successful bidder prior to start of detail engineering.

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13.0 DRAWING DOCUMENT DISTRIBUTION SCHEDULE

The tentative drawing distribution schedule shall be as per Annex-VIII enclosed in the specification. This shall be finalised with the successful bidder after award of contract.

DRAWINGS ENCLOSED WITH THE SPECIFICATION

The following drawings/ sketches enclosed will form part of the specification.

- a) Flow Diagram- Mill Reject Handling System- PE-DG-367-160-A001, R-0
- b) Plot plan- PE-DG-367-100-M001, R-02
- c) General Arrangement of HP 1103 Bowl Mill
- d) GA/Layout of Compressor House
- e) Sketch showing the SILO Location
- f) Sketch showing the control room location
- g) Sketch showing the Compressor House location


The flow diagram shows the minimum requirement to be followed including minimum requirement of instruments. Any additional equipment/instruments required for safe, efficient & reliable operation of the system within the battery limit shall also be considered as included in bidder's scope without any commercial/ cost implication to BHEL.

15.0 SPECIFIC REQUIREMENTS

- a) In case of any deviation the bidder shall furnish/indicate the same clause by clause in enclosed deviation schedule. No other format shall be accepted and in absence of the schedule bidder shall comply to this specification.
- b) Bidder shall furnish all drawings/data/catalogues as indicated in different sections of specifications along with the offer in sufficient nos.
- c) Bidder shall furnish duly filled in data sheets-B for all equipments, motors, cables etc. for our review along with the offer.
- d) Bidder shall be responsible for the following after the award of contract.
 - 1) Electrical equipment layout.
 - 2) Cable trench and tray layout.
 - 3) Power and control cable schedules showing routing details.
 - 4) Equipment earthing layout.
 - 5) Cable terminal details, interconnection drawings.
 - 6) All civil and loading details of civil design, if any.

Notes:

1. Makes of all equipment in bidder's scope shall be subject to purchaser's approval.
2. All equipment supplied by the bidder shall be suitable for the power supply fault level and other climatic conditions mentioned in the project information / specification.
3. Any other equipment/material/service required to make the installation complete in all respect shall also be included whether mentioned above or not unless specifically excluded.
4. Any approval required from electrical inspector or any other authority for electrical installation shall be arranged by bidder.

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15.0.1 List of drawings / documents to be furnished along with offer

1. Design philosophy
2. Flow scheme of mill reject system
3. Data sheet – B of Motor, cable, compressor, chain pulley block, bag filter, etc
4. Sub vendor list
5. List of mandatory spares(if applicable)
6. List of erection and commissioning spares
7. List of tools and tackles
8. Quality Plan
9. Electric Load Data
10. Instrument air and Water Requirement

15.0.2 List of drawing/documents to be furnished after placement of LOI

Following drawings and documents shall be submitted to BHEL for approval after the placement of LOI: -

- a) P & I Diagram (Mill Reject System)
- b) Control Write – up of Mill reject system
- c) Design Philosophy of Mill reject system
- d) P & ID, Write up and sizing calculation of compressor
- e) Design Calculation of Air and Mill Reject Mixture by Compressor
- f) Equipment Layout of Mill Reject System
- g) Piping Layout of Mill reject System
- h) Cable Layout
- i) Earthing Layout
- j) General arrangement Of Denseveyor
- k) Data Sheet of Denseveyor/pyrite vessel
- l) General arrangement of Pyrite hopper
- m) Data Sheet of Pyrite hopper
- n) General arrangement an foundation plan of Air receiver
- o) Data Sheet of air receiver
- p) General arrangement of bunker discharge gate
- q) Data Sheet of discharge gate
- r) General arrangement of Bunker
- s) Design calculation of bunker and load data
- t) Data Sheet of bunker
- u) Structural arrangement of Bunker
- v) General arrangement of terminal box
- w) Data sheet of terminal box
- x) General arrangement of 200NB PRV


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- y) Data sheet of PRV
- z) Data Sheet of compressor
- aa) General arrangement and Foundation Plan for Compressor
- bb) General arrangement of compressor motor
- cc) Data Sheet of Compressor motor
- dd) General arrangement of Knife gate valve with cylinder and CWG actuator
- ee) Data sheet of knife gate valve
- ff) General arrangement of Bag Filter
- gg) Data sheet of Bag Filter
- hh) General arrangement of ACI pipe bend
- ii) Data Sheet of Pipe bend
- jj) Control scheme
- kk) Mimic Diagram
- ll) C & I Cable schedule
- mm) I/O Schedule
- nn) Pneumatic circuit of denseveyor
- oo) Pneumatic circuit of for cylinder operated Plate Valve
- pp) Block Logic Diagram of denseveyor
- qq) List of Inter locks
- rr) Painting Schedule
- ss) Piping Schedule
- tt) Valve Schedule
- uu) Instrument Schedule
- vv) QP Schedule
- ww) Sub- Contractor Schedule / Vendor list
- xx) Foundation details of mill reject storage bunker
- yy) Foundation details of Compressor and Air receiver
- zz) Filed Quality Plan
- aaa) List of recommended Spares for 3 years of operation
- bbb) List of Erection and Commissioning spares
- ccc) List of tools and tackles
- ddd) Manufacturer's test certificate for materials.

1. Schedule of lubricants indicating quantity, make and trade name of at least three manufacturers.

NOTE: -


- 1) Drawing shall be prepared in AutoCAD software.

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- 2) Only manual calculation with authentic supporting literature shall be furnished (e.g. Handbook / standards / codes).
- 3) 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.
- 4) 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.
- 5) All drawings shall be prepared as per BHEL's title block and bear BHEL's drawing No.

SPECIFIC C&I REQUIREMENT

- 16.0.1 The bidder will terminate all signals from instruments/sensors on each pyrite hopper/ transporter vessel on local control panel/ pneumatic panel dedicated to each pyrite hopper/ transporter vessel. Analogues & binary signals shall be terminated on separate Terminal boxes for wiring to PLC/DCS (As applicable). Alternatively bidder may provide JB's for each pyrite hopper/Denseveyor. In such case, separate JB's shall be provided for terminating analogue & binary signals.
- 16.0.2 The bidder will terminate all signals from local & field instruments /sensors related to compressor on compressor control panel. Analogues & binary signals shall be terminated on separate terminal boxes for wiring to PLC/DCS (As applicable). Alternatively bidder may provide JB's properly mounted on rack and local to the compressor for terminating field & local signals from compressor control panel. In such case, separate JB's shall be provided for terminating analogue & binary signals.
- 16.0.3 Signals from mill reject bunker, air receivers, service water & instrument air line shall be directly connected to PLC/DCS (As applicable).
- 16.0.4 Screened control cables shall be used for signal exchange between Local Panels/ JB's/ Switches on bunker & air receiver and PLC/DCS (As applicable).

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MILL REJECTS HANDLING SYSTEM DATA
BELLARY 1 700MW

Dt 23.04.2012

Max. Mill reject quantity per mill (kg/hr)	:	417 (1% OF MILL MAX LOAD WITH DC AT 100%BMCR)
Reject Temperature (normal) Deg. C	:	~180
Reject Temperature (design) Deg. C	:	~ 200
No. of mills per boiler	:	7 (seven)
No. of mills working at 100% BMCR With worst coal firing	:	6 (six)
No. of mills working at 100% BMCR With design coal firing	:	5 (five)
Type of Mills	:	HP 1103 MILLS WITH PLANETARY GEAR BOX AND DYNAMIC CLASSIFIER
Arrangement for Reject collection Hopper	:	BETWEEN MILL AND BOILER (SIDE ARRANGEMENT)
No. of pyrite hoppers per mill	:	1 (ONE)
Elevation of Mill Reject Spout (wrt FFL in Mill Area)	:	3.000 M FROM 0.0 M ELEV
Max Size of Mill rejects to be handled	:	50 MM
Worst coal fired at 100% BMCR	:	415 THP
Design coal fired at 100% BMCR	:	356 TPH
Mill Capacity (DC/ WC)	:	DC – 92.7 TPH WC – 82.1 TPH
MILL GA DRAWING/ FOUNDATION PLAN	:	Attached
Drawing no.	:	0-00-620-85950 1-61-811-01625 0-00-610-85951



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		COAL HANDLING SYSTEM		SHEET 44 OF 52
3.0	Construction			hours storage. Earthen type with proper slope.
COAL SAMPLING SYSTEM				
1.0	Type			Automatic
2.0	Location of sampler			As per the flow diagram
3.0	Capacity of each of the conveyors	TPH		As per data sheets
4.0	Type of primary cutter			Swinging type
5.0	Materials of construction			
5.1	Primary cutter			S.S. -304/316
5.2	Liners for hoppers			S.S. conforming to AISI-409M
5.3	Trough of screw conveyor			SS-304 / 316 or MS with SS-liner
MILL REJECT HANDLING SYSTEM				
1	Type of mill reject system offered			Pneumatic Dense Phase Conveying
.2	Design Extraction Rate			1.5 % coal consumption at 100% BMCR considering worst coal.
.3	No of mills working per boiler			5 working + 1 stand By (in case of worst Coal)
.4	No of Pyrite hoppers			One for each mill.
.5	No. of denseveyors/air lock vessels			One for each mill.
.6	No of storage bin offered and capacity			Two Nos of 55T capacity for each unit
.7	Construction of mill reject storage bin			MS (IS 2062) fabricated with 3mm thick SS-304 liner in conical as well as vertical portion. 40 mm (max. 5%)
.8	Max size of rejects to be handled	mm		1600 for Volumetric considerations: 2400 for Structural design/ load consideration
9	Bulk density of rejects considered	Kg/M ³		


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	COAL HANDLING SYSTEM	SHEET 45 OF 52
10	Conveying pipes	As per IS 1239, Heavy grade ,MS pipe
11	Bends/fittings/Laterals	Alloy Cast Iron, 400 BHN
12	Quenching arrangements for cooling rejects	Provided
13	Type of conveying air compressors	Water cooled, Reciprocating type.


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SECTION C2

SPECIFIC TECHNICAL REQUIREMENTS FOR ELECTRICAL

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ELECTRICAL EQUIPMENT SPECIFICATION

	TITLE:	BHEL DOCUMENTS NO.: PE-TS-367-160-A001	
	TECHNICAL SPECIFICATION FOR MILL REJECT HANDLING SYSTEM	VOLUME II-B	
	1 700 MW BELLARY TPS UNIT 3 KARNATAKA POWER CORPORATION LIMITED	SECTION -C	
		REV. NO. 00	DATE: 7/13/2012
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1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER :


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


2.0 EQUIPMENT & SERVICES TO BE PROVIDED BY PURCHASER FOR ELECTRICAL & TERMINAL POINTS: Refer “Electrical Scope between BHEL and Vendor”.


3.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

- 3.1 Bidder shall confirm total compliance to the electrical specification without any deviation from the technical/ quality assurance requirements stipulated. In line with this, two signed and stamped copies of the following shall be furnished by the bidder as technical offer:
 - a) A copy of this sheet “Electrical Equipment Specification for “Mill Reject System” and sheet “Electrical Scope between BHEL and Vendor” with bidder’s signature and company stamp.
 - b) List of Erection and Commissioning spares.
 - c) Electrical load requirement
- 3.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer.
- 4.0 List of enclosures :
 - a) Specification of LV Motors
 - b) Data sheet-A of LV Motors.
 - c) Electrical Load data format.
 - d) Datasheet-C (to be filled by Vendor)
 - e) QP for LV motors

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TECHNICAL SPECIFICATION FOR MILL RECT HANDLING SYSTEM			
1 700 MW BELLARY TPS UNIT 3 KARNATAKA POWER CORPORATION LIMITED			

KPCL/BTPS/03/EPC 	KARNATAKA POWER CORPORATION LIMITED BELLARY TPS,UNIT-3 OF 700 MW		SECTION: D2.23
	TITLE	MOTORS	VOLUME-IV SHEET 1 OF 6
<p>1.0 A.C. MOTORS</p> <p>1.1 All HT motors shall be suitable for 11kV / 3.3kV, 3 phase, 50 Hz and LV motors shall be suitable for 415V, 3 Phase, 50 Hz power supply.</p> <p>1.2 The motor rating shall be arrived at considering 15% margin over the duty point input or 10% over the maximum demand of the driven equipment, whichever is higher. Motors shall be capable of starting and accelerating the load with the applicable method of starting without exceeding acceptable winding temperatures when supply voltage is 80% of the rated voltage for HT motors and 85% for LV motors. HT motors shall also be capable of satisfactory operation at full load at a supply voltage of 80% of the rated voltage for 5 min. commencing from hot condition.</p> <p>1.3 Motors shall be capable of developing the rated full load torque even if the supply voltage drops to 70% of the rated voltage. If such operation is envisaged for a period of one second, the pull out torque of the motor shall be atleast 205% of full load torque.</p> <p>1.4 Motors shall withstand for 1 second the voltage and torque stresses developed due to the vector difference between the motor residual voltage and the incoming supply voltage equal to 150% of the rated voltage during fast change over of buses.</p> <p>1.5 Locked rotor current of the HT motors rated 1500 kW and below shall be limited to 600% inclusive of 20% tolerance of the full load current of the motors and motor rated above 1500 kW shall be limited to 450% (inclusive of 20% tolerance) of full load current of the motor. Locked rotor current of the LV motor shall not exceed 600% of full load current inclusive of 20% tolerance.</p> <p>1.6 The locked rotor withstand time under hot condition at 110% rated voltage shall be more than the starting time at minimum permissible voltage specified above by atleast three seconds or 15% of the accelerating time whichever is greater. Provision of speed switch shall be avoided to the extent possible.</p> <p>1.7 The degree of protection for the motor enclosure shall be IP-55 and IP-54 for outdoor & indoor respectively and terminal boxes shall be provided with atleast IP-55. For single core cable termination, gland plates shall be of non-magnetic material. All motors located in hazardous area shall have flame proof design.</p> <p>1.8 All HT motors shall be provided with vibration pads for mounting vibration detectors.</p> <p>1.9 Motors rated 1000 kW and above shall be provided with differential protection. These motors shall be provided with star connected stator windings. The 3 nos. current transformers, one for each phase shall be mounted in a separate compartment in the neutral side terminal box. The three phases shall be connected to form the star point after they pass through the CTs. The CTs shall be of relay accuracy and the CT characteristics shall be compatible with the differential relay. The additional 3 nos. CTs of identical characteristics shall be provided in the 11kV / 3.3 kV switchgear panel. kWh meters shall be provided on all motor feeders.</p> <p>1.10 The ring oiling system shall be adequate for starting and continuous operation of the motor for atleast one half hour without pressure oiling system in operation.</p>			
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1 700 MW BELLARY TPS UNIT 3 KARNATAKA POWER CORPORATION LIMITED			

KPC/L/BTPS/03/EPC 	KARNATAKA POWER CORPORATION LIMITED BELLARY TPS.UNIT-3 OF 700 MW	SECTION: D2.23. VOLUME-IV SHEET 2 OF 6
	TITLE MOTORS	
1.11	For 11kV & 3.3kV motors, 6 nos. duplex/ 12 nos. simplex RTDs for winding shall be provided. Each bearing shall be provided with one no.PT-100 duplex type RTDs for temperature monitoring. These motors shall be designed to withstand atleast 5% harmonics in the supply voltage.	
1.12	The maximum double amplitude vibrations for motors upto 1500 rpm shall be 25 microns and 15 microns upto 3000 rpm. For 415V motors, maximum double amplitude vibrations upto 1500 rpm shall be 40 microns and 15 microns upto 3000 rpm.	
1.13	Maximum noise level measured at a distance of 1 metre from the outer surface of the motor shall not exceed 85 dB (A).	
1.14	Cable boxes of all 11kV & 3.3kV motors shall be provided with quick disconnecting type terminal connectors to facilitate easy disconnection and removal of the motors without requiring unsealing or otherwise disturbing the external cable connections and leaving the phase segregated terminal box intact.	
1.15	The insulation system for 11000V & 3300 V AC motors shall withstand the negative or positive 0.3 / 3.0 microsecond wave (2.7 pu rated peak line to earth operating voltage) switching surges originating from non-effectively earthed power system. All 11000V & 3300 V AC motors shall have BIL and withstand frequency voltage as per relevant standards.	
1.16	If required by the system, variable frequency controller shall be provided for I.D.Fans.	
2.0	DC MOTORS	
2.1	DC motors shall be suitable for the DC system voltage available in the plant. Motor shall be capable of starting and accelerating the load with the applicable method of starting, without exceeding acceptable winding temperatures, when the supply voltage is in the range of 85% to 110% of rated motor voltage. The field windings for the motors shall be continuously rated without forced ventilation.	
3.0	ACTUATOR MOTORS	
3.1	The actuator motors shall be designed for short time duty (S2) in accordance with IEC 60034-1.	
3.2	Hand wheel operation shall be provided in addition to motor drive.	
3.3	The DC and AC actuator shall be provided with accessories viz., Torque limit switch, end of travel switch, adjustable limit switch, hand wheel motor, thermostat, integral starter, valve position indicator, Manual-Auto lever with suitable locking arrangement, etc.. Complete actuator shall be tested at factory as per IS 9334.	
3.4	Two normally open and two normally closed or two changeover potential free contacts corresponding to open and close positions of the valve shall be provided.	
3.5	Degree of protection for actuator motor enclosure shall be IP-55 and IP-67 for indoor and outdoor respectively.	
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 1 700 MW BELLARY TPS UNIT 3
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KPCL/BTPS/03/EPC 	KARNATAKA POWER CORPORATION LIMITED BELLARY TPS, UNIT-3 OF 700 MW		SECTION: D2.23 VOLUME-IV SHEET 3 OF 6																																														
	TITLE MOTORS																																																
<p>4.0 TESTS</p> <p>4.1 Tests on all types of motors shall be conducted as per relevant standard.</p> <p>4.2 All type, routine & acceptance tests as per relevant IS shall be conducted on 11 kV & 3.3 kV motors. For LT motors, type test for each rating and frame size & make, and for all motors routine and acceptance tests shall be conducted as per relevant standards.</p> <p>4.3 For 11000V and 3300V AC motors, in addition to all the tests specified above, polarisation index test shall be carried out as a routine test on each motor (the minimum value of polarisation index for all motors shall be 2 when determined according to IS : 7816).</p> <p>4.4 Noise level measurement and vibration test as per standards shall be conducted on all motors.</p> <p>4.5 Di-electric tests to establish the insulation withstand level of motors as indicated in Clause 1.15 shall be performed on a sample coil (identical to those to be used in the motor quoted for) for each type of motor. These tested sample coils shall not be used in the motors to be supplied.</p> <p>4.6 All characteristic curves for the motors including hot and cold withstand characteristics, starting time vs current, current vs speed, speed vs torque at 110%, 100% and 90% of rated voltage, negative withstand characteristics, rotor voltage vs rotor current curves (for wound motors), Efficiency, power factor, slip, current Vs output curve etc., shall be furnished.</p> <p>5.0 TECHNICAL REQUIREMENTS</p> <p>The motors shall comply with the particulars indicated below and CONTRACTOR shall furnish the details in respective column given below (to be separately submitted for different type & rating of the motor).</p>																																																	
<table border="1"> <thead> <tr> <th>SL. NO.</th> <th>DESCRIPTION</th> <th>UNIT</th> <th>SPECIFICATION REQUIREMENT</th> <th>CONTRACTOR</th> </tr> </thead> <tbody> <tr> <td>I</td> <td>AC Motors</td> <td></td> <td></td> <td></td> </tr> <tr> <td>1.0</td> <td>Application/Designation</td> <td></td> <td>*</td> <td></td> </tr> <tr> <td>2.0</td> <td>Manufacturer</td> <td></td> <td>*</td> <td></td> </tr> <tr> <td>3.0</td> <td>Type of motors/ frame size</td> <td></td> <td>Squirrel cage except for cranes</td> <td></td> </tr> <tr> <td>4.0</td> <td>Rated</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>(a) Output</td> <td>kW</td> <td>*</td> <td></td> </tr> <tr> <td></td> <td>(b) Speed</td> <td>rpm</td> <td>*</td> <td></td> </tr> <tr> <td></td> <td>(c) Voltage</td> <td>V.</td> <td>*</td> <td></td> </tr> </tbody> </table>	SL. NO.	DESCRIPTION	UNIT	SPECIFICATION REQUIREMENT	CONTRACTOR	I	AC Motors				1.0	Application/Designation		*		2.0	Manufacturer		*		3.0	Type of motors/ frame size		Squirrel cage except for cranes		4.0	Rated					(a) Output	kW	*			(b) Speed	rpm	*			(c) Voltage	V.	*					
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	TITLE MOTORS			
	(d) No.of Phases / Frequency		*	
	(e) System neutral		*	
5.0				
5.1	Type of Duty (IS-325 or equivalent)		*	
5.2	Duty designation (IS-325 or equivalent)		*	
6.0	Supply Conditions			
	(a) Allowable variations in			
	(i) Voltage	%	± 10	
	(ii) Frequency	%	± 5	
	(iii) Combined	%	± 10	
	(b) Permissible unbalance in supply voltage	%	2	
7.0	Current		*	
	(a) Full load	Amps,	*	
	(b) Starting	% FL	*	
8.0	Method of starting		DOL	
8.1	Starting time	Sec		
	With rated Voltage			
	With min. Voltage			
	With Max. Voltage			
8.2	Safe stall time under hot/cold condition	Sec		
	With rated Voltage			
	With min. Voltage			
	With Max. Voltage			
9.0	Insulation			
9.1	Class of insulation		Class F with temperature rise limited to Class B	



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		BELLARY TPS.UNIT-3 OF 700 MW		VOLUME-IV	
TITLE		MOTORS		SHEET 5 OF 6	
9.2	Temperature rise by winding resistance method	Deg. C	For LV motors (Temp. limited to 65°C), For HT motors (temp. rise limited to Class B)		
10.0	Type of cooling (IS : 6362)	Deg. C	TEFC for LV, TEFC / TETV/CACA for 11/3.3 KV motors.		
11.0	Degree of protection (IS:4691 or equivalent)		Refer Clause 1.7		
12.0	Suitable for outdoor operation	Yes / No	*		
13.0	Normal winding connection	Star / Delta	*		
14.0	Permissible No. of equally spread starts per hour under normal service conditions		*		
15.0	Efficiency (%)	%			
	Full load				
	75 % Load				
	50 % Load				
	25 % Load				
16.0	Power Factor				
	Full Load				
	75 % Load				
	50 % Load				
	25 % Load				
17.0	Torque				
	Starting				
	Maximum (Pullout)				
	Pull up				
18.0	Motor reactance (pu)				
	Subtransient				
	Transient				
	Steady state				
15.0	Fault level	kA/se c	*		



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	TITLE MOTORS		

Sl	DC MOTORS			
16.0	Rated Voltage	V	220 V DC	
17.0	Class of Insulation	:	Class F with temperature rise limited to class B	
18.0	Temperature rise	:	--- do -----	
19.0	Method of starting	:	*	


Items under AC motors which are applicable for DC motors shall also be listed

NOTE :

1.0 “*” Information shall be filled furnished by CONTRACTOR along with offer.

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ELECTRICAL LOAD FORMAT

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ELECTRICAL SCOPE FOR VENDOR AND BHEL



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STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

PACKAGE : MILL REJECT SYSTEM
PROJECT :

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC	BHEL	BHEL	1. 415 V AC/240 V AC 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 including power supply equipment (battery charger etc) required for the PLC/control panel (as applicable) for the system supplied by 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. Sizes and quantity of cables required shall be informed by vendor at contract stage (based on inputs provided by BHEL). Finalisation of cable sizes shall be done by BHEL. Vendor shall provide lugs & glands accordingly. 2. Laying of cables by BHEL, except for local cabling in conduits supplied by vendor as part of scope. 3. Termination at BHEL equipment terminals by BHEL. 4. Termination at Vendor equipment terminals by Vendor.
4	Any special type of cable like compensating, co-axial, prefab, MCC, fibre optical etc.	Vendor	Vendor	
5	Cable trays, accessories & cable trays supporting system	BHEL	BHEL	
6	Cable glands and lugs for equipments supplied by Vendor	Vendor	Vendor	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power cables 3. Solder less crimping type heavy duty copper lugs for control cables.
7	Conduit and conduit accessories for cabling between equipments supplied by vendor	Vendor	Vendor	Conduits shall be medium duty, hot dip galvanised cold rolled mild steel rigid conduit as per IS: 9537. Makes of conduits shall be subject to customer BHEL approval at contract stage.
8	Lighting	BHEL	BHEL	
9	Equipment grounding & lightning protection	BHEL	BHEL	
10	Below grade grounding	BHEL	BHEL	
11	LT Motors with base plate and foundation hardware	Vendor	Vendor	Makes shall be subject to customer BHEL approval at contract stage.

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**TECHNICAL SPECIFICATION FOR
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STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR


PACKAGE : MILL REJECT SYSTEM

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
12	Mandatory spares	Vendor	-	
13	Recommended O & M spares, E & C spares, erection & maintenance tools & tackle.	Vendor	-	Vendor to quote as per specification.
14	Any other equipment/material/service required for completeness of system but not specified above (to ensure trouble free and efficient operation of the system).	Vendor	Vendor	
15	a) Input cable schedules (C & I) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for C & I systems for vendor supplied equipment shall be furnished during detail engineering by vendor in soft copies in the BHEL cable schedule format.
16	Equipment layout drawings	Vendor	-	For ensuring cabling requirements are met, vendor shall furnish layout drawings (both in print form as well as in AUTOCAD) of the complete plant (including electrical area) indicating location and identification of all equipments requiring cabling, and shall incorporate cable trays routing details marked on the drawing as per PEM interface comments. Electrical equipment layout drawing shall be to BHEL approval. For necessary interface review.
17	Electrical Equipment GA drawing	Vendor	-	

NOTES:

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

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SECTION C3

SPECIFIC TECHNICAL REQUIREMENTS FOR C&I



**MEASURING REQUIREMENTS (C&I)
FOR MILL REJECT HANDLING
SYSTEM
(PLC BASED)**


DRAWING NO:

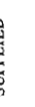
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SPECIFIC TECHNICAL REQUIREMENTS

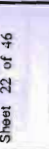
	<p>KARNATAKA POWER CORPORATION LIMITED BELLARY TPS, UNIT-3 OF 700 MW</p>	<p>SECTION: D3.4 VOLUME-IV SHEET 53 OF 73</p>
<p>TITLE</p>	<p>SPECIFICATIONS FOR DDCMIS/INSTRUMENTS TO BE SUPPLIED</p>	
<p>34.00.00</p>	<p>vendor. Quantity shall be as required.</p>	
<p>34.01.01</p>	<p>Vibration Monitoring System (VMS) and Analysis System: Vibration pickups and transducers shall be provided on Y-axis for all 3.3/11KV equipments with isolated 4-20 MA DC outputs and 2 Nos. SPDT alarm contacts for high and very high condition & fault for each pickup. The system shall be complete with transducers, monitors, redundant power supply, isolators mounted inside the cabinet. The sensors, mounting pads, brackets, special cables etc. shall be included.</p>	
<p>34.01.02</p>	<p>The Vibration Monitoring System shall be furnished on a system basis including vibration transducers with low noise flexible cables in flexible conduit, terminated in local terminal boxes, necessary pre-amplifier/ electronics mounted in local weatherproof boxes(IP-65) vibration monitors & mounting racks/cabinets. The Vibration-monitoring system shall include all power supplies, inter-connecting cabling, calibration equipment, indicators, integrating units, signal conditioning devices and all other accessories required for monitoring of Vibration at each point. However, the finally selected sensor type shall also depend on recommendation of the equipment manufacturer & suitable for application requirement.</p>	
<p>34.01.03</p>	<p>Transducers shall be furnished in weatherproof housing suitable for field conditions. Monitor shall provide vibration indication calibrated in velocity units along with provisions of changing to displacement unit (field programmable) for each measurement point in both horizontal & vertical planes. The vibration monitor racks with power supplies shall be mounted in unit control panel. However, for CWP/ACWP the rack cabinet shall be located in CW pump house.</p>	
<p>34.01.04</p>	<p>The functional requirement for vibration monitoring system shall include but not be limited to the following: a. Vibration monitor front face status indications shall be available for indications of healthy conditions of pick-up circuit, monitor circuit and power supply. Also set point indication with set point adjustment facility for setting alarm & trip levels shall be provided. b. The facility shall be available from front of mounting rack for functional checking of monitors with inhibition of alarm of alarm and trip contact outputs during test. c. All vibration monitoring equipment shall be functionally tested for circuit continuity and output response. All the components & inter-connection cables shall be tested to ensure compliance with the specification requirements & all other applicable codes and standards.</p>	
<p>34.01.05</p>	<p>For turbine and generators vibration pickups and transducers shall be provided on both X & Y axis as part of turbo supervisory system. The monitoring system</p>	

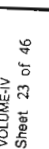
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<p>TITLE</p>	<p>SPECIFICATIONS FOR DDCMIS/INSTRUMENTS TO BE SUPPLIED</p>	
<p>32.00.00</p>	<p>System Cabinets: These cabinets shall house signal conditioning cards, input/output cards, processor cards & associated power supply units. Indoor located, free standing vertical type system cabinets with 2 mm thick sheet metal of cold rolled steel; double doors with neoprene gaskets; keylocks; antivibration pads of 15 mm thick; Fluorescent lighting; fan in each cabinet with leolers, brass wire mesh, door switches, removable gland plate of 3 mm thick, cable glands, cubicle earthing, lifting bolt, fire proof compound (50 mm thickness) for sealing cable entry; fire detector for each section; space heater for each section (strip type). Lamp shall be provided in each cabinet to indicate the cabinet having fault condition. The racks in system cabinets shall have provision along with plug in sockets/back plane to house at-least 20% additional cards, to accommodate for engineering flexibility or future expansion. The protection class shall be IP-32. The paint shade and thickness etc shall be as decided during engineering. Doors shall have concealed type of hinges and swing of 100 degrees. The doors shall be provided both at the front and rear. Power supply distribution shall be provided on per cabinet basis with all associated MCBs, protections, etc. The system cabinets, racks in system cabinets, slots in the racks & the terminals shall have identification numbers. A stainless steel metal tag (plate) shall be fixed to the inside of the door & the layout of the racks, slots & details of the card type/service shall be inscribed on this metal tag. Each cabinet shall be provided with one each 3pin receptacles for 240 V, IP 50 C/S. Smoke detector shall be mounted in each system panel and shall be connected to the plant Fire detection and Alarm system.</p>	
<p>33.00.00</p>	<p>Local Panels: Indoor/Outdoor located, free standing vertical type local panels with 3 mm thick sheet material of cold rolled steel; antivibration pads of 15 mm thick; fluorescent lighting; Double doors with neoprene gaskets at every 1.5 m; blower & louvers in each section with brass mesh; fire proof compound (50 mm thick) for sealing cable entry (bottom); fire detector for each section; space heater with thermostatic control for each section (strip type). IP 65 degree of protection for enclosure. Removable cover plates with locking facility shall be provided along the bottom of the front desk continuously to facilitate maintenance work. The length of each cover plate shall not exceed 1 m. CFL of 40 W shall be provided from one end of the panel to the other end at continuous length and shall be operated by the door switches as well as by manual switches. Name plates shall be provided for all instruments/inserts with Tag. No. & short description of service engraved. These shall be phenolic overlays (1.6mm thick), black background with white lettering & shall be fixed to the panel by stainless steel screws (counter sunk). Each section of the panels shall be provided with one each 3 pin receptacles for 240V, IP 50 C/S & 110 V, IP, 50 c/s. Panel shall be delivered totally wired. All instruments, inserts and annunciation windows shall be mounted & wiring connections at these hardwares shall be terminated at site by</p>	


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<p>Operator's command execution time : 1 sec DAS data update time : 1 sec Closed loop control update time of 200 m sec for critical loops & 500 m sec for other loops (from change of output of the sensor of the transmitter/ temperature element to the corresponding control command output). Open loop control update time of 50-100 m sec. However, for SG/TG protections higher speed shall be considered as per manufacturer's requirement.</p> <p>Controller loading : Max. 60% Data bus loading : Max 50% Overall system availability : 99.7%</p> <p>5.6.02 Worst Loading Conditions : For distributed control system the worst loading condition shall include the following tasks :</p> <p>(a) All process inputs scanning and processing is in progress and all the data is transmitted over the main data bus every one second. (b) All closed loop controls in operation (c) All open loop controls in operation (d) All output devices are in operation with rated performance/speed. (e) Control/information request is initiated on control VDU. (f) In burst mode operation, 100 digital alarms are generated per second for a period of 10 seconds.</p> <p>6.0.00 General Guidelines for Provision of Instruments/Instruments to be provided for Systems/Equipment:</p> <p>6.1.00 Bidder shall provide the various field instruments, in-line instruments directly mounted on pipe and panel mounted instruments including the accessories as required for different systems/equipment of the plant as per the guide lines given in clause of this section below.</p> <p>6.1.01 Bidder shall include the field sensors/transmitters/ initiating devices for the following :</p> <ol style="list-style-type: none"> 1. Sensors/transmitters required for all closed loop controls shall be provided considering the sensor level redundancy for controlled parameters and parameters required for compensation. 2. Sensors/initiating devices required for all open loop controls shall be provided considering the sensor level redundancy as required and as called for. 3. Sensors/transmitters required for measurement system. 4. Sensors/Initiating Devices shall be provided for status indication on CRT of various drives required for the plant. 5. Initiating Devices/contacts shall be provided for fault/abnormal conditions of the process/equipment/ systems for Sequence of events recording and Annunciation System. 6. Necessary field sensors, smart converters, smart transmitters, temperature elements, probes, transducers, process switches viz, pressure, temperature, 		


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<p>level, flow & limit switches etc, required for functional completeness and/or otherwise felt necessary by Bidder, with all necessary stubs, bosses, first isolation (Root) valves, cocks, manifolds, instrument isolation & drain valves, impulse pipes & tubes, mounting stands & brackets, protection covers, racks & canopies, mounting accessories etc, terminated to local junction boxes / proximeter housings with suitable type of cables, glands, lugs and sleeves, conductor marker / ferrule. Technical specifications provided elsewhere, as part of this specification shall apply as the technical guideline.</p> <p>7. Pressure instrument shall have the unit suffixed with 'a' or 'g' to indicate absolute or gauge pressure, respectively. Scales and charts of all instruments shall have linear graduations. Deviation indicators shall have the null position at mid scale. The normal operating parameter shall be identified with a clear green mark.</p>	<p>6.2.00 Selection of Ranges for Instruments:</p> <p>The ranges of the instruments shall be selected based on the philosophy indicated below:</p> <ol style="list-style-type: none"> For pressure and draft measurements, the maximum operating pressure will be within 70 to 80% of the maximum scale range. All pump suction measurement and steam pressure measurements in extraction steam and in heaters will cover the negative pressure range also and all draft gauges will cover the negative pressure as well as the positive pressure as the case may be. For temperature measurement, the maximum operating temperature will be within 80 to 90% of the maximum scale range. For pressure switches and temperature switches, the set points shall fall within 40% to 70% of the scale range selected. All displays shall be in engineering units. Instrument scales displayed on screen will have graduations with scale divisions based on multiples of 10. The smallest division shall preferably be a whole number approximately 1% of the scale range if not otherwise impracticable. For level measurement, the maximum of the range will cover the overflow point or six inches from the top of the vessel and the minimum of the range will be six inches above the bottom of the vessel. Also, the gauge glasses will be stacked with overlap to cover permissive, alarm and trip levels. For flow measurement, the maximum range shall be fixed at about 10 to 15% above the maximum operating flow. For electro-chemical measurements (conductivity, pH, dissolved O₂, Silica etc.), the maximum range will be around 10 to 15% higher than the recommended alarm settings. <p>6.2.02 Engineering units: The following system of units shall be followed for various displays and scales Unless otherwise mentioned shall be</p> <ol style="list-style-type: none"> Pressure: Kg/cm² 	

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<p>6.3.00 The general guidelines for various instruments, which have to be provided on Plant equipments/systems are elaborated below.</p> <p>6.3.01 Pressure indicators shall be provided for</p> <ol style="list-style-type: none"> Suction and discharge lines of pumps/fans, including on suction/discharge header if two or more pumps are employed for the same service. All input and output lines of process equipment. Inlets and outlets of heaters, heat exchangers and desuperheaters. <p>6.3.02 Pressure Switches shall be provided</p> <ol style="list-style-type: none"> On all process lines/Equipment where parameter abnormality/status including pre trips alarms to be communicated to the operator in control room. For all permissive conditions governed by safety operation of the equipment, eg. pr. adequate, conditions. For all protection conditions, Eg. pr. very high/very low conditions For all interlock conditions which governs starting of standby equipment or subsequent equipment for safety operation of the system. 3 switches shall be employed for protection in case of critical applications Inlet and outlet of filters/strainers. <p>6.3.03 Differential Pressure Switches shall be provided</p> <ol style="list-style-type: none"> Across filters/strainers for remote monitoring Across condenser CW line for remote monitoring and interlocks <p>6.3.04 Differential Pressure Indicators shall be provided</p> <ol style="list-style-type: none"> Across filters/strainers for local monitoring Across condenser CW line for local monitoring <p>6.3.05 Pressure Transmitters shall be provided</p> <ol style="list-style-type: none"> At suction and discharge of all major pumps/fans. For all control and monitoring applications as demanded by the process. It shall be noted that for all critical analog/binary controls applications 3 	<ol style="list-style-type: none"> Differential Pressure: mm of H₂O column / Kg/cm² Draught: mm of H₂O column Vacuum : mm of H₂O column Temperature : Degree Celsius (O C) Flow (Steam, Water): Tonnes / hr. Flow (Oil) : Tonnes/hr Flow Air : Tonnes / hr Density : gms/cc Level : mm Conductivity : Micro-mho / cm Gas Analyzer: Percentage by weight or as specified in respective case. Dissolved Oxygen / Silica / : ppm or ppb Sodium / Hydrogen Coal flow : Tones / hr Speed : RPM 	

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	transmitters shall be provided. 3. Pressure conditions of all major vessels/tanks like Deaerator, Hotwell, Boiler Drum etc. 4. All inputs for equipment/unit performance calculation.	
6.3.06	Differential Pressure Transmitters shall be provided. 1. For all the requirements of differential pressure, flow and level measurements. For critical control applications 3 transmitters shall be provided. 2. All inputs for equipment/unit performance calculation. 3. Auxiliary cooling water services flow measurement instead of variable area flow meters.	
6.3.07	Temperature indicators (Thermometers) shall be provided 1. On all process lines where local indication is warranted by the system either for monitoring or testing. 2. On the inlet/outlet equipments such as heaters, desuperheaters, Heat Exchangers & Coolers for both the fluid media. 3. Capillary type temperature indicators shall be used in vibration prone areas. 4. Thermowell shall be provided for all temperature indicators.	
6.3.08	Temperature Switches shall be provided 1. For all process lines where parameter abnormality to be communicated to the operator in control room where redundant transmitters are not provided 2. For all permissive & interlock conditions governed by the safety operation of the equipment where redundant transmitters are not provided and for protection of the equipment. 3. For all critical services 3 nos. shall be provided for protection application.	
6.3.09	Resistance temperature detectors (RTD's) shall be provided for all services where maximum temperature does not exceed 150 degrees centigrade. 1. The element shall be 3 wire type/4 wire duplex with all thermowell. 2. The RTD is employed for remote display for providing necessary information to the operator about the performance of the related equipment such as pumps, fans, Motors..etc Eg.: Suction/Discharge of pumps and fans inlet/outlet of heat exchangers, fans / pumps bearings, motor windings, motor bearings etc.	
6.3.10	Thermocouples shall be provided for all services where normal operating temperature exceeds 150 deg C. 1. The element shall be duplexed integral with thermowell, K-type for temperature upto 600 degC and R- type for temperature above 600 degC. 2. The thermocouple is employed for remote display, for control applications, density correction for flow measurements. 3. All thermocouple shall be directly connected to the respective input modules in DDCMIS through Extension/Compensating cables. The extension/compensating cables shall be laid from T/C till DDCMIS	

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	cabinets and the cold junction compensation shall be carried out at* DDCMIS. Extension cables shall be supplied for K & T type Thermocouples and Compensating cables for all R & S Type Thermocouples. 4. Metal temperature thermocouples shall be provided for the services like pipe metal, separator/Drum, SH/RH tube metal temperature. For metal thermocouples suitable pads with clamps etc., shall be provided. The termination of these thermocouples shall be at low temperature area with adequate extension length of thermocouples.	
6.3.11	Thermo wells shall be provided along with Temperature elements of RTD & Thermocouples except for metal/bearing/winding temperature measurements. 1. For measurement of fine gas temperature, Inconal coated with tungsten carbide or suitable abrasion resistant thermo wells shall be provided. 2. For measurement of pulveriser outlet temperature tungsten carbide block thermo wells abrasion resistant not tungsten carbide coated thermowell shall be used. Also the terminals of Thermocouple shall not be at the top of Mills itself. The thermocouple wires are to be laid up to JB through SS tubing of required diameter and the head shall be placed nearer to the JB. Compensating cable exposed to atmosphere in the conventional method melts away due to high temperature at the top of Mill. 3. For measurement of water & steam temperature SS thermo wells or better, shall be used.	
6.3.12	Temperature Transmitters are not envisaged. Level gauges shall be provided 1. On all tanks and the maximum length of one gauge glass shall not exceed 1 metre. The gauge glasses shall be stacked to cover the complete height of the tanks including over flow level. There shall be an overlap of minimum 150 mm, when more than one level gauge is required. Suitable platforms shall be provided for purpose of taking measurements during maintenance. 2. All high pressure vessel shall be provided with level gauges on either end as per Boiler statutory requirement.	
6.3.13	Level switches shall be provided, 1. On all equipment (storage vessel) where parameter abnormality/status to be communicated to the operator in the control room. 2. All permissive and interlock conditions governed by the safety operation of the equipment and for protection conditions. 3. For all critical services, 3 switches shall be provided for protection application. 4. The instrument shall be external cage type with SW connection with isolation facility for surface mounted tanks and top mounted with still pipe for all sumps.	
6.3.14	Level transmitters shall be provided on process equipment where continuous remote monitoring and/or control of level is envisaged.	

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10.00.00	<p>RESISTANCE TEMPERATURE DETECTORS (RTD) WITH THERMOWELL: Duplex type with accuracy of $\pm 0.5\%$ of span, response time 1-2 seconds; Spring loaded mineral insulated three (3) wire RTD assembly with 316 SS Thermowell housed in aluminium casing (epoxy coated) having a process connection of M33 x 2 thread or 150 RF flanged. IP 65 or equivalent degree of protection for enclosure. Material of accessories will be SS. Thermowell with hex head with screwed cover & SS chain, barstock assembly. Element lead size will be 18 AWG. The insulation resistance at 540° shall not be less than 5M ohms. Repeatability over full range shall be better than 0.02%. RTDs shall be ungrounded. RTD shall be supplied as an assembly complete with thermowell meeting ANSI 19.3-1994 (latest) requirements.</p>	
11.00.00	<p>Test Thermowells: Pipe/equipment mounted temperature test wells of 316 SS with a process connection of M33x2 thread, except for Turbine applications process connection shall be welded as per DIN 43763. Material of accessories will be SS. Thermowell with hex head of fabricated assembly for air and flue gas system, for rest of the services bar stock assembly. The thermowell construction shall meet the ANSI 19.3-1994 (latest) requirements. The thermowells shall be hardfaced/sterlited to avoid erosion for boiler area applications</p>	
12.00.00	<p>Pressure Indicators: Direct reading, pipe mounted Pressure gauges of aluminium casing with six (6) inch phenolic dial (white dial with black numerals), 316 SS Bourdon tube, AISI304 nylon movements and micrometer type adjustable pointer with an accuracy of $\pm 0.5\%$ of span including accessories like syphons for steam services, snubbers for pump discharge applications and chemical diaphragm for corrosive and oil services and name plate. Material of accessories will be SS. IP65 or equivalent degree of protection for enclosure. Over range protection will be 50% above maximum pressure.</p>	
13.00.00	<p>Pressure Switches: Non indicating type, field mounted Pressure Switches of aluminium casing (epoxy coated), and 316 SS element and accuracy of $\pm 1\%$ of span, including accessories like syphons for steam services, snubbers for pump discharge applications and chemical diaphragm for corrosive and oil services and name plate. Material of accessories will be SS. Auto reset micro switch with internal adjustment for set values with 2 SPDT contacts rated for 0.2 A at 220 V DC. IP 65 or equivalent degree of protection for enclosure. Over range protection 50% above maximum pressure. Scale for setting shall be provided.</p>	

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14.00.00 15.00.00 16.00.00 17.00.00	<p><u>Differential Pressure Indicators:</u> Direct reading type, pipe mounted, bellows or diaphragm operated differential pressure indicators; aluminium casing (epoxy coated) with six (6) inch dial (white dial with black numerals), with micrometer type pointer, 316 SS pressure element; an accuracy of $\pm 0.5\%$ of span including accessories like snubbers for pump discharge application, chemical diaphragm with 15 m PVC covered SS armoured capillary for each limb for corrosive and oil services and 5 way manifold. Material of accessories will be SS. IP 65 or equivalent degree of protection. Over range protection will be 50% above maximum pressure.</p> <p><u>Differential Pressure Switches:</u> Bellows or diaphragm operated non-indicating field mounted type; aluminium casing (epoxy coated); 316 SS pressure element nylon movement; an accuracy of $\pm 1\%$ of span with an adjustable contact including accessories like snubbers for pump discharge applications, chemical diaphragm with 15 m capillary for each limb for all corrosive and oil services and 5 way manifold. Material of accessories will be SS. Auto reset micro switch with adjustable set values with 2 SPDT contacts rated for 0.2 A at 220 V DC. IP 65 or equivalent degree of protection over range protection 50% above maximum pressure. Repeatability shall be $\pm 0.5\%$ FSR.</p> <p><u>Thermometers:</u> Indicating type, field mounted, filled system with 5 metre capillary and six (6) inch dial housed in aluminium casing (epoxy coated) with an accuracy of $\pm 1\%$ of span, response time of 2-4 seconds, auto temperature calibration, linear calibration over the range and 316 SS thermowell having a process connection of M33 x 2 thread. Material of accessories will be SS. IP 65 or equivalent degree of protection for enclosure. Thermowell with Hex head of fabricated assembly for air and flue gas system for rest of the services bar stock assembly. The thermowell construction shall meet the ANSI 19.3-1994 (latest) requirements.</p> <p><u>Temperature Switch:</u> Non Indicating type, field mounted, filled system with 5 metre capillary housed in Aluminium casing (epoxy coated) with an accuracy of $\pm 1\%$ span, auto temperature calibration, linear calibration over the range and 316 SS thermowell having a process connection of M33x2 thread. Micro switch with reset type with adjustable set values with 2 SPDT contacts rated for 0.2 A, 220 DC. IP 65 or equivalent degree of protection for enclosure. Thermowell with hex head of fabricated assembly for air and flue gas system, for rest of the services bar stock assembly. Material of accessories will be SS. The thermowell construction shall meet the ANSI 19.3-1994 (latest) requirements.</p>	


AVX Package controls

essential spare - CV

SR - Local Panel VMS

Instruments Cables

3

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18.00.00 Level gauges:

Tubular type level gauges for low pressure upto 7 kg/cm² & reflex type for high pressure water & steam services & vacuum services with automatic ball check valves, illuminator (240 AC), pyrex / borosilicate glass, mica shield, brass guard rods & brass holders. Material of accessories (name plate, etc.) will be SS. Tubular glass OD will be 5/8". Vent & drain valves shall be provided. Connection shall be screwed or flanged (ANSI class 150 RF). Enclosure shall be IP 65.

19.00.00 Level Switches:

External float operated level switches for tanks and vessels and top mounted level switches and underground tanks. The top mounted level switches shall be supplied with steel tubes to suit Purchaser's requirement. Micro switch with 2 SPDT contacts rated for 0.2 A, 220 V DC. Material of float & float chord will be 316 SS & cage material shall be fabricated steel and the material of accessories will be SS. IP 65 or equivalent degree of protection for enclosure.


Accessories like name plate, drain valve for external case type level switches, mating flange, gaskets (asbestos), fasteners, bolts & nuts, etc. shall be supplied.

20.00.00 Flow Glasses:


Online flow glasses for pipe size up to 4" with a rotary wheel (not a flapper type) suitable for installation on vertical or horizontal pipe lines, material pyrex tempered glass. Body material will be carbon steel, rotor & wetted parts will be bronze. The material of accessories will be SS. IP 65 or equivalent degree of protection for enclosure. Upto 50 NB size, connection shall be screwed above 50 mm NB size it shall be flanged - ANSI, 150 RF. Accessories like name plate, mating flanges with gaskets (neoprene), bolts & nuts, etc. shall be supplied. Enclosure shall be IP65.

21.00.00 Flow Elements:

SS 316 flow nozzles for all steam and feed water services with D and D/2 pressure tappings; 316SS flow orifice plate assembly for all water services with flange tap connections; B ratio of 0.5 & 0.7. Element material of SS 316. The material of accessories will be SS. All the flow elements shall have 3 pairs of differential pressure tappings complete with root valves. Orifice plate shall not be less than 3 mm thick for nominal pipe diameter upto 300 mm & not less than 6 mm thick for pipe diameter > 300 mm. The flow elements shall be supplied as assemblies with High/low pressure tappings, root valves as required. Performance Guarantee flow elements shall be provided

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MILL REJECT HANDLING SYSTEM DATA SHEET-A

SYSTEM TECHNICAL DATA SHEET

1.	Type of mill reject system	:	Pneumatic Pressure Conveying
2.	Capacity of pneumatic system	:	As per Annexure A
3.	Nos. of Transport air compressors	:	2 x 100% Non lubricated reciprocating compressors.
4.	Capacity of mill reject silo	:	55 T each.
5.	Dust loading condition of outlet air	:	50 mg/NM ³
6.	Max. size of rejects to be handled	:	Up-to 50 mm (5% of total reject) rest 25 mm & below
7.	No. of denseveyor envisaged	:	One no per mill
8.	Material of construction	:	
	a) Denseveyor	:	Mild steel IS-2062 Gr B
	b) Dome valve/Inlet valve	:	As per Specification.
9.	Quantity of material to be conveyed per hour by each denseveyor	:	As per Annexure A
10.	Capacity of denseveyor envisaged	:	To suit the conveying rate with 85% filling
11.	Material to be conveyed	:	Coal mill reject (Temp. up to 200 degree C)
12.	Density of material	:	1600 kg/M ³ for volumetric calculation 2400 Kg/M ³ for civil/structural design
13.	Any cooling envisaged for dome valve	:	Bidder to decide.
14.	Pipe size	:	To suit the conveying rate.
15.	Air supply pressure available	:	Bidder to decide.
16.	Inlet/ Outlet Valves of the mill reject hopper (pyrite hopper)	:	Pneumatic cylinder operated knife edge discharge gate valve at mill outlet-200 Nb
17.	Material of pipeline and its thickness	:	MS as per IS: 1239 heavy grade
18.	Sizing Grids for hopper	:	Yes
19.	Emergency Discharge Chute & oversize reject removal chute	:	Emergency Discharge Manually operated KGV Oversize with Manually optd KGV with limit switch)
20.	Bends/ Fittings/ Laterals	:	Alloy CI to 400 BHN
21.	Type of joint in pipeline	:	Flanged.


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- 22 Explosion vent for pyrite hopper : Yes
 23 Pneumatic/ local control panel : Yes with DOP of IP 55

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**PYRITE HOPPER
DATA SHEET -A**

S.NO.	DESCRIPTION	UNIT	DATA/PARTICULARS
1.0	Number required	-----	One (1) for each mill
2.0	Material Handled	-----	Coal Mill rejects
3.0	Number of outlet	-----	Three (3)
4.0	MATERIAL OF CONSTRUCTION AND THICKNESS HAVE: -		
5.1	Pyrite hopper Plates	mm	8 mm thick. MS as per IS: 2062 Gr. A/B (Min) with sizing grid
5.2	Discharge Valve	----	Pneumatically operated valves
5.3	Density of rejects	Metric Tonnes/m ³	1.6 for Volume Calculation 2.4 for Structural Load calculation
5.4	Inlet valve to pyrite hopper	----	Pneumatically operated KGV with expansion joint
5.5	Valves at <ul style="list-style-type: none"> • Maintenance valve • Over size chute • Emergency chute 		Manual operated KGV Pneumatically operated KGV Manual operated KGV
5.6	Min. instruments required	----	Two nos. of level switches (High/High-High) One (1) no of temperature switch
5.7	Explosion vent	----	Rupture Disc type, one no per hopper
5.8	Water Spraying arrangement with Solenoid Valve	----	Yes (Manual isolation & bypass valve also to be provided)

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**TRANSPORTER VESSEL AND ACCESSORIES
DATA SHEET -A**

S.NO	DESCRIPTION	DATA/PARTICULARS
1	No. of transporter vessel envisaged	: One per mill
2	Material of construction	
	a) Transporter vessel	: Mild Steel IS – 2062, Gr B
	b) Dome Valve/ Inlet Valve	: As per Manufacturer's Standard
3	Quantity of material to be conveyed per hour by each transporter vessel	: As per Annexure A
4	Capacity of transporter vessel envisaged	: To suit the conveying rate.
5	Material to be conveyed	: Coal Mill reject (Temp upto 200 degree C)
6	Maximum size of material to be handled	: Up to 50mm (max 5%), Normal 20-25mm
7	Density of material	: 2.4 T/m ³ for weigh purpose 1.6 T/m ³ for volumetric calculation
8	Air supply pressure available	: Bidder to decide
9	Any Cooling envisaged for dome valve	: Bidder to decide
10	Pipe Size	: Bidder to decide
11	Material of pipe line and its thickness	: MS as per IS 1239 Heavy Grade
12	Type of joint in pipe line	: Flanged
13	Distance over which material is to be conveyed and the lift	: Refer Layout Drawing.
14	Inlet Valve of the vessel	: Plate valve/ Dome Valve/ Butterfly Valve / cone valve as per manufacturing proven design.

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**MILL REJECT BUNKER & ACCESSORIES
DATA SHEET -A**

S.NO.	DESCRIPTION	UNIT	DATA/PARTICULARS
1.0	Number required for unit	-----	As per Flow Diagram
2.0	Material Handled	-----	Coal Mill rejects
3.0	Effective Capacity	Tonnes	55
4.0	Number of outlet	-----	One
5.0	Minimum free board	mm	500
6.0	MATERIAL OF CONSTRUCTION AND THICKNESS OF: -		
6.1	Bunker Plates	mm	8mm thk. MS plates (min) as per IS: 2062 Gr. A/B
6.2	Liners	mm	3 mm thk. SS-304 on conical & cylindrical portion
6.3	Discharge gate	----	Twin Sector gates Cast Iron IS210/ MS to IS 2062 with TISCRA/ SAIL HARD Liner, Min 400 BHN
6.4	Size of Bunker Discharge	mm	Minimum 400 mm
6.5	Method of Discharge gate operation	-----	Manually.
6.6	Minimum Valley Angle	-----	60 Degrees
6.7	Density of rejects	Tonnes/m ³	1.6 for Volume Calculation 2.4 for Structural Load calculation

Notes


Following Accessories shall be provided


- 1 Level probe (high) shall be as per C&I specification requirement.
- 2 Counter weight type Pressure relief valve designed for max. Pressure subjected.
- 3 Reverse pulse jet Bag filter with emission level of 50 mg/m³ with air to cloth ratio 1.5m/min


	TITLE:	BHEL DOCUMENTS NO.: PE-TS-367-160-A001	
	TECHNICAL SPECIFICATION FOR MILL RE ECT HANDLING SYSTEM	VOLUME II-B	
	1 700 MW BELLARY TPS UNIT 3 KARNATAKA POWER CORPORATION LIMITED	SECTION -C	
		REV. NO. 00	DATE: 7/13/2012
		Page	

**HAND OPERATED CHAIN PULLEY
BLOCK WITH GEARED TROLLEY
DATA SHEET -A**


S.NO.	DESCRIPTION	
1)	Capacity (In Kg)	To suit the heaviest equipment lifting on silo top
2)	Service condition	Class II outdoor
3)	No. of CPB	Four Nos.
4)	Lift (m)	To suit the requirement/ 16 m (min.)
5)	Type of suspension	Traveling Trolley
6)	Head Room	As per Vendor data
7)	Type of gear in CPB	Spur Gear
8)	Type of bearing	Ball/Roller
9)	Grade of Load Chain	Alloy Steel /Gr. 80.
10)	Grade of Hand Chain	Steel / Gr. 30
11)	Factor of Safety	As per Relevant IS

 DATA SHEET FOR PLC SYSTEM Project: 1 X 700 MW BELLARY-3		SPECIFICATION NO.:	
		VOLUME	II B
		SECTION	D
		REV. NO. 02	DATE: 19.07.2008
		SHEET	1 OF 1
Data Sheet No.: PES-145-36-DS1-0			
Data Sheet A & B			
DATA SHEET-A FOR PLC SYSTEM (TO BE FILLED BY PURCHASER)		DATA SHEET – B (TO BE FILLED BY BIDDER)	
GENERAL	PROJECT		
	SERVICE		
	QUANTITY	<input checked="" type="checkbox"/> UNITISED <input type="checkbox"/> COMMON	
	LOCATION	<input checked="" type="checkbox"/> INDOOR <input type="checkbox"/> OUTDOOR	
PLC EQUIPMENT	MAKE / MODEL NO.	BIDDER TO INDICATE	
	PROCESSOR	REDUNDANT WITH HOT STANDBY	
	DATA BUS (HMI)	<input type="checkbox"/> COPPER WIRE <input type="checkbox"/> FIBRE OPTIC	
	DATA BUS (I/O - CPU)	<input type="checkbox"/> COPPER WIRE <input type="checkbox"/> FIBRE OPTIC	
	DATA BUS (REMOTE I/O - CPU)	<input type="checkbox"/> COPPER WIRE <input type="checkbox"/> FIBRE OPTIC	
	FIELD CONTACTS INTERROGATION VOLTAGE	<input checked="" type="checkbox"/> 24 V <input type="checkbox"/> 48 V	
	LOCATION OF COUPLING RELAYS	<input checked="" type="checkbox"/> MCC <input type="checkbox"/> PLC PANEL	
	DESKTOP OWS QUANTITY	<input type="checkbox"/> ONE <input checked="" type="checkbox"/> TWO <input type="checkbox"/> 1 No. of LCD	
	DESKTOP MONITOR TYPE	<input type="checkbox"/> 19" <input checked="" type="checkbox"/> 21" TFT/CRT MONITOR	
	PRINTER (A3 & A4) - QUANTITY	INKJET _____ LASER B/W _____ COLOR INKJET _____ COLOR LASER _____ 01 _____	
	PRINTER (A3 & A4) - MODEL	INKJET _____ LASER B/W _____ COLOR INKJET _____ COLOR LASER _____ 01 _____	
	PROGRAMMING / CONFIGURATION FACILITY	A) <input type="checkbox"/> HAND HELD B) ENGINEERING SOFTWARE <input checked="" type="checkbox"/> ONE OWS <input type="checkbox"/> ALL OWS	
	SAFETY STANDARD	_____	
	COMPUTER FURNITURE	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
PANEL	QUANTITY	BIDDER TO INDICATE	
	CLASS OF PROTECTION	<input checked="" type="checkbox"/> IP55	
	REMOTE I/O PANEL	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	
	COLOUR	AS PER IS-5 SHADE _____	
	BACK-UP PB _____	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
	MIMIC	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
	CONTROL HARDWARE	<input checked="" type="checkbox"/> PB <input checked="" type="checkbox"/> INDICATORS <input type="checkbox"/> FACIAS _____ Nos. <input type="checkbox"/> OTHERS	
COMMUNICATION TO OTHER SYSTEM	HARDWIRED	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	
	PURPOSE	<input type="checkbox"/> CONTROL <input checked="" type="checkbox"/> MONITORING	
	MEDIUM	<input type="checkbox"/> UTP <input checked="" type="checkbox"/> FIBRE OPTIC <input type="checkbox"/> OTHERS	
	TIME SYNCHRONIZATION SIGNAL FORMAT	<input type="checkbox"/> PULSE <input type="checkbox"/> RS-485 <input checked="" type="checkbox"/> IRIG-B	
	SOFTLINK	<input type="checkbox"/> MODBUS <input type="checkbox"/> OPC	
	SERIAL LINK	COMMUNICATION PORT TYPE _____	
POWER SUPPLY INPUT FEEDER	PLC PANEL	BIDDER TO INDICATE LOAD DATA	
	REMOTE I/O PANEL	BIDDER TO INDICATE LOAD DATA	

	DATA SHEET FOR LOCAL CONTROL PANEL		SPECIFICATION NO.: PE-TS-999-145-I990				
			VOLUME				
			SECTION				
			REV. NO.	00	DATE:		
TAG No. Qty.....		Data Sheet A & B					
DATA SHEET-A FOR LOCAL PANEL (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)				
GENERAL	MANUFACTURER						
	CONSTRUCTION		<input checked="" type="checkbox"/> FOLDED <input type="checkbox"/> WELDED (As per requirement)				
	ENCLOSURE SHEET THICKNESS	FRONT	3.0 mm				
OTHER		3.0 mm					
DOOR		3.0 mm					
TECHNICAL	INPUT POWER SUPPLY		<input type="checkbox"/> 240V 50 Hz AC <input type="checkbox"/> 220V DC <input checked="" type="checkbox"/> 415V 3 PHASE <input type="checkbox"/>				
	NO. OF FEEDERS		<input type="checkbox"/> ONE <input checked="" type="checkbox"/> TWO				
	CONTROL SUPPLY		<input type="checkbox"/> 110V AC <input checked="" type="checkbox"/> 220V AC <input type="checkbox"/> 220V DC <input type="checkbox"/> During detailed engg. (As per requirement)				
	ALARM ANNUNCIATOR WINDOW (EXCLUDING SPARES)		_____ NOS. (AS REQUIRED)				
	PAINT TYPE		<input type="checkbox"/> EPOXY ENAMEL <input checked="" type="checkbox"/> EPOXY POWDER COATED				
	PANEL COLOUR (EXTERNAL)		<input checked="" type="checkbox"/> LIGHT GREY (Shade 631 IS-5) (Project specific) <input type="checkbox"/> OPALINE GREEN (Shade 275) <input type="checkbox"/> During detailed engg.				
	FINISH		<input checked="" type="checkbox"/> MATT <input type="checkbox"/> GLOSSY <input type="checkbox"/> SEMI GLOSSY				
	PANEL COLOUR (INTERNAL)		<input checked="" type="checkbox"/> WHITE <input type="checkbox"/> CREAM <input type="checkbox"/> OFF WHITE				
	FINISH		<input type="checkbox"/> MATT <input type="checkbox"/> GLOSSY <input checked="" type="checkbox"/> SEMI GLOSSY				
	CLASS OF PROTECTION		<input checked="" type="checkbox"/> IP-65 <input type="checkbox"/> IP-55				
	CONTROL HARDWARE		PLC BASED				
	FOUNDATION ARRANGEMENT		<input checked="" type="checkbox"/> FOUNDATION BOLTS <input type="checkbox"/> ANCHOR FASTENERS				
	WEIGHT OF PANEL (Kg.)						
	PANEL TYPE		<input type="checkbox"/> PRESSURISED <input checked="" type="checkbox"/> UNPRESSURISED As per Requirement				
	CABLE GLAND		<input type="checkbox"/> SINGLE COMPRESSION <input checked="" type="checkbox"/> DOUBLE COMPRESSION				
	AMMETER (TYPE OF INPUT)		<input type="checkbox"/> 1 Amp CT <input type="checkbox"/> 4-20 mA				
NAME SIGNATURE DATE	PREPARED BY		CHECKED BY		APPROVED BY		COMPANY SEAL NAME SIGNATURE DATE

	DATA SHEET FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE:
		SHEET	1 OF 2
TAG No. Qty.....		Data Sheet No.: PE-DC-999-145-1026	
Data Sheet A & B			
DATA SHEET-A FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE (TO BE FILLED BY PURCHASER)		DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	

GENERAL	MANUFACTURER			
	MODEL NUMBER			
TECHNICAL	PRESSURE ELEMENT	<input type="checkbox"/> BOURDON <input checked="" type="checkbox"/> DIAPHRAGM <input type="checkbox"/> BELLOW		
	MATERIAL	SENSING ELEMENT – AISI 316 SS MOVEMENT – AISI 304 SS CASING – <input checked="" type="checkbox"/> DIE CAST AL <input type="checkbox"/> SS		
	ENCLOSURE	<input type="checkbox"/> IP-55 <input checked="" type="checkbox"/> IP-65 <input type="checkbox"/> FUEL GAS HAZARDOUS APPL. EXPL. PROOF		
	DIAL	SIZE: <input type="checkbox"/> 100MM <input checked="" type="checkbox"/> 150MM COLOR: WHITE NUMERALS: BLACK SCALE: <input checked="" type="checkbox"/> LINEAR <input type="checkbox"/> SQUARE ROOT		
	CASE	COLOUR : BLACK		
	ADJUSTMENT	<input checked="" type="checkbox"/> EXT. MICROMETER SCREW <input type="checkbox"/> INT. MICRO SCREW		
	MOUNTING	<input checked="" type="checkbox"/> LOCAL <input type="checkbox"/> PANEL OR RACK		
	OVER RANGE PROTECTION	<input checked="" type="checkbox"/> 150% OF MAX. PRESSURE <input type="checkbox"/> 125% ABOVE 150 KG/CM2 FSD <input type="checkbox"/> AS REQUIRED		
	BLOW OUT DISC	SUITABLE MATERIAL		
	SWITCHING FACILITY NO./TYPE OF CONTACTS CONTACT RATINGS SETTING RANGE REPEATABILITY POWER SUPPLY	NOT REQUIRED		
	PERFORMANCE	ACCURACY	± 0.5% OR BETTER OF FULL SCALE DEFLECTION	
	CONNECTION	PROCESS	AS APPLICABLE	
LOCATION		<input type="checkbox"/> BACK <input type="checkbox"/> BOTTOM <input checked="" type="checkbox"/> AS REQUIRED		
ACCESSORIES	NAME PLATE / METAL TAG	SS		
	MOUNTING	<input type="checkbox"/> WALL <input checked="" type="checkbox"/> PIPE – U CLAMPS & BOLTS <input type="checkbox"/> PANEL / RACK <input type="checkbox"/> AS REQUIRED		
	OTHER	AS PER ENCLOSED DIAGRAM OR CUSTOMER SPECIFICATION		
NAME			NAME	
SIGNATURE			SIGNATURE	
DATE			DATE	


	DATA SHEET FOR PRESSURE / DIFFERENTIAL PRESSURE SWITCH			SPECIFICATION NO.:	
				VOLUME	
				SECTION	
				REV. NO.	DATE:
				SHEET	1 OF 2
TAG No. Qty.....			Data Sheet No.: PES-DC-999-145-10		
Data Sheet A & B					
DATA SHEET-A FOR PRESSURE / DIFFERENTIAL PRESSURE SWITCH (TO BE FILLED BY PURCHASER)				DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
GENERAL	MANUFACTURER				
	MODEL NUMBER				
TECHNICAL	PRESSURE ELEMENT	<input type="checkbox"/> DIAPHRAGM <input type="checkbox"/> BELLOW (for low range) <input type="checkbox"/> PISTON <input type="checkbox"/> BOURDON (for high range)			
	MATERIAL	ELEMENT: <input checked="" type="checkbox"/> AISI 316 SS <input type="checkbox"/> Ph. Br. CASING : DIE CAST AL			
	ENCLOSURE	<input type="checkbox"/> INDOOR MOUNTED IP-55 <input checked="" type="checkbox"/> OUTDOOR MOUNTED IP-65 <input type="checkbox"/> FUEL GAS HAZARDOUS APPL. EXPL. PROOF			
	SWITCH TYPE	<input checked="" type="checkbox"/> MICRO <input type="checkbox"/> ENCLOSURE HERMETICALLY SEALED			
	SWITCH CONTACT	TWO NOS. SPDT			
	SWITCH RATING	<input type="checkbox"/> 5A 230V AC <input checked="" type="checkbox"/> 0.25A 220V DC			
	SETTING & DEAD BAND	ADJUSTABLE			
	MOUNTING	<input checked="" type="checkbox"/> DIRECT <input type="checkbox"/> PANEL OR RACK			
	OVER RANGE PROTECTION	115% ABOVE 150 Kg/Cm2 FSD 125% BELOW 150 Kg/Cm2 FSD			
PERFORMANCE	ACCURACY (SCALE)	± 1%			
	REPEATABILITY	± 0.5%			
CONNECTION	PROCESS	1/4" NPT (F) AT BOTTOM			
	ELECTRICAL	WITH GLAND TO SUIT CABLE OF MAXIMUM o.d. 17.5 MM.			
NAME SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY	COMPANY SEAL NAME SIGNATURE DATE	


RF TYPE LEVEL SWITCH:**A. ELECTRONIC CONTROLLER**

INPUT SUPPLY VOLTAGE :	24 VDC
RELAY OUT PUT :	2 NOS. RELAY CHANGE OVER POTENTIAL FREE CONTACT
CONTACT RATING :	5 AMPS at 240VAC & 0.25A, 220V DC
ENCLOSURE PROTECTION :	IP-66
ENCLOSURE HOUSING :	CAST ALUMINIUM
AMBIENT TEMPERATURE :	60 °C

B. SENSING PROBE

MATERIAL :	STAINLESS STEEL - 316
MOUNTING :	40 NB BSP THREADED
APPLICATION TEMPERATURE :	350 °C (MAX.)
ENCLOSURE PROTECTION :	IP-66
ENCLOSURE HOUSING :	CAST ALUMINIUM
INSULATION :	CERAMIC/PTFE
NO. OF CONTACTS :	2 NO. + 2NC, SPDT SNAP DRY CONTACT
ELECT. CONNECTION :	PLUG IN SOCKET
REPEATABILITY :	±0.5% OF FULL RANGE
ACCESSORIES :	40NB MOUNTING SOCKET
OVER RANGE PROOF PRESSURE :	150% OF MAX. DESIGN PRESSURE


	DATA SHEET FOR TEMPERATURE / DIFFERENTIAL TEMPERATURE SWITCH			SPECIFICATION NO.:	
				VOLUME	
				SECTION	
				REV. NO.	DATE:
				SHEET	1
TAG No. Qty.....			Data Sheet No.: PES-145-32-DS1-0		
Data Sheet A & B					
DATA SHEET-A FOR TEMPERATURE / DIFFERENTIAL TEMPERATURE SWITCH (TO BE FILLED BY PURCHASER)				DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
GENERAL	MANUFACTURER	Bidder to Specify			
	MODEL NUMBER	Bidder to Specify			
TECHNICAL	TYPE OF ELEMENT	MERCURY FILLED			
	SENSING ELEMENT	<input type="checkbox"/> BELLOWS <input type="checkbox"/> PISTON <input type="checkbox"/> DIAPHRAGM			
	MATERIAL	ELEMENT : 316 SS CASE : DIE CAST AL BULB & CAPILLARY : AISI 316 SS CAPILLARY ARMOUR : <input checked="" type="checkbox"/> SS <input type="checkbox"/> FLEXIBLE THERMOWELL : <input checked="" type="checkbox"/> AISI 316 SS MOVEMENT : <input checked="" type="checkbox"/> AISI 304 SS			
	ENCLOSURE	<input type="checkbox"/> INDOOR MOUNTED IP-55 <input checked="" type="checkbox"/> OUTDOOR MOUNTED IP-65 <input type="checkbox"/> FUEL GAS HAZARDOUS APPL. EXPL. PROOF			
	SWITCH TYPE	MICRO			
	SWITCH CONTACT	<input checked="" type="checkbox"/> 2 NOS. SPDT <input type="checkbox"/> DPDT			
	SWITCH RATING	<input type="checkbox"/> 5A 230V AC <input checked="" type="checkbox"/> 0.25A 220V DC			
	SETTING & DEAD BAND	ADJUSTABLE (WIDE RANGE)			
	MOUNTING	<input checked="" type="checkbox"/> FIELD <input type="checkbox"/> PANEL OR RACK			
	TEMP. COMPENSATION	<input checked="" type="checkbox"/> CASE COMP.			
	OVER RANGE PROTECTION	115% OF MAXIMUM TEMPERATURE			
	BULB DIA	<input type="checkbox"/> 12 MM <input type="checkbox"/> ANY OTHER (SPECIFY)			
	CAPILLARY LENGTH	<input checked="" type="checkbox"/> 5M (FOR LOCAL MOUNTING) <input type="checkbox"/> 15M (FOR PANEL/RACK MOUNTING)			
PERFORMANCE	ACCURACY	± 1% OF FULL SCALE OR BETTER			
	REPEATABILITY	LESS THAN ±0.5%			
CONNECTION	TEMPERATURE SWITCH	<input type="checkbox"/> M20X1.5M ADJ. ON STEM TO SUIT THERMOWELL			
	THERMOWELL	<input checked="" type="checkbox"/> YES <input type="checkbox"/> BAR STACK TYPE			
	THERMOWELL CONNECTION	M20X1.5M FEMALE (FOR INSTRUMENT CONNECTION) M33X2 MALE (FOR STUB CONNECTION) DESIGN CODE: ANSI 19.3			
	ELECT. CONNECTION	WITH GLAND TO SUIT CABLE OF MAX. OD 17.5MM			
ACCESSORIES	INSTALLATION ACCESSORIES	<input checked="" type="checkbox"/> AS REQUIRED			
NAME	PREPARED BY	CHECKED BY	APPROVED BY	COMPANY SEAL NAME SIGNATURE DATE	
	SIGNATURE				
	DATE				

	DATA SHEET FOR TEMPERATURE / DIFFERENTIAL TEMPERATURE SWITCH	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE:
SHEET 1 OF 2			

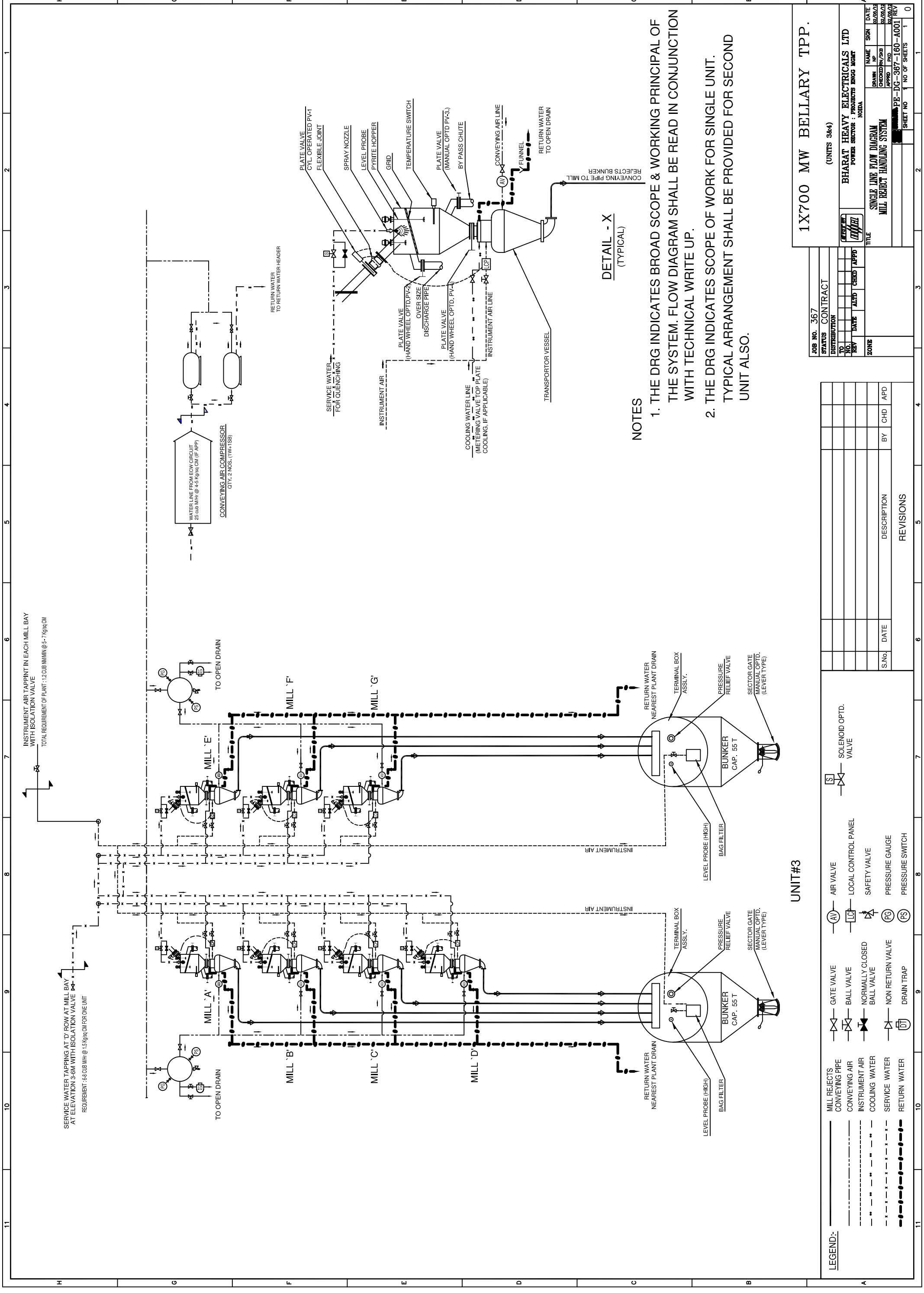
TAG No. Qty.....

Data Sheet No.: **PES-145-32A-DS1-0****Data Sheet C**
 DATA SHEET-C FOR TEMPERATURE / DIFFERENTIAL TEMPERATURE SWITCH
 (TO BE FILLED BY CONTRACTOR AFTER AWARD OF CONTRACT)

GENERAL	MANUFACTURER			
	MODEL NUMBER			
TECHNICAL	TYPE OF ELEMENT			
	SENSING ELEMENT			
	MATERIAL			
	ENCLOSURE			
	SWITCH TYPE			
	SWITCH CONTACT			
	SWITCH RATING			
	SETTING & DEAD BAND			
	MOUNTING			
	TEMP. COMPENSATION			
	OVER RANGE PROTECTION			
	BULB DIA			
PERFORMANCE	CAPILLARY LENGTH			
	ACCURACY			
	REPEATABILITY			
CONNECTION	TEMPERATURE SWITCH			
	THERMOWELL			
	THERMOWELL CONNECTION			
	ELECT. CONNECTION			
ACCESSORIES	INSTALLATION ACCESSORIES			
NAME SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY	COMPANY SEAL NAME SIGNATURE DATE

	TITLE:	BHEL DOCUMENTS NO.: PE-TS-367-160-A001	
	TECHNICAL SPECIFICATION FOR MILL RE ECT HANDLING SYSTEM	VOLUME II-B	
	1 700 MW BELLARY TPS UNIT 3 KARNATAKA POWER CORPORATION LIMITED	SECTION -C	
		REV. NO. 00	DATE: 7/13/2012
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**FLOW DIAGRAM
ANNE URE-4**



INSTRUMENT AIR TAPPING IN EACH MILL BAY WITH ISOLATION VALVE
TOTAL REQUIREMENT OF PLANT: 1.2 CUB (MM/MIN) @ 5-7 (kg/sq CM)

SERVICE WATER TAPPING AT 'D' ROW AT MILL BAY AT ELEVATION 3-6M WITH ISOLATION VALVE
REQUIREMENT: 6.8 CUB M/H @ 1.5 (kg/sq CM) FOR ONE UNIT

NOTES

1. THE DRG INDICATES BROAD SCOPE & WORKING PRINCIPAL OF THE SYSTEM. FLOW DIAGRAM SHALL BE READ IN CONJUNCTION WITH TECHNICAL WRITE UP.
2. THE DRG INDICATES SCOPE OF WORK FOR SINGLE UNIT. TYPICAL ARRANGEMENT SHALL BE PROVIDED FOR SECOND UNIT ALSO.

DETAIL - X
(TYPICAL)

UNIT#3

LEGEND:-

	MILL REJECTS CONVEYING PIPE		AIR VALVE
	CONVEYING AIR		LOCAL CONTROL PANEL
	INSTRUMENT AIR		SAFETY VALVE
	COOLING WATER		NORMALLY CLOSED BALL VALVE
	SERVICE WATER		NON RETURN VALVE
	RETURN WATER		DRAIN TRAP
	SOLENOID OPTD. VALVE		PRESSURE GAUGE
	GATE VALVE		PRESSURE SWITCH
	BALL VALVE		
	NORMALLY CLOSED BALL VALVE		
	NON RETURN VALVE		
	DRAIN TRAP		

JOB NO. 367		STATUS CONTRACT	
TO	NO.	DATE	ALTD
BY	NO.	DATE	ALTD
ZONE	ALTD	CHGD	APPD


1X700 MW BELLARY TPP.
(UNITS 3&4)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR : PRODUCTS ENG'G MGMT

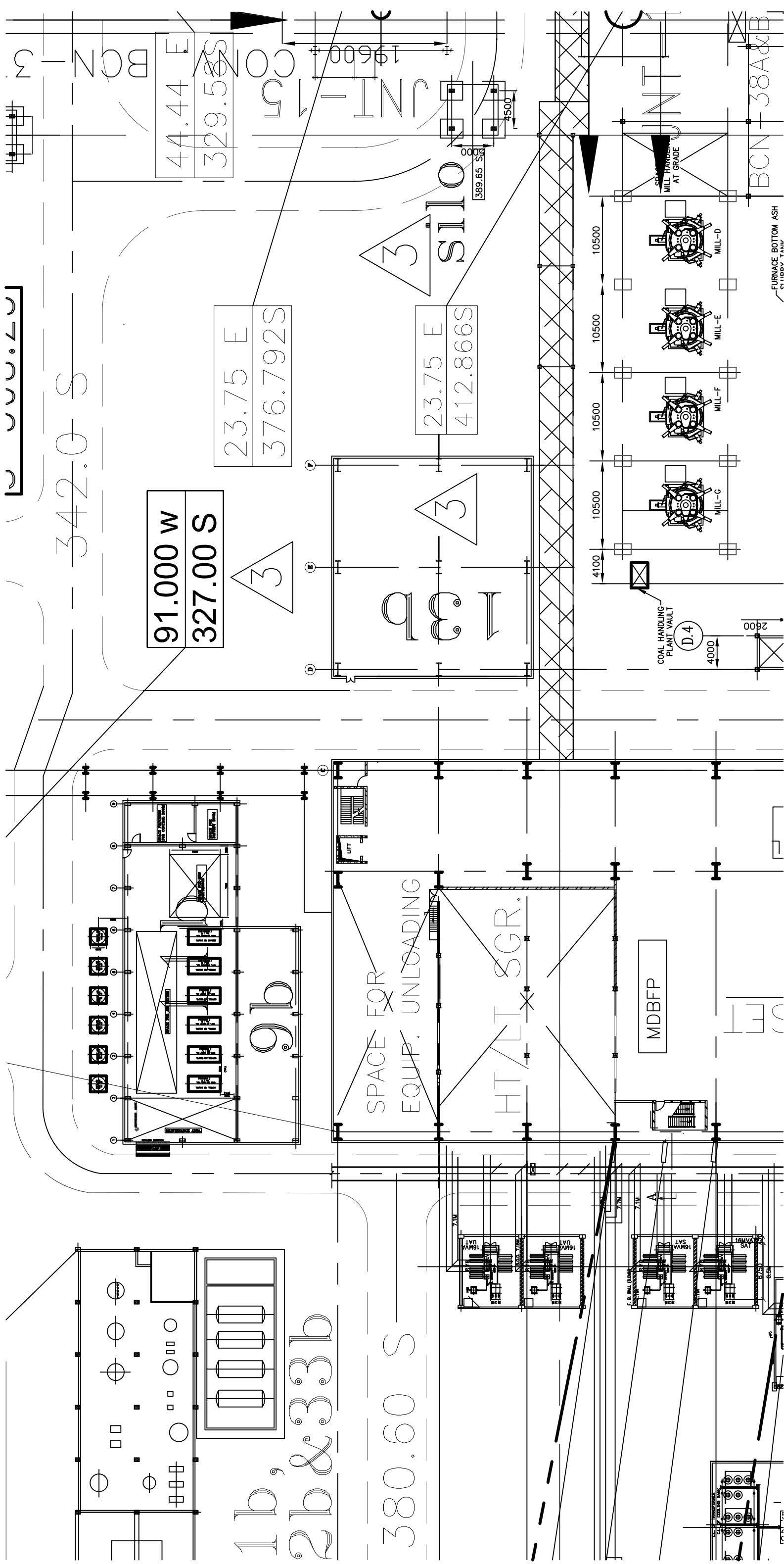
SINGLE LINE FLOW DIAGRAM
MILL REJECT HANDLING SYSTEM

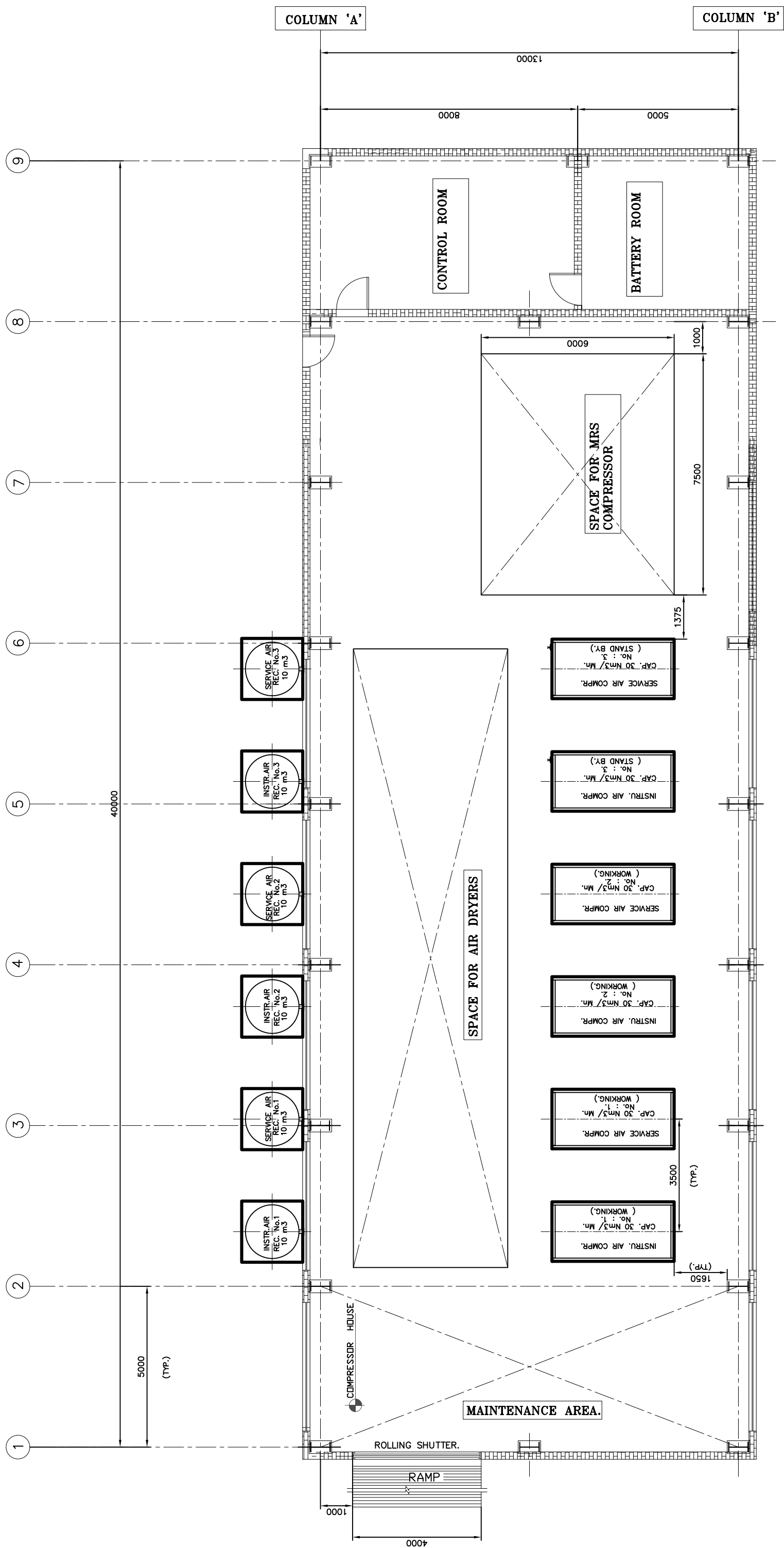
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PE-DG-387-160-A001

	TITLE:	BHEL DOCUMENTS NO.: PE-TS-367-160-A001	
	TECHNICAL SPECIFICATION FOR MILL RE ECT HANDLING SYSTEM	VOLUME II-B	
	1 700 MW BELLARY TPS UNIT 3 KARNATAKA POWER CORPORATION LIMITED	SECTION -C	
		REV. NO. 00	DATE: 7/13/2012
		Page	

**LAYOUT FOR MILL RE ECT SYSTEM
ANNE URE-5**





FIRST ANGLE PROJECTION

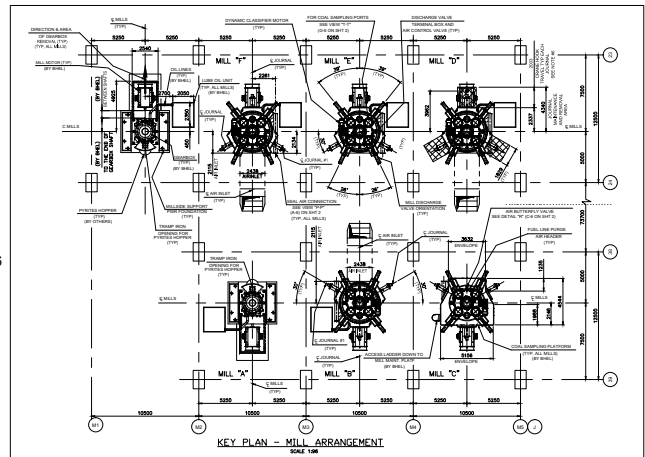
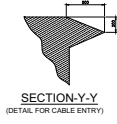
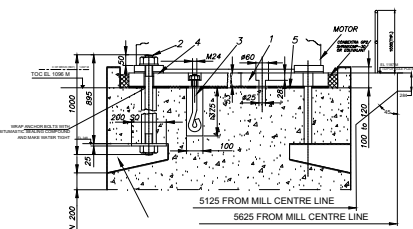
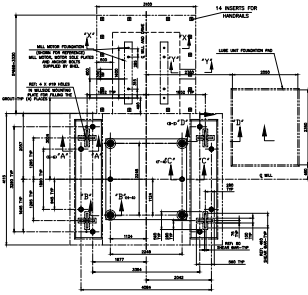
(ALL DIMENSIONS ARE IN mm)

15858019000

DRG. NO. OF 03

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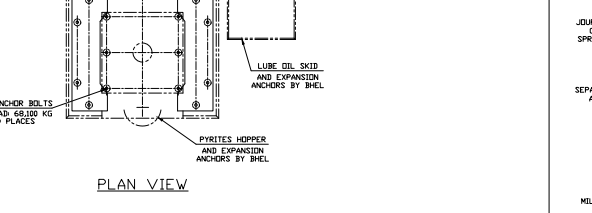
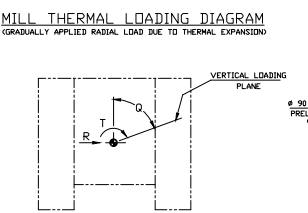
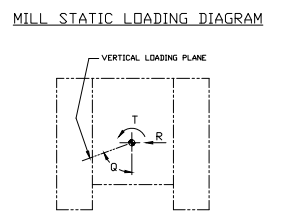
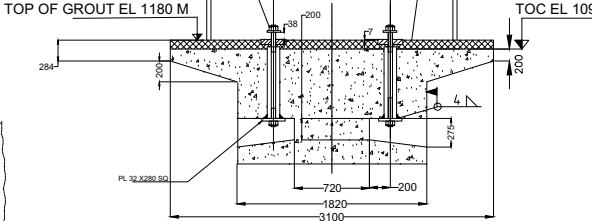
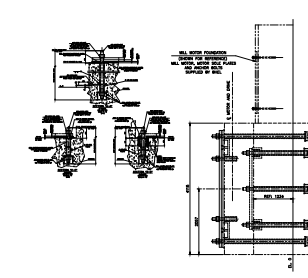
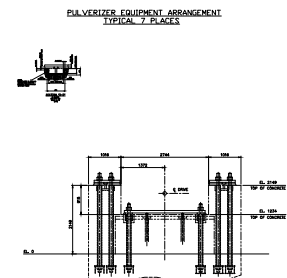
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SECTION-E-E

SECTION-X-X

KEY PLAN - MILL ARRANGEMENT



MILL STATIC LOADING DIAGRAM

MILL THERMAL LOADING DIAGRAM

PLAN VIEW

TOP VIEW

TOP VIEW

GEARBOX LOADING DIAGRAM

MILL BODY LOADING DIAGRAM

TOP VIEW

TOP VIEW

GEARBOX LOADING DIAGRAM

MILL BODY LOADING DIAGRAM

MAXIMUM DYNAMIC FOUNDATION LOADING (ACTUAL)

MOMENT [M]	126,738 KGM.
THRUST [TH]	190,680 KGF.
RADIAL [R]	38,590 KGF.
TORQUE [T]	97,280 KGM.
ANGLE [Q]	0° THRU 360° RANDOM DIRECTION SEE NOTE #2
TDRQUE [Tn]	PEAK TORQUE

NOTES:

1. ALL DYNAMIC LOADS ARE IN ADDITION TO THE STATIC LOADS.
2. THE MOMENT (M) AND RADIAL FORCE (R) COULD OCCUR IN ANY VERTICAL PLANE - I.E., THE ANGLE "Q" RANGES FROM 0° TO 360° PER THE DIAGRAM.

LEGEND:

- - LOAD CENTER KGM - KILLOGRAM-METRE KGF - KILLOGRAM-FORCE
- - C.G. - CENTER OF GRAVITY

MT - METRIC TON
NN - NEWTON-METRE

FOUNDATION NOTES:

1. THE FOUNDATION SHALL BE AS PER THE FOUNDATION DESIGN BY THE CLIENT.
2. THE FOUNDATION SHALL BE AS PER THE FOUNDATION DESIGN BY THE CLIENT.
3. THE FOUNDATION SHALL BE AS PER THE FOUNDATION DESIGN BY THE CLIENT.
4. THE FOUNDATION SHALL BE AS PER THE FOUNDATION DESIGN BY THE CLIENT.
5. THE FOUNDATION SHALL BE AS PER THE FOUNDATION DESIGN BY THE CLIENT.
6. THE FOUNDATION SHALL BE AS PER THE FOUNDATION DESIGN BY THE CLIENT.
7. THE FOUNDATION SHALL BE AS PER THE FOUNDATION DESIGN BY THE CLIENT.
8. THE FOUNDATION SHALL BE AS PER THE FOUNDATION DESIGN BY THE CLIENT.
9. THE FOUNDATION SHALL BE AS PER THE FOUNDATION DESIGN BY THE CLIENT.
10. THE FOUNDATION SHALL BE AS PER THE FOUNDATION DESIGN BY THE CLIENT.

GENERAL NOTES:

1. THE MILL SHALL BE AS PER THE MILL DESIGN BY THE CLIENT.
2. THE MILL SHALL BE AS PER THE MILL DESIGN BY THE CLIENT.
3. THE MILL SHALL BE AS PER THE MILL DESIGN BY THE CLIENT.
4. THE MILL SHALL BE AS PER THE MILL DESIGN BY THE CLIENT.
5. THE MILL SHALL BE AS PER THE MILL DESIGN BY THE CLIENT.
6. THE MILL SHALL BE AS PER THE MILL DESIGN BY THE CLIENT.
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8. THE MILL SHALL BE AS PER THE MILL DESIGN BY THE CLIENT.
9. THE MILL SHALL BE AS PER THE MILL DESIGN BY THE CLIENT.
10. THE MILL SHALL BE AS PER THE MILL DESIGN BY THE CLIENT.

MILL DATA

1. MOTOR SPEED : 985 RPM
2. SPEED OF PULVERIZER : 35 RPM
3. TOTAL WT. OF MILL : 1.140 TONNES. (EXCLUDING MOTOR)
4. TYPE OF LOAD : MODERATE SHOCK LOAD.

MOTOR DATA:-

- SUPPLIER : BHEL - BHOPAL
- MODEL : 100T 100
- FULL LOAD AMP STATOR : 190 AMP
- VOLUME 3 FRAME NO. H-3000 WELLS
- APPROX. WEIGHT OF MOTOR : 700 KGS
- APPROX. WEIGHT OF MOTOR : 1700 KGS
- GEAR RATIO : 1:28
- MAXIMUM FOUNDATION LOAD : 112 MT - UPRINGS
- MIN. SHOCK LOAD : 100 MT - UPRINGS
- DIRECTION OF ROTATION : 1 - CLOCKWISE (BY OBSERVER)

THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED.

1. REF. TO HYD230261 FOR UNSPECIFIED TOLERANCES.
2. CHAMFER M/CD. SHARP EDGES 1.2 TO 1.0 AT 45°
3. INTERNAL M/CD. CORNER RADI 1 TO 0.7
4. THE SURFACE ROUGHNESS WHERE-EVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUT SIDE THE BACK SLASH GIVEN OR THE TOP MOST RIGHT CORNER OF THE DRG.

OWNER : KARNATAKA POWER CORPORATION LTD.

OWNER CONSULTANT : TRACTEBEL ENGINEERING PVT LTD.

PROJECT : BELLARY TPS UNIT # 3, 1X700MW

REV.	DATE	ALTERED	UNCL. DIMS. GR. SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO. OF ITEMS

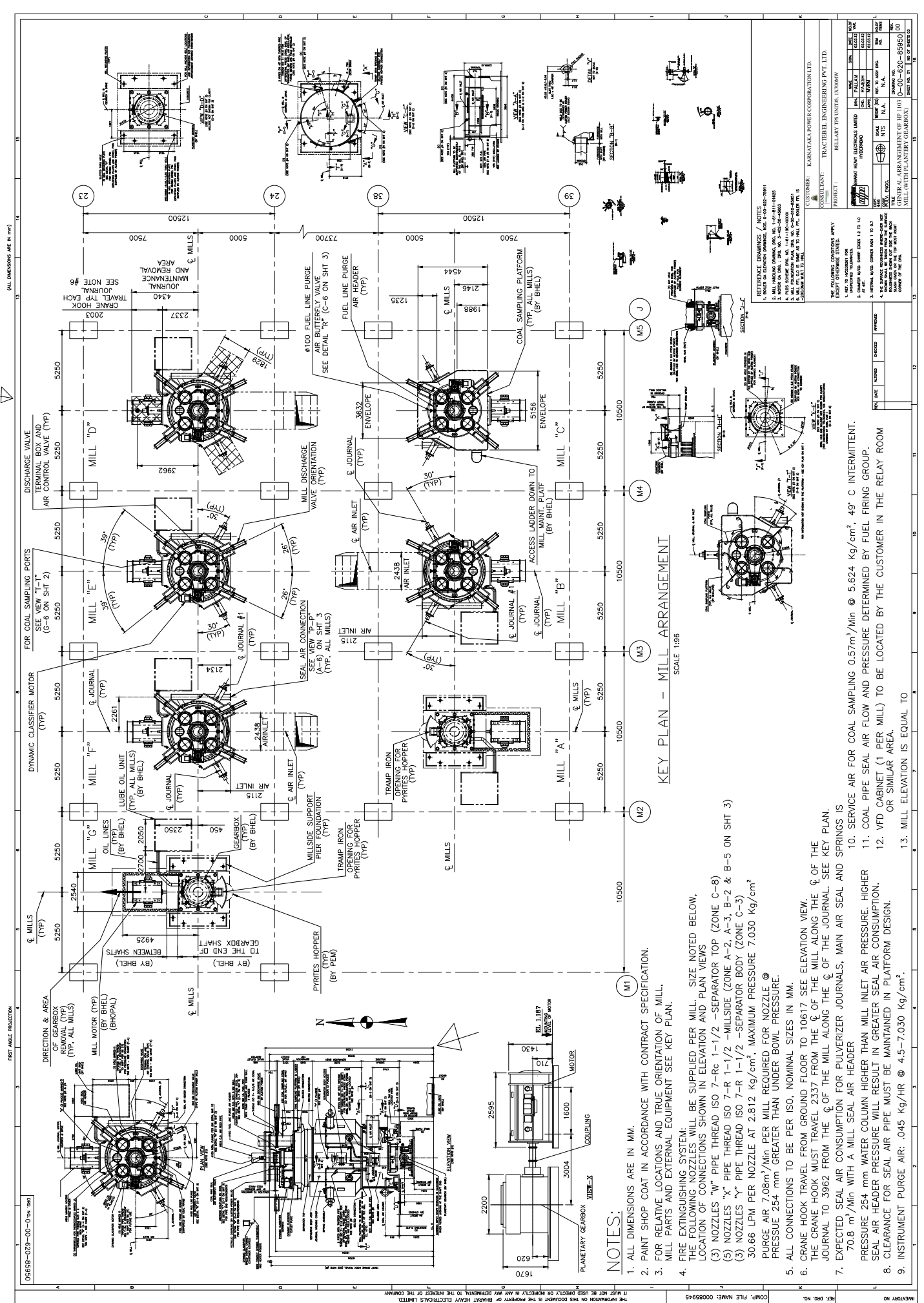
DEPT.	UNCL. DIMS. GR. SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO. OF ITEMS

TITLE : FOUNDATION PLAN OF HP-1103 MILL (WITH PLANETARY GEAR BOX)

DRAWING NO. : 0-00-610-85951

SHEET NO. 01

NO. OF SHEETS 03



REFERENCE DRAWINGS / NOTES


1. MILLER IS ELEVATION DRAWING, REF. 0-00-002-7981
2. MILLER IS PLAN VIEW, REF. 0-00-002-7981
3. MILLER IS SECTION, REF. 0-00-002-7981
4. MILLER IS SECTION, REF. 0-00-002-7981
5. MILLER IS SECTION, REF. 0-00-002-7981
6. MILLER IS SECTION, REF. 0-00-002-7981

THE FOLLOWING CONDITIONS APPLY EXCEPT WHERE SHOWN OTHERWISE:

1. UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS.
2. UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS.
3. UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS.
4. UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS.
5. UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS.
6. UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS.


CUSTOMER: KANATAKA POWER CORPORATION LTD.
CONSULTANT: TRACEBELL ENGINEERING PVT. LTD.
PROJECT: BELMATHUR THERMAL POWER PLANT

NO.	REV.	DATE	BY	CHKD.	DESCRIPTION
1					ISSUED FOR APPROVAL
2					ISSUED FOR APPROVAL
3					ISSUED FOR APPROVAL
4					ISSUED FOR APPROVAL
5					ISSUED FOR APPROVAL
6					ISSUED FOR APPROVAL
7					ISSUED FOR APPROVAL
8					ISSUED FOR APPROVAL
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68					ISSUED FOR APPROVAL
69					ISSUED FOR APPROVAL
70					ISSUED FOR APPROVAL

	TITLE:	BHEL DOCUMENTS NO.: PE-TS-367-160-A001	
	TECHNICAL SPECIFICATION FOR MILL RE ECT HANDLING SYSTEM	VOLUME II-B	
	1 700 MW BELLARY TPS UNIT 3 KARNATAKA POWER CORPORATION LIMITED	SECTION -C	
		REV. NO. 00	DATE: 7/13/2012
		Page	

**QUALITY PLAN
ANNE URE-6**



Sl. No.		Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1		2	3	4	5	6	7	8	9		10			11
									TYPE	D	M	C	K	
<div style="display: flex; justify-content: space-between;"> <div style="width: 15%;">  </div> <div style="width: 35%;"> S/Contactor :- Mfgr :- </div> <div style="width: 30%;"> Manufacturing Quality Plan Item :- Metallic Expansion Bellow QAP No. :- LOI Nos:- Contractor :- M/s BHEL </div> <div style="width: 20%;"> Project:- Package :- Mill Rejects System Client :- Consultant :- </div> </div>														
1	Materials													
1.1	Bellows	Physical & Chemical	Major	Lab Analysis	1 per Heat	SA240 TP304 / Approved Drg.	SA240 TP304 / Approved Drg.	MTC	√	V	V	V		
1.2	Flanges / End Pipe	Physical & Chemical	Major	Lab Analysis	1 per Heat	IS 2062 / Approved Drg.	IS 2062 / Approved Drg.	MTC	√	V	V	V		
2	In Process													
2.1	Bellows & Pipe ** -> For Bellow	Dimension Soundness of Weld of L-Seam	Major Major	Measu-rement DPT ** (Before & After Forming)	100% 100%	Approved Drg. ASTM E-165	Approved Drg. No Crack / Linear Indication	IR IR	√ √	P P	V V	V V		
3	Final Inspection													
3.1	Assembly	DP Test of Fillet welds of Bellow to Pipe & Pipe to Flange	Major	Visual	100%	ASTM E-165	No Crack / Linear Indication	IR	√	P	W	V		
3.2	Testing	Dimensions Pressure Spring Rate Test (Axial)	Major Critical Critical	Measurement Hydraulic Stiffness Test	100% 100% 100%	Approved Drg. EJMA D.3.2.1 / Data Sheet EJMA / Data Sheet	Approved Drg. EJMA D.3.2.1 / Approved Drg EJMA / Data Sheet	IR IR IR	√ √ √	P P P	W W W	W W W		


Document No.:-




Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
		Deflection	Critical	Deflection Test	100%	EJMA / Data Sheet	EJMA / Data Sheet	IR	√	P	W	W	
3.3	Painting	Visual / Measurement	Major	DFT	100%	Approved Painting Schedule	Approved Painting Schedule	IR	√	P	-	-	
Manufacturer / Sub Vendor		Contractor	LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & K -> client P->Perform, V-> Verification, W-> Witness				For Client Use:-		Document No.:-				
SIGNATURES							Name & Signature of Approving Authority with Seal						

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final


Procedure for Axial Spring Rate Test & Deflection Test are enclosed

		S/Contactor :-			Manufacturing Quality Plan			Project:-					
		Manufacturer :-			Item :- Rupture Disc			Package :- Mill Rejects System					
					QAP No. :-			Client :-					
					LOI Nos:-			Consultant :-					
					Contractor :- M/s BHEL								
Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
1	Materials -> Rupture Disc Material	Physical & Chemical Properties	Major	Chemical Analysis, YTS & UTS	1 per Heat	ASTM A240 Type - 304 / Appved Data Sheet / Drg.	ASTM A240 Type - 304 / Appved Data Sheet	MTC	√	V	V	V	
2	Final Inspection -> Dimension -> Burst Test of Rupture Disc	Measurement Functional	Major Major	Mesurement Burst Test @ 200 Degree Centigrade	100% 1 per lot offered	App. Drawing Approved drawing / Datasheet	App. Drawing Min 0.4 bar (g) @ 200 degree C Max 0.6 bar (g) @ 200 degree C / App. Data Sheet	IR IR / Burst Test Certificate	√ √	P P	W W	W W	
Manufacturer / Sub Vendor		Contractor		LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & K ->Client P->Perform, V-> Verification, W-> Witness			For Client Use:-		Document No.:-				
SIGNATURES									Name & Signature of Approving Authority with Seal				

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

		S/Contactor :-			Manufacturing Quality Plan			Project:-					
		Manufacturer :-			Item:- CHAIN PULLY BLOCK			Package :- Mill Rejects System					
					QAP No. :-			Client :-					
					LOI Nos:-			Contractor :- M/s BHEL					
								Consultant :-					
Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
1	Materials												
->	Load Chain	Mech. Properties Breaking Load Test, Proof Load test	Major	Review of Mfr's Test Certificate	1 per Lot	IS:6216 /Appr. Drg / Appr. Data sheet	IS:6216 /Appr. Drg / Appr. Data sheet	MTC	√	P/V	V	V	
->	Load Sheave	Mech. Properties Chemical Composition	Major	Lab Analysis	1 per Heat	IS:1865 /Appr. Drg / Data sheet	IS:1865 /Appr. Drg / Data sheet	MTC	√	P/V	V	V	
->	Gear & Pinion	Chemical Composition	Major	Lab Analysis	1 per Heat	IS:4432/Appr. Drg / Data sheet	IS:4432/Appr. Drg / Data sheet	MTC	√	P/V	V	V	
->	Hook	Mech. Properties Chemical Composition	Major	Lab Analysis	1 per Heat	IS:8610 / IS:1875 /Appr. Drg / Data sheet	IS:8610 / IS:1875 /Appr. Drg / Data sheet	MTC	√	P/V	V	V	
2	In Process												
->	Hook	Proof Load Test	Major	Load Test	100%	IS:8610 /Appr. Drg / Appr. Data sheet	IS:8610 /Appr. Drg / Appr. Data sheet	MTC / IR	√	P	V	V	
		DPT after Load Test	Major	DPT	100%	ASTM E-165	ASTM E-165 / No Defects	IR	√	P	V	V	
3	Final Inspection												
->	Assembly	Operation Check	Major	Visual	100%	Smooth Operation /	Smooth Operation / IS	IR	√	P	W	V	
		Functional Test	Major	Visual	100%	IS 3832 Appr. Drg /	3832 Appr. Drg / Appr.	IR	√	P	W	V	
		Load Test & Over Load Test	Major	Load Test	100%	App. Data Sheet	Data Sheet	IR	√	P	W	V	
		Overall Dimensions	Major	Measurement	100%			IR	√	P	W	V	
		Visual (After Load Test)	Major	Visual	100%	IS 3832	IS 3832	IR	√	P	W	V	
SIGNATURES Manufacturer / Sub Vendor		LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT P->Perform, V-> Verification, W-> Witness			For Client Use:-				Document No.:-				
					Name & Signature of Approving Authority with Seal								


Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

		S/Contactor :- Manufacturer :-			Manufacturing Quality Plan Item :- Bag Filter (Without Enclosure) QAP No. :- LOI Nos:- Contractor :- M/s BHEL			Project:- Package :- Mill Rejects System Client :- Consultant :-					
Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
1	Materials												
1.1	Manifold Body / Casings (MS Plate / Sheet / Pipe)	Chemical & Physical	Major	Chemical & Mechanical	1 per Lot	App. Drawing / Data Sheet / IS:2062 Gr. A / IS:1079 Gr. 0 / IS: 1239 Class Med.	App. Drawing / Data Sheet / IS:2062 Gr. A / IS:1079 Gr. 0 / IS : 1239 Class Med.	MTC	√	V	V	V	
1.2	Bag Cages (Inserts)	Chemical & Physical	Major	Chemical & Mechanical	1 per Lot	App. Drawing / data sheet / IS:7887 Gr.8 / IS:1079 Gr. 0	App. Drawing / data sheet / IS:7887 Gr.8 / IS:1079 Gr. 0	MTC	√	V	V	V	
1.3	Solenoid Valves	Functional	Major	Operational	100%	Approved Drawing / Appr. Data Sheet	Approved Drawing / Appr. Data Sheet	MTC	√	P	V	V	
1.4	Sequence Controller	Functional	Major	Operational	100%	Approved Drawing / Appr. Data Sheet	Approved Drawing / Appr. Data Sheet	MTC	√	P	V	V	
1.5	Filter Bags (Make :- Charminar / Supreme)	Physical	Major	Visual / Measurement	100%	Approved Drawing / Appr. Data Sheet	Approved Drawing / Appr. Data Sheet	MTC	√	P	V	V	
2	In Process												
2.1	Manifold	Dimensional & Visual	Minor	Dimensional & Visual	100%	As per Mfr's Drg.	As per Mfr's Drg.	IR	√	P	V	V	** -> DPT & Hydro - Test of Manifold to be witnessed by vendor
2.2		Welding	Major	DPT on Final Weld	100%	ASTM E-165	No Defect	IR	√	P	V**	V	
2.3		Hydro Test for 30 Minutes	Major	Leakage	100%	Appr. Data sheet	No Leakage	IR	√	P	V**	V	

Document No.:-

Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks	
1	2	3	4	5	6	7	8	9		10			11	
								TYPE	D	M	C	K		
3	Final Inspection													
3.1	Assembly \$-> Pneumatic Test at 1.1 times W/Pressure	Dimensional Pne. test of Manifold in Assly. Functional Test of Pulsing System	Major Major Major	Measurement Leakage by soap solution Pulse Sequence	100% 100% 100%	Appr. Drawing Appr. Data Sheet Appr. Data sheet / Testing Procedure	Appr. Drawing No Leakage Appr. Data sheet / Testing Procedure	IR IR IR	√ √ √	P P P	W W W	V V V	Pressure Drop across Filter Bags & Emission Level at Filter outlet shall be checked at Site	
4	Painting	Measurement & Visual	Major	DFT / Finish	100%	Appr. Painting Schedule	Appr. Painting Schedule	IR	√	P	-	-		
TESTING PROCEDURE TO BAG FILTER														
<p>1-> Functional test through compressed air , Sequential pulsing through valves and sequential controller on No - Load Condition to be conducted.</p> <p>2-> The Solenoid valve shall be connected to the sequential timer and suitable electric supply shall be provided. Air header to be connected to supply of compressed air. The Timer is set and Sequential operation of Solenoid operated valve is observed.</p>														
Manufacturer / Sub Vendor		Contractor		LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT P->Perform, V-> Verification, W-> Witness				For Client Use:-		Document No.:-				
SIGNATURES						Name & Signature of Approving Authority with Seal								


Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

		S/Contactor :-			Manufacturing Quality Plan			Project:-					
		Manufacturer :-			Item :- MS GI ERW Pipes (IS:1239/IS3589) QAP No. :- LOI Nos:-			Package :- Mill Rejects System Client :-					
					Contractor :- M/s BHEL			Consultant :-					
Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
1	Final Inspection of Finished Pipes	Physical Dimensional Mechanical Properties Chemical Hydro Test	Major Major Major Major	Visual Measurement Tensile, elongation, Bend or Flattening Chemical Analysis Pressure Testing	100% 100% IS: 4711 1 per heat 100%	IS:1239 / IS:3589 / Approved Data Sheet	IS:1239 / IS:3589 / Approved Data Sheet	IR IR / TC TC IR / TC	- √ √ √	P P / V P / V P	W* W* V W*	V V V W*	* -> Random 5% of offered lot irrespective of size
2	Galvanising (For GI Pipes)	Uniformity & mass of Zinc Coating, Adhesion test, Free bore test	Major	As per IS:4736	As per IS:4736	As per IS:4736 / Approved Data Sheet	As per IS:4736 / Approved Data Sheet	IR	√	P	W #	V	# one sample for each size
3	Identification	Verification of Batch No. / Mfg stamp / Heat No.	Major	Visual	100%	Mfgr Practise / IS 1239 / IS 3589	Mfgr Practise / IS 1239 / IS 3589	IR	√	P	W	V	
4	Review of QA Documents	-----	-----	-----	-----	As per QAP	As per QAP	-----	√	V	V	V	
NOTES :- For SAIL Pipes verification of reports for the tests mentioned in Sl. No. 1 & 2 by BHEL & KPCL. For GI Pipes, Galvanising Check as per relevant standard shall be done. All material shall be as per approved data sheet in case of ambiguity in QAP, material as data sheet shall be final.													
Manufacturer / Sub Vendor SIGNATURES		Contractor		LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT P->Perform, V-> Verification, W-> Witness				For Client Use:-		Document No.:-			
				Name & Signature of Approving Authority with Seal									

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

Sl. No.		Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking			Remarks
1		2	3	4	5	6	7	8	9		10		11
									TYPE	D	M	C	K
1	Raw Material												
1.1	Scrap Receipt	Chemical	Major	Lab Analysis	Random Sample / Lot	Mfg's Std	Mfg's Std	Mfg's Log Sheet	-	P	-	-	
1.2	Ferro Alloys	Chemical	Major	Lab Analysis	Random Sample / Lot	Mfg's Std	Mfg's Std	Mfg's Log Sheet	-	P	-	-	
2	Final Inspection												
2.1	Product Analysis	Chemical Analysis	Major	Chemical	1 / heat	MBPL's Standard	MBPL's Standard	MTC	√	P	V**	V	** Chemical. Analysis to be Witnessed by Vendor
2.2	Leakage	Hydro Test	Major	Pressure Test	100%	Approved Drg / Data Sheet	No Leakage	IR	√	P	W*	W*	* 10% by Vendor / BHEL / CLIENT
2.3	Dimension	Dimension	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	√	P	W*	W*	
2.4	Hardness	Hardness	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR/TC	√	P	W*	W*	
Manufacturer / Sub Vendor			Contractor			LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT P->Perform, V-> Verification, W-> Witness		For Client Use:-		Document No.:-			
SIGNATURES													Name & Signature of Approving Authority with Seal


Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking				Remarks										
1	2	3	4	5	6	7	8	9	10				11										
								TYPE	D	M	C	K											
													S/Contactor :- Manufacturer :-			Manufacturing Quality Plan Item :- Knife Gate Valve Manual / Pneumatic QAP No. : LOI Nos:- Contractor :- M/s BHEL				Project:- Package :- Mill Rejects System Client :- Consultant :-			
1	Raw Material / Bought Out s																						
1.1	Body	Chemical & Mechanical	Major	Foundary TC	1 per Heat	Relevant IS / Appr. Drg / Data Sheet	Relevant IS / Appr. Drg / Data Sheet	TC	√	P/V	V	V											
1.2	Gate	do	Major	Lab Analysis	1 per lot	do	do	Mill / Lab TC	√	P/V	V	V											
1.3	Stem (For Manual Valve)	do	Major	Lab Analysis	1 per batch	do	do	do	√	P/V	V	V											
1.4	Pneumatic Cylinder (For Pneu. Valve)	Visual & Functional	Major	Mfr's TC Review	100%	Smooth Operation	Smooth Operation	Mfr's TC	√	P/V	V	V											
2 In - Process Inspection																							
2.1	Body, Gate	Dimensional	Major	Measurement	100%	Mfr's Drawing	In-Process Insp. Record	-		P	V	V	-> Test Pressure as per Data Sheet										
2.2	Body Shell Test	Leak Tightness	Major	Hydro Static Test #	100%	Approved Drg / Data Sheet	No Leakage	IR	√	P	V	V											
3 Final Inspection																							
3.1	Assembled Valve	Dimension	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	√	P	W	W	BHEL / Vendor/CLIENT to Witness 10 of Quantity.										
3.2	do	Function	Major	Operation	100%	Smooth Operation	Smooth Operation	IR	√	P	W	W											
3.3	do	Seat Leakage	Major	Hydro Static Test #	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	√	P	W	W											
Manufacturer / Sub Vendor		Contractor		LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT P->Perform, V-> Verification, W-> Witness			For Client Use:-		Document No.:-														
SIGNATURES		Name & Signature of Approving Authority with Seal																					

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

SI. No.		Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking				Remarks
1		2	3	4	5	6	7	8	9		10			11
									TYPE	D	M	C	K	
1		Raw Material / Bought Out s												
1.1	Cylinder	Chemical & Mechanical	Major	Mfr's TC	1 per Heat or Lot	Relevant IS / Appr. Drg / Data Sheet	Relevant IS / Appr. Drg / Data Sheet	TC	√	P/V	V	V		
1.2	Frame Head	do	Major	do	do	do	do	do	√	P/V	V	V		
1.3	Outer Head	do	Major	do	do	do	do	do	√	P/V	V	V		
1.4	Crank Shaft	do	Major	do	do	do	do	do	√	P/V	V	V		
1.5	Connecting Rod	do	Major	do	do	do	do	do	√	P/V	V	V		
1.6	Temp. Switch	Mfr's TC	Major	Visual Review	100%	do	do	do	√	V	V	V		
1.7	Control Panel	Mfr's TC	Major	Visual Review	100%	do	do	do	√	V	V	V		
2		In - Process Inspection												
2.1	Cylinder, Frame Head & Outer Head	Leak Tightness	Major	Hydro Static Test	100%	Appr. drg. / Data Sheet	No Leakage	IR	√	P	V	V		
2.2	After Cooler	Leak Tightness	Major	Hydro Static Test	100%	Approved Drg / Data Sheet	No Leakage	IR	√	P	V	V		
3		Final Inspection												
3.1	After Cooler	Dimension / Visual	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	√	P	W	W		
3.2	Control Panel	Dimension / Visual	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	√	P	W	W		
3.3	Compressor Assly	Nozzle Test (Mech. Run Test)	Major	Performance	100%	Approved Drg / Data Sheet / BS 1571 Part-2	Approved Drg / Data Sheet	IR	√	P	W	W		
Manufacturer / Sub Vendor		Contractor		LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT P->Perform, V-> Verification, W-> Witness				For Client Use:-		Document No.:-				
SIGNATURES								Name & Signature of Approving Authority with Seal						

Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

		S/Contactor :- Manufacturer :-			Manufacturing Quality Plan Item :- Sump Pump QAP No. :- LOI Nos:- Contractor :- M/s BHEL			Project:- Package :- Mill Rejects System Client - Consultant :- .					
Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
1	Raw Material / Bought Outs												
1.1	Casing	Chemical, Mechanical, Hardness, Surface Defect	Major	Chem. Comp. Mechanical Hardness Visual	1 per Heat 1 per Heat 1 Per Heat 100 %	Relevant IS / Appr. Drg / Data Sheet	Relevant IS / Appr. Drg / Data Sheet	TC	√	P/V	V	V	
1.2	Impeller	do	Major	do	do	do	do	do	√	P/V	V	V	
1.3	Shaft	Chemical, Mechanical, Surface Defect	Major	Chem. Comp. Mechanical Visual & UT if Dia >50 mm	1 per Heat 1 per Heat 100 %	Relevant IS / Appr. Drg / Data Sheet / ASTM E 388 for UT	Relevant IS / Appr. Drg / Data Sheet / ASTM E 388	do	√	P/V	V	V	
1.4	Shaft Sleeve	Chemical Hardness	Major	Chem. Comp. Hardness	do	do	do	do	√	P/V	V	V	
2	In - Process Inspection												
2.1	Casing	Soundness of Casting / Leakage	Major	Hydro Static Test	100%	Appr drg. / Data Sheet / IS 5120	No Leakage	IR	√	P	V	V	Hyd. Test at 200% of pump rated head or 150% of Shut off head which ever is higher for 30 min.
2.2	Impeller	Residual unbalance	Major	Dyanamic / Static Balancing	100%	Approved Drg / Data Sheet / ISO 1940 Gr. 6.3	ISO 1940 Gr. 6.3	IR	√	P	V	V	

Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking				Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	K	
3	Final Inspection												
3.3	Performance Test with Calibrated Test Lab Motor	Q Vs Head, Power & Efficiency, Noise & Vibration	Major	Measurement & Curves	100%	Approved Drg / Data Sheet / HIS	Approved Drg / Data Sheet / HIS	IR	√	P	W	W	Noise - 85 db max. & Vibration - 50 microns max.
3.2	Pump strip test in case of doubt due to abnormal sound	Undue Wear	Major	Visual / Strip Test	100%	Mfr's Standard	No Undue Wear	IR	√	P	W	W	
3.3	Painting	Visual & Measurement	Major	Visual & Measurement	100%	As per approved Painting Schedule	As per approved Painting	IR	-	P	-	-	
Manufacturer / Sub Vendor		Contractor	LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT P->Perform, V-> Verification, W-> Witness				For Client Use:-		Document No.:-				
SIGNATURES							Name & Signature of Approving Authority with Seal						


Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final

Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking					Remarks	
1	2	3	4	5	6	7	8	9	10					11	
								TYPE	D	M	C	K			
1	Raw Material														
1.1	Bellows	physical & Chemical	Major	Lab Analysis	1 per Heat	AS204 TP304/ Approved Drg.	AS204 TP304/ Approved Drg.	MTC	√	V	V	V			
1.2	Fianges/ End Pipe	physical & Chemical	Major	Lab Analysis	1 per lot	IS 2062 / Approved Drg.	IS 2062 / Approved Drg.	MTC	√	V	V	V			
2	In - Process Inspection														
2.1	Bellows & Pipe ** For Bellows	Dimension Soundness Of Weld of L-Seam	Major major	Measurement DPT **(Before & After Forming)	100% 100%	Approved Drg. ASTM E- 165	Approved Drg. No Cracks/ Linear Indication	IR IR	√	P P	V V	V V			
3	Final Inspection														
3.1	Assembly	DP Test of Fillet Weld of Bellows to Pipe & Pipe to Fiange	Major	visual	100%	ASTM E-165	No Crack / Linear Inication	IR	√	P	W	V			
3.2	Testing	Dimensions pressure	Major Critical	Measurement Hydraulic	100% 100%	Approved Drg EJMA D.3.2.1/ Data sheet	Approved Drg EJMA D.3.2.1/ Approved Drg.	IR IR	√ √	P P	W W	W W			
		Spring Rate Test (Axial)	Critical	Stiffness Test	100%	EJMA / Data Sheet	EJMA / Data Sheet	IR	√	P	W	W			
		Deflection	Critical	Deflection Test	100%	EJMA / Data Sheet	EJMA/Data Sheet	IR	√	p	W	W			
3.30	Painting	Visual/ Measurement	Major	DFT	100%	Approved Painting Schedule	Approved Painting Schedule	IR	√	p					
LEGENDS:-							For Client Use:-		Document No.:-						
Records identified by √ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report															
Manufacturer / Sub Vendor		Contractor		M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT											
SIGNATURES		P->Perform, V-> Verification, W-> Witness			Name & Signature of Approving Authority with Seal										


Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final


Sl. No.		Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking				Remarks
1		2	3	4	5	6	7	8	9	10				11
									TYPE	D	M	C	N	
1		Materials CRCA Sheet	Visual Chem. & Physical. Thickness	Major Major Major	Visual Chem.& Physical. Measurement	100% 100% 100%	Appr. Drg / IS: 513 Do App. Drawing	Appr. Drg / IS: 513 Do App. Drawing	IR TC IR/TC	- √ √	P V V	- V V	- V V	
2		Bought outs Verification of type, size & Make of FLV unit, PG, PS, SV	Visual	Major	Visual	100%	Appr. Drawing / Data Sheet	Approved Drawing / Data Sheet	IR/TC	√	V	V	V	
3		Painting Pre Treatment 7 tank process	Physical	Major	DFT / Shade / Finish	100%	Appr. Painting Schedule	Appr. Painting Schedule	IR/TC	√	V	V	V	
4		Final Inspection	Visual	Major	Visual	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	√	P	W	V	
			Dimension	Major	Measurement	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	√	P	W	V	
			Check for Pneumatic Circuit	Major	Visual	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	√	P	W	V	
			Check for Wiring / Mountings / Terminations	Major	Visual / Continuity	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	√	P	W	V	
			Functional Check for Solenoid Valve	Major	Functional	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	√	P	W	V	
5		QA Documents	Review	Major	verification	100%	-	-	-					
Manufacturer / Sub Vendor		Contractor					LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC-Test Certificate , IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N ->CLIENT P->Perform, V-> Verification, W-> Witness			For Client Use:-		Document. No.:		
SIGNATURES							Name & Signature of Approving Authority with Seal							


SI. No.		Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1		2	3	4	5	6	7	8	9		10			11
									TYPE	D	M	C	N	
Raw Materials														
1	1.1	Dome & dome Valve Body	Dimensions Surface Defects Physical Check Chemical Check	Major	Measurement Visual TS & Hardness Chemical Comp.	100% 100% 1/Heat 1/Heat	App. Drg. / Data Sheet / Standard	App. Drg. / Data Sheet / Standard	- - TC TC	- - √ √	P P P/V P/V	- - V V	- - V V	
	1.2	Plates for Vessel	Dimensions Surface Defects Physical Check Chemical Check	Major	Measurement Visual TS & Elongation Chemical Comp.	100% 100% 1/Heat 1/Heat	App. Drg. / Data Sheet / IS Standard	App. Drg. / Data Sheet / IS Standard	- - TC TC	- - √ √	P P P/V P/V	- - V V	- - V V	
	1.3	Insert Seal	Surface Defects Hardness	Major	Visual Measurement	100% 1/Lot	Mfr's Drg. / Std	Mfr's Drg. / Std	- IR	- √	P P/V	- V	- V	
	1.4	Shaft	Physical Check Chemical Check	Major	TS & Elongation Chemical Comp.	1/Heat 1/Heat	App. Drg./ IS Std.	App. Drg./ IS Std.	TC	√	P/V	V	V	
In - Process Insp.														
	2.1	Welders & Welding	WPS / PQR / WPQ Welding Defects	Major Major Major	Procedure / Qualification DPT on Root run DPT on Final run	100% 100% 10%	ASME sec - IX ASTM E-165 ASTM E-165	ASME sec - IX ASTM E-165 ASTM E-165	WPS / PQR IR IR	√ √ √	P/V P/V P/V	V V V	V V V	Welders to be approved by BHEL / CLIENT
	2.3	Machining of Dome & dome Valve	Visual & Dimension	Minor	Visual, Measurement	100%	Mfr's Drg / Standard	Mfr's Drg / Standard	-	-	P	-	-	
	2.4	Hydotest of Vessel	Soundness / Leakage	Major	Visual, Hydro Pressure Test	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	√	P/V	W	W	
Final Inspection														
	3.1	Final Assly	Completeness & Dimension	Major	Visual / Measurement	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	√	P/V	W	W	At Painted Condition
	3.2	Run Test / Performance	Operation of Dome Valve	Minor	Visual, 5 times Cycle operation	100%	Mfr's Standard	Mfr's Standard	IR	√	P/V	W	W	
	3.3	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	√	P/V	W	W	
QA Documentation														
	4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan	-		P/V	V	V	
Manufacturer / Sub Vendor		Contractor		LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC-Test Certificate , IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT P->Perform, V-> Verification, W-> Witness				For Client Use:-			Document No.			
SIGNATURES										Name & Signature of Approving Authority with Seal				


		S/Contractor :			Manufacturing Quality Plan			Project:					
		Mfr:- Works:-			Item :- Pyrite Hopper QAP No. LOI Nos Contractor :- M/s BHEL			Package :- Mill Rejects System Client :-					
Sl. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1	2	3	4	5	6	7	8	9		10			11
								TYPE	D	M	C	N	
1	Raw Materials												
1.1	Plates for Body	Dimensions Surface Defects Physical Check Chemical Check	Major	Measurement Visual TS & Elongation Chemical Comp.	100% 100% 1/Heat 1/Heat	App. Drg. / Data Sheet / IS Standard	App. Drg. / Data Sheet / IS Standard	- - MTC	- - √	P P P/V	- - V	- - V	
1.2	Spray Nozzle	Surface Defects Chemical Check Dimensions	Major	Visual Chemical Comp. Measurement	100% 1/Lot 100%	Mfr's Drg. / IS Standard	Mfr's Drg. / IS Standard	- MTC IR	- √ √	P P/V P	- V V	- V V	
2	In - Process Insp.												
2.1	Welders & Welding	WPS / PQR / WPQ Welding Defects	Major	Procedure / Qualification DPT on Root run DPT on Final run	100% 100% 10%	ASME sec - IX ASTM E-165 ASTM E-165	ASME sec - IX ASTM E-165 ASTM E-165	WPS / PQR IR IR	√ √ √	P/V P/V P/V	V V W	V V W	Welders to be approved by BHEL
2.2	Fabrication	Fit up, Marking, Cutting, Grinding	Minor	Visual, Measurement	100%	Mfr's Standard	Mfr's Standard	- -	- -	P P	- -	- -	
3	Final Inspection												
3.1	Final Assly	Completeness & Dimension	Major	Visual	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	√	P/V	W	W	* -> Witness 10%
3.2	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	-	P/V	W	-	Painting shall be Heat Resistance
4	QA Documentation												
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan	-	-	P/V	V	V	
Manufacturer / Sub Vendor		Contractor		LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC-Test Certificate , IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> Client P->Perform, V-> Verification, W-> Witness				For Client Use:-		Document No.:-			
SIGNATURES								Name & Signature of Approving Authority with Seal					


Sl. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking	Remarks					
1	2	3	4	5	6	7	8	9	10	11					
									TYPE	D	M	C	K		
1	Raw Materials														
1.1	Plates for Body	Dimensions Surface Defects Physical Check Chemical Check	Major	Measurement Visual TS & Elongation Chemical Comp.	100% 100% 1/Heat 1/Heat	App. Drg. / Data Sheet / IS Standard	App. Drg. / Data Sheet / IS Standard	- - MTC MTC	- - √ P/V √ P/V	- - V V	- - V V				
2	In - Process Insp.														
2.1	Welders Qualification & Welding	WPS / PQR / WPQ Welding Defects	Major	Procedure / Qualification DPT on Root run DPT on Final run	100% 100% 10%	ASME sec - IX ASTM E-165 ASTM E-165	ASME sec - IX ASTM E-165 ASTM E-165	WPS / PQR IR	√ P/V √ P/V	V V	V V				Welders to be approved by BHEL / KPCL
2.2	Flange Machining and Drilling	Dimensions	Major	Measurement	100%	Mfr/Appr. Drg	Mfr/Appr. Drg	IR	-	P	-	-			
2.3	Connection -pipe to flange, pipe to body	Fit up	Major	Joint set up, PCD, Orientation	100%	Mfr/Appr. Drg	Mfr/Appr. Drg	IR	-	P	-	-			If Applicable
2.4	Fabrication	Fit up, Marking, Cutting, Grinding	Minor	Visual, Measurement	100%	Mfr's Standard	Mfr's Standard	-	-	P	-	-			
3	Final Inspection														
3.1	Final Assly	Completeness & Dimension	Major	Visual	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	√ P/V	W	W				
3.2	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	-	P/V	W	-			Painting before disp.
4	QA Documentation														
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan		-	P/V	V	V			
Manufacturer / Sub Vendor		Contractor		LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC-Test Certificate , IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT P->Perform, V-> Verification, W-> Witness				For Client Use:-		Document No.:-					
SIGNATURES						Name & Signature of Approving Authority with Seal									


S/Contactor :-		Manufacturing Quality Plan						Project:-					
		Item :- Bunker Discharge Gate						Package :- Mill Rejects System					
		Mfg:- Works:-						Client :-					
		Contractor :- M/s BHEL						Consultant :-					
Sl. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records	Agency for Checking				Remarks
1	2	3	4	5	6	7	8	9	10				11
								TYPE	D	M	C	K	
1 Raw Materials													
1.1	Plates for Body	Dimensions Surface Defects Physical Check Chemical Check	Major	Measurement Visual TS & Elongation Chemical Comp.	100% 100% 1/Heat 1/Heat	App. Drg. / Data Sheet / IS Standard	App. Drg. / Data Sheet / IS Standard	- TC TC	- √ √	P P/V P/V	- V V	- V V	
1.2	Shaft	Physical Check Chemical Check UT If Dia > 50 mm	Major	TS & Elongation Chemical Comp. Internal defect	1/Heat 1/Heat 100%	do	do	TC TC IR	√ √ √	P/V P/V P/V	V V V	V V V	
1.3	Cylinder / Actuator	Visual / Specification	Major	Visual	100%	do	do	Mfr's TC	√	V	V	V	
2 In - Process Insp.													
2.1	Welders & Welding	WPS / PQR / WPC Welding Defects	Major Major Major	Procedure / Qualification DPT on Root run DPT on Final run	100% 100% 10%	ASME sec - IX ASTM E-165 ASTM E-165	ASME sec - IX ASTM E-165 ASTM E-165	WPS / PQR IR IR	√ √ √	P/V P/V P/V	V V W	V V V	Welders to be approved by BHEL / CLIENT
3 Final Inspection													
3.1	Final Assly	Completeness & Dimension	Major	Visual	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	√	P/V	W	W	
3.2	Operation with job / shop actuator	Opening & Closing of Gate	Major	Visual	100%	Proper Working	Smooth Operation	IR	√	P/V	W	W	
3.3	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	-	P/V	W	-	Painting before disp.
4 QA Documentation													
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan		-	P/V	V	V	
Manufacturer / Sub Vendor		Contractor		LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC - Test Certificate, IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N-> CLIENT P->Perform, V-> Verification, W-> Witness				For Client Use:-		Document No.:-			
SIGNATURES								Name & Signature of Approving Authority with Seal					


Sl. No.		Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks
1		2	3	4	5	6	7	8	9		10			11
									TYPE	D	M	C	K	
<div style="display: flex; justify-content: space-between;"> <div style="width: 15%;">  </div> <div style="width: 35%;"> S/Contactor :- Mfgr:- Works:- </div> <div style="width: 35%;"> Manufacturing Quality Plan Item :- Pressure Relief Valve QAP No. : LOI Nos:- Contractor :- M/s BHEL </div> <div style="width: 15%;"> Project:- Package :- Mill Rejects System Client :- . Consultant :- </div> </div>														
1 Raw Materials														
1.1	Plates for Body	Dimensions Surface Defects Physical Check Chemical Check	Major	Measurement Visual TS & Elongation Chemical Comp.	100% 100% 1/Heat 1/Heat	App. Drg. / Data Sheet / IS Standard	App. Drg. / Data Sheet / IS Standard	- - MTC MTC	- - √ √	P P P/V P/V	- - V V	- - V V	- - V V	
2 In - Process Insp.														
2.1	Welders & Welding	WPS / PQR / WPQ Welding Defects	Major Major Major	Procedure / Qualification DPT on Root run DPT on Final run	100% 100% 10%	ASME sec - IX ASTM E-165 ASTM E-165	ASME sec - IX ASTM E-165 ASTM E-165	WPS / PQR IR IR	√ √ √	P/V P/V P/V	V V W	V V V	V V V	Welders to be approved by BHEL / KPCL
2.2	Fabrication	Fit up, Marking, Cutting, Grinding	Minor	Visual, Measurement	100%	Mfr's Standard	Mfr's Standard	-	-	P	-	-	-	
3 Final Inspection														
3.1	Final Assly	Completeness & Dimension	Major	Visual	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	√	P/V	W	W	W	
3.2	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	-	P/V	W	-	-	Painting before disp.
4 QA Documentation														
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan	-	-	P/V	V	V	V	
Manufacturer / Sub Vendor		Contractor		LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC-Test Certificate , IR - Insp. Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT P->Perform, V-> Verification, W-> Witness				For Client Use:-		Document No.:-				
SIGNATURES								Name & Signature of Approving Authority with Seal						


		S/Contactor :-			Manufacturing Quality Plan			Project:-						
		Mfrgr:-			Item :- Air Receiver			Package :- Mill Rejects System						
		Works:-			QAP No. :-			Client :-						
					Contractor :- M/s BHEL			Consultant :-						
Sl. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records		Agency for Checking			Remarks	
1	2	3	4	5	6	7	8	9		10			11	
								TYPE	D	M	C	K		
1	Raw Materials													
1.1	Plates for Shell, Dished End & Flange	Dimensions Surface Defects Physical Check Chemical Check	Major	Measurement Visual TS & Elongation Chemical Comp.	100% 100% 1/Heat 1/Heat	App. Drg. / Data Sheet / IS Standard	App. Drg. / Data Sheet / IS Standard	- - TC TC	- - √ √	P P P/V P/V	- - V V	- - V V	- - V V	
1.2	Formed Dished End	Dimensions Thickness/Thinning DPT of Knuckle	Major	Measurement Measurement DP Test	100% 100% 100%	App. Drg. / Data Sheet ASTM E-165	App. Drg. / Data Sheet ASTM E-165	IR IR TC	√ √ √	P P P/V	- - V	- - V	- - V	
2	In - Process Insp.													
2.1	Welders & Welding	WPS / PQR / WPQ Welding Defects do do	Major Major Major Critical	Procedure / Qualification DPT on Root run DPT on Final run Radiography Test on all C/S & L/S including T & X	100% 100% 10% 100%	ASME sec - IX ASTM E-165 ASTM E-165 IS 2825 Class-II / ASME Sec VIII	ASME sec - IX ASTM E-165 ASTM E-165 IS 2825 Class II / ASME Sec VIII	WPS / PQR IR IR RT Film / Report	√ √ √ √	P/V P/V P/V P/V	V V V V	V V V V	V V V V	Welders to be approved by BHEL / CLIENT
2.2	Fabrication	Marking, Cutting, Rolling, Edge Preparation, Joint & Nozzle set up	Major	Visual, Measurement (Ovality, off set orientation)	100%	Mfr's Standard / Approved Drg.	Mfr's Standard / Approved Drg.	IR	-	P	-	-	-	
3	Final Inspection													
3.1	Final Assly	Completeness & Dimension	Major	Visual / Measurement	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	√	P/V	W	W	W	
3.2	Hydotest of Vessel	Soundness / Leakage	Major	Visual, Hydro Pressure Test	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	√	P/V	W	W	W	
3.3	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR		P/V	W	-	-	Painting before disp.
4	QA Documentation													
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan	-	-	P/V	V	V	V	
Manufacturer / Sub Vendor SIGNATURES		Contractor		LEGENDS:- Records identified by √ shall be essentially included in QA documentation. TC -> Test Certificate , IR - Inspection Report M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N-> CLIENT P->Perform, V-> Verification, W-> Witness			For Client Use:-			Document No.:-			Name & Signature of Approving Authority with Seal	


		QUALITY PLAN SHEET 1 OF 9			CUSTOMER :			PROJECT			SPECIFICATION :		
					BIDDER/ VENDOR			TITLE			NUMBER :		
SYSTEM		ITEM: AC ELECT. MOTORS 75KW & ABOVE (LV & MV)			SECTION			VOLUME III					
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
									P	W	V		
1	2	3	4	5	6	7	8	9	10			11	
1.0	RAW MATERIAL & BROUGHT CONTROL												
1.1	SHEET STEEL, PLATES, SECTION, EYEBOLTS	1.SURFACE CONDITION	MA	VISUAL	100%	-	FREE FROM BLINKS, CRACKS, WAVINESS ETC	LOG BOOK	3	-	-		
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANFR'S DRG./SPEC	MANFR'S DRG./SPEC	-DO-	3	-	-		
		3.PROOF LOAD TEST (EYE BOLT)	MA	MECH. TEST	-DO-	-DO-	-DO-	INSPEC. REPORT	3	-	-		
1.2	HARDWARES	1.SURFACE CONDITION	MA	VISUAL	100%		FREE FROM CRACKS, UN-EVENNESS ETC.	-DO-	3	-	-		
		2.PROPERTY CLASS	MA	VISUAL	SAMPLES	MANFR'S DRG./SPEC BOOK	RELEVANT IS/SPEC.	SUPPLIERS TC & LOG	3	-	2	PROPERTY CLASS MARKING SHALL BE CHECKED BY THE VENDOR	
1.3	CASTING	1.SURFACE CONDITION	MA	VISUAL	100%		FREE FROM CRACKS, BLOW HOLES ETC.	LOG BOOK	3	-	-		
		2.CHEM. & PHY. PROP.	MA	CHEM & MECH TEST	1/HEAT NO.	MANFR'S DRG./SPEC	RELEVANT IS/	SUPPLIER'S TC	3	-	2	HEAT NO. SHALL BE VERIFIED	
		3.DIMENSIONS	MA	MEASUREMENT	100%	MANUFR'S DRG.	MANUFR'S DRG.	LOG BOOK	3	-	-		
1.4	PAINT & VARNISH	1.MAKE, SHADE, SHELF LIFE & TYPE	MA	VISUAL	100% CONTINUOUS	MANFR'S DRG./SPEC	MANFR'S DRG./SPEC	LOG BOOK	3	-	-		
BHEL			PARTICULARS			BIDDER/VENDOR							
			NAME										
			SIGNATURE										
			DATE						BIDDER'S/VENDORS COMPANY SEAL				


		QUALITY PLAN SHEET 2 OF 9		CUSTOMER :			PROJECT TITLE			SPECIFICATION NUMBER :		
				BIDDER/ VENDOR SYSTEM			QUALITY PLAN NUMBER PED-506-00-Q-007/2			SPECIFICATION TITLE		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			VOLUME III
1	2	3	4	5	6	7	8	9	P	W	V	REMARKS
1.5	SHAFT (FORGED OR ROLLED)	1. SURFACE COND.	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	-	VENDOR'S APPROVAL IDENTIFICATION SHALL BE MAINTAINED
		2. CHEM. & PHYSICAL PROPERTIES	MA	CHEM. & PHYSICAL TESTS	1/HEAT NO. OR HEAT TREATMENT BATCH NO	MFG. DRG. SPEC.	RELEVANT IS	SUPPLIER'S TC	3	-	2	
		3. DIMENSIONS	MA	MEASUREMENT	100%	-DO-	MANUFR'S DRG.	LOG BOOK	3	-	-	
		4. INTERNAL FLOWS	CR	UT	-DO-	ASTM-A388	MANUFR'S SPEC. BHEL SPEC.	-DO-	3	2	1	
1.6	SPACE HEATERS, CONNECTORS, TERMINAL BLOCKS, CABLES, CABLE LUGS, CARBON BRUSH TEMP. DETECTORS, RTD, BTD'S	1. MAKE & RATING	MA	VISUAL	-DO-	MANUFR'S DRG. SPEC.	MANUFR'S DRG. SPEC.	-DO-	3	-	-	
		2. PHYSICAL COND.	MA	-DO-	-DO-	-	NO BREAKAGE ON OTHER PHY. DESIGN	-DO-	3	-	-	
		3. DIMENSIONS (WHEREVER APPLICABLE)	MA	MEASUREMENT	SAMPLE	MANUFR'S DRG./ SPEC.	MANUFR'S DRG. / SPEC.	-DO-	3	-	-	
		4. PERFORMANCE/ CALIBRATION	MA	TEST	100%	-DO-	-DO-	INSP. REPORT	3	-	-	
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			


		QUALITY PLAN			CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :		
					BIDDER/ VENDOR			QUALITY PLAN NUMBER PED-506-00-Q-007/2			SPECIFICATION : TITLE		
SHEET 3 OF 9		SYSTEM			ITEM: AC ELECT. MOTORS 75KW & ABOVE (LV & MV)			SECTION			VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
									P	W	V		
1	2	3	4	5	6	7	8	9	10			11	
1.7	OTHER INSULATING MATERIALS LIKE SLEEVES, BINDINGS CORDS, PAPERS, PRESS BOARDS ETC.	1. SURFACE COND. 2. OTHER CHARACTERISTICS	MA MA	VISUAL TEST	100% SAMPLE	- MANUF'S SPEC.	NO VISUAL DEFECTS MANUF'S SPEC.	INSPT. REPORT LOG BOOK AND OR SUPPLIER'S TC	3 3	- -	- 2		
1.8	SHEET STAMPING (PUNCHED)	1. SURFACE COND. 2.DIMENSIONS INCLUDING BURS HEIGHT 3. ACCEPTANCE TESTS	MA MA MA	VISUAL MEASUREMENT ELECT. & MECH TESTS	100% SAMPLE -DO-	- MANUFR'S DRG. . MANUF'S SPEC./ RELEVANT IS	NO VISUAL DEFECTS (FREE FROM BURS) MANUFR'S DRG. RELEVANT IS	LOG BOOK -DO- SUPPLIER'S TC	3 3 3	- - -	- 2 2	FOR MV MOTOR INSULATION/VARNISH THICKNESS SHALL BE MORE THAN THE BURS HEIGHT	
1.9	CONDUCTORS	1. SURFACE FINISH 2.ELECT. PROP. & MECH. PROP	MA MA	VISUAL ELECT. & MECH.TEST	100% SAMPLES	- RELEVANT IS/ BS OR OTHER STANDARDS	FREE FROM VISUAL DEFECTS RELEVANT IS/ BS OR OTHER STANDARDS	LOG BOOK SUPPLIERS TC & VENDOR'S INSPN. REPORTS	3 3/2	- -	- 2		
BHEL			PARTICULARS			BIDDER/VENDOR							
			NAME										
			SIGNATURE										
			DATE						BIDDER'S/VENDORS COMPANY SEAL				


		QUALITY PLAN SHEET 4 OF 9			CUSTOMER :			PROJECT			SPECIFICATION :		
					BIDDER/ VENDOR			TITLE			NUMBER :		
SYSTEM		ITEM: AC ELECT. MOTORS 75KW & ABOVE (LV & MV)			SECTION			VOLUME III					
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
									P	W	V		
1	2	3	4	5	6	7	8	9	10			11	
1.10	BEARINGS	3.DIMENSIONS	MA	MEASUREMENT	-DO-	-DO-	-DO-	Log Book	3	-	-		
		1.MAKE & TYPE	MA	VISUAL	100%	MANFR'S DRG.	MANFR'S DRG.	-DO-	3	-	-		
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	BHEL DATA SHEET	BHEL DATA SHEET BEARING MANUF'S CATALOGUES	-DO-	3	-	-		
1.11	SLIP RING	3.SURFACE FINISH	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	-		
		1.SURFACE COND.	MA	VISUAL	100%	-	-DO-	-DO-	3	-	-		
		2.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANUF'S DRG	MANUF'S DRG	-DO-	3	-	-		
		3.TEMP.WITH-STAND CAPACITY	MA	ELECT.TEST	-DO-	MANUF'S SPEC.	MANUF'S SPEC.	-DO-	3	-	-		
1.12	OIL SEALS & GASKETS	4.HV/IR	MA	-DO-	100%	-DO-	-DO-	-DO-	3	-	-		
		1.MATERIAL OF GASKET	MA	VISUAL	100%	MANUF'S DRG/SPECS	MANUF'S DRG./ SPECS.	-DO-	3	-	-		
		2.SURFACE COND.	MA	VISUAL	100%	-	FREE FROM VISUAL DEFECTS	-DO-	3	-	-		
		3.DIMENSIONS	MA	MEASUREMENT	SAMPLE	MANUF'S DRG	MANUF'S DRG	-DO-	3	-	-		
BHEL			PARTICULARS			BIDDER/VENDOR							
			NAME										
			SIGNATURE										
			DATE						BIDDER'S/VENDORS COMPANY SEAL				


		QUALITY PLAN			CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :		
					BIDDER/ VENDOR			QUALITY PLAN NUMBER PED-506-00-Q-007/2			SPECIFICATION : TITLE		
SHEET 5 OF 9		SYSTEM			ITEM: AC ELECT. MOTORS 75KW & ABOVE (LV & MV)			SECTION			VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
									P	W	V		
1	2	3	4	5	6	7	8	9	10			11	
2.0	IN PROCESS												
2.1	STATOR FRAME WELDING (IN CASE OF FABRICATED STATOR)	1.WORKMANSHIP & CLEANNESS	MA	VISUAL	100%	-DO-	GOOD FINISH	LOG BOOK	3	-	-		
		2.DIMENSIONS	MA	MEASUREMENT	-DO-	MANUF'S DRG	MANUF'S DRG	-DO-	3	-	-		
2.2	MACHINING	1.FINISH	MA	VISUAL	100%	-DO-	GOOD FINISH	LOG BOOK	3	-	-		
		2.DIMENSIONS	MA	MEASUREMENT	-DO-	MANUF'S DRG	MANUF'S DRG	-DO-	3	-	-		
		3.SHAFT SURFACE FLOWS	MA	PT	-DO-	RELEVANT SPEC./ ASTM-E165	MANUF'S SPEC./ BHEL SPEC./	-DO-	3	-	1		
2.3	PAINTING	1.SURFACE PREPARATION	MA	VISUAL	100%	MANFR'S SPEC/BHEL SPEC./ RELEVANT STAND	BHEL SPEC. SAME AS COL.7	LOG BOOK	3	-	-		
		2.PAINT THICKNESS (BOTH PRIMER & FINISH COAT)	MA	MEASUREMENT BY ELCOMETER	SAMPLE	-DO-	-DO-	-DO-	3	-	2		
		3.SHADE	MA	VISUAL	-DO-	-DO-	-DO-	Log Book	3	-	-		
		4.ADHESION	MA	CROSS CUTTING & TAPE TEST	-DO-	-DO-	-DO-	Log Book	3	-	-		
BHEL			PARTICULARS			BIDDER/VENDOR							
			NAME										
			SIGNATURE										
			DATE						BIDDER'S/VENDORS COMPANY SEAL				


		QUALITY PLAN			CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :		
					BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-506-00-Q-007/2			SPECIFICATION : TITLE		
		SHEET 6 OF 9			SYSTEM			ITEM: AC ELECT. MOTORS 75KW & ABOVE (LV & MV)			SECTION		VOLUME III
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
									P	W	V		
1	2	3	4	5	6	7	8	9	10			11	
2.4	SHEET STACKING	1.COMPLETENESS	MA	MEASUREMENT	SAMPLE	MANUFR'S SPEC.	MANUFR'S SPEC.	Log Book	3	-	-	(FOR MOTORS OF 2MW AND ABOVE)	
		2.COMPRESSION & TIGHTENING	MA	MEASUREMENT	100%	-DO-	-DO-	Log Book	3	-	-		
		3.CORE LOSS & HOTOPT	MA	ELECT.TEST	-DO-	-DO-	-DO-	Log Book	3	-	2		
2.5	WINDING	1.COMPLETENESS	CR	VISUAL	100%	MANUFR'S SPEC./BHEL SPEC.	MANUFR'S SPEC./BHEL SPEC.	Log Book	3	-	-	FOR MV MOTOR	
		2.CLEANLINESS	CR	-DO-	-DO-	-DO-	-DO-	Log Book	3	-	-		
		3.IR-HV-IR	CR	ELECT. TEST	-DO-	-DO-	-DO-	Log Book	3	-	-		
		4.RESISTANCE	CR	-DO-	-DO-	-DO-	-DO-	Log Book	3	-	2		
		5.INTERTURN INSULATION	CR	-DO-	-DO-	-DO-	-DO-	Log Book	3	2	-		
		6.SURGE WITH STAND AND TAN. DELTA TEST	CR	-DO-	-DO-	-DO-	-DO-	Log Book	3	2	1		
2.6	IMPREGNATION	1.VISCOSCITY	MA	PHY. TEST	AT STARTING	-DO-	-DO-	Log Book	3	-	-	THREE DIPS TO BE GIVEN	
		2.TEMP. PRESSURE VACCUM	MA	PROCESS CHECK	CONTINUOUS	-DO-	-DO-	Log Book	3	-	-		
		3.NO. OF DIPS	MA	-DO-	-DO-	-DO-	-DO-	Log Book	3	-	2		
BHEL			PARTICULARS			BIDDER/VENDOR							
			NAME										
			SIGNATURE										
			DATE						BIDDER'S/VENDORS COMPANY SEAL				

		QUALITY PLAN		CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :		
				BIDDER/ VENDOR			QUALITY PLAN NUMBER PED-506-00-Q-007/2			SPECIFICATION : TITLE		
SHEET 7 OF 9		SYSTEM			ITEM: AC ELECT. MOTORS 75KW & ABOVE (LV & MV)			SECTION		VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
2.7	COMPLETE STATOR ASSEMBLY	4.DURATION	MA	-DO-	-DO-	-DO-	-DO-	Log Book	3	-	2	VERIFICATION FOR MV MOTOR ONLY
		1.COMPACTNESS & CLEANLINESS	MA	VISUAL	100%	-DO-	-DO-	Log Book	3	-	-	
2.8	BRAZING/COMPRESSION JOINT	1.COMPLETENESS	CR	-DO-	-DO-	-DO-	-DO-	Log Book	3	-	-	
		2.SOUNDNESS	CR	MALLET TEST & MV TEST	-DO-	-DO-	-DO-	Log Book	3	-	-	
		3.HV	MA	ELECT. TEST	-DO-	-DO-	-DO-	Log Book	3	-	-	
2.9	COMPLETE ROTOR ASSEMBLY	1.RESIDUAL UNBALANCE	CR	DYN. BALANCE	-DO-	MFG SPEC./ ISO 1940	MFG. DWG.	Log Book	3	2	1	
		2.SOUNDNESS OF DIE CASTING	CR	ELECT. (GROWLER TEST)	-DO-	MFG. SPEC.	MFG. SPEC.	Log Book	3	2	-	
2.10	ASSEMBLY	1.ALIGNMENT	MA	MEAS.	-DO-	-DO-	-DO-	Log Book	3	-	-	
		2.WORKMANSHIP	MA	VISUAL	-DO-	-DO-	-DO-	Log Book	3	-	-	
		3.AXIAL PLAY	MA	MEAS.	-DO-	-DO-	-DO-	Log Book	3	-	2	
		4.DIMENSIONS	MA	-DO-	-DO-	MFG.DRG./ MFG SPEC.	MFG. DRG/ RELEVANT IS	Log Book	3	-	-	
		5.CORRECTNESS, COMPLETENESS TERMINATIONS/ MARKING/ COLOUR CODE	MA	VISUAL	100%	MFG SPEC. RELEVANT IS	MFG SPEC. RELEVANT IS	Log Book	3	-	-	
BHEL			PARTICULARS		BIDDER/VENDOR							
			NAME									
			SIGNATURE									
			DATE					BIDDER'S/VENDORS COMPANY SEAL				

		QUALITY PLAN			CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :		
					BIDDER/ VENDOR SYSTEM			QUALITY PLAN NUMBER PED-506-00-Q-007/2			SPECIFICATION : TITLE		
SHEET 8 OF 9					ITEM: AC ELECT. MOTORS 75KW & ABOVE (LV & MV)			SECTION			VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
									P	W	V		
1	2	3	4	5	6	7	8	9	10			11	
3.0	TESTS	1.TYPE TESTS INCLUDING SPECIAL TESTS AS PER BHEL SPEC.	MA	ELECT.TEST	1/TYPE/SIZE	IS-325/ BHEL SPEC./ DATA SHEET	IS-325/ BHEL SPEC./ DATA SHEET	TEST REPORT	3	1	1,2	NOTE - 1	
		2.ROUTINE TESTS INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	-DO-	-DO-	-DO-	3	1,2	1,2	NOTE - 2	
		3.VIBRATION	MA	-DO-	100%	IS-12075	IS-12075	-DO-	3	1,2	-		
		4.OVERALL DIMENSIONS AND ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPC. REPORT	3	2,1	-		
		5.DEGREE OF PROTECTION	MA	ELECT. & MECH. TEST	1/TYPE/ SIZE	RELEVANT IS	BHEL SPEC. AND DATA SHEET	TC	3	-	2,1	TC FROM AN INDEPENDENT LABORATORY NOTE-3	
		6.NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPC. REPORT	3	2,1	-		
		7.EXPLOSION FLAME PROOF NESS (IF SPECIFIED)	MA	EXPLOSION FLAME PROOF TEST	1/TYPE	IS-3682 IS-8239 IS-8240	IS-3682 IS-8239 IS-8240	TC	3	-	2,1	NOTE-3	
		8.PAINT SHADE, THICKNESS & FINISH	MA	VISUAL & MEASUREMENT BY ELKOMETER	SAMPLE	BHEL SPEC. & DATA SHEET	BHEL SPEC. & DATA SHEET	TC	3	2,1	-	SAMPLING PLAN TO BE DECIDED BY INSPECTION AGENCY	
BHEL			PARTICULARS			BIDDER/VENDOR							
			NAME										
			SIGNATURE										
			DATE						BIDDER'S/VENDORS COMPANY SEAL				

		QUALITY PLAN			CUSTOMER :			PROJECT TITLE			SPECIFICATION : NUMBER :	
		SHEET 9 OF 9			BIDDER/ VENDOR :			QUALITY PLAN NUMBER PED-506-00-Q-007/2			SPECIFICATION : TITLE	
SYSTEM			ITEM: AC ELECT. MOTORS 75KW & ABOVE (LV & MV)			SECTION		VOLUME III				
SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
<p>NOTES:</p> <p>1 DEPENDING UPON THE SIZE AND CRITICALLY, WITNESSING BY BHEL SHALL BE DECIDED.</p> <p>2 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON.</p> <p>3 IN CASE TEST CERTIFICATES FOR THESE TESTS ON SIMILAR TYPE, SIZE AND DESIGN OF MOTOR FROM INDEPENDENT LABORATORY ARE AVAILABLE, THESE TEST MAY NOT BE REPEATED.</p> <p>4 WHEREVER CUSTOMER IS INVOLVED IN INSPECTION WITH THE CUSTOMERS, AGENCY (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER.</p>												
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

		QUALITY PLAN			CUSTOMER :			PROJECT			SPECIFICATION :		
					BIDDER/ VENDOR			TITLE			NUMBER :		
SHEET 1 OF 2		SYSTEM			ITEM AC ELECT. MOTORS BELOW 75KW (LV)			SECTION			VOLUME III		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS	
									P	W	V		
1	2	3	4	5	6	7	8	9	10			11	
1.0	PAINTING	1.SHADE	MA	VISUAL	SAMPLE	MANUFR'S SPEC/BHEL SPEC./RELEVANT STANDARD	BHEL SPEC. SAME AS COL.7	LOG BOOK	3	-	-		
2.0	ASSEMBLY	1.WORKMANSHIP	MA	VISUAL	100%	MANUF'S SPEC	MANUF'S SPEC	-DO-	3	-	-		
		2.DIMENSIONS	MA	-DO-	-DO-	MFG. DRG./ MFG. SPEC.	MFG. DRG./ MFG. SPEC.	-DO-	3	-	-		
		3.CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOUR CODE	MA	VISUAL	100%	MFG.SPEC./ RELEVANT IS	MFG.SPEC. RELEVANT IS	-DO-	3	-	-		
3.0	TESTS	1.ROUTINE TEST INCLUDING SPECIAL TEST AS PER BHEL SPEC.	MA	-DO-	100%	IS-325/ BHEL SPEC./ DATA SHEET	SAME AS COL.7	TEST REPORT	3	2,1	2,1	NOTE -1	
		2.OVERALL DIMENSIONS & ORIENTATION	MA	MEASUREMENT & VISUAL	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET & RELEVANT IS	INSPN. REPORT	2	1	-		
BHEL			PARTICULARS			BIDDER/VENDOR							
			NAME										
			SIGNATURE										
			DATE						BIDDER'S/VENDORS COMPANY SEAL				

		QUALITY PLAN		CUSTOMER :			PROJECT TITLE			SPECIFICATION :		
				BIDDER/ :			QUALITY PLAN			NUMBER :		
SHEET 2 OF 2		VENDOR			NUMBER PED-506-00-Q-006/0			SPECIFICATION :				
SYSTEM		ITEM AC ELECT. MOTORS BELOW 75KW (LV)			SECTION			VOLUME III				
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	
1	2	3	4	5	6	7	8	9	10			11
		3.NAMEPLATE DETAILS	MA	VISUAL	100%	IS-325 & DATA SHEET	IS-325 & DATA SHEET	INSPN. REPORT	3	1	-	
	NOTES:	<p>1 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON</p> <p>2 WHERE EVER CUSTOMER IS INVOLVED IN INSPECTION, (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER.</p> <p>3 FOR EXHAUST/VENTILATION FAN MOTORS OF RATING UPTO 1.5KW , ONLY ROUTINE TEST CERTIFICATES SHALL BE FURNISHED FOR SCRUTINY.</p>										
BHEL			PARTICULARS			BIDDER/VENDOR						
			NAME									
			SIGNATURE									
			DATE						BIDDER'S/VENDORS COMPANY SEAL			

**STANDARD QUALITY PLAN
FOR
PROGRAMMABLE LOGIC CONTROLLER**

QUALITY PLAN NO.: **PE-QP-999-145-I036**

VOLUME IIB

SECTION D

REV. NO. **01**

DATE: **24.08.2007**

SHEET 5 OF 8

FACTORY ACCEPTANCE TEST (FAT) PROCEDURE

This document covers procedure to conduct/witness PLC system functional tests in order to demonstrate conformity to purchase specifications and related engineering documents. The test shall be conducted at the system suppliers works. The system supplier shall conduct all functional tests before commencing FAT and test results shall be made available during FAT. Vendor must furnish following relevant drawings, duly approved by BHEL Engineering, for reference during FAT.

- a) Technical Specification of PLC.
- b) PLC System Configuration
- c) General Assembly Drawings.
- d) Panel Wiring Diagrams.
- e) Bill of Quantity for PLC System.
- f) Logic Diagram.
- g) HMI Schematics.
- h) Input / Output List.

Further the vendor shall furnish applicable product specification, datasheets, catalogues, test-certificates, and internal inspection records to enable FAT. Vendor shall also submit, [to the inspecting agency](#), his standard test procedure, for clauses given below; where vendor's standard practice has been referred.

APPLICABLE TEST PROCEDURE:

1. Input/Output Functional Verification.

Check for correctness of addressing of racks, slots and I/O modules as per applicable PLC configuration diagram. Appropriate signal generators shall be used to simulate Inputs and outputs to check operation and SCAN time. [Check online replacement of cards, processors, power supply etc.](#)

2. Processor Verification

PLC Configuration drawing to be referred for ascertaining

- i) Redundancy

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ii) Type (Hot or Cold)

Both the processors are to be checked for healthiness in case of redundant configuration as per vendor's standard practice. In case of hot redundancy, switchover of control from primary processor to standby processor shall be demonstrated for uninterrupted control and data processing as per vendor's standard practice. Switchover shall be witnessed, by manual power off or resetting the Primary CPU or simulating failure of primary processor. Checking should be by witnessing the lighting up of Processor's LEDs as per manufacturer's product standard.

Vendor shall demonstrate, as per Vendor's standard practice, adequate Loading (Spare Capacity) of Processors, as mentioned in contract specs. This shall be done, by simulating worst load operation of fully integrated PLC system.

3. Power Supply Module Verification

Check if PSM is in redundant mode as per specification. Check the healthiness of power supply from both the modules' lamp indication/measurement. Simulate failure of one PSM and verify that standby PSM has taken over without any interruption.

4. Communication System Verification

Communication system has to be in line with approved PLC Configuration Diagram. Verify that both the communication buses are intact and connected. Communication between PLC processors, I/O rack, OWS etc. is to be checked through simulation of input data. Simulate the bus failure by disconnection of working bus. Check that the communication continues without interruption or loss of data.

Following response times are to be demonstrated as per vendor's standard practice for conformance to contract specifications:

1. Screen update time
2. I/O scan time
3. SOE resolution time
4. Data transfer time with third party system using Communication Protocol as per Contract specification and as per quantum of data as per approved signal exchange list.

5. Diagnostic Verification

Product Catalogue/Literature shall be referred for checking of all diagnostic features. Hardware failure to be simulated by removing an I/O

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6. Control Panel /Desk Verification

- i) PLC driven annunciation system should be checked by alarm signal simulation.
- ii) Push Button and selector switch operation should be checked by verification of corresponding change of status of Data Base point.
- iii) Indicating lamp / MIMIC should be checked by corresponding Data Base point simulation.

7. Software Verification

- i). Control Logics:- Software switches, lamps and Analog sources shall be used for simulation of field conditions .Control logics shall be checked for its correct functionality as per approved logic schemes
- ii). Engineering features:-
 - a) Online changing of parameters, set points.
 - b) Online modification in Control Logic Diagrams.
 - c) Online configuration of Graphics, Trends, Logs, HSR.
- iii). HMI features:-
Check for configuration & operation of Graphics, Trends, Logs, HSR and Alarms, in the form of Displays and Printouts, by simulation of Inputs as per approved documents.

8. Burn in Elevated Temperature test

Electronic equipments shall be subjected to Burn in elevated temperature test as per the procedure detailed below:

- a) (i) PLC modules are kept at 50 Deg c under continuous energized condition for 48 hours.

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ii) 48 hours test period shall be divided into 4 equal time segment of 12 hours duration each. For every 12 hours duration segment, after lapse of first 11 hours 110% of nominal voltage shall be applied to the panel under test for a period of 30 minutes followed by application of 90% of nominal voltage for the next 30 minutes.

b) Assembled Panels with complete wiring shall be kept under continuous energized condition for 120 hours at ambient temperature. Temperature rise in panels should be below 10 Deg C above ambient.


 PEM :: C&I	<h2 style="margin: 0;">STANDARD QUALITY PLAN FOR PROGRAMMABLE LOGIC CONTROLLER</h2>	QUALITY PLAN NO.: PE-QP-999-145-4036	VOLUME IIB	SECTION D	REV. NO. 01 DATE: 24.08.2007	SHEET 1 OF 8
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Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records P	Agency \$			Remarks
									W	V	V	
1.0	Materials /Components											
1.1	Panels & Control Desks	Physical Inspection for Dimensions, Painting, Cutouts, Lifting / Locking Arrangements, Components, Drawing Pocket, Mounting accessories, Plinth & AV Pads, Cable Gland Plates, Hardwares, Hinges, Louvers & Filters, Fans & Panel Lamps	MA	Visual	100%	Contract specifications, Approved GA Drawings, BOQ	As per ref documents. No physical damage.	BHEL Quality Inspection Report.	3/2	2	1	
1.2	Power Supply/Packs, Battery & Battery charger, Transformer, UPS.	Physical Inspection Physical Damages Dimensions Mounting Accessories	MA	Visual	100%	Contract specifications, BOQ.	As per reference documents, Test Report	BHEL Quality Inspection Report.	3/2	2	1	
1.3	Indicating Lamp, Annunciator, Meters, Transducers, Signal Converters, Instruments, Single Loop Controllers	Physical Verification Physical Damages Dimensions Accessories	MA	Visual	100%	Contract specifications, BOQ.	As per documents No physical damage. Test/ Calibration report.	BHEL Quality Inspection Report	3/2	2	1	
1.4	PLC processors, I/O modules, Power Supply modules, Communication modules, Mounting Racks, Ethernet	Physical Inspection <ul style="list-style-type: none"> • Identification Labels • Physical Damages • Quantity • Spare Capacity 	MA	Visual	100%	Product Catalogue, Data sheets, Approved Configuration diagram, BOQ	As per ref documents. Test Certificates	BHEL Quality Inspection Report.	3/2	2	1	


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

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

1 - BHEL
 2 - Vendor
 3 - Sub-vendor

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		QUALITY PLAN NO.: PE-QP-999-145-1036											
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Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	P	W	V	Remarks	
1.5	CPU, Monitor, Keyboard, Mouse, CD Drives, Printers, OS, System Software, Engineering software in the form of Licensed CD.	Physical Inspection Identification Labels, Tech. Specification Physical Damages Accessories Installation arrangements for Computers & Printers	MA	Visual	100%	Contract specifications, Product Catalogue, Approved GA / Configuration drawing, BOQ.	As per reference documents.	BHEL Quality Inspection Report.	3/2	2	1		

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Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records			Remarks	
								P	W	V		
2.0	Assembly											
2.1	Functional Test for HMI/OWS devices such as Monitors, Keyboards, Mouse, Printers etc.	Operation	MA	Functional	100%	Approved Configuration Diagram & BOQ and FAT	Correct Operation of interconnected Devices of HMI system.	BHEL Quality Inspection Report.	2	1	1	
2.2	Hardware Functional Verification.	Physical arrangement, Wiring check & labeling, Continuity Checking, IR & HV test	MA	Visual/ Electrical	100%	Approved GA Drawing, Panel Wiring Diagram, IR & HV as per relevant International standard	Test Certification	BHEL Quality Inspection Report.	2	2	1	
2.3	Powering Up	Healthiness of all the modules/equipment, associated with Powering of PLC system	MA	Visual /Electrical	100%	Approved power supply scheme	All equipment to be healthy on power ON	BHEL Quality Inspection Report.	2	1	1	
2.4	Burn in test for PLC modules	Healthiness of PLC modules on Continuous Energisation, Temperature maintenance	MA	Visual/ Electrical	100%	FAT Procedure	Test certification as per FAT	BHEL Quality Inspection Report.	2	2	1	

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Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$			Remarks
									P	W	V	

3.0	Factory Acceptance Test (FAT)											
3.1	Input Output Functional Verification	I/O configuration, I/O operation	MA	Visual/Electrical	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	
3.2	Processor Verification	Processor configuration, Powering up, standby operation (as applicable) and Loading	MA	Visual	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	
3.3	Power Supply Module Verification	Redundancy Operation	MA	Electrical	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	
3.4	Communication System Verification	Redundancy operation of Communication System, Measurement of Response Time, Communication with third party system	MA	Electrical	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	
3.5	Diagnostic Verification	Self Diagnostic features of PLC system	MA	Visual	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	
3.6	Control Panel/Desk Verification	Operation of PLC driven annunciation system, Mosaic, Push buttons & selector switches, Indicating lamps	MA	Visual	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	
3.7	Software Verification	(i) Control Logics (ii) Engineering Features (iii) HMI Features	MA	Visual	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	

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STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL

STD QUALITY PLAN NO.: **PE-QP-999-145-I056**

VOLUME IIB

SECTION D

REV. NO. **01** DATE: **22-02-2008**


SHEET 1 OF 7


Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency [§]			Remarks
									P	W	V	
1.0	INCOMING Sheet Steel (CRCA & HR)	1. Chemical Composition	MA	Chemical analysis	Sample	IS:1079 IS:513	IS:1079 IS:513	Test Certificate	3	---	2	
		2. Bend Test	CR	Mech. test	Sample	IS:1079 IS:513	IS:1079 IS:513	Log Book	2	---	---	
		3. Surface finish	MA	Visual	100%	Factory Standard / Sample	Factory Standard / Sample	Log Book	2	---	---	
		4. Waviness	MA	Visual	100%	Factory Standard	No Waviness	Log Book	2	---	---	
		5. Thickness	MA	Measurement	100%	BHEL Spec.	BHEL Spec.	Log Book	2	---	---	
		6. Mill marking	MA	Visual	100%	Factory Standard	Factory Standard	Log Book	2	---	1	
2.0	Flats / Angles / Channels	1. Dimensions	MA	Measurement	Sample	IS:2062	IS:2062	Log Book	2	---	---	
		2. Surface Defects	MA	Visual	100%	Factory Standard / Sample	Factory Standard / Sample	Log Book	2	---	---	
		3. Straightness	MA	Measurement	100%	Factory Std.	Factory Std.	Log Book	2	---	---	
		4. Mill marking	MA	Visual	100%	IS:2062	IS:2062	Log Book	2	---	1	
3.0	Cables / Wires	1. Visual / Surface defects	MA	Visual	100%	BHEL Spec. and IS:1554 or IS:694	BHEL Spec. and IS:1554 or IS:694	Log Book	2	---	---	
		2. IR and HV	MA	Electrical	100%	BHEL Spec. and IS:1554 or IS:694	BHEL Spec. and IS:1554 or IS:694	Log Book	2	---	---	

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SI. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency [§]			Remarks								
									P	W	V									
									 STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL											
									STD QUALITY PLAN NO.: PE-QP-999-145-I056											
									VOLUME IIB SECTION D REV. NO. 01 DATE: 22-02-2008 SHEET 2 OF 7											
		3. Conductor a) Resistance b) Size c) Sheet colour	MA MA MA	Electrical Measurement Visual	100% 100% 100%	BHEL Spec. and IS:1554 or IS:694	BHEL Spec. and IS:1554 or IS:694	Log Book	2	---	---									
		4. Type / Routine Test Certificates	MA	Verification	100%	BHEL Spec. and IS:1554 or IS:694	BHEL Spec. and IS:1554 or IS:694	Log Book	3	---	2									
4.0	Electrical Components like Annunciator Transformers Lamps Switches PBs Contactors Relays Timers Space Heaters Thermostat Indicating meters etc.	1. Verification at make and Type 2. Verification of Test Certificates 3. Operation / Functional check 4. I.R. 5. H.V. 6. Calibration 7. Pick up / Drop off Voltage	CR CR CR MA MA MA MA	Visual Scrutiny of Type / Routine T.Cs. Electrical Electrical Electrical Electrical	Sample 100% Sample+ 100% 100% 100% 100% 100%	BHEL Spec. and BOM Relevant IS Relevant Indian Std & Catalogue Relevant Indian Std & Catalogue Relevant Indian Std & Catalogue Relevant Indian Std & Catalogue Relevant Indian Std & Catalogue	BHEL Spec. and BOM Relevant IS Relevant Indian Std & Catalogue Relevant Indian Std & Catalogue Relevant Indian Std & Catalogue Relevant Indian Std & Catalogue Relevant Indian Std & Catalogue	Log Book Log Book Log Book Log Book Log Book Log Book Log Book	2 2 2 2 2 2 2	--- --- --- --- --- --- ---	--- --- --- --- --- --- ---	+ for relay & contactors only @ for all components except relays & contactors. 1								
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									P	W	V											
									<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;">  PEM :: C&I </div> <div style="text-align: center;"> STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL </div> <div style="text-align: right;"> STD QUALITY PLAN NO.: PE-QP-999-145-I056 VOLUME IIB SECTION D REV. NO. 01 DATE: 22-02-2008 SHEET 3 OF 7 </div> </div>													
									5.0	Misc. Components like Gaskets, Terminal Blocks etc.	1. Verification of Type / Make		MA	Visual	Sample	BHEL Spec. & Mfrs. Catalogue	BHEL Spec. & Mfrs. Catalogue	Log Book	2	---	---	
											2. Surface defects		MA	Visual	Sample	BHEL Spec. & Mfrs. Catalogue	BHEL Spec. & Mfrs. Catalogue	Log Book	2	---	---	
		3. IR / HV on Terminal Blocks	MA	Electrical	Sample	BHEL Spec. & Mfrs. Catalogue	BHEL Spec. & Mfrs. Catalogue	Log Book	2	---	---											
6.0	IN PROCESS Blanking / Bending / Forming	1. Dimensions	MI	Measurement	100%	Approved Mfr. drgs.	Approved Mfr. drgs.	Log Book	2	---	---											
		2. Surface defects after bending	MA	Visual	100%	Factory Standard	Factory Standard	Log Book	2	---	---											
7.0	Nibbling / Punching	1. Cutout Sizes	MI	Measurement	100%	Approved Mfr. drgs.	Approved Mfr. drgs.	Log Book	2	---	---											
		2. Deburring	MA	Visual	100%	Approved Mfr. drgs.	Approved Mfr. drgs.	Log Book	2	---	---											
8.0	ASSEMBLY Frame Assembly & Sheet fixing	1. Dimensions	MA	Measurement	100%	Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards	Log Book	2	---	2											
		2. Alignment	MA	Measurement	100%	Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards	Log Book	2	---	2											
		3. Welding Quality	MA	Visual	100%	Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards	Log Book	2	---	2											
		4. Surface defects	MA	Visual	100%	Approved drg. / Mfr. Standards	Approved drg. / Mfr. Standards	Log Book	2	---	2											
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SI. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency [§]			Remarks	
									P	W	V		
		STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL						STD QUALITY PLAN NO.: PE-QP-999-145-I056					
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9.0	Pre-treatment and Painting	1. Pretreatment Process	MA	Visual	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1		
		2. Process parameters like bath temp. concentration etc.	MA	Measurement	Periodic	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1		
		3. Dipping / Removal Time	MA	Measurement	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1		
		4. Surface quality after every dip	MA	Visual	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1		
		5. Primer after phosphating	MA	Visual, Thickness	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1		
		6. Putty Application & Rubbing after primer	MA	Visual	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1		
		7. Paint first coat	MA	Visual, Thickness	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1		
		8. Putty Application and Rubbing after first coat of paint	MA	Visual	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1		
		9. Paint second coat	MA	Visual, Thickness, Scratch test Colour adhesion	100%	Factory Standard & IS: 6005	Factory Standard & IS: 6005	Log Book	2	---	1		
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Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency [§]			Remarks
									P	W	V	
		STANDARD QUALITY PLAN FOR LOCAL CONTROL PANEL					STD QUALITY PLAN NO.: PE-QP-999-145-I056 VOLUME IIB SECTION D REV. NO. 01 DATE: 22-02-2008 SHEET 5 OF 7					
10.	Panel Wiring	1. Wiring Layout	MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	---	
		2. Wiring Termination (Crimped Lugs)	MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	---	
		3. Ferrule numbers	MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	---	
		4. Colour of wiring	MA	Visual	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	1	
		5. Size of Conductor	MA	Measurement	100%	Approved drgs. & Specs.	Approved drgs. & Specs.	Log Book	2	---	1	
11.	Component Mounting	1. Correct components	MA	Visual	100%	Approved drgs., Specs. & BOM	Approved drgs., Specs. & BOM	Log Book	2	---	---	
		2. Fixing	MA	Visual	100%	Approved drgs., Specs. & BOM	Approved drgs., Specs. & BOM	Log Book	2	---	---	
12.	FINAL Final Inspection	1. Workmanship	MA	Visual	100%	Factory Standard	Factory Standard	Inspection Report	2	1	1	} At Random by BHEL, based on 100 % internal test reports by Mfr.
		2. Component layout (neatness, accessibility & safety) Mounting / Proper fixing of all components	MA	Visual	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1	
		3. Components identification Marking / Name plates	MA	Visual	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1	

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									P	W	V	
		5. Dimensions	MA	Measurement	100%	BHEL approved drg. / Spec., BOM	BHEL approved drg. / Spec., BOM	Inspection Report	2	1	1	At Random by BHEL, based on 100 % internal test reports by Mfr.
		6. Door functioning	MA	Functional	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1	
		7. Paint Shade	CR	Visual	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1	
		8. Paint Thickness	CR	Measurement	100%	BHEL approved drg. / Spec.	BHEL approved drg. / Spec.	Inspection Report	2	1	1	
		9. Workmanship of Gaskets	MA	Visual	100%	Factory Standard	Factory Standard	Inspection Report	2	1	1	
		10. Wiring Layout	MA	Visual	100%	BHEL approved drg.	BHEL approved drg.	Inspection Report	2	1	1	
		11. Wire Termination	MA	Pulling manually	Sample	----	Firm termination	Inspection Report	2	1	1	
		12. Continuity	MA	Electrical	100%	----	Continuity OK	Inspection Report	2	1	1	

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

LEGEND: * CR - Critical characteristics
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	CHECK LIST FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE (MECHANICAL AUXILIARY PACKAGES)	SPECIFICATION NO.: PE-TS-375-145-I054	
		VOLUME	
		SECTION	
		REV. NO. 00	DATE: 15.02.2012
		SHEET 16	OF 16


SL NO	TESTS/CHECKS	QUANTM OF CHECK	REFERENCE DOC. ACCEPTANCE NORMS	AGENCY			REMARKS
				P	W	V	
1.0	CHECK FOR		APPROVED TECHINCAL REQUIREMENT/ DATA SHEET				MFR TO CARRY OUT ROUTINE TEST ON 100%. WHEN MATL CORELATION ARE NOT AVAILABLE MFR'S COMPLIANCE TO BE PROVIDED
	1.1 DIAL SIZE	100%		M	C	C	
	1.2 MODEL NO/TAG NO	100%		M	C	C	
	1.3 RANGE/SCALE	100%		M	C	C	
	1.4 END CONNECTION	100%		M	C	C	
	1.5 SWITCH CONTACT RATING & NOS	100%		M	C	C	
2.0	CALIBRATION						
	2.1 ACCURACY	100%		M	C	B	
	2.2 REPEATABILITY (FOR SWITCH)	100%		M	C	B	
	2.3 SET POINT ADJUSTMENT FOR SWITCH	100%		M	C	C	
3.0	OVER PRESSURE & LEAK TEST	100%		M	C	C	
4.0	OPERATION OF PR. RELEIF DEVICE	ONE PER TYPE		M	C	C	
5.0	REVIEW OF T.C. FOR MATERIAL OF--						
	5.1 SENSOR	FOR LOT		-	-	B	
	5.2 MOVEMENT		-	-	B		
	5.3 PROCESS CONNECTION		-	-	B		
	5.4 HOUSING		-	-	B		
6.0	REVIEW OF T.C. FOR DEGREE OF PROTECTION	TYPE TEST	-	-	B		
7.0	REVIEW OF T.C. FOR CONTACT RATING OF SWITCH	ONE PER TYPE	-	-	B		
8.0	ACCESSORIES AS APPLICABLE	100%	M	C	C		

LEGEND:

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

NOTE:

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

	CHECK LIST FOR PRESSURE / DIFFERENTIAL PRESSURE SWITCH (Mechanical Auxiliary Packages)	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE:
		SHEET 4 OF 4	
Data Sheet No.: PE-CL-999-145-1031-0			

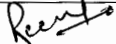
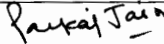
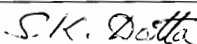
SL NO	TESTS/CHECKS	QUANTUM OF CHECK	REFERENCE DOC. ACCEPTANCE NORMS	AGENCY			REMARKS	
				P	W	V		
1.0	CHECK FOR		APPROVED TECHNICAL REQUIREMENT/ DATA SHEET/ RELEVANT STANDARD / MANUFACTURER CATALOGUE				MFR TO CARRY OUT ROUTINE TEST ON 100%.	
	1.1 MODEL NO/TAG NO	100%		M	C	C		
	1.2 RANGE/SCALE	100%	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

LEGEND:

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NOTE:

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

	PREPARED BY	CHECKED BY	APPROVED BY
NAME	REENA VERMA	PANKAJ JAIN	S.K.DATTA
SIGNATURE			
DATE	22.09.08	22.09.08	22.09.08

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^{\$}			Remarks
									P	W	V	
1.0 Material / Components												
1.1	Casing, Sensing Element and Thermowell	1. Physical, Chemical Properties	MA	Physical, Chemical Test	One Sample from each lot	Approved drg. / data sheet / BHEL Spec.	Approved drg. / data sheet / BHEL Spec.	Test Certificate	3/2	---	2,1#	# Compliance certificate to be verified.
		2. Workmanship, finish and dimensions	MA	Visual, Measurement	100%	Manufacturing standards / drgs.	Manufacturing standards / drgs.	Inspection Report / Log Book	3/2	---	2,1#	
1.2	Switch	Contact type & no.	MA	Visual	100%	Approved drg. / data sheet / BHEL Spec.	Approved drg. / data sheet / BHEL Spec.	- do -	3	---	2,1#	
2.0 Assembly		1. Marking – Tag No., Model, Range	MA	Visual	100%	- do -	- do -	Inspection Report	2	1	---	**25% quantity with minimum of 1 piece / type & size
		2. Workmanship	MA	Visual	100%	- do -	- do -	- do -	2	1	---	
		3. Scale graduation	MA	Visual	100%	- do -	- do -	- do -	2	1	---	
		4. Dimensions and end connections	MA	Measurement	100%	- do -	- do -	- do -	2	1**	1	
		5. Switch – contact type & nos.	MA	Visual	100%	Approved drg. / data sheet / BHEL Spec.	Approved drg. / data sheet / BHEL Spec.	Inspection Report	2	1**	1	
3.0 Routine Test		1. Calibration, accuracy, repeatability, overload, set point adjustment, differential	CR	Measurement	100%	- do -	- do -	- do -	2	1**	1	

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Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^{\$}			Remarks
									P	W	V	
4.0	Type Test	2. HydroTest	CR	Measurement	100%	Approved drg. / data sheet / BHEL Spec.	No Leakage	Inspection Report	2	1**	1	●Type Test Certificate to be verified
		3. IR, HV	CR	Measurement	100%	- do -	Approved drg. / data sheet / BHEL Spec.	- do -	2	1**	1	
		1. Enclosure Protection Class (weather proof-ness, explosion proof-ness, etc.)	CR	Verification	Each type	- do -	- do -	Test Certificate	2	---	1●	
		2. Ambient temperature compensation (0 - 60°C)	CR	Verification	Each type	- do -	- do -	- do -	2	---	1●	
		3. Switch contact rating	CR	Verification	Each type	- do -	- do -	- do -	2	---	1●	
5.0	Painting	Shade & Finish	MA	Visual	100%	- do -	- do -	Inspection Report	2	1**	1	
6.0	Packing	Soundness	MA	Visual	100%	- do -	- do -	- do -	2	---	---	

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	TITLE:	BHEL DOCUMENTS NO.: PE-TS-307-182-A001	
	TECHNICAL SPECIFICATION FOR MILL REJECT HANDLING SYSTEM	VOLUME II-B	
	1X700 MW BELLARY TPS UNIT#3 KARNATAKA POWER CORPORATION LIMITED	SECTION -D	
		REV. NO. 0.0	DATE: 19-07-2012
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SECTION-D

GENERAL TECHNICAL REQUIREMENT

	TITLE:	BHEL DOCUMENTS NO.: PE-TS-307-182-A001	
	TECHNICAL SPECIFICATION FOR MILL REJECT HANDLING SYSTEM	VOLUME II-B	
	1X700 MW BELLARY TPS UNIT#3 KARNATAKA POWER CORPORATION LIMITED	SECTION -D	
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SECTION-D1

GENERAL TECHNICAL REQUIREMENT FOR MECHANICAL

	TITLE:	BHEL DOCUMENTS NO.: PE-TS-307-182-A001	
	TECHNICAL SPECIFICATION FOR MILL REJECT HANDLING SYSTEM	VOLUME II-B	
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GENERAL


This specification covers the PURCHASER'S general requirement of design, manufacture, fabrication, assembly, inspection; testing and delivery to site or mill reject bunker and accessories specified.

DESIGN AND CONSTRUCTION

1. Mill Discharge Spout and Pyrite Hopper

- Each coal mill has a discharge spout with an Air electric cylinder operated knife gate valve for discharging rejects into a pyrite hopper of adequate capacity. This hopper shall serve to store the mill rejects between each operating cycle of dense phase system. Minimum effective storage capacity shall be 2-3 times the effective (batch capacity) of the conveying vessel.
- Each pyrite hopper shall be provided with an air electric air cylinder operated plate/dome type valve of approved design at the bottom, adequately sized manhole/inspection door, impingement deflector plate, sizing grid and emergency chute with manually operated Knife gate valve and reject quenching arrangement (water spray) shall be provided. Any platform/ structural support (as per IS 2062 Gr A/B) required to maintain the above equipment before pneumatically operated plate / dome valve. Necessary explosion vent (rupture disc with MOC SS 304/316) of proven design shall be provided in each pyrite hopper.
- Each emergency chute shall be provided with a manually operated gate valve to transfer mill rejects from pyrite hopper to ground or to Owner's trolley. The gates shall be of robust construction and suitable for trouble free operation. The lever/gear wheel arrangement for manual operation shall be designed such that minimum effort is required to operate the gate. Necessary access and platform shall be provided. Limit switches shall be provided to indicate the valve position on control panel.
- Each pyrite hopper shall be provided with two level switches – one to start the operating sequence and the other to indicate the hopper above grid choked condition.
- Open/ Close Limit switches shall be provided in all manual and pneumatic KGVs and these limit switches shall be interlocked with MRS control system. Solenoid box cum local control panel shall be provided. Same shall house system start stop, vessel pressure indication, probe over ride, purge button so that system can be locally optd. It shall be possible to operate individual vessel from local pneumatic panel for few cycles in emergency.
- Following control modes shall be provided
 - Remote mode: System shall be controlled through MRS control System.
 - Local Mode:
 - a) Energized mode: Manual override shall be selected from MRS control System. System logic shall be executed in MRS control system itself.

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b) De-energized mode: MRS control system shall be delinked and system (individual stack up assembly) shall be operated manually.

- The sizing grid shall be provided inside the pyrite hopper to prevent oversized mill rejects, tramp iron etc. from entering the conveying vessel. The arrangement for collecting bigger pieces of coal rejects from the grid includes, among others, Knife Gate Valve, chute work etc. Bigger pieces of coal rejects shall roll down from the grid and through KGVs, chute work etc. Bigger pieces of coal rejects shall roll down from the grid and can be removed through the over sized seized reject removal gate (to be provided preferably at the bottom of inspection door) be discharged to Owners trolley. The arrangement shall be finalized during detail engineering. The grid shall be made of minimum 10 mm dia. M.S. bars IS with clear opening of 50 mm x 50 mm.

2 MILL REJECTS VALVES


- Valves isolating pyrite hopper and mill rejects conveying vessel shall be of plate/dome type, pneumatically operated, quick opening and closing remote controlled design. The valve shall be of reliable and proven quality. It shall be possible to operate it cutting through the material flow. These shall be provided with proper sealing arrangement such that whenever the material is being conveyed from vessel to the bin, there shall not be any leakage of air from vessel to pyrite hopper/atmosphere. Solenoid valves and air piping shall be included in contractor's scope; 'open' and 'close' limit switches shall be provided for panel indication of open/close status of valve. For isolating downstream equipment from pyrite hopper, manually operated knife gate valve shall be provided above pneumatically operated plate/dome valve as explained above.
- The plate/knife edge valve shall be tested hydraulically as per MSS-SP81 with permissible leakage for seat. The dome valve seat shall be tested pneumatically after complete assembly of valve along with operational test.

▪ MATERIAL OF CONSTRUCTION

The valve components shall be suitable for trouble free operation while handling hot mill reject.

Body	C.I IS: 210/Grade 260 or BS: 1452
Dome/Plate	Alloy C.I (225-250 BHN)
Shaft	Stainless steel (AISI: 316)

- Control valves and pneumatic actuators details shall be as per details indicated below


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3. Compressed Air Line Valves

- a) Remote actuated main valves on compressed air pipe lines shall be pilot operated solenoid operated 100% leak proof valve.
- b) Spring balanced two/three position control valves shall be either solenoid operated or pilot air pressure operated or pilot air pressure operated. In addition, mechanical lever for manual operation of valves shall be provided material of construction is subject to approval during detail engineering stage. Material of construction shall have minimum surface friction and be rust and weatherproof.
- c) Pneumatic actuators shall be completely enclosed type, double acting. The pneumatic cylinders for operation of valves shall be selected considering (5) Kg/cm² pressure. However maximum pressure available may be 7 Kg/Cm². Material of construction shall be stainless steel. Integral micro limit switches for 'Open' and 'Close' position shall be provided. External pointer for valve shall also be provided.
- d) The main valves shall be tested hydraulically to a pressure of minimum 1.5 times (for seat) and 2.0 times (for body) the maximum pressure encountered. Control valves and pneumatic cylinders shall be tested to a pressure of minimum 1.5 times the maximum pressure encountered.
- e) Above valves shall meet the requirements of any international / Indian Standard Codes. Bidder shall clearly indicate in his offer the applicable standard/code.

4. Conveying System and Conveying air compressor

- a) From each surge pyrite hopper Mill Rejects shall be pneumatically conveyed along a pipe line in dense phase using a pressure vessel (conveying vessel) as discharge device. Conveying vessel shall be of bottom discharge type.
- b) Supply pressure of compressed air shall be in the range of 5-7 kg/cm²(g). Suitable pressure adjustment device shall be provided by the Bidder before each conveying vessel to obtain the required pressure in the conveying vessel.
- c) Mill Rejects shall be conveyed in the pipe line in intermittent mode i.e. conveying vessel is filled up periodically and all the contents of conveying vessel are emptied at a time. Conveying system shall be idle till sufficient mill rejects are accumulated. It shall be optimized for minimum air consumption considering flow of Mill Rejects into surge pyrite hopper and the specified conveying capacity.
- d) Bulk mean velocity of material in the conveying pipe line shall be less than 10 meters/sec. Average velocity shall be computed from actual cycle time and length of piping (material travel path) during a number of conveying cycles.
- e) Guaranteed Bulk mean solid/ Air weight ratio shall not be less than 20. Average value shall be computed from actual air consumption and actual quantity of solids conveyed during a number of conveying cycles. For this purpose conveying cycle shall start from start of conveying vessel inlet valve open and terminate at the close of air supply line to conveying vessel.

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- f) All the pneumatic and solenoid valves associated with each surge pyrite hopper conveying system shall be mounted locally in a water and dust tight enclosure. Degree of protected of enclosure shall confirm to IP-55. Manual operation of the system from local panel in case of failure of remote operation system.
- g) Pneumatic conveying system shall be designed to empty even the completely filled up pyrite hopper through conveying vessel by operating in a number of automatic conveying cycles.
- h) System shall be so designed that reject generated in one hr/ mill shall be conveyed pneumatically in one hour itself.

5. CONVEYING AIR COMPRESSOR Non lubricated reciprocating type air compressors

1.0 GENERAL

This standard specification covers the design, material construction features, manufacture, inspection & testing at manufacturer's works, painting and packing requirements of air compressor with drive.

2.0 CODES & STANDARDS:

2.1 The design, manufacture, inspection & testing of air compressor as specified hereinafter shall comply with the requirements of the latest applicable Indian / British American Standards. The following standards/codes shall be following in particular.


- i) IS: 5456 - Code of practice for testing pf positive displacement type air compressors and exhauster.
- ii) IS: 5727 - Glossary of terms relating to compressors and exhauster.
- iii) IS: 6206 - Guide for selection, installation and maintenance of air compressors.

2.2 In case of any conflict between the above mentioned standards / codes and specification, the stipulations in the technical specification shall prevail. In case of any further conflict the same shall be referred to purchaser's engineer for clarification whose decision shall be final & binding.

3.0 DESIGN AND CONSTRUCTION

Air compressors will be designed for continuous operation with high efficiency to satisfy the performance requirement.

The continuous motor rating (at 500 C ambient) will be at least ten percent (10%) above the maximum load demand of the driven equipment under the entire operating range. When the driver is not directly coupled to the compressor, due

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consideration will be made for losses in power transmission, in addition to the above margin.


Noise level of compressors not to exceed 85 dBA to a reference of 0.0002 microbar when measured at a distance of 1.5 m above the floor in elevation and at a distance of 1 m horizontally from the nearest surface of compressor.

Compressors to be designed for Continuous, Load-Unload and On-Off mode operation.

Satisfactory operation in parallel shall be ensured without any uneven load sharing, undue vibration, noise etc.

Design / Construction

- i) Skid mounted compressor (non lubricated reciprocating) shall be provided.
- ii) Compression chamber Wall thickness to withstand maximum design pressure.
- iii) Casing with a large inlet port for fast filling and low air velocity.
- iv) To provide suitable arrangement for cleaning of the cooling water jackets during maintenance of compressor.
- v) Dynamically balanced, one piece Rotors with asymmetric profile, to keep leakage losses to a minimum and ensure high efficiency.
- vi) Rotor shaft mounted, oil lubricated, highly precise timing gear shall be designed to counter act the axial forces incurred in compression.
- vii) Life of Oil lubricated anti-friction type bearing be at least 8000 running hours.
- viii) Shaft Seals of floating restrictive ring type design.
- ix) The shaft seal rings and retainers shall be free for radial self-adjustment on the rotor shafts.
- x) Minimum design service factor for the integral, oil lubricated type, step-up Gear Box shall be of 1.5.
- xi) To provide safety valves on low pressure and high pressure stages.
- xii) A direct driven positive displacement type oil pump connection to the main drive shaft is preferred. Alternatively a separate motor driven oil pump be provided.
- xiii) The lubrication system to include oil pump, oil filter, oil cooler and oil tank / sump.
- xiv) Cooling shall be by closed circuit Demineralised water.
- xv) Compressor shall be directly coupled with constant speed squirrel cage induction motor conforming to the technical specification attached elsewhere.

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Material of construction

The materials of various components shall conform to the applicable BIS / BS / ASTM / DIN standard or any other reputed standards.

- | | | |
|-------|---------------------------------------|--|
| i) | Compressor chamber: | Cast iron coated with corrosion resistant material. |
| ii) | Rotors: | Forged carbon steel coated with corrosion resistant material |
| iii) | Timing Gear: | Low, Alloy Steel. |
| iv) | Inlet throttle valve & Housing: | Aluminum |
| v) | Shaft Seals: | High, Alloy Steel. |
| vi) | Safety valves: | Brass |
| vii) | Water separator: | Cast Iron |
| viii) | Non-return valves: | Stainless steel spring loaded type. |
| ix) | Blow off valve: | Stainless steel. |
| x) | Unloading Cylinder header: | Aluminum |
| xi) | Tube of Blow off cooler / oil cooler: | SS 304 |
| xii) | Outer casing of coolers: | Carbon Steel |
| xiii) | Gear box: | Cast Iron |
| xiv) | Gears: | Alloy Steel. |

However, Material of Construction of components of Screw Compressor of reputed manufacturer shall also be acceptable subject to BHEL/Customer's approval.

Accessories


Each compressor skid to include Suction filter, silencer, intercooler & After Cooler with moisture separators, automatic drain traps, instruments, control panel Base plate, coupling guard and load unload panel. Foundation bolt, nuts, anti vibration pads and operation and maintenance tools.

Control Philosophy

Each compressor must be operatable under continuous, auto, "Load-Unload" or "On-Off" mode (i.e.) "Dual control modes".

Any of the compressors shall be selectable at control panel to operate either for Base duty (Auto Load-Unload) or Standby duty (Auto On-Off) operation.

In "Base duty" mode, whenever air supply from compressors exceeds the demand, control system shall:

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- Operate the load-unload circuit at a predetermined set pressure.
- Throttle the inlet valve.
- Open the blow off valve.

Unloaded compressors to run in idling mode and when system pressure drops due to more demand, the load-unload circuit shall operate again to bring the compressor to 100% load after closing the blow-off valve.

When the pressure in the system rises to pre-set high value, the compressor shall be unloaded and shall run in idling mode for a specific period, (set by a timer), the compressor may be loaded to; full load in case of drop in system pressure or compressor may be stopped in case the system pressure does not drop and compressor continues to idle for more than a pre-set time.

The pressure and duration of time to be set shall be adjustable at site from the panel.

Further all interlocks for safe and proper operation of the compressors shall be provided by the Bidder.

All pressure and temperature conditions used for tripping the compressor shall be provided with pre-trip annunciation in the control panel.

Independent switches shall be used for alarms (annunciations) and tripping or interlock as far as possible.

An electrically operated automatic valve shall be provided on cooling water supply line of each compressor which will automatically shut off the cooling water supply, in case compressor is not running for more than set time duration. Suitable interlock shall also be provided for opening the valve before starting of the compressor.

Intake Filter and Silencer

Intake Air Filter and Silencer shall be comply with the following requirements:

Performance

- Filtering efficiency minimum 99% down to 10 microns.
- Maximum pressure drop across filter at design flow rate in new condition be 250 mm of water column.
- Design Airflow rate corresponding to compressor airflow.


Quantity: One per compressor

Design air data

- Dust concentration: 30 mg / M3
- Particle size in microns: Up to 10 microns

Type/Design: Heavy duty type Construction

- To provide densely packed, replaceable type paper as filtering media.
- Filter to be designed to have sound suppressing characteristics.
- Preferably Filter and silencer be combined type.
- Filter to take suction from outside not from compressor room.

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Inter Cooler & After Cooler

Inter cooler and after cooler shall comply with the following requirements:

Performance

- Outlet temperature of air from intercooler to suit the equipment offered.
- Outlet temperature of air after cooler to be limited to 10 Deg.C of inlet cooling water temperature.

Type: Shell and tube type

Construction

- Design code: TEMA class "C" or equivalent.
- With removable tube bundle type.
- With internal baffling.
- Design pressure in airside: 2 Kg / Cm² more than air inlet pressure.
- Design pressure in waterside: Not less than shut off head of DM cooling water pump.

Material

- Tube : SS 304.
- Shell : SA 285 Gr.C or equivalent
- Tube sheet: SA 285 Gr.C or equivalent
- Baffle : Carbon steel
- Flanges : Steel IS 2062.


Accessories

- To provide necessary vent & drain connections.
- Moisture separation units with level gauge.
- Automatic drains trap stations with bypass & isolating valves for moisture separators.
- Safety valves
- Lifting eye bolts, tools & tackles if any.

4.0 **Instrumentation and Accessories:**

Detailed specification for the Instrumentation shall be referred in the control and instrumentation section of this volume.

The bidder shall include instruments / controls to facilitate safe, reliable and efficient operation for the system offered. The instrumentation control system offered by the bidder shall be subjected to approval of the Employer during detailed engineering.

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All Instrumentation and Control equipments required for Compressed air system such as primary and secondary instruments, control panels / cabinets, cable etc. shall meet the requirements specified in control and instrumentation section of the Volume.

The protection and interlock system shall be subject to the approval of the Employer.

All pressure and temperature conditions used for tripping the compressor shall be provided with pre-trip annunciation in the control panel.

Following general philosophy shall be followed regarding instrumentation.

Pressure Indicators / Vacuum gauge:

- i. At inlet outlet of each compression stage (air line).
- ii. At inlet and outlet of cooling water header.
- iii. At inlet and outlet of (air line) each heat exchangers of compressors.
- iv. At each air receiver and at outlet header of compressor
- v. At inlet of each of the filters of compressors assembly.

Pressure Switches (Individual for each function).


- i. At inlet/outlet of each compressor stage of the compressor (for annunciation / interlock).
- ii. At each air receiver for:
 - a) High/Low pressure alarm, for start/stop control.
 - b) For load/unload control.
 - c) At common discharge outlet of compressor & air drying plant (for alarm)
 - d) At discharge of each compressor.

Temperature Indicators

- i. At inlet and outlet of each heat exchangers / coolers of compressor in the lube oil, air & cooling water circuits.
- ii. At inlet and outlet of each adsorber vessel.
- iii. At common discharge outlet of compressor

Temperature Switches / Temperature Controllers

- i. At inlet and outlet of each heat exchangers / coolers of compressor in the air & cooling water and lube oil circuits for low & high alarms, trip & interlock.
- ii. At discharge of each compressor (before air receiver).
- iii. At common discharge outlet of air compressors

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5.0 INSPECTION & TESTING

- 5.1 The manufacturer shall conduct all tests to ensure that the equipment finished shall conform to the requirements of this specification and in compliance with requirements of applicable codes & standard.
- 5.2 All materials used for conveying air compressor and drive shall be of tested quality. Materials shall be tested as per the relevant standards and test certificates shall be made available to the purchaser.
- 5.3 Test at Shop:
- All pressure parts shall be subjected to hydraulic testing at a pressure or 150% of design pressure for a period not less than one (1) hour.
 - Pneumatic test at design pressure shall also be carried out.

6.0 PAINTING

- All parts of air compressors with drive shall be painted as per the specification furnished elsewhere.
- Before transportation of the equipment necessary cleaning, flushing etc, shall be done shop coats of rust inhibiting paints, lacquers etc., shall be applied to various parts as necessary.


6.0 CONVEYING VESSEL

A CODES AND STANDARDS

- The design, material, construction, manufacture, inspection and performance of the Transporter vessel and accessories, shall comply with all statutory regulations and safety codes currently applicable in the locality where the equipment will be installed. The equipment shall also conform to the latest applicable Indian/British/USA/DIN Standards.
- The material of construction and other works of the Transporter vessel and accessories shall in general conform to the following standards/codes but will be subjected to any modification and requirement as specified in Data sheet A of Section D.

- Transporter Vessel : Mild Steel Construction as per IS-2825/BS-5500
- Dome/Metering valve : IS-210 FG 260 (body) ,
 - Dome- Alloy CI 225-250BHN
 - Butter fly/ plate: SS 316/304 400 BHN (min)

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- Shaft: SS-316

iii) Flange : MS as per ANSI-16.11


- Where the above standards are in conflict with the stipulations of this specification, this specification supersedes them. In case of any further conflict in this matter, the decision of the Engineer will be final and binding.

B DESIGN REQUIREMENTS

- The dense phase pneumatic conveying system shall be designed for low velocity conveying of materials as specified in Data Sheet-A.
- The system shall consist of dome shaped vessels made of Carbon Steel complete with pneumatically operated dome/metering valves capable of closing through a solid head of material to make a pressure tight seal.
- The bottom of vessel shall have an alloy CI transition bend and a control air supply system to the side of the conveying vessel.
- Airtight seal system shall be provided between the transporter vessel and the feeding point.
- Transporter vessel shall be equipped with air strainer/filter to prevent pipe scale /dirt from causing pressure regulator malfunctioning.
- Automatic drain filter and oil fog lubricator set shall be fitted into the instrument airline to dome/metering valve and other pneumatic actuators for use with pneumatic controls.
- Any air line stop valve fitted in the air supply line of transporter vessel shall be of gate or ball type to avoid any restriction to air flow, when open.

C CONSTRUCTIONAL FEATURES

- The transporter vessel shall be fabricated from mild steel plate to the design of vendor. The vessel shall be of welded structure and shall be provided with necessary supporting structure. The vessel will be airtight / leak proof in fully assembled condition. Conveying vessel shall be class-III vessel, designed and tested as per IS 2825 for pressure vessel. Temperature of the Mill Reject coming into the conveying vessel shall be considered at 100°C. Conveying vessel shall be designed for a pressure 10% above the max. Pressure encountered in vessel. The conveying vessel shall be constructed with tested quality mild steel plates. They shall withstand the abrasive action and hot condition of mill rejects and the operating air pressure. The conveying vessel shall be supported independently on steel columns. The vessel shall have suitable located and adequately numbered air connections for supply of compressed air for conveying mill rejects through pipes to overhead bin.

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- Dome/Metering/Plate valve shall be of manufacturer's standard construction and will be easily open able and closeable type. Flanges will be of mild steel construction as per relevant standard. All joints will be flanged with asbestos or silicon rubber gaskets suitable for 200°C. Terminal boxes will be of mild steel body with cast deflector plate/liner on compete impact area.
- The isolating valve at the top of vessel and the outlet bend piece at the bottom of the vessel shall be connected to vessel through air tight flanged joints. The material of construction for the outlet bend shall be alloy C.I. with minimum 400 BHN. All bends will be of long radius cast bends. Conveying pipes will be of mild steel heavy duty type of thickness as specified in Data Sheet-A.
- Conveying vessel shall be tested hydraulically for 1.5 times the design pressure or two times the operating pressure whichever is higher.
- All 90 deg turn shall be met with two nos. 45 deg or three nos. 30 deg bends. All joints shall be flanged end only.

D TESTING AND INSPECTION

- The purchaser shall have free access to those parts of manufacturer's works which are concerned with the fabrication of the steel work and shall be afforded with all reasonable facilities at all stages of preparation, fabrication and trial assemblies for satisfying himself that the fabrication is being undertaken in accordance with the provisions of this specification
- Should any structure or part of a structure be found not to comply with any of the provision of this specification, it shall be liable to rejection. No structure or part of the structure, once rejected shall be resubmitted for inspection/test except in cases where the purchaser or his authorized representative considers the defect as rectifiable defects which may appear during fabrication shall be made with the consent of and according to the procedure laid down by the purchaser, the purchaser may, at his discretion, check the test results obtained at the manufacturer's works by independent tests at the Government test house or elsewhere, and should not be found to be unsatisfactory shall be rejected. The costs of such tests shall be borne by the contractor.

Scope of inspection shall include but not limited to the following:

- i) Material used in the fabrication shall be with manufacturer's test certificate with proper correlation for physical properties and chemical analysis. In the absence of correlation actual tests shall be done.
- ii) Welder shall be qualified as per ASME standard. Only qualified welders shall be employed for the fabrication purpose.
- iii) Electrodes shall be of makes approved by BHEL.

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- iv) All fillet welds, root run and trial run of butt welds shall be subjected to visual dye penetrating test with no linear indication. Acceptable norm for dye-penetrating test shall be as per appendix-8 of ASME SEC. VII Div. 1.
- v) Special tests like NDT as per relevant code will be carried out for fabrication items.
- vi) Chemical analysis and hardness tests of linear plates shall be carried out.
- vii) Dimension shall be maintained as per approved drawings.


5. Mill Rejects Conveying Piping, bends Fitting and Accessories

- a) Minimum 125.0 NB. x 5.4 mm thick ERW steel pipe as per IS: 1239. Heavy class shall be supplied for mill rejects conveying piping.
- b) The routing of the mill rejects conveying pipes is to be submitted by the contractor, which shall be subjected to approval by the employer, during detailed engineering.
- c) The pipe work shall be of such design as to enable quick dismantling repairs with flanged type joints. The flanges shall be slip on flat faced flanges as per ANSI B16.5 rating fabricated out of carbon steel plates to IS:2062/applicable international standard. Gaskets shall be of compressed rubberized asbestos fiber with minimum 3 mm thickness.
- d) All fittings (i.e. bends, specials etc) used in the lines shall be as per good engineering practice, commensurate with the service conditions. The material of construction of fittings shall be alloy C.I with minimum hardness of 400 BHN.
- e) The specification includes supply of all steel hangers supports and steel pipe bridge for routing of mill rejects piping. However mill rejects piping in the coal mill area shall be supported on purchaser's columns/floor.

7. MILL REJECTS STORAGE BIN

A CODES AND STANDARDS

- o The design, materials of construction, manufactures, inspection, testing and performance of the mill reject bunker shall comply with all statutory regulations and all safety codes currently applicable in the locality where the equipment will be installed.
- o The material of construction and other works of the mill reject bunker shall in general conform to the following standards /codes but will be subject to any modification and requirements as specified in data sheet A of Section-D.
 - 1) Structural steel : IS-2062, Gr. 'A'
 - 2) Rolled Steel Beams, Channels and


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	Angle Sections	:	IS-808
3)	Scheme of Symbols for Welding	:	IS-813
4)	Covered Electrodes for Metal Arc Welding of Structural Steel	:	IS-814
5)	Code of practice for use of Metal Arc Welding for general Construction in Mild Steel	:	IS-816
6)	Code of practice for inspection of Welds	:	IS-822
7)	Code of practice for use of structural steel in general building construction	:	IS-800
8)	Dimension for steel plate, sheet and Strip for structural and general Engineering purposes.	:	IS-1730
9)	Recommendation for metal arc welding	:	IS-9575

Where the above standards are in conflict with the stipulations of this specification, the specification supersedes them. In case of any further conflict in this matter, the decision of the ENGINEER shall be final binding.


B DESIGN REQUIREMENT

- The coal mill reject bunker shall have a capacity as specified in data sheet-A and shall be fabricated of mild steel plate with adequate stiffeners welded on. The bunker shall be supported on the concrete foundation provided by the purchaser. Foundation bolts, grating etc shall be provided by the bidder.
- The reject bunker shall be complete with manually operated twin sector discharge gate as per data sheet A, steel liners, flanged connections, platforms, arches staircase, hand railings etc. The equipment shall be designed and equipped for outdoor operation, complete with all accessories and ready for erection and placed in serving for desired duty.
- Vendor shall furnish all steel work required for support and access for operation and maintenance. This shall include platforms, grating/ chequered plates (min 6 mm), stairways, railings, base plates, foundation bolts etc. Purchaser will provide only the foundation with pockets. These shall have shed over it and shall be provided with monorail & hoist for equipment handling.

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C CONSTRUCTIONAL FEATURES

- The bunker shall be fabricated to the design of vendor, but not less than 10 mm steel plate with adequate stiffeners. The bunker shall be of welded structure and shall be provided with necessary supporting structure Flanged opening shall be provided at the bottom of the bunker for attaching the twin sector gate. The inclined part of the bunker shall be designed with a valley angle of not less than 60 deg. to the horizontal. The design of the bunker shall be such that the problem of formation of arch is eliminated. The inside surfaces shall be provided with renewable 3 mm thick SS-304 liner covering the complete bunker. Explosion diaphragm shall be provided to release the air from the Bin. In case the pressure exceeds 1.0 kg/cm² (g). Free board shall be considered for bunker design.
- The reject bin shall be sized at least to above mentioned capacities and shall be designed and located such that they can emptied from bottom into Owner's trucks (10T capacity) at regular intervals. The bunker supporting column shall be so spaced to have a clear road access of 5 m width & clear headroom of 5.5 m.
- Access and platform shall provided with 32 mm thick MS grating 32 MS GI pipe hand railing shall be provided wherever required.
- Manually operated/Air cylinder operated (as indicated in data sheet) undercut gate shall be provided at the mouth of each reject bin. Gate shall be double pivoted sector type. Suitable levers, pulleys/sheaves, ropes, air cylinder etc. shall be provided for operating the gate from the operating platform or from panel. The gate shall be designed for heavy duty application.
- Suitable vent with filters shall be provided at the top of the silo. Vent filters shall have adequate number of bags made from synthetic fabric suitable for coal dust. Maximum air to cloth ratio (NM³/min/M²) shall be considered as 1.5 with isolation of 10% bags. The material of filter bags shall be suitable for prolonged operation up to a temp of 140°C without losing its collection efficiency and durability. Filter bags shall be suitably treated to minimize the chances of filter bags catching fire. It shall be possible to plug opening for the damaged bag filters, if any, to facilitate uninterrupted operation of the unit. The guaranteed particulate emission rate from the filter shall not be more than 50mg/Nm³ of air. Suitable explosion vents shall be provided for the bag filter unit. Sequential cleaning cycle shall be initiated with pressure drop signal across the bag filter once sufficient cleaning air pressure is available. Solenoid/pneumatic valves shall be provided for this purpose. Bag cleaning mechanism shall be automatic, and shall comprise of solenoid valves, air nozzles shall be placed just above the filter bags to facilitate individual cleaning of each bag. Manifold of the bag filter shall be of SS-304/ MS GI painted. For the case, if bag filter casing is manufactured at some other source then smoke/bubble test shall be carried out on bag filter casing at works to ensure welding defects.
- The reject conveying pipes shall be terminated at the top of bins in individual terminal boxes. The terminal boxes shall be of steel construction with necessary deflector or impingement plate to take care of impact and wear due to high velocity reject particles discharging into the bin.
- One (1) no. level switch shall be provided in the bin to indicate 'Bin Full' condition.


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D INSPECTION AND TESTING

- The purchaser shall have a free access at all reasonable times to these parts of manufacturer's works which are concerned with the fabrication of the steel work and shall be afforded all reasonable facilities at all stages of preparation, fabrication and trial assemblies for satisfying himself that the fabrication is being undertaken in accordance with the provisions of this specification.
- Should any structure or part of a structure be found not to comply with any of the provisions of this specification, it shall be liable to rejection. No structure or part of structure, once rejected shall be resubmitted for inspection/ test except in cases where the purchaser or his authorized representative considers the defect as rectifiable. Defects which may appear during fabrication shall be made good with the consent of and according to the procedure laid down by the purchaser. The purchaser may, at his discretion, check the test results obtained at the manufacture's works by independent tests at the government test house or elsewhere and should the material so tested be found to be unsatisfactory shall be rejected. The cost of such tests shall be borne by the contractor.
- Examination of material of construction, verification, correlation and identification with material test certificate.
- Ensuring that the relevant weld procedure and welder qualifications tests are in accordance with fabrication code.
- Inspection during fabrication at appropriate stage including fit up. Witness of dye penetration testing at root and final run for all groove welds and final run for fillet welds as per ASTM E 165. All surfaces examined shall be free of:
 - a) Relevant linear indications (Linear indications are those indications in which length is more than three times the width and only indication with major dimension greater than 1.6 mm shall be considered relevant).
 - b) Four or more rounded defects in a line separated by 1.6 mm or less (edge to edge). Rounded indications are those where length less than three times the width.
- Any other tests as specified in the fabrication code.
- Dimensional check match marking as per approved drawings.

E SCOPE OF INSPECTION FOR RACK AND PINION SECTOR GATE

- Examination of materials of construction, verification, correlation/testing and identification of material with test certificate for important items like body, drives, worm shaft, rack & pinion, wheel etc.
- D.P. checks on drive shaft & worm shaft as per IS-3658 and there shall be no surface defects.
- Dimensional check

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- For chain, proof load shall be carried out.
- Shore Hardness of rubber component
- Check for overall dimension, completeness, no load working after assembly.
- Clearing, marking and painting.

8 AIR LINE, COOLING WATER AND DRAIN PIPING, VALVES, FITTINGS AND ACCESSORIES PIPING

The scheme and scope of supply of the air piping, water piping and drain piping is to be submitted by the Bidder, which shall work out the sizes of air piping for the various services based on the system requirements (Design) and submit the final layout and pipe sizing data to the 'Engineer' for approval.

All pipes shall be tested hydraulically after installation to minimum 1.5 times the maximum pressure encountered.

The air piping shall be galvanized and shall be as per IS: 1239 Heavy Grade.

The water piping shall be as per IS: 1239 Heavy grade galvanized.

For compressed air piping for instrument and control following standard shall be adopted

- | | |
|-------------------------|---|
| a) Up to 6mm and 6mm | Copper tubing |
| b) Above 6mm upto 15 NB | Polyurethane flexible hose |
| c) Above 15 NB | As per IS 1239 heavy grade, galvanized. |

Following line velocities shall be assumed for estimating pipes sizes of compressed air lines.

Pipe Size	1.1.1.1.1.1 Velocity m/sec		
	Below 50mm	50-150mm	200mm and up
Pressure below 2kg/cm ² (g)	15-20	20-30	25-35
Pressure above 2kg/cm ² (g)	20-30	25-40	35-45

Screwed couplings shall be used.

Valves:


- a) Code and Standards

IS: 778 - Gunmetal gate, globe and check valves for general purpose.

IS: 780 - Sluice valve for water works purposes (50 to 300 mm)

Any other BS or equivalent international standard are acceptable.

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- b) For valves of 50 mm size and above and up to a working pressure of 10 kg/cm²(g):

Type	- Bolted bonnet, outside screw and yoke, rising stem, flat faced flanged end.
Material of construction	- Body –Cast iron (IS: 210 Gr. 260) with 0.30% max (P) and 0.12 max. (S) Trim & Stem – Gun metal.


- c) For valves below 50 mm size and upto a working pressure of 10kg/cm² (g):

Type	- Union bonnet, rising stem, screwed end.
Material of construction	- Body –Gun metal, Trim & Stem – Gun metal.

All valves will be tested to minimum 1.5 times (for body) and 1.0 times (for seat) the maximum pressure encountered Air tests shall be conducted to detect seat leakage.

9. AIR RECEIVERS

- As far as possible, the design, manufacture and performance of air receivers shall be in accordance with the latest applicable Indian / British / American / DIN standards. The latest editions of the following shall be followed in particular :
 - IS: 2825 – Code for unfired pressure vessels.
 - ASME – Section – VIII, Division – 1.
 - BS – 487 – Fusion welded steel air receivers.
 - IS: 7938 – Air receivers for compressed air installation.
- The materials of the various components shall conform to applicable IS/BS/ASTM/DIN standards.
- The air receivers shall be vertical self-supporting cylindrical vessels with supporting stands for resting on the civil foundation.
- Other design parameters and design internal pressure of the receiver shall be as per the data specification sheet enclosed. The receiver shall be designed as per IS: 7938.
- Receivers shall be of welded construction with a minimum number of joints. Longitudinal seams in adjacent section of shell shall not be in the same line.
- Receivers shall be provided with gasket inspection openings. Receivers below 500 mm diameter shall have at least two inspection holes. For receivers of larger diameter, manhole of minimum 450 mm diameter shall be provided. These openings shall be placed as far as possible from any welded seam and in no instance shall pierce any seam.

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- All welding shall be performed in accordance with relevant codes. Filler material that will deposit weld metal with a composition and structure as near as that of the material being welded shall be used. All welding electrodes shall be got approved by the Owner. The electrodes shall be dried in ovens immediately before use to ensure freedom from porosity. All the circumferential and longitudinal butt welds of the air receiver shall be subjected to spot radiography. Tee joints and dished welding shall be subjected to 100% radiography.
- All other welding on the air receiver, including fillet weld and nozzle connection shall be DP tested as per IS: 2825 (Para 8.7.11).
- Each finished receiver complete with all welded attachments shall be hydraulically tested at 150% of the design pressure. The test pressure shall be maintained for at least 30 minutes. All joints shall be gentle hammered during the test.
- Receivers shall be provided with relief valve of the capacity and set pressure as specified in the data specification sheet. The spring in the relief valve in service for pressure up to and including 250 psi shall not be reset for any pressure more than 10% above or below the design set pressure. For higher pressures, the spring shall not be reset for any pressure more or below 5% design set pressure.
- Each air receiver shall be complete with drain connection of 25 mm NB with a trap station consisting of a trap, strainer, isolation and bypass valves.
- The receiver shall be provided with necessary number of nozzles. The orientation of the nozzles shall be subjected to the approval of the Owner.
- Local instruments like pressure gauge switch and temp. gauge of suitable range if asked for in the data specification sheet shall be supplied.


10. SUMP PUMPS

Sump pump (fixed type/trolley mounted) (5 m³/hr and 10 MWC), as per MOC specification given below shall be provided. Sump pump hose shall be connected to nearest drain available.

MOC OF PUMP

Casing & suction Bell : 2.5% Ni-CI to IS 210 Gr, FG-260
 Impeller : 2.5% Ni-CI to IS 210 Gr, FG-260
 Shaft/Sleeves : EN-8

The make of pump shall be subjected to approval of BHEL.

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1.0.0 GENERAL

This specification covers the design, manufacture, assembly, inspection and testing at manufacturer's and/or his sub-constructor's works of hand operated chain pulley block.

2.0.0 CODES AND STANDARDS

The design, manufacture, inspection and testing and performance of hand operated chain pulley blocks shall confirm to latest editions of the following standards: -

- | | | |
|----|------------------------|---|
| a) | IS: 3832 | Specification for hand operated chain pulley block. |
| b) | IS 807: 1976 | Codes of Practice for Design, Manufacture, Erection and Testing (Structural Portion) of cranes and hoists |
| c) | IS: 3109(Part II) | Calibrated load chain for pulley blocks and other lifting appliances |
| d) | IS: 2429(Part II) | Calibrated hand chain for pulley blocks and other lifting appliances |
| e) | IS: 4460 | Method for rating of machine cut spur and helical gears |
| f) | Material Specification | IS or approved |

3.0.0 EQUIPMENT

3.1.0 CHAIN PULLEY BLOCK


The block shall be so designed that all components shall withstand without failure, an application to the block of a load equal to at least four times the working load limit.

3.1.1 *Frame*

Frame shall be robust in design and of welded construction. The frame shall be selected in such a way that head room requirement is minimum. Frame shall maintain alignment under all expected conditions of services.

3.1.2 *Chain*

The load chain shall be electrically welded, accurately calibrated, and pitched and polished conforming to IS: 6216 Grade 80 as specified in data sheet 'A'.

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The hand chain shall also be electrically welded, calibrated, pitched and polished and shall conform to IS: 2429 (Part II) grade 30. The length of chain and link dimension shall be as per IS: 3832.

3.1.3 Hook

The forged hook shall be properly heat-treated and so designed that in loaded condition, it is free to swivel without twisting the load chain. The hook shall conform to IS: 3815.

3.1.4 Reduction Gear

The reduction gear shall be spur or worm/worm wheel type. The spur gear and worm shall be of high-grade carbon steel and heat treated. The worm wheel shall be of bronze. A detachable steel cover shall be provided for total enclosure of the gear train and ample lubrication to be provided.

3.1.5 Brakes

Brakes shall be of screw friction disc type self-actuating or any other approved type as per manufacturer's standard practice. Brake capacity shall be ample and humid atmosphere shall not affect materials used. The brake shall prevent self lowering of load and arrest and sustain load in all working positions. The load brake shall also allow smooth lowering of the load without serious overheating which may impair sufficient working of block

3.1.6 Bearing

Bearing used shall be as per guidelines laid down in IS: 3832.

3.1.7 Wheel

The load chain wheel shall be made of heavy duty malleable casting and shall be designed to ensure, effective operation of the chain. Load chain, wheel shall be mounted on two ball bearings. Hand chain wheel shall be made from malleable casting/pressed sheet steel. The idler wheel shall be so shaped as to avoid the twisting of the chain during operation. The P.C.D of idler wheels shall be such that the bending action of the link is avoided. The hand chain wheel shall be provided with flanges and designed to ensure effective operation with hand chain.

3.1.8 Other components

All other components of chain pulley block such as anchorage, guide, pawl, stripper etc. shall be designed and provided as per IS: 3832.

3.2.0 MONORAIL TROLLEY

Monorail trolley shall be provided if called for in the enclosed Data Sheet—A. Monorail trolley frame shall be of heavy section rolled steel, held together by bolts. Wheels shall be of high grade cast iron mounted on ball bearings. Axles and shafts shall be of carbon steel, accurately



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machined and suitably supported. The trolley shall be suitable for variations in I section beams. The trolley shall be geared travel type.

The hand chain required for trolley travel shall be as per clause 3.1.2 of this specification.

Hand chain wheel shall be as per clause 3.1.7 of this specification.

4.0.0 INSPECTION AND TESTING

The scope of inspection shall include but not limited to the following:


- Material identification/co-relation for important items like hook, load chain, hand chain, wheels, nut and pawl etc.
- Hardness for pawl and ratchet
- Dye penetration test for hooks
- Operational test including operational effort, velocity ratio etc,
- Proof load test up to 1.5 times of working load limit.
- Dimensional check of hook
- Marking

5.0.0 DATASHEET

S. No.	Parameter	Description
1	Capacity (In Kg)	Suitable for lifting the heaviest load but not less than One (1) ton
2	Service condition	Class II outdoor
3	No. of CPB	1 per bunker
4	Lift (m)	To suit bunker height and equipment on bunker roof top to be handled.
5	Type of suspension	Travelling Trolley
6	Head Room	Minimum permissible
7	Type of gear in CPB	Spur Gear
8	Type of bearing	Ball/Roller
9	Grade of Load Chain	Alloy Steel /Gr 80
10	Grade of Hand Chain	Steel / Gr. 30
11	Factor of Safety	As per Relevant IS


System modification required/ Points to be taken care by Bidder for system design:

1. Rupture disk burst alarm-cum indication is to be provided by bidder.
2. In case of system is in local operation remote interlock shall be in energized mode and valve opening and closing shall be controlled through PLC/DCS as per control architecture.
3. Location of Mill Reject Storage Bunker shown in tender specification is tentative only and final location may vary by 10% which shall be finalized during detail engg.
4. DM water for compressor cooling be in closed circuit. Bidder shall design the system/equipment to meet this requirement.
5. Bidder shall be responsible for providing foundation loads and verifying foundation design (by others) for conveying compressors, bunkers, and air receivers.
6. Bunker discharge sector gate shall be provided with canvas chute of suitable length for dust free unloading.
7. Each Conveying air Compressor shall be sized to cater air requirement of 1 unit as per criteria mentioned elsewhere in the specs. There shall be total 2 nos (1W+1SB) compressors.
8. Refer **Annexure A** and **Annexure B** for additional points to be taken care of by bidder.

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SECTION-D3

GENERAL TECHNICAL REQUIREMENT FOR C&I


	MEASURING REQUIREMENTS (C&I) FOR MILL REJECT HANDLING SYSTEM (PLC BASED)	DRAWING NO:	
		REV. NO. 00	DATE: 13.07.2012
		SHEET 1	OF 2

GENERAL REQUIREMENTS FOR MEASURING INSTRUMENTS

- 1.0 Measuring instruments/equipment and subsystems offered by the Bidder shall be from reputed experience manufacturers (from BHEL/customer approved vendor list) of specified type and range of equipment.. Further, all instruments shall be of proven reliability, accuracy, repeatability requiring a minimum of maintenance. All instrumentation equipment and accessories under this specification shall be furnished as per technical specifications, ranges, makes/ numbers as approved by BHEL during detailed engineering.
- 2.0 Every panel-mounted instrument, requiring power supply, shall be provided with a pair of easily replaceable glass cartridge fuses of suitable rating. Every instrument shall be provided with a ground terminal and shall be suitably connected to panel grounding bus.
- 3.0 All local gauges as well as transmitters, sensors and switches for parameters like pressure, temperature, level, flow etc. as required for the safe and efficient operation and maintenance under the scope of specification shall be provided. The necessary root valves, impulse pipings and all the other accessories required for mounting/erection of local instruments shall be furnished even if not specifically asked for.
- 4.0 Instruments shall be terminated up to LCP with control cable (1.5sqmm). The LCP shall be fully wired. All the necessary cables, flexible conduits, junction boxes and accessories for the above purpose shall be included. Double root valves shall be provided for all pressure tapping where the pressure exceeds 40 Kg / Cm².
- 5.0 Pressure gauge to be provided at the discharge of each sump pump.
- 6.0 The customer specification attached as Specific Technical Requirement will supercede the Data sheets, if there is any mismatch.

PLC Specifications For Mill Reject Handling System:

1. The controls for Mill Reject Handling System shall be realized in PLC based control system.
2. The requirements given below are to be read in conjunction with detailed Technical specification & data sheets-A,B & C enclosed elsewhere 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.
3. PLC based control system shall be provided with hot redundant processors. The Switch over from one processor to another processor shall be bump less and the switch over time shall be within 50 ms. The processor shall be of 32 bits minimum.
4. In addition to the PLC based system, a control panel shall be provided to locate 1No of OWS, mouse etc.
5. Plant schematic for monitoring & operation shall be available on OWS, bidder to further submit list of important signal along with applicable schematic for monitoring in DCS.
6. The PLC based control system shall include all Primary and Secondary Instruments, Local control panels. 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.
7. Time synchronization of PLC with DCS is to be carried out. Necessary hardware/software for same at PLC end to be provided by vendor.
8. PLC shall be connected to DCS through OFC with MODBUS Protocol for monitoring.
9. Vendor shall provide at least 20% or minimum one no. spare channels as hot-on-rail spares in each configured cards/modules. In addition to this 10% or minimum one no. extra assigned complete spare cards mounted on rails in sub-racks for each type of I/O modules shall also to be provided.
10. Each PLC has to be accompanied by a LIU (Light interface unit/Fibre patch chord) which has multi mode SC couplers / adapters.
11. All bidirectional drives are with integral starter, typical Hook-up diagram of drives is attached for reference
12. Bidder to provide redundant UPS, battery charger, switches & battery bank (lead Acid PLANTE type)for minimum 60 minute back up at 100 % load.
13. Soft link communication between PLC & DDCMIS shall be redundant Bi-directional OPC link. Bidder shall include required hardware at PLC end. the protocol between PLC & DDCMIS shall beTCP/IP Ethernet & the maximum communication time for receipt of signal at DDCMIS end should not exceed 2 seconds.
14. Bidder shall provide redundant UPS with 60 minutes UPS battery back up & necessary redundant power packs for PLC panel & PC,OWS, printer etc.
15. In PLC based system annunciation system shall be driven by PLC
16. For PLC system with OWS shall also include laser printer & control desk
17. LPB station for start/stop & open/close shall be provided for testing & maintenance facility.
18. Connected data cable for PLC to remote I/O panels shall be through redundant cable/optic fibers with redundant I/O.
19. All instruments/Drives shall be terminated on JB/Panel in field & both instrument/Drives& JB/Panel & connecting Instrument & Control Cable is in Bidder Scope

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1. SCOPE

This specification covers the Design, Manufacture, Assembly, Inspection and Testing at manufacturer's works, proper packing and delivery to site, erection and commissioning of the PLC Control & Monitoring System comprising PLC Control panel/Remote I/O panel (housing Processors, I/O cards, power supply packs etc.), Operator workstations(OWS), Printers, Annunciation system, UPS, cables and all other equipments and accessories required for completeness of the system as mentioned in different sections of this specification.

2. GENERAL


- 2.1. The PLC shall perform protection logic, interlock and sequential control functions such as binary logic operation, set/reset operation, timers, counters, logic blocks, math functions, input quality checking engineering unit conversion, Boolean functions & PID control (Analog logic function).
- 2.2. The system shall be redundant in processor, power supply and communication interfaces unless otherwise specified. The system shall have self-diagnostic features. The control of all drives and equipment shall be effected through the keyboard/mouse / panel mounted push button / control switches as per Data sheets-A&B.
- 2.3. The system shall have facility for connecting to Main Plant's Distributed control system (DCS) using hardware / software interface for two-way transfer of signals.
- 2.4. The mimic shall be displayed on the OWS screen and may also be provided on the control desk/panel (as per Data sheets).
- 2.5. In case OWS is provided, HMI functions like Trends, Curves, Bar charts, Historical storage of Data, Logs and reports etc. shall be provided in addition to Plant-schematics. The necessary catalogue / literature elaborating the features of HMI shall be supplied along with the bid.
- 2.6. It shall be possible to use the same OWS as programming station.
- 2.7. The PLC system shall be sized to meet process/system requirements as per the approved P&IDs and Control write-up.
- 2.8. The PLC system shall be designed to ensure that no single device failure should result in failure of any other device.
- 2.9. Signal multiplication where required shall be done in PLC. Use of relays for multiplication of contacts (for control, monitoring and alarm) is not acceptable. The control/ monitoring components on the control panel/ desk shall be driven through I/O modules.

3. TECHNICAL REQUIREMENTS

Details of various PLC system components shall be inclusive of but not limited to the following:

3.1. CODES AND STANDARDS

- 3.1.1. The equipment covered under this specification shall meet the requirements of latest edition of all applicable codes and standards like ANSI, NEMA, IEEE, IEC, NEC & IS.

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3.1.2. PLC shall conform to IEC: 1131

3.1.3. The offered PLC shall **comply with safety standards as per Data sheet-A&B.**

3.2. CONTROL PANEL

3.2.1. PLC control panel shall be freestanding type with provision for mimic display, push-button stations, control switches, indicating lamps, metering instruments like Indicators, ammeters etc. and facia windows for critical alarms.

3.2.2. The salient features of construction shall be:

Sheet material: Cold rolled sheet steel

Frame thickness: Not less than 3.0mm

Enclosure thickness: Not less than 2.0 mm for load bearing sections (mounted with instruments) and Not less than 1.6 mm for others

Gland plate thickness: 3.0mm

Base channel: ISMC 100 with anti-vibration mounting & foundation bolts.


3.2.3. Each panel shall be identified by a name plate, which shall be of non-rusting metal or three ply lamincold, with engraved lettering.

3.2.4. 25 x 6 mm Copper ground bus to be provided for each panel.

3.2.5. 240V AC single phase, thermostatically controlled space heaters shall be provided. Each free standing panel shall have a door switch operated fluorescent lamp and a 240V AC plug point.

3.2.6. Painting treatment shall be as per IS: 6005. Two coats of lead oxide primer shall be followed by powder coating. Paint shade shall be as specified in the "Data sheet for PLC system"-Data Sheet-A&B.

3.2.7. The annunciation system shall be facia window type, driven by the PLC. Audible alarm, Acknowledge, Reset and lamp test facility shall be provided as per ISA sequence – S18.1, M.


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3.3. PROCESSORS

- 3.3.1. The microprocessors shall be 32 bit, and Hot redundant.
- 3.3.2. Hot redundancy: PLC shall be provided with two processors (Main processing unit and memories) one for normal operation and one as hot standby. In case of failure of working processor, there shall be an appropriate alarm and simultaneously the hot standby processor shall take over the complete operation automatically. This transfer from main processor to standby processor shall be bump less and shall not cause any disturbance whatsoever. In the event of both processors failing, the system shall revert to fail safe mode. It shall be possible to keep any of the processor as master and other as standby.
- 3.3.3. An authorized forcing facility shall be provided for changing the status of inputs and outputs, timers and flags to facilitate fault finding and other testing requirements.**
- 3.3.4. The standby processor shall be updated automatically in line with the changes made in the working processor.
- 3.3.5. In the event of any replacement of the processor, synchronization of the replaced processor shall be automatic upon live insertion.**
- 3.3.6. The cycle time for input scanning, execution of logics, overheads and output scan shall not exceed 120 m sec.
- 3.3.7. The processor & memory shall be loaded up to 50% at normal conditions and maximum up to 60% under worst loading conditions.
- 3.3.8. The memories shall be field expandable.

3.4. INPUT / OUTPUT Modules

- 3.4.1. Input/output card assignments shall be modular i.e. no single card shall be assigned with more than one drive of a particular sub-system. The maximum number of channels per I/O module shall be as follows.
- Analog Input Module: 16
 - Analog Output Module: 16
 - Binary Input Module: 32
 - Binary Output Module: 32
 - Analog Input/output combined: 16
 - Binary Input/output combined: 32
- 3.4.2. On line I/O replacement: All I/O cards shall have quick disconnect terminations allowing for card replacement without disconnection of external wiring and without switching off the power supply.
- 3.4.3. 10% spare capacity shall be ensured in each card channel assignment. Overall minimum 20% spare channels shall be provided.

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3.4.4. Output command to MCC/Switchgear shall be through coupling relays, whose mounting location shall be as per "Data sheet A & B for PLC System". In case coupling relays are located in PLC Panel, the same shall be in PLC vendor's scope of supply.

3.4.5. Status feedback from MCC shall be in the form of potential free contact.

3.5. DATA BUS/ I/O BUS

3.5.1. The Data bus connecting PLC and HMI work stations shall be TCP/IP on Ethernet.

3.5.2. The Data bus and I/O bus communication medium shall be twisted pair shield copper conductor for indoor locations and those areas not subjected to induced signals. Repeaters/signal amplifiers shall not be used. Copper conductor cable used shall be Category-5 or better. The communication medium shall be Fibre optic cable in the event any portion of communication cable run is in outdoor or where distances are beyond 500 meters.

3.6. OPERATOR WORK STATION (OWS)


3.6.1. The OWS and Keyboard shall be desktop mounted and shall be used for controlling, monitoring and programming function.

3.6.2. Colour CRT(s) with keyboard and mouse shall be as per Data Sheet-A&B. CRT shall have graphic display facility.

3.6.3. The OWS shall be with Windows based operating system having necessary Engineering/Configuring software.

3.7. PRINTER

Printers shall be provided as per Data Sheet-A&B.

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3.8. COMMUNICATION WITH PLANT DCS

- 3.8.1. The PLC system shall be provided with hardwired/serial interface for communication with plant DCS.
- 3.8.2. Serial communication to / from DCS where provided shall be engineered to ensure that signal communication time from / to DCS shall not exceed 1 seconds for control / feedback.
- 3.8.3. Serial communication to DCS shall be OPC (Data access 2.0), Ethernet based TCP/IP Protocol. Alternatively the serial communication shall be MODBUS protocol on RS 485 network.
- 3.8.4. Data transmitted from PLC to DCS shall include all information necessary for the DCS graphic displays to monitor and control the process equipment and PLC. Such data may include pertinent analog and digital status information, interlock, alarms and maintenance conditions. Data transmitted from DCS to the PLC shall include necessary signals to provide operator control interface from DCS for the process/equipment being controlled by PLC.
- 3.8.5. Bidder to include 'Light interface units, converters, Ethernet switch, accessories at PLC end for connectivity to other system. The bidder's terminal point shall be Ethernet port in case of copper medium connection to DCS or LIU in case of Fiber optic medium for connectivity with plant DCS. In case distance between PLC & DCS is greater than 1.8 Km, single mode of optical fiber cable with compatible accessories shall be used. For distance less than 1.8 Km multimode optical fiber ports shall be used.


3.9. POWER SUPPLY Scheme

- 3.9.1. PLC Panel and I/O Cabinets: PLC system shall be provided with 2x100% UPS fed from Two Nos. redundant 415V, 3-ph feeders, as per the scheme PE-SD-999-145-001, sh-08 of 08. Each UPS shall have 30 minutes back up. Input feeder failure shall be monitored in the PLC system. Necessary redundant power pack and transformers shall be provided (in the PLC panel) to derive the power supply for control desk, PLC panel and input / output cabinets etc
- 3.9.2. Remote I/O panels: Similar power supply arrangement as for PLC panels shall be provided if it is not possible to extend the power cable form UPS of PLC panels.
- 3.9.3. Each OWS and associated HMI peripherals shall be provided with a feeder from either one of the UPS

4. DRAWING/DOCUMENT AND DATA TO BE FURNISHED AFTER AWARD OF THE CONTRACT:

4.1. For Approval:

- PLC system configuration drawing along with functional write-up.
- Input/Output signal list.
- BOM of PLC
- List of PLC controlled devices
- Control panel/control desk GA drawings.
- Control desk/panel component layout drawing.
- Control panel/control desk Foundation detail and cutout drawings
- Power distribution scheme.

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- Block logic diagrams.
- Annunciation list.
- PLC control room layout drawing.
- List of soft signal exchange with Plant DCS.
- List of mandatory spares
- Quality plan
- Data Sheet-C
- CRT display
- Power supply scheme for PLC system, HMI & peripherals, Remote I/O etc.

4.2. For Information:

- Cable schedule and cable interconnection drawing(in BHEL approved format)
 - Between Field and PLC
 - Between Field and MCC
 - Between MCC and PLC
- Electronic earthing requirements.
- Panel Heat dissipation data
- Product/component catalogues.
- Operation & Maintenance Manual on CDs.
- Softcopy of Final/As-built drawings on CDs.
- Calculation for Processor, Memory & Data bus loading


The above list is the minimum requirements. Additional documents/calculations required shall be finalized during contract stage.

5. DRAWINGS AND DOCUMENTS TO BE SUBMITTED ALONG WITH THE BID

- Proposed PLC system configuration drawing with write-up
- Product catalogues and specifications for PLC as well as HMI application.
- Proposed power supply schemes for PLC system, peripherals, and Remote I/O panels.

6. TESTING AND INSPECTION

- 6.1. The bidder shall adopt suitable quality assurance program to ensure that the equipments offered will meet the specification requirements in full.
- 6.2. BHEL's standard Quality Plan for PLC is enclosed with the specification. The bidder shall furnish his acceptance to BHEL's QP and submit the signed and stamped copy of QP along with the offer.
- 6.3. The complete PLC system, including all instrument and devices shall be subjected to standard factory tests (i.e. Type Tests and Routine Tests) as per relevant IS, NEMA, IEEE, IEC.
- 6.4. Factory Acceptance Test-FAT (Functional Tests) shall be performed prior to shipment and Owner/Purchaser shall be notified 15 days before the schedules dates of the test.
- 6.5. The certificates for following type tests, as per IEC Standard, shall be submitted: -
 - Surge protection test as per IEC-225-4
 - Dry heat test as per IEC-68-2-2
 - Damp Heat test as per IEC-68-2-3

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- Vibration Heat test as per IEC-68-2-6
- Electrostatic discharge test as per IEC-801-2 or equivalent
- Radio frequency Immunity test as per IEC-801-6 or equivalent
- Electromagnetic Immunity test as per IEC-801-3 or equivalent

7. SPARES AND CONSUMABLES

7.1. Commissioning Spares and consumables

The bidder shall supply all commissioning spares and consumables 'as required' during Start-up, as part of the main equipment supply.

7.2. Mandatory Spares

The bidder shall offer alongwith main offer, the Mandatory Spares as specified elsewhere in the specification. The Mandatory Spares offered shall be of the same make and type as the main equipment.

7.3. Recommended Spares

The bidder shall furnish a list of Recommended Spares indicating the normal service expectancy period and frequency of replacement; quantities recommended for 3 years operation alongwith unit rate against each item to enable BHEL/BHEL's Customer to place a separate order later, if required.

7.4. Special Tools & Tackles

The bidder shall supply all Special Tools & Tackles 'as required' during Start-up and further maintenance of the system, as part of the main equipment supply.

7.5. Spares, Service support

Bidder shall provide availability of spares and service support for minimum 10 years after guarantee period.

8. MARKING AND PACKING


8.1. Marking:

A stainless steel name-plate shall be permanently fixed on each equipment giving its Tag/serial Number and salient technical specification.

8.2. Packing:

All equipment/materials shall be suitably packed and protected for the entire period of dispatch, storage and erection against impact, abrasion, corrosion, incidental damage due to vermin, sunlight, high temperature, rain, moisture, humidity, dust, sea-water spray (where applicable) as well as rough handling and delays in transit and storage in open.

9. PERFORMANCE AND GUARANTEE

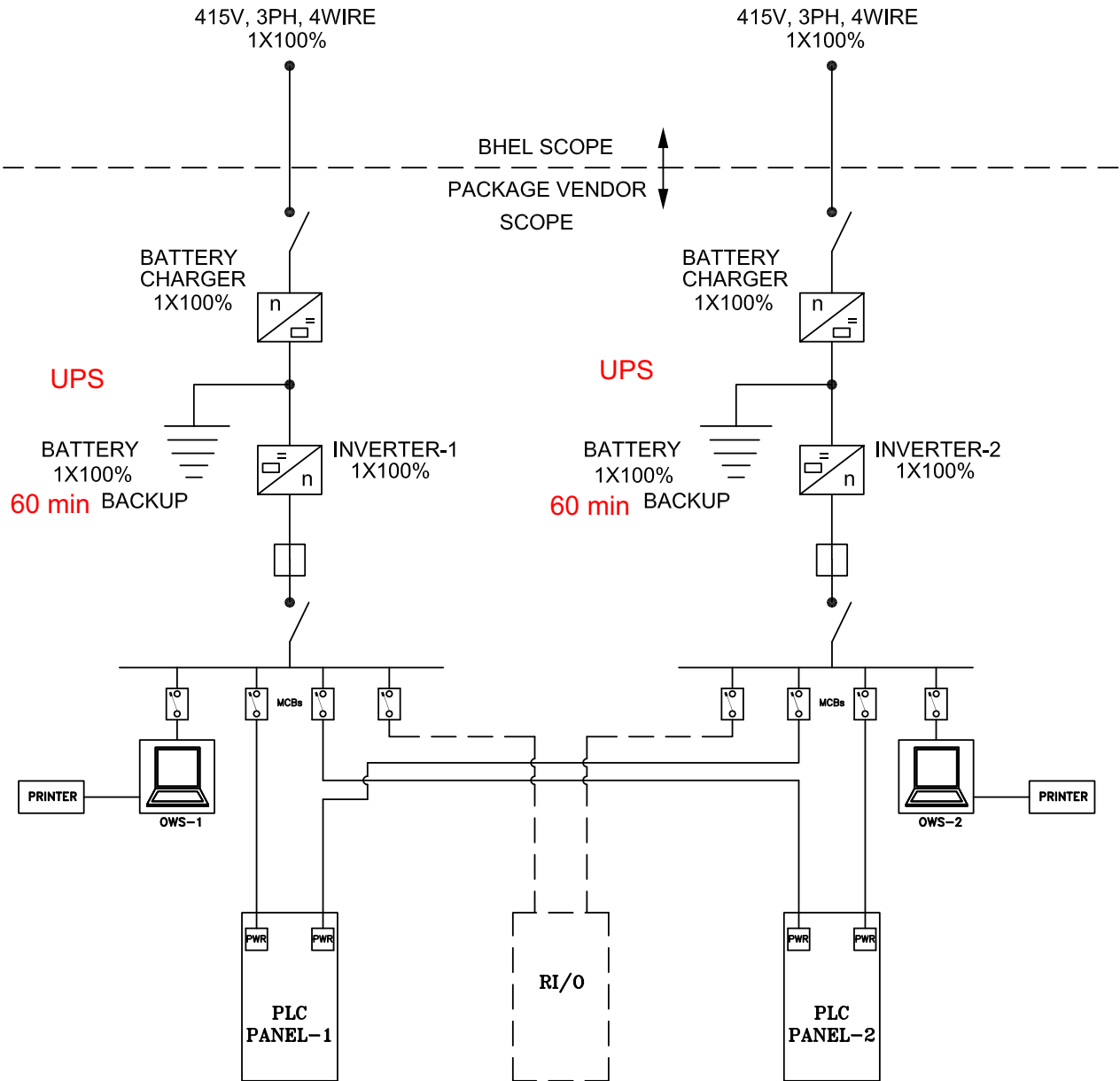
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The PLC system shall be guaranteed to meet the performance requirement as specified and also for trouble-free continuous operation for 12 months from the date of commissioning or 18 months from the date of delivery at site whichever is later unless specified otherwise in Vol-IIB Section - B or Section - C.

10. APPLICABLE DATA SHEET FORMS

This document shall be read with the following data sheet forms :

- Data Sheet A & B for PLC system - PE-DC-999-145-I036-1
- Data Sheet C for PLC system - PE-DC-999-145-I036-2



UPS SCHEME

**TYPICAL POWER SUPPLY ARRANGEMENT
FOR PLC BASED CONTROL SYSTEM**




BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE	NAME		SIGN	DATE
	DRN	GA		
I	DSGN	SSB		26.08.07
	CHD	AK		26.08.07
	APPD	AK		26.08.07

DRG. NO. PE-SD-999-145-001

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	TECHNICAL SPECIFICATION FOR MILL REJECT HANDLING SYSTEM	VOLUME II-B	
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**SUB VENDOR LIST
ANNE URE-7**

PRO ECT :1x700 MW BELLARY TPS UNIT 3 CONTRACTOR :BHEL - PEM PACKAGE: MILL RE ECT SYSTEM		LIST OF SUB-VENDORS	
SL. NO.	ITEMS	PROPOSED SUPPLIER	PLACE
I	SELF-MANUFACTURED ITEMS		
1	Pyrite Hopper/SURGE HOPPER	OEM	-
2	Denseveyor Vessel	OEM	-
3	Bunker Discharge Gate (Sector Type)	OEM	-
4	Terminal Box for storage bunker	OEM	-
5	Air Receiver	OEM	-
6	Pressure Relief Valve	OEM	-
7	Pnematic Panel/Air Control Module	OEM	-
II	BOUGHTOUT ITEMS		
A	MECHANICAL		
1	Bag Filter	ACCO THERMAX BATLI BOI	CALCUTTA PUNE SURAT
2	Drain Traps	SPRIAX GREAVES COTTON	MUMBAI MUMBAI
3	Gate/Globe/CheckValves(CI)	LEADER KBL Bankim H Sarkar	JULLUNDHAR KIRLOSKARWADI CALCUTTA CALCUTTA
4	Gate/Globe/CheckValves(GM)	Leader Bombay Metal & Alloys Sant Valves	JULLUNDHAR MUMBAI JULLUNDHAR
5	Gate/Globe/CheckValves(CS/FCS)	KSB FOURESS LEADER AUDCO(L & T)	Coimboitore Mumbai JULLUNDHAR Chennai
6	Ball Valves	Micro Finish (UPTO 40 NB) Fisher XOMOX Precision Engg.	Hubli CHENNAI MUMBAI
7	Safety Relief Valves	Leader BHEL Keystone SPIRAX MARSHAL	JULLUNDHAR TRICHY HALOL PUNE
8	MS/GI ERW Pipes	Jindal Surya Roshini	GHAZIABZD BAHADURGARH


PRO ECT :1x700 MW BELLARY TPS UNIT 3 CONTRACTOR :BHEL - PEM PACKAGE: MILL RE ECT SYSTEM		LIST OF SUB-VENDORS	
SL. NO.	ITEMS	PROPOSED SUPPLIER	PLACE
		SAIL	Duragpur
9	ACI Bends	Menon Metallic CRAWLEY & RAY PARAMOUNT BMW Steels Ltd.	Pune HOWRAH MNAGPUR HATHRAS
10	Plate Valve / Knife Gate Valve (C/W Optd / Cylinder Operated)	VAAS Industries FOURESS Macawber Beekay Pvt . Ltd	CHENNAI Mumbai New Delhi
11	Metallic Expansion Bellow	Metallic Bellows Lone Star	CHENNAI CHENNAI
12	Rupture Disc	BS & B Safety System	CHENNAI
13	Mono Rail Hoist / Chain Pulley Block	Hercules (Indef) Leap	BOMBAY New Delhi
14	Conveying Air Compressor (Reciprocating)	Kirlosakr Pneumatics KG Khosla Ingersol Rand	PUNE FARIDABAD AHEMDABAD
15	Pneumatic Actuator /Cylinder	Schrader Nucon Duncal	MUMBAI HYDERABAD MUMBAI
16	Sump Pumps (Water Service)	Mac Nilly KSB Pumps MATHER & PLATT SAM	BANGALORE PUNE PUNE COIMBATORE
17	Steel Plates/ Structures/Sections	SAIL JINDAL TISCO IISCO RINL	
18	Gratings	INDIANA	
B	ELECTRICAL & INSTRUMENTATION		
1	Motors (LT)	SIEMENS MARATHON KEC CGL ABB BBL	MUMBAI KOLKATA BANGALORE/HUBLI AHMED NAGAR FARIDABAD MUMBAI
2	Air Filter/ Lubricator / Regulator	PLACKA SHAVONORGAN EIP BULK CONTROL	CHENNAI MUMBAI DELHI
4	Annunciators	IIC PECON PROCON	MUMBAI AHEMDABAD CHENNAI


PROJECT :1x700 MW BELLARY TPS UNIT 3 CONTRACTOR :BHEL - PEM PACKAGE: MILL RE ECT SYSTEM		LIST OF SUB-VENDORS	
SL. NO.	ITEMS	PROPOSED SUPPLIER	PLACE
5	Solenoid Valves	NUCON ROTEX AUTOMATION ASCO SCHRADER DUNCAN LTD AVCON CONTROLS	HYDERABAD BARODA / V.V. CHENNAI MUMBAI MUMBAI
6	Pressure Switch & DP switch	SWITZER TRAFAG INDFOS INDIA	CHENNAI RANIPET GHAZIABAD
7	Press Gauge & DP Gauge	GENERAL INSTRUMENT BELLS CONTROLS MANOMETER INDIA SWITZER (DP SWITCHES) AN INSTRUMENTS H. GURU SOUTH INDIA	MUMBAI / GOA KOLKATA MUMBAI CHENNAI MUMBAI / GOA BANGALORE
9	Pulse Valves (Solenoid Valve)	Asco	CHENNAI
11	Cable Gland	SUNIL & CO. ARUP ENGG. QUALITY PRECISION COMMET	KOLKATA KOLKATA KOLKATA MUMBAI
12	Cable Lug	DOWELLS BILLET (3D)	MUMBAI VALSAD
13	Cable Tray	INAR PROFILES PVT. LTD INDIANA GRATING	VISAKHAPATNAM PUNE
14	Limit Switch	BCH Siemens ASEA Jai Balaji	NEW DELHI NEW DELHI NEW DELHI NEW DELHI
<p>NOTE:- LIST OF SUB VENDORS ARE TENTATIVE, BIDDERS ARE REQUESTED TO SUBMIT THERE SUB VENDOR LIST AT THE TIME OF CONTRACT WHICH SHALL BE APPROVED BY CUSTOMER/BHEL.BIDDER SHALL PROCURE EQUIPEMENT/ INSTRUMENTS FROM APPROVED VENDOR LIST ONLY FOR WHICH BHEL WILL NOT ENTERTAIN ANY COMMERCIAL IMPLICATION.</p>			


VENDOR LIST FOR C & I	
ITEMS	MAKE
PLC	ABB /GE FANUC /L& T LTD/ROCKWELL /SIEMENS /SCHNEIDER ELECTRIC
CONTROL VALVE	DeZURIK/CONTINENTAL /CONTROL COMPONENT INC/DRESSER/FOURESS ENGG/FISHER /FORBES MARSHALL/WEIR VALVES /IL/MIL/R.K.CONTROL
LEVEL SWITCH	BLISS ANAND/CHEMTROLS/HI-TECH SYS/LEVCON/RAMAN INST/SIGMA/SOR INC/SBEM /V. AUTOMAT /WAAREE INST
PRESSURE SWITCH	DRESSER/INDFOS /SWITZER/SOR INC/VASU
ANALYTICAL INSTRUMENTS	FORBES MARSHALL /FISHER-ROSEMOUNT /SIEMENS
PRESSURE GUAGE	A.N.INST/BUDENBERG GAUGE/DRESSER IND/FORBES MARSHALL/GENERAL INST CONSORTIUM/GLUCK/H.GURU IND/H.GURU INST/MANOMETER/WAAREE INSTRUMENTS
TEMPERATURE GUAGE	A.N.INST/BUDENBERG GAUGE/FORBES MARSHALL/H.GURU IND/H.GURU INSTWAAREE INSTRUMENTS/GOA INST/GOA THERMOSTATIC INST/
FLOW ELEMENT	BRISTOL BABCOCK/BALIGA LIGHTING EQUIP/ENGINEERING SPECIALITIES /IL/MICRO/MINCO/STAR-MECH
TEMPETAURE ELEMENT	GENERAL INST CONSORTIUM/DETRIVE INST & ELECTRONICS /PYRO ELECTRIC /TOSHNIWAL BROS/WAAREE INST
TRANSMITTERS	BRISTOL BABCOCK/BIRLA KENT-TAYLOR /BLISS ANAND/FISHER-ROSEMOUNT/SIEMENS/SBEM /SMART INST/TATA HONEYWELL/V.AUTOMAT & INSTS/
TEMPERATURE SWITCH	INDFOSS/DRESSER/SWITZER/SOR INC/TOSHNIWAL BRO/VASU TECH
SIGHT FLOW INDICATORS	BLISS ANAND/CHEMTROLS/INSTRUMENTATION ENGINEERS /SIGMA/TELACE EQUIP
INST PIPE FITTINGS	AURA INCORPORATED/HYD-AIR ENGG/METPRESS ENGG/PRECISION ENGG/SWITZER INST/VIKAS INDUSTRIAL
DP SWITCH	KAUSTUBA UDYOG /SWITZER/SOR INC/VASU TECH
ANUBAR	ENDRESS+HAUSER GmbH +Co.KG /SWITZER/STAR-MECH
CONTROL PANEL	CONTROL & SWGR CO/INDUSTRIAL CONTROLS & APPS/PYROTECH/PROCON INST
JUNCTION BOXES	BALIGA LIGHTING EQUIP/CREATIVE INST/DEVI POLY/INFO CONTROL /K.S.INTRUMENTS /MANISHA ENTERPRISE/SUCHITRA INDUSTRIES
INST TUBE FITTINGS	AURA INCORPORATED/HYD-AIR ENGG/METPRESS ENGG/PRECISION ENGG/SWITZER INST/VIKAS INDUSTRIAL
ROTAMETERS	CHEMTROLS SAMIL/EUREKA IND/IL/TRANSDUCERS AND CONTROLS/

	TITLE:	BHEL DOCUMENTS NO.: PE-TS-307-182-A001	
	TECHNICAL SPECIFICATION FOR MILL REJECT HANDLING SYSTEM	VOLUME II-B	
	1X700 MW BELLARY TPS UNIT#3 KARNATAKA POWER CORPORATION LIMITED	SECTION -D	
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**PAINING SCHEME DETAILS
ANNE URE-8**

	TITLE	DOCUMENT NO. PE-SC-217-100-M656	
	<p style="text-align: center;">PAINTING SCHEDULE</p> <p style="text-align: center;">KPCL BELLARY TPS (1X500 MW)</p>		
		REV.NO. 01	DATE 26/07/2005
		SHEET 1	OF 3
1.0	<u>GENERAL PAINTING REQUIREMENTS</u>		
1.1	Painting of equipment shall be carried out as per the specifications indicated below and attached annexures and shall conform to the relevant IS specification/ international standards for the material and workmanship.		
1.2	The following Indian Standards may be referred to for carrying out the painting job :		
	IS:5	:	Colours for ready mixed paints and enamels
	IS:1303	:	Glossary of terms relating to paints
	IS:2379	:	Colour code for identification of pipelines
	IS:1477	:	Code of practice for painting of ferrous metals in buildings (Parts I & II)
	IS:2524	:	Code of practice for painting of non-ferrous metals in buildings (Parts I & II)
	IS:2395	:	Code of practice for painting of concrete, masonry and plaster surfaces (Parts I & II)
	IS:2338	:	Code of practice for finishing of wood and wood based materials (Parts I & II)
	IS:6278	:	Code of practice for white washing and colour Washing
	IS:158	:	Ready mixed paint, brushing, bituminous, black, leadfree, acid, alkali, water and heat resisting
	IS:2074	:	Ready mixed paint, air drying, red Oxide Zinc Chrome, priming
	IS:104	:	Ready mixed paint, brushing, Zinc Chrome, priming
	IS: 2932	:	Enamel , synthetic, exterior (a) undercoating (b) Finishing

	TITLE	DOCUMENT NO. PE-SC-217-100-M656
	PAINTING SCHEDULE KPCL BELLARY TPS (1X500 MW)	
		REV.NO. 01 DATE 26/07/2005
		SHEET 2 OF 3
1.3	Preparation of Surfaces All surfaces to be painted shall be thoroughly cleaned of all grease , oil, loose mill scale , dust , rust and any other foreign matter. Mechanical cleaning by power tool and scrapping with steel wire brushes shall be adopted to clear the surfaces. However, in certain locations where power tool cleaning cannot be carried out sand scrapping may be permitted with steel wire brushes and /or abrasive paper. Cleaning with solvents shall be resorted to only in such areas where other methods specified above have not achieved the desired results. Cleaning with solvents shall be adopted only after written approval of the OWNER/OWNER REPRESENTATIVE. The sheet steel of electrical and instrumentation panels shall be pre-treated through chemical cleaning (7 tank) process of rinsing, degreasing, rinsing, derusting, rinsing, phosphating and rinsing. However, in case mechanical cleaning is also required the Contractor shall carry out the same to get a smooth finish.	
1.4	Primer Paint After the surface is prepared one coat of Zinc Phosphate primer conforming to IS 2074 shall be applied. After this first coat is dried up completely, second coat of primer shall be applied. Primer shall be applied by brushing, spray, roller as per manufacture recommendation to ensure a continuous film. The dry film thickness of each coat shall be as indicated in Ann-I & II enclosed. Insulated surfaces will have only primer coating and no finish painting.	
1.5	Finish Paint Synthetic enamel paint conforming to IS 2932 shall be used for finish coats. The colour /shade shall be as approved by the OWNER. After cleaning the dust on the dried up primer, first coat of synthetic enamel shall be applied. After this first coat dries up hard, the surface is wet scrubbed cutting down to a smooth finish and ensuring that at no place the first coat is completely removed. After allowing the water to get evaporated completely, the second finish coat of synthetic enamel paint shall be applied.	
1.6	Painting and Corrosion Protection for Pipes & Fittings	
1.6.1	All uninsulated piping systems, hangers and supports shall have two coats of Zinc Phosphate Primer (conforming to IS 2074) and finish paint using synthetic enamel paint to give a finish coat. Shades shall be as per IS 5 or as indicated by PURCHASER/OWNER. Service of the pipeline designations shall be painted on all pipes at visible locations.	
1.6.2	Before application of paint, Contractor shall clean the pipes of all mill scale, dirt dust, soot grease, rust etc.,	

	TITLE	DOCUMENT NO. PE-SC-217-100-M656											
	PAINING SCHEDULE KPCL BELLARY TPS (1X500 MW)												
		REV.NO. 01	DATE 26/07/2005										
		SHEET 3	OF 3										
1.6.3	All pipe lines, piping components shall be adequately protected against corrosion during manufacture, fabrication, shipment and storage by appropriate protective paint.												
1.6.4	Shop fabricated equipment/items shall be dispatched with final paint. Necessary touch up shall be done at site. Site fabricated equipment/items shall be dispatched with primer painting only and final painting shall be applied at site.												
1.7	Painting and Corrosion Protection for Valves & Specialties Two coats of primer of thickness as indicated in Ann-It shall be applied to all steel and cast iron exposed surfaces as required to prevent corrosion before dispatch. The use of grease or oil, other than light grade mineral oil, for corrosion protection is prohibited. Bores of all valves shall be covered immediately after testing, draining and drying with suitable plastic end covers to avoid ingress of foreign materials.												
1.8	Suggested Colour Codes for Painting Suggested colour codes shall be furnished by the successful bidder after award of contract. Colour codes for piping shall be as per IS 2379 with necessary modifications. Where band colour is specified for piping, same shall be provided at 30 metre intervals on long uninterrupted lines and also adjacent to valves and junctions.												
1.9	Approved Paint Makes <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">i) Asian Paints (I) Ltd.</td> <td style="width: 50%;">vi) Shalimar Paints Ltd.</td> </tr> <tr> <td>ii) Berger Paints India Ltd</td> <td>vii) Addison Paints Ltd.</td> </tr> <tr> <td>iii) Goodlass Nerolac</td> <td>viii) Grand Polycoat</td> </tr> <tr> <td>iv) Jenson & Nicholson (I) Ltd</td> <td>ix) Bombay Paints</td> </tr> <tr> <td>v) CDC carboline (I) Ltd.</td> <td></td> </tr> </table>			i) Asian Paints (I) Ltd.	vi) Shalimar Paints Ltd.	ii) Berger Paints India Ltd	vii) Addison Paints Ltd.	iii) Goodlass Nerolac	viii) Grand Polycoat	iv) Jenson & Nicholson (I) Ltd	ix) Bombay Paints	v) CDC carboline (I) Ltd.	
i) Asian Paints (I) Ltd.	vi) Shalimar Paints Ltd.												
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iv) Jenson & Nicholson (I) Ltd	ix) Bombay Paints												
v) CDC carboline (I) Ltd.													
2.0	<u>PAINING SCHEDULES</u>												
2.1	Painting schedules for various systems/ items are furnished as per enclosed Annexures-I and II . Vendors of different packages/ items will furnish detailed painting schedule for customer approval during detail engineering as per this guide specification.												



TITLE

DOCUMENT NO. PE-SC-217-100-M656

PAINTING SCHEDULE**KPCL BELLARY TPS (1X500 MW)**

REV.NO. 01

DATE 26/07/2005

SHEET 1 OF 2

Annexure-I

Paint Reference Scheme	Surface Preparation Grade / Surface Profile	Primer Coat			Intermediate Coat			Finish Coat			Total DFT in microns
		Premier Paint	No. of Coats	DFT in Microns	Intermediate Paint	No. of Coats	DFT in Microns	Finish Paint (See Note)	No. of Coats	DFT in Microns	
Various type of equipment/valve, etc. (Temp. upto 90°C)	Degreasing and Mech. Cleaning with wire brushing/hand tool (Sa1/St2/St3 as applicable)	HB Zinc Phosphate (alkyd Medium) as per IS:2074	2	35-45 per coat	- NA	-	-	Synthetic enamel (alkyd med.) as per IS:2932	2	20 – 25 per coat	110 - 140
LP Piping/structurals/ Vessels, etc. (Temp. upto 90°)	- do -	HB Zinc Phosphate as per IS:2074 (alkyd medium)	2	35 – 45 per coat	- NA	-	-	Synthetic enamel (alkyd med.) as per IS:2932	2	20 – 25 per coat	110- 140
Equipment with (Temp. upto 250°)	- do -	Heat resistant Al – paint	2	20 per coat	- NA	-	-	NA	Insulated	NA	40
Equipment in corrosive areas like CPU (regeneration) Dosing skid, etc.	Blast clean to Sa 2 ^{1/2}	HB Epoxy resin based zinc phosphate primer	1	50 per coat	Epoxy based MIO pigmented paint	1	50 per coat	Polyamide cured Epoxy finish coat	2	25 – 35 per coat	150 - 170
Elect. / Control Panels, etc.	Seven tank process	HB Zinc phosphate (alkyd Medium) as per IS:2074	2	35 – 45 per coat	-NA	-	-	Synthetic enamel (alkyd med.) as per IS:2932	2	20 – 25 per coat	110 - 140



TITLE

DOCUMENT NO. PE-SC-217-100-M656

PAINTING SCHEDULE**KPCL BELLARY TPS (1X500 MW)**

REV.NO. 01 DATE 26/07/2005

SHEET 2 OF 2

Notes:

1. Surface preparation shown is as per Swedish Standards SIS 05-5900 or equivalent Indian std. Degreasing will be as per Standard SSPC-SP1.
2. In case of insulated surfaces, only primer coats shall be applied.
3. GM/SS items with piping and G.I. pipes will not be painted. However these items carrying under Fire Fighting System shall be painted Fire Red as per TAC guidelines. Further SS/GI piping shall be given necessary colour banding for identification as per colour scheme.
4. All instruments shall be painted as per manufacturer standard practice.
5. All structural steel items shall be painted at site. Piping shall go with primer coating & finish paint shall be applied at site. Equipment shall be finish painted at shop.
6. Method of painting application shall be as per paint manufacturer's recommendation.
7. **Based on above painting schedule, detailed painting schedule will be prepared by respective package supplier and these be submitted to KPCL for their approval.**
8. **This painting schedule is applicable for bought out equipment/packages of PEM. Painting specification for various piping/ equipment in scope of various other BHEL units like Power cycle piping, CW piping, LP piping, R.E. joints, Butterfly valves, Power cycle valve etc., shall be furnished by unit separately.**


ANNEXURE II

Condensate/DM Water Storage Tank			
	Internal	External	Underneath
Surface preparation	Blast clean to SA 2.5	Hand/Power tool cleaning/ wire brushing to ST-2	Blast clean to SA 2.5
Primer	1 coat of epoxy resin based zinc phosphate high build primer (2 pack), DFT : 50 – 70 microns	2 coats of red oxide zinc chromate primer (IS 2074) of 30 - 35 microns DFT each	1 coat of high build coal tar epoxy suitably pigmented, DFT : 80 – 100 microns
Finish	2 coats of solvent free epoxy paint, DFT – 35 microns each	2 coats of synthetic enamel (IS – 2932) paint of 20 – 25 microns DFT each	N.A
Total DFT	120 – 140 microns	100 – 120 microns	80 – 100 microns

NaOH Breather and Seal Pot			
	Internal	External	Underneath
Surface preparation	Blast clean to SA 2.5	Blast clean to SA 2.5	N.A.
Primer	1 coat of epoxy resin based zinc phosphate high build primer (2 pack), DFT : 50 – 70 microns	2 coats of epoxy resin based zinc phosphate primer of 35-50 microns.	N.A.
Finish	2 coats of solvent free epoxy paint, DFT – 35 microns each	2 coats of polyamide cured epoxy finish paint of 30-35 microns each	N.A.
Total DFT	120 – 140 microns	130 – 170 microns	

ANNEXURE II

LDO/HFO Storage Tank			
	Internal	External	Underneath
Surface preparation	Wire bushing	ST2 (Wire Brushing/ Hand tool cleaning)	Blast clean to SA 2.5
Primer	NA	2 coats of red oxide zinc chromate primer (IS 2074) of 30 - 35 microns DFT each	1 coat of high build coal tar epoxy suitably pigmented, DFT : 80 – 100 microns
Finish	2 coats of double boiled linseed oil	2 coats of synthetic enamel (IS – 2932) paint of 20 – 25 microns (DFT) each	N.A
Total DFT		100 – 120 microns	80 – 100 microns

	TITLE: TECHNICAL SPECIFICATION FOR MILL REJECT HANDLING SYSTEM 1X700 MW BELLARY TPS UNIT#3 KARNATAKA POWER CORPORATION LIMITED	BHEL DOCUMENTS NO.: PE-TS-307-182-A001	
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DRAWING DOCUMNTS DISTRIBUTION SCHEDULE
ANNE URE-9

KPCL/BTPS/03/700

KARNATAKA POWER CORPORATION LTD

SECTION: F11



TITLE

DOCUMENT DISTRIBUTION SCHEDULE

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	KPCL (Design)	KPCL SITE	VENDOR
CORRESPONDENCE			
KPCL TO VENDOR	S	1*	O
VENDOR TO KPCL	O+1	1*	S
MANUFACTURING			
TEST REPORT	O+1	2	S
INSTRUCTION MANUALS			
- PRELIMINARY	3	2	S
- FINAL	5	10	S
DRAWINGS			
- PRELIMINARY	4P	1P	S
- RETURN PRELIMINARY	S	1P	1P
- FINAL APPROVED	+2P+CD+	10P + 2CD	S
Erection Drawings	1P+ 1 CD	6P +1CD	S
Spare Parts List	1P + 1CD	10P + 3CD	

LEGEND

* ' - On technical correspondence only

O - ORIGINAL

S - SOURCE


P - PRINT

R - REPRODUCIBLE


CD - COMPACT DISC

KPCL (DESIGN) - Chief Engineer (Thermal Designs), KARNATAKA POWER CORPORATION LIMITED
22/23 Sudhrshan Complex, Sheshadri Road Bangalore 560 09


KPCL (SITE) - Chief Engineer (C, CE(O&M), KARNATAKA POWER CORPORATION LIMITED,
Bellary Thermal Power Plant, Kuduthini, Bellary Dist 56.....

	TITLE:	BHEL DOCUMENTS NO.: PE-TS-307-182-A001	
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**PLOT PLAN
ANNE URE-10**

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VOLUME-III

	TITLE:	BHEL DOCUMENTS NO.: PE-TS-307-182-A001	
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DATA SHEETS



TITLE MILL REJECT HANDLING SYSTEM BAG FILTER DATA SHEET - B	SPECIFICATION NO. PE-TS-367-160-A001	
	VOLUME -III	
	SECTION	
	REV 0	DATE 3 May, 2012
	SHEET 1 OF 1	


BAG FILTER

S.NO	DESCRIPTION	DATA/PARTICULARS
1	No. of Bag Filter envisaged	:
2	Name of Manufacturer	:
3	Location	:
4	Type of Bag Filter	:
5	Bag Material	:
6	Cage Material	:
7	Bag Size and quantity	:
8	Air to Cloth Ratio	:
9	Bag Filter Dimensions	:
10	Bag Filter Weight	:
11	Dust Emission rate at the outlet(mg/m ³)	:
12	Pressure and quantity of I.A. air supply required (Kg/cm ²)	:
13	Spare filtration area provided	:

	Title	Spec. No.: PE-TS-367-160-A001	
	COMPRESSED AIR SYSTEM	Volume III	SUB SECTION DM8
	DATA SHEET B	Sheet 1 of 3 (R-0)	3 May, 2012


SL.NO.	ITEM	UNIT	PARTICULARS
1.00.00	AIR COMPRESSOR		Conveying air compressor
1.01.00	GENERAL		
1.01.01	Manufacturer		
1.01.02	Model No.		
1.01.03	Type of Compressor		
1.01.04	Numbers offered	Nos.	
1.02.00	Guaranteed Performance		
1.02.01	Capacity of each Compressor	NM ³ /min	
1.02.02	Discharge Pressure at Compressor HP outlet	Kg/cm ²	
1.02.03	Void		
1.02.04	Capacity considering design ambient condition (FAD)	M ³ /min	
1.02.05	Outlet Air Temperature after HP stage of compressor at design capacity	°C	
1.02.06	Outlet Air Temperature after after cooler	°C	
1.02.07	Void	°C	
1.02.08	Input Power required at the compressor shaft at design condition	kW	
1.02.09	Input Power required at the compressor shaft at fully unloaded condition	kW	
1.02.10	Guaranteed Power consumption at motor input terminals at rated conditions (i.e., without any tolerance)	kW	
1.02.11	Motor Rating of Drive Motor	kW	
1.02.12	Drive Motor speed	rpm	

Name of Bidder / Vendor						
Project						
Revision No.	0	1	2	3	4	5
Signature of Bidder / Vendor / Authorised Representative						
Date						

	Title	Spec. No.: PE-TS-367-160-A001		
	COMPRESSED AIR SYSTEM	Volume III	SUB SECTION DM8	
	DATA SHEET B	Sheet 2 of 3 (R-0)	3 May, 2012	

1.03.00	Material of Construction				
1.03.01	Compressor Chamber				
1.03.02	Rotors				
1.03.03	Inlet Throttle Valve				
1.03.04	Housing of Valve				
1.03.05	Timing Gears				
1.04.00	Max. Weight to be handled / lifted during erection and during maintenance				
2.00.00	INTAKE AIR FILTER & SILENCER				
2.01.00	Type				
2.02.00	Efficiency with corresponding particle size in microns	%			
2.03.00	Pressure drop across filter at rated flow in new condition	MMWC			
2.04.00	Filtering Medium				
2.05.00	Silencer Feature incorporated				
3.00.00	Air Recei ers				
3.01.00	Capacity	M ³			
3.02.00	Numbers offered	Nos			
3.03.00	Design Code				
3.04.00	Design Pressure	Kg/cm ²			
3.05.00	Material of Construction				
4.00.00	Intercooler, Aftercooler & Heat Exchangers				
4.01.00	Numbers per compressors or ADP offered	Nos			
4.02.00	Temperature				
4.02.01	Compressed Air inlet/outlet	°C			
4.02.02	Cooling Water inlet / outlet	°C			
4.03.00	Moisture separator provided as per specification?	Yes / No			
			Intercooler	Aftercooler	

Name of Bidder / Vendor						
Project						
Revision No.	0	1	2	3	4	5
Signature of Bidder / Vendor / Authorised Representative						
Date						

	Title	Spec. No.: PE-TS-367-160-A001	
	COMPRESSED AIR SYSTEM	Volume III	SUB SECTION DM8
	DATA SHEET B	Sheet 3 of 3 (R-0)	3 May, 2012

4.04.00	Level gauge, automatic drain trap etc provided as per specification?	Yes / No			
4.05.00	Material of Construction (Suitable for DM Water)				
4.05.01	Tube				
4.05.02	Shell				
4.05.03	Tube sheet				
5.00.00	Interconnecting Pipes Val es Etc.				
5.01.00	Whether all piping valves pipe supports fitting sampling connections instruments and other accessories provided as per specified and as per system requirements?				

Name of Bidder / Vendor						
Project						
Revision No.	0	1	2	3	4	5
Signature of Bidder / Vendor / Authorised Representative						
Date						



TITLE MILL REJECT DNSEVEYOR AND ACCESSORIES DATA SHEET - B	SPECIFICATION NO. PE-TS-367-160-A001	
	VOLUME -III	
	SECTION D	
	REV 0	DATE 3 May, 2012
	SHEET 1 OF 1	

DENSEVEYOR(TRANSPORTOR) AND ACCESSORIES


S.NO	DESCRIPTION	DATA/PARTICULARS
1	No. of denseveyor envisaged	:
2	Name of Manufacturer	:
3	Material of construction of Denseveyor	:
4	Wall thickness	:
5	Size and material of dome/butterfly valve	:
6	Any Liner of transportor vessel envisaged	:
7	Method of operation of the Dome/Butterfly Valve	:
8	Rate of Air supply required(NM ³ /min)	:
9	Pressure of air supply required(Kg/cm ²)	:
10	Capacity of removal ,T/hr	:
11	Capacity of Vessel (Water filled cap.)	:
12	Cycle timer of Denseveyor / Transportor operation : (sec)	:
13	Outlet size of Denseveyor vessel (Average Velocity)	:
14	Conveying velocity m/sec	:
15	Qty of I.A. required & its pressure	:
16	Max. and Min. pressure of instrument air reqd.	:
17	Time required to open dome/butterfly valve	:
18	Type of sealing for dome valve/ metering/ cut off valve	:



TITLE MILL REJECT HANDLING SYSTEM TECHNICAL SPECIFICATION STORAGE BUNKER DATA SHEET - B	SPECIFICATION NO. PE-TS-367-160-A001	
	VOLUME-III	
	SECTION	
	REV 0	DATE 3 May, 2012
	SHEET 1	OF 1


STORAGE BUNKER

S.NO	DESCRIPTION	UNIT	DATA/PARTICULARS
1.0	Quantity	-----	
2.0	Material Handled	-----	
3.0	Capacity Tones	-----	
4.0	No of outlet	-----	
5.0	MATERIAL OF CONSTRUCTION & THICKNESS		
6.1	Bunker Plates	mm	
6.2	Liner (MOC & Thk)	mm	
6.3	Discharge Gate	-----	
6.4	Size of Bunker Discharge	mm	
6.5	Type of covering on Bunker Top	-----	
6.6	Valley angle	degree	
7.0	Painting		

	TITLE	SPECIFICATION NO.
	MOTOR DATA SHEET - C	VOLUME II B
		SECTION D
		REV NO. 00 DATE 23/04/2012
		SHEET 1 OF 2


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


NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	TITLE	SPECIFICATION NO.
	MOTOR DATA SHEET - C	VOLUME II B
		SECTION D
		REV NO. 00 DATE 23/04/2012
		SHEET 2 OF 2

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

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

	DATA SHEET FOR PLC SYSTEM		SPECIFICATION NO.:	
			VOLUME II B	
			SECTION D	
			REV. NO. 02	DATE: 19.07.2008
			SHEET 1	OF 1
Data Sheet No.: PES-145-36-DS2-0				
Data Sheet C				
DATA SHEET – C (TO BE FILLED BY BIDDER AFTER AWARD OF CONTRACT)				
GENERAL *	PROJECT			
	SERVICE			
	QUANTITY			
	LOCATION			
PLC EQUIPMENT	MAKE / MODEL NO.			
	PROCESSOR			
	DATA BUS (HMI)			
	DATA BUS (I/O - CPU)			
	DATA BUS (REMOTE I/O - CPU)			
	FIELD CONTACTS INTERROGATION VOLTAGE			
	LOCATION OF COUPLING RELAYS			
	DESKTOP OWS QUANTITY			
	DESKTOP MONITOR TYPE			
	PRINTER (A4) - QUANTITY			
	PRINTER (A4) - MODEL			
	PROGRAMMING / CONFIGURATION FACILITY			
	SAFETY STANDARD			
	COMPUTER FURNITURE			
PANEL	QUANTITY			
	CLASS OF PROTECTION			
	REMOTE I/O PANEL			
	COLOUR			
	BACK-UP DESK			
	MIMIC			
	CONTROL HARDWARE			
COMMUNICATION TO OTHER SYSTEM	HARDWIRED			
	PURPOSE			
	MEDIUM			
	TIME SYNCHRONIZATION SIGNAL FORMAT			
	SOFTLINK			
	SERIAL LINK			
POWER SUPPLY INPUT FEEDER	PLC PANEL			
	REMOTE I/O PANEL			

	DATA SHEET FOR LOCAL PANELS	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE:
		SHEET 1	OF 1

TAG No. Qty.....

Data Sheet C
 DATA SHEET-C FOR LOCAL PANEL
 (TO BE FILLED BY CONTRACTOR AFTER AWARD OF CONTRACT)

GENERAL	MANUFACTURER		
	CONSTRUCTION		
	ENCLOSURE SHEET THICKNESS	FRONT	
		OTHER	
DOOR			
TECHNICAL	INPUT POWER SUPPLY		
	NO. OF FEEDERS		
	CONTROL SUPPLY		
	ALARM ANNUNCIATOR WINDOW (EXCLUDING SPARES)		
	PAINT TYPE		
	PANEL COLOUR (EXTERNAL)		
	FINISH		
	PANEL COLOUR (INTERNAL)		
	FINISH		
	CLASS OF PROTECTION		
	CONTROL HARDWARE		
	FOUNDATION ARRANGEMENT		
	WEIGHT OF PANEL (Kg.)		
	PANEL TYPE		
	CABLE GLAND		
	AAMETER (TYPE OF INPUT)		
NAME SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY
	COMPANY SEAL		
			NAME
			SIGNATURE
			DATE

FORM NO. PEM-6666-0



**DATA SHEET FOR
PRESSURE / DIFFERENTIAL PRESSURE GAUGE**

SPECIFICATION NO.:	
VOLUME	
SECTION	
REV. NO.	DATE:
SHEET 1	OF 2


TAG No. Qty.....

Data Sheet No.: **PE-DC-999-145-1026**

Data Sheet C

DATA SHEET-C FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE
(TO BE FILLED BY CONTRACTOR AFTER AWARD OF CONTRACT)

GENERAL	MANUFACTURER	
	MODEL NUMBER	
TECHNICAL	PRESSURE ELEMENT	
	MATERIAL	
	ENCLOSURE	
	DIAL	
	CASE	
	ADJUSTMENT	
	MOUNTING	
	OVER RANGE PROTECTION	
	BLOW OUT DISC	
	SETTING RANGE	
PERFORMANCE	ACCURACY	
CONNECTION	PROCESS	
	LOCATION	
ACCESSORIES	NAME PLATE / METAL TAG	
	MOUNTING	
	OTHER	
NAME		NAME
SIGNATURE		SIGNATURE
DATE		DATE

	CHECK LIST FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE (MECHANICAL AUXILIARY PACKAGES)	SPECIFICATION NO.: PE-TS-375-145-I054	
		VOLUME	
		SECTION	
		REV. NO. 00	DATE: 15.02.2012
		SHEET 16	OF 16

SL NO	TESTS/CHECKS	QUANTM OF CHECK	REFERENCE DOC. ACCEPTANCE NORMS	AGENCY			REMARKS
				P	W	V	
1.0	CHECK FOR		APPROVED TECHINCAL REQUIREMENT/ DATA SHEET				MFR TO CARRY OUT ROUTINE TEST ON 100%. WHEN MATL CORELATION ARE NOT AVAILABLE MFR'S COMPLIANCE TO BE PROVIDED
	1.1 DIAL SIZE	100%		M	C	C	
	1.2 MODEL NO/TAG NO	100%		M	C	C	
	1.3 RANGE/SCALE	100%		M	C	C	
	1.4 END CONNECTION	100%		M	C	C	
	1.5 SWITCH CONTACT RATING & NOS	100%		M	C	C	
2.0	CALIBRATION						
	2.1 ACCURACY	100%		M	C	B	
	2.2 REPEATABILITY (FOR SWITCH)	100%		M	C	B	
	2.3 SET POINT ADJUSTMENT FOR SWITCH	100%		M	C	C	
3.0	OVER PRESSURE & LEAK TEST	100%		M	C	C	
4.0	OPERATION OF PR. RELEIF DEVICE	ONE PER TYPE		M	C	C	
5.0	REVIEW OF T.C. FOR MATERIAL OF--						
	5.1 SENSOR	FOR LOT		-	-	B	
	5.2 MOVEMENT		-	-	B		
	5.3 PROCESS CONNECTION		-	-	B		
	5.4 HOUSING		-	-	B		
6.0	REVIEW OF T.C. FOR DEGREE OF PROTECTION	TYPE TEST	-	-	B		
7.0	REVIEW OF T.C. FOR CONTACT RATING OF SWITCH	ONE PER TYPE	-	-	B		
8.0	ACCESSORIES AS APPLICABLE	100%	M	C	C		

LEGEND:

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

NOTE:

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

FORM NO. PEM - 8888-0



TITLE

TYPICAL INSTALLATION DIAGRAM FOR PRESSURE SWITCH

SPECIFICATION NO. PE-DC-999-145-1031A

VOLUME IIB

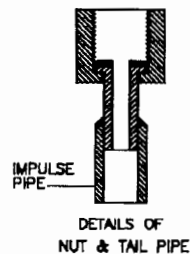
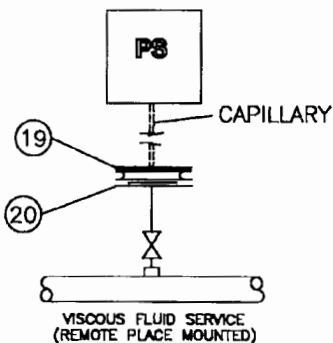
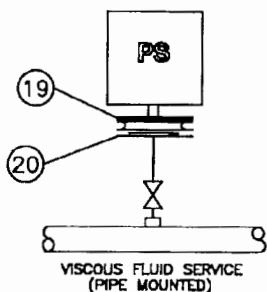
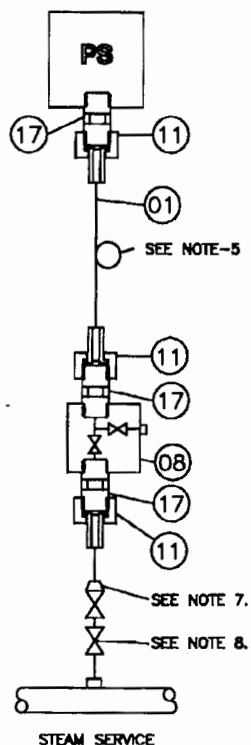
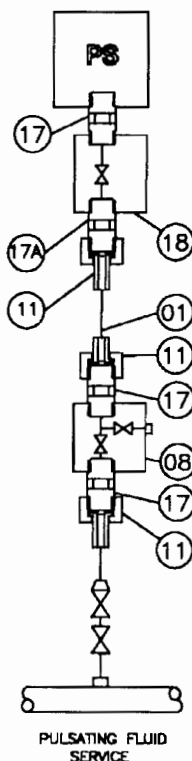
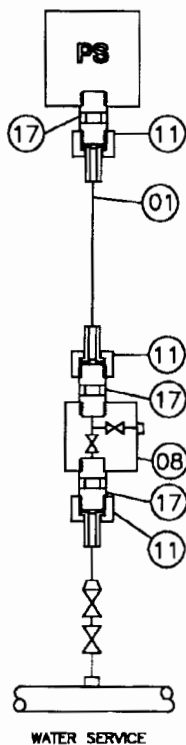
SECTION D

REV. NO. 00


DATE 23-09-08

SHEET 02

OF 03



ITEM NO	ITEM/DESCRIPTION	MATERIAL	SIZE	QTY			
				WATER	PULSATING	STEAM	VISCOUS
01	SEAMLESS STEEL IMPULSE PIPE	ASTM A108/A335	1/2"/15NB	1.5M	1.5M	1.5M	
08	TWO VALVE 3-WAY MANIFOLD	STAINLESS STEEL SS316	1/2" NPT(F) ENDS	01	01	01	
17	MALE CONNECTOR	STAINLESS STEEL SS316	1/2" NPT(M) x M20x1.5(M) ENDS	03	03	03	
17A	MALE CONNECTOR	STAINLESS STEEL SS316	M20x1.5(M) ENDS		01		
18	SNUBBER	STAINLESS STEEL SS316	M20x1.5(F) ENDS		01		
19	CHEMICAL SEAL	STAINLESS STEEL SS316	2" ANSI 300				01
20	MATING FLANGE	ASTM A105	2" ANSI 300				02
11	M20x1.5 SS NUT WITH ANNEALED COPPER WASHER & 100mm LONG TAIL PIPE TO SUIT 1/2" NB PIPE	STAINLESS STEEL SS316	M20x1.5x 1/2" NB	03	03	03	

	DATA SHEET FOR TEMPERATURE / DIFFERENTIAL TEMPERATURE SWITCH			SPECIFICATION NO.:		
	VOLUME					
	SECTION					
	REV. NO.			DATE:		
	SHEET		1	OF		2
TAG No. Qty.....			Data Sheet No.: PES-145-32-DS1-0			
Data Sheet A & B						
DATA SHEET-A FOR TEMPERATURE / DIFFERENTIAL TEMPERATURE SWITCH (TO BE FILLED BY PURCHASER)				DATA SHEET-B (TO BE FILLED-UP BY BIDDER)		
GENERAL	MANUFACTURER	Bidder to Specify				
	MODEL NUMBER	Bidder to Specify				
TECHNICAL	TYPE OF ELEMENT	MERCURY FILLED				
	SENSING ELEMENT	<input type="checkbox"/> BELLOWS <input type="checkbox"/> PISTON <input type="checkbox"/> DIAPHRAGM				
	MATERIAL	ELEMENT : 316 SS CASE : DIE CAST AL BULB & CAPILLARY : AISI 316 SS CAPILLARY ARMOUR : <input checked="" type="checkbox"/> SS <input type="checkbox"/> FLEXIBLE THERMOWELL : <input checked="" type="checkbox"/> AISI 316 SS MOVEMENT : <input checked="" type="checkbox"/> AISI 304 SS				
	ENCLOSURE	<input type="checkbox"/> INDOOR MOUNTED IP-55 <input checked="" type="checkbox"/> OUTDOOR MOUNTED IP-65 <input type="checkbox"/> FUEL GAS HAZARDOUS APPL. EXPL. PROOF				
	SWITCH TYPE	MICRO				
	SWITCH CONTACT	<input checked="" type="checkbox"/> 2 NOS. SPDT <input type="checkbox"/> DPDT				
	SWITCH RATING	<input type="checkbox"/> 5A 230V AC <input checked="" type="checkbox"/> 0.25A 220V DC				
	SETTING & DEAD BAND	ADJUSTABLE (WIDE RANGE)				
	MOUNTING	<input checked="" type="checkbox"/> FIELD <input type="checkbox"/> PANEL OR RACK				
	TEMP. COMPENSATION	<input checked="" type="checkbox"/> CASE COMP.				
	OVER RANGE PROTECTION	115% OF MAXIMUM TEMPERATURE				
	BULB DIA	<input type="checkbox"/> 12 MM <input type="checkbox"/> ANY OTHER (SPECIFY)				
	CAPILLARY LENGTH	<input checked="" type="checkbox"/> 5M (FOR LOCAL MOUNTING) <input type="checkbox"/> 15M (FOR PANEL/RACK MOUNTING)				
	PERFORMANCE	ACCURACY	± 1% OF FULL SCALE OR BETTER			
REPEATABILITY		LESS THAN ±0.5%				
TEMPERATURE SWITCH		<input type="checkbox"/> M20X1.5M ADJ. ON STEM TO SUIT THERMOWELL				
CONNECTION	THERMOWELL	<input checked="" type="checkbox"/> YES <input type="checkbox"/> BAR STACK TYPE				
	THERMOWELL CONNECTION	M20X1.5M FEMALE (FOR INSTRUMENT CONNECTION) M33X2 MALE (FOR STUB CONNECTION) DESIGN CODE: ANSI 19.3				
	ELECT. CONNECTION	WITH GLAND TO SUIT CABLE OF MAX. OD 17.5MM				
	INSTALLATION ACCESSORIES	<input checked="" type="checkbox"/> AS REQUIRED				
ACCESSORIES	PREPARED BY	CHECKED BY	APPROVED BY		COMPANY SEAL	
	NAME					NAME
	SIGNATURE					SIGNATURE
DATE					DATE	

	DATA SHEET FOR TEMPERATURE / DIFFERENTIAL TEMPERATURE SWITCH		SPECIFICATION NO.:		
			VOLUME		
			SECTION		
			REV. NO.	DATE:	
		SHEET	1	OF	2

TAG No. Qty.....

Data Sheet No.: **PES-145-32A-DS1-0****Data Sheet C**

DATA SHEET-C FOR TEMPERATURE / DIFFERENTIAL TEMPERATURE SWITCH
(TO BE FILLED BY CONTRACTOR AFTER AWARD OF CONTRACT)

GENERAL	MANUFACTURER			
	MODEL NUMBER			
TECHNICAL	TYPE OF ELEMENT			
	SENSING ELEMENT			
	MATERIAL			
	ENCLOSURE			
	SWITCH TYPE			
	SWITCH CONTACT			
	SWITCH RATING			
	SETTING & DEAD BAND			
	MOUNTING			
	TEMP. COMPENSATION			
	OVER RANGE PROTECTION			
	BULB DIA			
PERFORMANCE	CAPILLARY LENGTH			
	ACCURACY			
	REPEATABILITY			
CONNECTION	TEMPERATURE SWITCH			
	THERMOWELL			
	THERMOWELL CONNECTION			
	ELECT. CONNECTION			
ACCESSORIES	INSTALLATION ACCESSORIES			
NAME SIGNATURE DATE	PREPARED BY	CHECKED BY	APPROVED BY	COMPANY SEAL NAME SIGNATURE DATE

**VOLUME-III
PRICE SCHEDULE, REV-2**

**Design, engineering, manufacturing, supply of material, fabrication, inspection, testing at manufacture s/
sub- endor s works, painting, forwarding, deli ery, complete erection & commissioning of Mill Reject
System for 1 700 MW BELLARY TPS UNIT 3.**

TENDER NO - PSER:SCT:DPL-M1264:11

SCH-6 - GUARANTEED POWER CONSUMPTION

SL NO	DESCRIPTION OF EQUIPMENT	NO OF EQUIPMENT		TOTAL GUARANTEED POWER CONSUMPTION FOR EACH EQUIPMENT AT MOTOR INPUT TERMINAL AND CONTROL PANEL	DUTY FACTOR	TOTAL KW
		WORKING	STANDBY			
(1)	(2)	(3A)	(3B)	(4)	(5)	(6)=(3Ax4x5)
1.0	Conveying air compressor.)	1	1		1	
TOTAL						

NOTE

- 1.0 Estimated power consumption (EPC) figure for the system (for working drives only) has been considered as 85 KW. So long bidder's quoted guaranteed power consumption (GPC) above remains within this EPC, there will be no technical loading of bid on power consumption for evaluation. However, if bidder's quoted GPC exceeds EPC, there shall be technical loading of bid for evaluation @ Rs 4.75 lac per KW of additional power over EPC.
- Bidder's guaranteed power consumption at motor input terminals (not shaft power) as furnished in relevant schedule shall be demonstrated by the successful bidder during performance testing at works/ site. In case power consumption is noted higher than EPC / bidder's quoted GPC whichever is higher, during inspection/ PG test, penalty @ Rs 1.87 lac per additional KW shall be levied on vendor.

PEM-6666-0



TITLE TECHNICAL SPECIFICATION FOR MILL REJECT HANDLING SYSTEM	SPECIFICATION NO. PE-TS-367-160-A001	
	VOLUME III	
	SECTION D	
	REV 00	DATE 3-May-12
	SHEET 1 OF 6	

PRE-BID CLARIFICATION SCHEDULE

S. No.	Section/Clause /Page No.	Statement of the referred clause	Clarification Re uired

The bidder hereby certifies that above mentioned are the only clarifications required on the technical specification for the subject package.

SIGNATURE: _____
 NAME: _____
 DESIGNATION: _____
 COMPANY: _____
 DATE: _____

COMPANY SEAL



TITLE

 TECHNICAL SPECIFICATION FOR
MILL REJECT HANDLING SYSTEM

SPECIFICATION NO. PE-TS-367-160-A001

VOLUME III

SECTION D

REV 00

DATE 3-May-12

SHEET 3 OF 6

S. No.	Description	Requirement m ³ /min & Pressure	Intermittent/Continuous
01			
02			
03			
04			
05			
06			

SERVICE WATER REQUIREMENT

S. No.	Description	Requirement m ³ /min & Pressure	Intermittent/Continuous
01			
02			
03			
04			
05			
06			

EQUIPMENT WATER REQUIREMENT

S. No.	Description	Requirement m ³ /min & Pressure	Intermittent/Continuous
01			
02			
03			
04			
05			
06			

- * Bidder shall furnish the instrument air, service water and equipment water requirement along with supporting calculation and reference document.

SIGNATURE: _____

NAME: _____

DESIGNATION: _____

COMPANY: _____

DATE: _____

COMPANY SEAL

PEM-6666-0



TITLE TECHNICAL SPECIFICATION FOR MILL REJECT HANDLING SYSTEM	SPECIFICATION NO. PE-TS-367-160-A001	
	VOLUME III	
	SECTION D	
	REV 00	DATE 3-May-12
	SHEET 4 OF 6	

S.No.	ITEM DESCRIPTION	QUANTITY
01		
02		
03		
04		
05		
06		
07		
08		
09		
10		

SIGNATURE: _____

NAME: _____

DESIGNATION: _____

COMPANY: _____

DATE: _____

COMPANY SEAL

PEM-6666-0



TITLE TECHNICAL SPECIFICATION FOR MILL REJECT HANDLING SYSTEM	SPECIFICATION NO. PE-TS-367-160-A001	
	VOLUME III	
	SECTION D	
	REV 00	DATE 3-May-12
	SHEET 5 OF 6	

S. No.	ITEM DESCRIPTION	QUANTITY
01		
02		
03		
04		
05		
06		
07		
08		
09		
10		

Bidders need to fill this list ONLY IF the Tools are SPECIAL in nature.

SIGNATURE: _____

NAME: _____

DESIGNATION: _____

COMPANY: _____

DATE: _____

COMPANY SEAL

PEM-6666-0



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

SPECIFICATION NO. PE-TS-367-160-A001
 VOLUME III
 SECTION D
 REV 00 DATE 3-May-12
 SHEET 6 OF 6

S. No.	ITEM DESCRIPTION	QUANTITY
01		
02		
03		
04		
05		
06		
07		
08		
09		
10		

SIGNATURE: _____

NAME: _____

DESIGNATION: _____

COMPANY: _____

DATE: _____

COMPANY SEAL

1 700 MW BELLARY TPS UNIT 3- MILL REJECT SYSTEM									
SUGGESTIVE PRICE FORMAT									
S.No	Details of Works or Equipment/System	1 Ex-works price	2 ED	3 CST	4 FREIGHT	5 Sum 1 to 4 FOR SITE	6 E&C Charges	7 Service Tax on E&C	8 5 6 7 Total
1.1.0	Lumpsum prices								
1.1.1	Total lumpsum firm price inclusive of all taxes duties and other levies as applicable for design, engineering, manufacturing, inspection and testing, painting, supply/delivery duly packed at project site including freight, unloading, storage and handling at site, design & construction of structural and minor civil works at site etc., erection and commissioning, trial run at site, PG Test and handing over to the customer of Complete Mill Reject System in line with drawings/ documents/ test procedures approved by BHEL/Customer, inclusive of all prevailing taxes, duties and other levies for Mill Reject System complete with all accessories including erection and commissioning spares as required for the total scope defined as per technical specification PE-TS-361-160-A001 taking into account all clarifications, confirmations and agreements till date.								
Notes:									
a)	<i>Bidder to note that total price indicated above at 1.1.1 shall be considered for evaluation and hence should be complete in all respect for the full scope defined and considering all terms and conditions agreed including electrical and control & instrumentation.</i>								
b)	Any item not included in the price quoted above and shown separately will not be taken cognizance of and the offer shall be liable for rejection.								
c)	In case, price indicated above does not match with the total of item wise break-up given at 1.2.0, the highest price so calculated shall be considered for evaluation but in case of order, the same shall be placed at the lowest price.								

1 700 MW BELLARY TPS UNIT 3- MILL REJECT SYSTEM										
SUGGESTIVE PRICE FORMAT										
S.No	Details of Works or Equipment/System	1 Ex-works price	2 ED	3 CST	4 FREIGHT	5 Sum 1 to 4 FOR SITE	6 E&C Charges	7 Service Tax on E&C	8	5 6 7 Total
1.2.0	Break - up of Prices given at 1.1.1 above.									
1.2.1	Lumpsum firm price for supply of denseveyors with dome /butterfly/ vertical swing type valve and accessories inclusive of all taxes, duties and other levies as applicable .									
1.2.2	Lumpsum firm price for supply of Pyrite hopper with level probes, temperature switch, rupture disc inclusive of all taxes, duties and other levies as applicable .									
1.2.3	Lumpsum firm price for supply of pneumatic panel/ Air control module/ Solenoid box with accessories inclusive of all taxes, duties and other levies as applicable									
1.2.4	Lumpsum firm price for supply of storage bunkers, pressure relief valves, bag filters with pressure switch , terminal boxes , level probes, chain pulley blocks with accessories inclusive of all taxes duties and other levies as applicable.									
1.2.5	Lumpsum firm price for air compressors with drive etc inclusive of all taxes, duties and other levies as applicable									
1.2.6	Lumpsum firm price for Air receivers with accessories inclusive of all taxes, duties and other levies as applicable									
1.2.7	Lumpsum firm price of pipes for Mill reject conveying, Compressed air & cooling water services etc inclusive of all taxes, duties and other levies as applicable									
1.2.8	Lumpsum firm price for Air & Water line valves inclusive of all taxes, duties and other levies as applicable									
1.2.9	Lumpsum firm price for pneumatically operated knife gate valves for different application inclusive of all taxes, duties and other levies as applicable .									
1.2.10	Lumpsum firm price for manually operated knife gate valves for different application inclusive of all taxes, duties and other levies as applicable .									
1.2.11	Lumpsum firm price for Alloy C.I bends/ fittings/laterals inclusive of all taxes, duties and other levies as applicable .									
1.2.12	Lumpsum firm price for Field instruments/controls/special cables/ cable glands & lugs, cable trays inclusive of all taxes, duties and other levies as applicable .									
1.2.13	Lumpsum firm price for LT power cable, control cable, signal cable/ instrumentation cable inclusive of all taxes, duties and other levies as applicable .									

1 700 MW BELLARY TPS UNIT 3- MILL REJECT SYSTEM									
SUGGESTIVE PRICE FORMAT									
S.No	Details of Works or Equipment/System	1 Ex-works price	2 ED	3 CST	4 FREIGHT	5 Sum 1 to 4 FOR SITE	6 E&C Charges	7 Service Tax on E&C	8 5 6 7 Total
1.2.14	Lumpsum firm price of trolley mounted sump pump along with all its control, inclusive of all taxes, duties and other levies as applicable.								
1.2.15	Lumpsum firm price for PLC control system with Hot standby processor including CRT(s), Battery, Battery Charger & UPS inclusive of all taxes, duties and other levies as applicable.								
1.2.17	Lumpsum firm price for Start-up & commissioning spares (Annexure I) as required inclusive of all taxes, duties and other levies as applicable .								
1.2.18	Lumpsum price for special Maintenance tools and tackels as per annexure II inclusive of all taxes, duties and other levies as applicable.								
1.2.19	Lumpsum firm prices of any other item under 1.2.1 inclusive of all taxes, duties and other levies as applicable (please specify quoted items)								
	Total of 1.2.1 to 1.2.19 Should match with 1.1.1 . However , the break up prices indicated under this head are for internal use only & NOT for any comparison purpose & or making adjustment for scope variation.								
1.4.0	Unit Prices To be used for adjustment against any scope variation and information								
1.4.1	Unit price per meter with erection/ laying of conveying air Pipes inclusive of taxes, duties & other levies etc. (bidder to indicate the pipe size also)								
1.4.1	Unit price per meter with erection/ laying of Mill Reject conveying Pipes inclusive of taxes, duties & other levies etc. (bidder to indicate the pipe size also)								
1.4.2	Unit price of pneumatically operated knife gate valve along with actuator,size 200 NB, inclusive of all taxes, duties and other levies as applicable (The price will include all associated accessories ie, solenoid, Limit switch required I/o in PLC etc required)								
1.4.3	Unit price of manually operated knife gate valve (size 200 NB) inclusive of all taxes, duties and other levies as applicable								

