

**3x660MW SUPERCRITICAL THERMAL POWER PLANT AT  
LALITPUR, UTTAR PRADESH**

**VOLUME - II B**


**TECHNICAL SPECIFICATION  
FOR  
MILL REJECT HANDLING SYSTEM**

**SPECIFICATION NO.: PE-TS-375-160-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.


	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR</b> <b>MILL REJECT HANDLING SYSTEM</b>  <b>3X660MW SUPERCRITICAL THERMAL POWER</b> <b>PLANT AT</b> <b>LALITPUR, UTTAR PRADESH</b>	BHEL DOCUMENTS NO.: PE-TS-375-160-A001	
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	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR MILL REJECT HANDLING SYSTEM</b>  <b>3x660MW SUPERCRITICAL THERMAL POWER PLANT AT LALITPUR, UTTAR PRADESH</b>	<b>BHEL DOCUMENTS NO.:</b> PE-TS-373-160-A001	
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**SECTION - A**  
**(SCOPE OF ENQUIRY)**


	TITLE:  <b>TECHNICAL SPECIFICATION FOR MILL REJECT HANDLING SYSTEM</b>  <b>3x660MW SUPERCRITICAL THERMAL POWER PLANT AT LALITPUR, UTTAR PRADESH</b>	BHEL DOCUMENTS NO.: PE-TS-373-160-A001	
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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 **3x660MW SUPERCRITICAL THERMAL POWER PLANT AT LALITPUR, UTTAR PRADESH**.
- 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****(PROJECT INFORMATION)**


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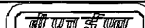
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<p style="text-align: center;"><b>PROJECT INFORMATION</b></p> <p>b) Maximum (Condenser &amp; PHE secondary side) 36°C</p> <p>17) Seismic data as per IS 1893: 2002</p> <p>a) Zone Zone-III</p> <p>b) Zone factor-Z 0.16</p> <p>c) Importance factor (I) 1.75 (as per latest IS1893)</p> <p>18.0 Auxiliary power supply Auxiliary electrical equipment to be supplied against this specification will be suitable for operation on the following supply system.</p> <p>(a) For motors rated above 1500 kW 11000V, 3 phase, 3 wire, 50Hz (Medium resistance earthed) AC Supply</p> <p>(b) For motors rated above 200 kW and up to &amp; including 1500 kW 6600V, 3 phase, 3 wire, 50Hz (Medium resistance earthed) AC Supply</p> <p>(c) For motor rated up to &amp; including 200kW 415V, 3 phase, 3 wire solidly earthed AC Supply</p> <p>(d) DC motor starters, DC solenoids, DC alarm, control and protections 220 V DC, 2 wire, unearthed DC</p> <p>(e) AC control &amp; protective devices 110 V, 1 phase, 50Hz, 2 wire AC supply. The single-phase 110V AC supply will be derived by Contractor by providing 415V/110V control transformers of adequate rating with MCCB IMCB on both the primary and secondary sides.</p> <p>(f) Uninterrupted power supply 240 V, 1 phase, 50Hz, 2 wire AC supply</p> <p style="text-align: right;">ISSUE RO</p>		

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<p style="text-align: center;"><b>PROJECT INFORMATION</b></p> <p>(g) AC solenoids, space heaters (for motors rated 30kW and above)      240 V, 1 phase, 2 wire, 50Hz AC system with solidly earthed neutral. The power supply will be derived by Contractor by providing 415V/ 240V transformer of adequate rating with MCCB/MCB on primary/secondary sides.</p> <p>(h) Solid state controls (including solenoid valves)      24 V DC, 2 wire, supply from (24V DC supply derived from 240 V AC UPS supply)</p> <p>(i) Lighting fixtures      240 V, 1 phase, 2 wire, 50Hz solidly earthed AC system.</p> <p>(j) a. Lighting fixtures and space heaters in panels      240 V, AC 1 phase, 2 wire, 50Hz solidly earthed AC system.</p> <p>b. Construction power supply      415V, 3 phase, 4 wire, 50Hz solidly earthed AC supply</p> <p>(k) The above voltages may vary as follows:</p> <p>All devices will be suitable for continuous operation over the entire range of voltage and frequency indicated below without any change in their performance.</p> <p>i. AC supply      Voltage variation      <math>\pm 10\%</math> Frequency variation      +5% to -5% Combined voltage &amp; frequency variation      10%</p> <p>ii. DC supply      Voltage variation      +10% to -15%</p> <p style="text-align: right;">ISSUE RO</p>		

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## SECTION – C

### (SPECIFIC TECHNICAL REQUIREMENTS)

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## SECTION – C1

(SPECIFIC TECHNICAL REQUIREMENTS FOR MECHANICAL)

	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR</b> <b>MILL REJECT HANDLING SYSTEM</b>  <b>3 X 660 MW Super Critical TPP at LALITPUR, Uttar Pradesh</b>	BHEL DOCUMENTS NO.: PE-TS-375-160-A001	
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**3x660 MW LPGCL LALITPUR TPP.**

Sno.	Items/Description	LALITPUR
1	No of mills/Unit	8 (7W+1S)
2	Reject generation 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	8 mm thk SAIL HARD / TISCRA L Liner at conical portion of bunker.
10	Pyrite Hopper Thickness	10 mm/ As per supplier's std practice, whichever is higher
11	Air Receiver	One per mill bay (Total 6 nos. for plant), As per IS 2825
12	Water spray system (Pyrite quenching)	Required
13	No of compressors	3 Nos (2W+1S), non lubricated reciprocating type compressor.(Each sized to cater air requirement of two units)
14	Sump Pump (Trolley Mounted type)	3 Nos. ( 1 per unit).
15	Bunker Capacity	55 T of each bunker. (Total 6 nos. Bunker)
16	Type of control/ Main control panel location	DCS based control system
17	Mandatory spares	Not Applicable
	<b>Sizing Criteria</b>	
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
<b>NOT E</b>	* Silo location marked in layout is tentative and same shall be finalized 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"> <li>Each Compressor shall be sized such that it can cater air requirement of two units.</li> <li>A margin of 50 % shall be considered over and above the required/ calculated/ minimum compressor capacity arrived for conveying of total reject generated.</li> <li>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.</li> <li>Guaranteed reject conveying rate 1000 kg/hr per mill.</li> <li>RH – As per project information.</li> <li>Air Temperature - As per project information.</li> <li>Height above MSL- As per project information.</li> <li>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.</li> </ol>
02	Air Receiver (Capacity)	<p><b>Capacity:</b> 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"> <li>Capacity – 2-3 times denseveyor / transporter vessel capacity.</li> <li>MOC – MS to IS 2062 Gr. A (min), min 10 mm thk.</li> <li>Rupture Disc Bursting Pressure – 0.5 kg /cm<sup>2</sup> (g)</li> <li>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.</li> <li>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.</li> </ol>
04	System Sizing Basis	<p>System shall be sized for two normal cycles (i.e. one cycle for each bay) and one in emergency.</p>
	a) Reject size to be handled	<p>Max. size of rejects to be handled – up to 50 mm (5% of total reject) rest 25 mm &amp; below</p>
	b) Conveying vessel	<p>To suit the conveying rate with 85% (max) filling</p>

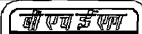
	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR</b> <b>MILL REJECT HANDLING SYSTEM</b> <b>3 X 660 MW Super Critical TPP at LALITPUR, Uttar Pradesh</b>	BHEL DOCUMENTS NO.: PE-TS-375-160-A001	
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05	Bunker & its Accessories	<p>a) <i>Quantity</i> – One (1) per bay (Two nos. per unit).</p> <p>b) <i>Effective Storage Capacity</i> – 55 T</p> <p>c) <i>Minimum free board</i> – 500 mm</p> <p>d) <i>Bunker Plate</i> – 10 mm thk. MS Plate conforming to IS 2062 Gr A</p> <p>e) <i>Liner</i> – 8 mm SAIL HARD/ TISCRAAL Liner on conical portion of bunker</p> <p>f) <i>Discharge Gate</i></p> <ol style="list-style-type: none"> <li>Size – 400 mm x 400 mm (clear open)</li> <li>Type – Twin Sector, Pneumatic operated.</li> <li>MOC – CI to IS 210/ MS 10 mm thick (min) to IS 2062 (Gr. A min) with 10 mm thick SAILHARD/TISCRAAL LINER on inner surface</li> </ol> <p>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 &amp; maintenance.</p> <p><b>Bag Filter</b></p> <p>Each Bag filter shall be sized considering simultaneous firing of one normal and one emergency cycle.</p> <ol style="list-style-type: none"> <li><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 &amp; durability.</li> <li><i>Air to Cloth Ratio</i> – 1.5 (Further 10 % additional bags shall be provided)</li> <li><i>Bag</i> – MS, IS 2062, Gr. A (min), 3.0 mm thick (min)</li> <li><i>Bag Cage</i> – MS, IS 2062, Gr. A galvanized.</li> <li><i>Outlet Air Quality</i> – 50 mg/nm<sup>3</sup> (max) (To be demonstrated during PG test)</li> <li><i>Bag Cleaning Mechanism</i> – Automatic and shall comprise of solenoid valves, air nozzles, adjustable solid state timer, pressure switches, piping and fittings etc.</li> <li>Test on bag filter casin : 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 &amp; casing is done at shop, relevant NDT shall be carried out as per approved MQP for checking the soundness of weld.</li> <li>Chain Pulley Block over bag filter: Shall have 25% margin over weight of bag filter, but in no case the capacity shall be lower than 1.0 T.</li> </ol>
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06	Lines for Various Services	<table><tr><th>Service</th><th colspan="3">Velocity in m/sec</th></tr><tr><th>Pipe size below 50 mm</th><th>Pipe size from 50 mm to 150 mm</th><th>Pipe size 200 mm &amp; above</th></tr><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><tr><td></td><td></td><td></td><td></td></tr><tr><th>Service</th><th colspan="3">Material of Construction &amp; other details</th></tr><tr><td>Conveying/ Compressed air / Instrument Air /Water Pipe</td><td colspan="3">MS ERW Gr. Heavy to IS 1239/3589 Minimum size of reject Conveying pipe shall be 125 NB. Pipes for reject conveying pipe shall have flanged ends. For other services, pipes 65 NB and above shall have flanged ends while pipes 50 NB &amp; below shall have screwed/ socket welded end. Instrument air pipe shall be galvanised both internally &amp; externally as per IS 4736.</td></tr><tr><td></td><td></td><td></td><td></td></tr></table>	Service	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							Service	Material of Construction & other details			Conveying/ Compressed air / Instrument Air /Water Pipe	MS ERW Gr. Heavy to IS 1239/3589 Minimum size of reject Conveying pipe shall be 125 NB. Pipes for reject conveying pipe shall have flanged ends. For other services, pipes 65 NB and above shall have flanged ends while pipes 50 NB & below shall have screwed/ socket welded end. Instrument air pipe shall be galvanised both internally & externally as per IS 4736.						
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		07	Knife Gate/Plate Valve (pyrite hopper inlet, oversize discharge, emergency discharge, hopper isolation/maintenance)	<b>Material of Construction</b>  Body – CI to IS 210 Gr FG 260 Gate/Plate – SS (ASTM A 240 type 304) with wearing parts provided with abrasion resistant material of hardness 350-400 BHN Size – 200 NB (min) for all valves  Deflection cone : Required before the pyrite hopper inlet knife gate valve																																					
		08	Dome Valve/ Swing Disk Inlet Valve	<b>Material of construction</b> Body – CI to IS 210 Gr. FG 260 Dome – Alloy CI with hardness as 250 BHN with leak proof seat. Shaft – SS 316 Disk – SS 304/ Alloy CI, hardness of 500 BHN (min)																																					
		09	Conveying pipe bend	<b>MOC &amp; Hardness</b> – Alloy CI, 450 BHN min with min 2% Ni End connection- Flanged																																					



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10	Fittings, Flanges, Fasteners & Gaskets	<table><tr><td colspan="2"><b>Fittings (Elbow, Tees and Reducers)</b></td></tr><tr><td>Service</td><td>Requirements</td></tr><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><tr><td colspan="2"><b>Flanges</b></td></tr><tr><td>Service</td><td>Requirement</td></tr><tr><td>All services</td><td>Fabricated out of IS 2062 Gr.B Plates/ Equivalent as per ASME B 16.5</td></tr><tr><td colspan="2"><b>Fasteners</b></td></tr><tr><td>Service</td><td>Requirement</td></tr><tr><td>All services</td><td>SA 193 Gr B7 or equivalent/SA 194 Gr 2H or equivalent</td></tr><tr><td colspan="2"><b>Gaskets</b></td></tr><tr><td>Service</td><td>Requirement</td></tr><tr><td>All services</td><td>TEFLON suitable for service temperatures, min 3 mm thick.</td></tr></table>	<b>Fittings (Elbow, Tees and Reducers)</b>		Service	Requirements	Instrument Air	IS 1239, Part-2 (Galvanized)	Water and conveying air	IS 1239, Part –2	<b>Flanges</b>		Service	Requirement	All services	Fabricated out of IS 2062 Gr.B Plates/ Equivalent as per ASME B 16.5	<b>Fasteners</b>		Service	Requirement	All services	SA 193 Gr B7 or equivalent/SA 194 Gr 2H or equivalent	<b>Gaskets</b>		Service	Requirement	All services	TEFLON suitable for service temperatures, min 3 mm thick.
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11	Valves for Air & Water Lines	<p><b>Instrument air line</b> Type : Ball Valve full bore, screwed end. MOC : Body – CS, Internals- 13% chrome SS-304</p> <p><b>ECW (DM Water) line for Compressor cooling</b> Type : Gate/Globe valve. Flat faced with flanged end for size 65 NB &amp; above and SW end for size 50 NB &amp; below. MOC : Body – SS, Internals &amp; Stem - SS</p> <p><b>Service Water line for Quenching &amp; Dome seal cooling</b> Type : Gate/Globe valve. Flat faced with flanged end for size 65 NB &amp; above and SW end for size 50 NB &amp; below. MOC : For size 65 NB &amp; above -Body – CI , Internals &amp; Stem – Gun Metal For size 50 NB &amp; below -Body– Gun Metal, Internals &amp; Stem – Gun Metal</p>																										
12	Sump Pumps	<p>Three (3) nos. of sump pump (Trolley Mounted) for plant i.e. One (1) no for each unit. Capacity – To meet system requirement but not less than 5 m<sup>3</sup>/hr MOC</p> <p>i. Casing &amp; 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/m<sup>3</sup> for volumetric calculation 2400 kg/m<sup>3</sup> for civil &amp; 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) 24 nos. of pneumatic Cylinder operated plate/ knife gate valve with open and close limit switches at mill outlet/pyrite hopper inlet.
- b) 24 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) 48 nos. (2 Nos. per pyrite hopper) of Level probes for pyrite hoppers (Radar type level transmitter shall be provided).
- d) 24 nos. of Temperature Switches for pyrite hoppers
- e) 24 nos. of hand wheel operated plate/knife gate valve at pyrite hopper outlet for pyrite hopper isolation
- f) 24 nos. of pneumatic 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) 24 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) 24 nos. of transporter vessel / denseveyor complete with pneumatically operated dome/ material handling valve, Alloy CI outlet bend, local control panel etc.
- i) 24 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 (450BHN).
- k) 3 sets of terminal boxes (One set per unit) with up stand on bunker top for terminating the reject conveying pipes.
- l) Six (6) nos. mill reject bunker along with structure, complete with lining on conical portion and lever operated bunker discharge gate with canvas chute at bunker outlet, staircase, operating & maintenance platform, hand railing, bag filter, level probe(RF type level Probe), pressure relieve valve, chain pulley block with traveling trolley and monorail arrangement etc.
- m) 3 nos. (2W+1S) non lubricated reciprocating type air compressor with drive motor, local control panel, instruments and all other accessories.
- n) Six nos. air receivers (i.e. two nos. per unit) complete with drain traps, safety relief valve, instruments and all accessories.
- o) 3 No. Trolley mounted 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.


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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) DCS 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 EXCLUDED from scope under Clause .No. 2.0 below.**

## 2.0 EXCLUSION


- 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 each bunker bay and a pressure of 2.5-3 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 6-7 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.

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#### 4.0 TERMINAL POINT

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

Mill Reject outlet towards road tanker : 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 at distance of 5m from MRS compressor house (Location).

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

Instrument Air : At First Col of each mill bay.

#### 5.0 PERFORMANCE /FUNCTIONAL GUARANTEES & LIQUIDATED DAMAGES

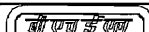
##### PG /FG test shall comprise of

- 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/nm<sup>3</sup> 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.

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## 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 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 wrt 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% of total reject)
Maximum size	:	50 mm (about 10% of total reject)
Temperature °C (Normal/Design)	:	180/200
Bulk density	:	1.6 T/m <sup>3</sup> for volumetric calculation
	:	2.4 T/m <sup>3</sup> 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.

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	3 X 660 MW Super Critical TPP at LALITPUR, Uttar Pradesh	REV. NO. 00	DATE: 08/07/2012
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### 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.

### 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-375-160-A001, R-0
- b) Plot plan- PE-DG-375-100-M001, R-01
- c) General Arrangement of HP 1103 MILL (with planetary gear box)


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.

### 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.

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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.

#### **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
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: -**

1. P & I Diagram (Mill Reject System)
2. Control Write – up of Mill reject system
3. Design Philosophy of Mill reject system
4. P & ID, Write up and sizing calculation of compressor
5. Design Calculation of Air and Mill Reject Mixture by Compressor
6. Equipment Layout of Mill Reject System
7. Piping Layout of Mill reject System
8. Cable Layout
9. Earthing Layout
10. General arrangement Of Denseveyor
11. Data Sheet of Denseveyor/pyrite vessel
12. General arrangement of Pyrite hopper
13. Data Sheet of Pyrite hopper
14. General arrangement an foundation plan of Air receiver
15. Data Sheet of air receiver
16. General arrangement of bunker discharge gate
17. Data Sheet of discharge gate
18. General arrangement of Bunker
19. Design calculation of bunker and load data
20. Data Sheet of bunker



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21. Structural arrangement of Bunker
22. General arrangement of terminal box
23. Data sheet of terminal box
24. General arrangement of 200NB PRV
25. Data sheet of PRV
26. Data Sheet of compressor
27. General arrangement and Foundation Plan for Compressor
28. General arrangement of compressor motor
29. Data Sheet of Compressor motor
30. General arrangement of Knife gate valve with cylinder and CWG actuator
31. Data sheet of knife gate valve
32. General arrangement of Bag Filter
33. Data sheet of Bag Filter
34. General arrangement of ACI pipe bend
35. Data Sheet of Pipe bend
36. Control scheme
37. Mimic Diagram
38. C & I Cable schedule
39. I/O Schedule
40. Pneumatic circuit of denseveyor
41. Pneumatic circuit of for cylinder operated Plate Valve
42. Block Logic Diagram of denseveyor
43. List of Inter locks
44. Painting Schedule
45. Piping Schedule
46. Valve Schedule
47. Instrument Schedule
48. QP Schedule
49. Sub- Contractor Schedule / Vendor list
50. Foundation details of mill reject storage bunker
51. Foundation details of Compressor and Air receiver
52. Filed Quality Plan
53. List of recommended Spares for 3 years of operation
54. List of Erection and Commissioning spares
55. List of tools and tackles

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56. Manufacturer's test certificate for materials.


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

**NOTE: -**

- 1) Drawing shall be prepared in AutoCAD software.
- 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**  
**BAJAJ HINDUSTHAN LTD. – LALITPUR PROJECT(LPGCL) -3x660 MW**


**REV 02 DT. 08-11-2011**

Max. Mill reject quantity per mill (kg/hr)		: 690.0 (1% OF MILL MAX LOAD With Design Coal at 100%BMCR)
Reject Temperature (normal)	Deg. C	: ~180
Reject Temperature (design)	Deg. C	: ~200
No. of mills per boiler		: EIGHT
No. of mills working at 100% TMCR with worst coal (Coal-1) firing		: SEVEN
No. of mills working at 100% TMCR with Design coal firing		: SEVEN
No. of mills working at 100% BMCR with design coal firing		: SEVEN
Type of Mills		: HP1103 BOWL MILL WITH PLANETARY GEARBOX & STATIC CLASSIFIER
Arrangement		: SIDE MILL LAYOUT
No. of pyrite hoppers per mill		: 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 (MAX.)
Worst coal (Coal-1) fired at 100% TMCR		: 478.0 TPH
Design coal fired at 100% TMCR		: 442.0 TPH
Design coal fired at 100% BMCR		: 478.0 TPH
MILL GA DRAWING		: 0-00-620-86001
FOUNDATION PLAN DRAWING		: 0-00-610-86002

	TITLE:		BHEL DOCUMENTS NO.: PE-TS-375-160-A001	
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## SECTION – C2

(SPECIFIC TECHNICAL REQUIREMENTS FOR ELECTRICAL)

	<b>TITLE :</b> <b>ELECTRICAL EQUIPMENT SPECIFICATION</b> <b>FOR</b> <b>MILL REJECT HANDLING SYSTEM</b>  <b>3X660 MW LALITPUR STPP</b>	<b>SPECIFICATION NO.</b> PE-TS-375-160-A001
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		<b>SECTION:</b> C
		<b>REV NO. :</b> 00 <b>DATE:</b> 08/08/2012
		<b>SHEET:</b> 1 OF 1

**1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:**

- Services and equipment as per "Electrical Scope between BHEL and Vendor".
- 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 plant shall be deemed to be included within the scope of this specification. The bidder without any extra charge shall provide the same.
- Supply of mandatory spares as specified in the specifications of mechanical equipments.
- Erection and commissioning spares.
- Erection & Maintenance tools & tackles.
- Electrical load requirement for Mill Reject Handling System.
- All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information.
- 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.
- Various drawings, data sheet 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 implications to BHEL.
- Motor shall meet minimum requirement of specification AC/DC motors.

**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, the bidder as technical offer shall furnish two signed and stamped copies of the following:

- A copy of this sheet "Electrical Equipment Specification for Mill Reject Handling System" and sheet "Electrical Scope between BHEL and Vendor" with bidder's signature and company stamp.
- List of Erection and Commissioning spares.
- List of Erection & Maintenance tools & tackles.
- 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**



- Electrical scope between BHEL & vendor.- 2 sheets
- Std. Technical specification for LV motors.- 5 sheets
- Std. Technical specification for Cabling installation.- 6 sheets.
- Data Sheets (A) for 415V Electric Motors.- 1 sheet.
- Data Sheets (C) for 415V Electric Motors- 2 sheets.
- Quality plan for motor below 75kW.- 2 sheets
- Quality plan for motor above 75kW.- 9 sheets
- Load data format.- 1 sheet

**SPECIFIC ELECTRICAL REQUIREMENT FOR MILL REJECT SYSTEM**



SL.NO.	PARAMETERS	UNIT	LALITPUR		
	<b>MOTOR</b>				
1	DESIGN AMBIENT TEMP	DEG. C	50		
2	VOLTAGE SUPPLY AND VARIATION	VOLT	415± 10%		
3	FREQUENCY WITH VARIATION	Hz	50± 5%		
4	COMBINED VOLTAGE & FREQUENCY VARIATION		10%		
5	MAX ACCEPTABLE RATING OF MOTOR AT 415 V	KW	200 KW & below		
6	SYSTEM FAULT LEVEL AND ITS DURATION	KA	50kA, 1sec		
7	SUTABILITY OF TERMINAL BOX FOR FAULT LEVEL AND DURATION		50 KA, 0.25 sec		
8	CLASS OF INSULATION & TEMP RISE LIMITED TO		Class-F and temp rise limited to Class-B		
9	MIN. STARTING VOLTAGE		85%		
10	MOTOR RATING FOR SINGLE PHASE SUPPLY		0.2 kW & Below		
11	MAXIMUM LOCKED ROTOR CURRENT	% OF FLC	600% inclusive of IS tol.		
12	ACCEPTABLE NOISE LEVEL	DB	85dB(A) at 1.5m		
13	TYPE OF STARTER PROVIDED IN MCC		DOL		
14	DOP OF ENCLOSURE		IP-55 & IP-54 for outdoor & indoor resp.		
15	SPACE HEATER REQUIREMENT	>30kW	30KW & ABOVE		
16	PAINT SHADE		SHADE 631 OF IS-5		
17	PF		0.88 (For above 37kW		
18	COOLING		TEFC		
19	VIBRATION		For motors upto 1500 rpm : 40 microns Upto 3000 rpm: 15 microns		
20	SPECIAL REQUIREMENT		MOTORS ARE ENERGY EFFICIENT (TYPE EFF 1) AS PER IS :12615-2004 & latest rev of IEEMA-19.		
21	LOCKED ROTOR WITHSTAND TIME	SEC	Under HOT CONDITION at 110% rated voltage shall be more than the starting time at min permissible voltage by atleast three seconds or 15% of the accelerating time whichever is greater.		



NOTES: The above requirement for LALITPUR Project is to be read in conjunction with BAJAJ POWER Ltd, technical specification no TCE.6071A-C-500-001, section-D2.5, Volume-IV.



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 bajaj industries ltd.	<b>MOTORS AND VALVE ACTUATORS</b>	 <b>TATA</b>
1.0	<b><u>A.C. MOTORS</u></b>	
1.1	Motors rated 200 kW and below shall be suitable for 415 V, 3 Phase, 50 Hz power supply. Motors rated above 200kW and up to and including 1500 kW shall be suitable for 6.6 kV, 3 phase, 50 Hz power supply. Motors of rating above 1500 kW shall be suitable for 11 kV, 3 phase, 50 Hz power supply.	
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.	
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 at least 205% of full load torque.	
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.	
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	
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 at least three seconds or 15% of the accelerating time whichever is greater. Provision of speed switch shall be avoided to the extent possible.	
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 at least IP-55. All motors for outdoor duty shall have detachable metal canopy. For single core cable termination, gland plates shall be of non-magnetic material. All motors located in hazardous area shall have flameproof design.	
1.8	All HT motors shall be provided with vibration pads for mounting vibration detectors.	
		ISSUE R0



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 bajaj hindusthan ltd.	<b>MOTORS AND VALVE ACTUATORS</b>	
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 loose by the BTG supplier for mounting in 11 kV and 6.6kV switchgear panel.	
1.10	The ring oiling system shall be adequate for starting and continuous operation of the motor for at least one half hour without pressure oiling system in operation.	
1.11	For 11kV & 6.6 kV motors, 6-nos. duplex RTDs for winding shall be provided for remote monitoring, alarm and tripping at DCS. Each bearing shall be provided with minimum two thermocouple for temperature remote monitoring, alarm and tripping at DCS. 6 nos. spare RTDs shall be provided for winding in HT motors.	
1.12	The maximum double amplitude vibrations for motors upto 1500 rpm shall be 25 microns and 15 microns upto 3000 rpm. For 415 V motors, maximum double amplitude vibrations upto 1500 rpm shall be 40 microns and 15 microns up to 3000 rpm.	
1.13	Maximum noise level measured at a distance of 1.5 metre from the outer surface of the motor shall not exceed 85 dB(A).	
1.14	<b><u>COOLING</u></b>  Type of cooling for LT motors shall be TEFC and for HT motors CACA/CACW/TETV/TEFC. Continuous duty LT motors shall be capable of three equally spread starts per hour under normal condition or two starts in quick succession from cold or one hot start, under rated load condition.  Continuous duty HT motors shall be capable of 10 equally spread starts per hour under normal condition or four starts in quick succession from cold or three hot starts under rated load condition.	
1.15	Surge protection shall be provided for all HT motors wherever applicable.	
1.16	Stress during Bus Transfer:	
1.17	The motor may be subjected to sudden application of 150% rated voltage during Bus transfer due to phase difference between the incoming voltage and motor residual voltage.	
1.18	Hot thermal withstand curve shall have a margin for at least 10% over the full load curve of the motor to permit relay setting utilizing motor rated capacity.	
		ISSUE R0






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 bajaj hindusthan ltd.	<b>MOTORS AND VALVE ACTUATORS</b>	 <b>TATA</b>
1.19	<p>Cable terminal boxes of all 11 kV and 6.6 kV 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.</p> <p>For motors where Differential protection is required two terminal boxes shall be provided one phase segregated type and one non-phase segregated type. The start of each winding shall be brought out to one box and the end to the other.</p> <p>In case no differential protection is required star point of the winding shall be formed in the neutral terminal box to be provided on one side of the motor. The phase segregated terminal box shall be placed on the other side of the motor.</p> <p>The terminal boxes of all HT and LT motors shall be suitable for termination of FRLS, XLPE armoured aluminium cables. Easy termination of cables shall be possible without employing additional adapter boxes.</p>	
1.20	<p>The insulation system for 11 kV and 6.6 kV 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 11 kV and 6.6 kV AC motors shall have BIL and power frequency withstand voltage as per relevant standards.</p>	
1.21	<p>Space heaters shall be provided for all LT motors of rating above 30 kW and all HT motors. Heaters to be automatically 'OFF' when the motor is switched 'ON'.</p>	
1.22	<p>All motors for outdoor duty shall have detachable metal canopy.</p>	
1.23	<p>Each motor shall have two earthing terminals.</p>	
1.24	<p>All motors shall be energy efficient type with eff-1 level as per latest revision of IEEMA-19. Standard.</p> <p>The power factor of HT and LT motors shall be equal to or better than the values indicated below:</p> <p>HT Motors : 0.9</p> <p>LT Motors (Above 37 kW) : 0.88</p>	
1.25	<p>All HT motors shall be designed for operation with Vacuum Circuit Breakers. All motors shall be suitable for DOL starting.</p>	
		<div>ISSUE R0</div>

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 bajaj hindusthan ltd.	<b>MOTORS AND VALVE ACTUATORS</b>	 <b>TATA</b>
1.26	<p>Terminal boxes shall have fault withstand capacity equal to at least rated short circuit level of the system voltage for 0.25 sec. The terminal boxes shall be reversible to suit cable entry from bottom or top and suitable for termination of FRLS, XLPE armoured aluminium cables. Each terminal box to have two inlets to accommodate any parallel cables as required. Separate terminal boxes to be provided for space heater, RTDs for windings/ bearings, vibration monitors etc. All terminal boxes shall be provided with two earthing studs for termination of protective earth conductor.</p> <p>Double compression type brass cable glands and crimping type copper lugs shall be provided for termination. Amp make connection shall be used for HT power cables and cage clamp type connectors shall be used for LT control cables. Amp type lugs shall be used for LT motors of rating 110 kW and above.</p>	
1.28	Variable frequency controller shall be provided for motors requiring speed control.	
1.29	Hot Air temperature measurement shall be provided for HT motors.	
1.30	Bimetallic strip shall be provided in terminal box for H.T motors.	
1.31	All LT motors terminal boxes shall be suitable for terminating FRLS, XLPE armoured Aluminium cable of size as per approved cable sizing calculation document for this project.	
2.0	<b><u>DC MOTORS</u></b>	
2.1	DC motors shall be suitable for 220 V DC system voltage. 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.	
2.2	DC motors shall have insulation class 'F' with temp.rise limited to class 'B' ie., 70°C over and ambient of 50°C.	
2.3	Variable frequency controller shall be provided for motors requiring speed control.	
2.4	<b>Constructional Features</b> Motors weighing more than 25 Kg shall be provided with eyebolts, lugs or other means to facilitate safe lifting.	
2.5	<b>Brushes and Brush Gear</b>	
2.5.1	Brush materials with large brush contact area for good commutation under high acceleration and overload conditions should be provided.	
2.5.2	The brushes shall be of electric graphite of high quality. The pressure on the brush shall be adjustable, if necessary.	
		ISSUE R0

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 bajaj hindusthan ltd.	<b>MOTORS AND VALVE ACTUATORS</b>	 <b>TATA</b>
2.5.3	The brush holder to which the brushes are fixed should be so constructed that the brushes touch the commutator face evenly. Individual brush holders shall be with drawble without disturbing any other part of the machine.	
2.5.4	There shall be provision for holding off each brush from commutator to facilitate maintenance.	
2.5.5	The brush rocker should be split to facilitate easy erection and dismantling which will enable the brush rocker to be adjusted to its correct position.	
2.5.6	When specified in Data Sheet-A1, motors located in acid fume area shall be specifically treated against corrosion from acid fumes and shall be provided with sealed bearings.	
2.6	<b>Terminal box</b>	
2.6.1	Terminal box shall be weather proof construction designed for outdoor service to eliminate entry of dust and water. Gaskets of neoprene or approved equivalent shall be provided at cover joints and between box and motor frame.	
2.6.2	All terminals should be brought out to the terminal box. The terminals shall be stud type with necessary plain washers, spring washers and check nuts. The construction of terminal box shall be such that the terminals are easily accessible. The terminals themselves shall be such as to facilitate easy change of connections in the box without disturbing any internal connections in the machine.	
2.7	<b>Accessories</b>	
2.7.1	Two independent earthing points shall be provided on opposite sides of the motor for bolted connection of the PURCHASER's earthing conductors. These earthing points shall be in addition to the earthing stud provided in the terminal box.	
2.7.2	Except when otherwise specified, the motors shall be provided with a bare shaft extension having a key slot and a key at the driving end.	
2.7.3	When the motor half coupling is supplied by the driven equipment VENDOR, the motor VENDOR shall strictly adhere to the dimensional requirements and other instructions related to accessory.	
2.8	<b>Starter Panel</b>	
2.8.1	Starter panel shall meet the following requirements.	
2.8.2	The starter for motor feeders shall preferably be housed within the main panel. If starting resistors are provided in the power circuits, the same can be located in a separate box which will be placed near the main panel.	
2.8.3	The motor Starter shall be provided with the following. a) Switch, fuses, air break contactors.	
		ISSUE R0

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 bajaj hindusthan ltd.	<b>MOTORS AND VALVE ACTUATORS</b>	
<p>b) Thermal overload relays (for alarm only)</p> <p>c) Starting resistors with associated timers.</p> <p>d) ON, OFF and fault indicating lamps.</p> <p>e) Necessary auxiliary contactors for fault alarm circuit.</p> <p>f) 240V space heating circuit (240V supply to be arranged VENDOR).</p> <p>g) ON, OFF PBs for testing purposes.</p> <p>h) One shunt, ammeter and one shunt for providing remote ammeter.</p> <p>i) Suitable circuitry to receive ON, OFF commands from remote panel, interlocks, off command from local Push button station etc.</p> <p>j) MCB for space heating circuit.</p> <p>3.0 <b><u>ACTUATOR MOTORS</u></b></p> <p>3.1 The actuator motors shall be designed for short time duty (S2) in accordance with IEC 34-1.</p> <p>3.2 Each actuator should have a hand wheel for emergency manual operation in addition to motor drive. Clockwise operation of hand wheel shall cause clockwise movement of the output drive. The hand wheel shall be clearly marked with an arrow and the word CLOSE. The hand wheel shall automatically disengage when the power to the motor is restored i.e. power drive shall have a preference over manual drive.</p> <p>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, etc. Complete actuator shall be tested at factory as per IS 9334.</p> <p>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.</p> <p>3.5 Actuator shall be weatherproof type with enclosure conforming to IP-67 degree of protection. It should be suitable for out-door use without the need for canopy. If the IP-68 degree of protection is required due to occasional submergence, the Owner / Project Manager will specify the depth and duration of such submergence.</p> <p>3.6 The actuator shall be suitable for installation in any position without lubrication leakage or other operational difficulty.</p> <p>3.7 The main gearbox of the actuator shall be special grease filled.</p> <p>3.8 Each actuator shall have a local mechanical position indicator. It should be suitable to indicate 0 - 100% position of the valve (continuous type).</p>		
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SPEC NO : TCE.6071A-C-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b> <b>3 X 660 MW Super Critical TPP at Lalitpur,</b> <b>Uttar Pradesh</b>	VOLUME - IV SECTION: D2.5 SHEET 7 OF 11
 bajaj hindusthan ltd.	<b>MOTORS AND VALVE ACTUATORS</b>	 <b>TATA</b>
<p>3.9 In order to minimise the amount of spare parts required, parts and sub-assemblies limit / torque switches, limit switch counter gear assembly, torque switch drive assembly, mechanical position indicator assembly etc. individually interchangeable / replaceable throughout the models selected.</p> <p>3.10 The actuator shall be painted with corrosion resistant epoxy resin paint. Paint shade shall be Grey as per IS-631 grade 5.</p> <p>3.11 In order to prevent condensation, a space heater shall be provided in the switch compartment, suitable for continuous operation.</p> <p>3.12 Actuator mounting dimensions shall be according to ISO-5210. For rising stem applications, the design must allow the removal of actuator from the output drive without disturbing the function of valve.</p> <p>3.13 <b>Limit and Torque Switches</b></p> <p>3.13.1 Independent torque and limit switches shall be provided in the actuator. A minimum of two position limit switches and two torque switches, one each for each direction of travel, having 2 NO + 2 NC potential free contacts, shall be supplied. If called for in the data sheet, two additional limit switches shall be provided for intermediate positions.</p> <p>3.13.2 Torque switch dial shall be graduated directly in "kg-m" for easy setting to desired value within the range specified. Separate dials shall be provided for CLOSE and OPEN torque switches.</p> <p>3.13.3 The switches shall individually be enclosed to a minimum of IP-66 protection class.</p> <p>3.13.4 Torque and limit switches shall have only stainless steel flaps for better protection against environmental condition.</p> <p>3.13.5 Limit switches shall be operated by gear driven cams, which are mechanically linked to the driving devices. The counter gear used for counting and tripping the limit switches shall be of metallic construction like brass etc. No plastic gearing shall be allowed.</p> <p>3.13.6 To guarantee proper function under high ambient temperatures, torque and limit switch sensing shall be of mechanical type.</p> <p>3.13.7 If specified in data sheet, two additional limit switches of 2NO + 2NC contact, each adjustable at any intermediate position, shall be provided in the actuator.</p>		
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		VOLUME NO. : <b>II-B</b>
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## **GENERAL TECHNICAL REQUIREMENTS**

**FOR**

**LV MOTORS**

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

	TITLE : <b>GENERAL TECHNICAL REQUIREMENTS</b>  <b>FOR</b>  <b>LV MOTORS</b>	SPECIFICATION NO. PE-SS-999-506-E101
		VOLUME NO. : <b>II-B</b>
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1.0

INTENT OF SPECIFIATION

The specification covers the design, materials, constructional features, manufacture, inspection and testing at manufacturer’s work, and packing of Low voltage (LV) squirrel cage induction motors along with all accessories for driving auxiliaries in thermal power station.

Motors having a voltage rating of below 1000V are referred to as low voltage (LV) motors.

2.0

CODES AND STANDARDS

Motors shall fully comply with latest edition, including all amendments and revision, of following codes and standards:

IS:325	Three phase Induction motors
IS : 900	Code of practice for installation and maintenance of induction motors
IS: 996	Single phase small AC and universal motors
IS: 4722	Rotating Electrical machines
IS: 4691	Degree of Protection provided by enclosures for rotating electrical machines
IS: 4728	Terminal marking and direction of rotation rotating electrical machines
IS: 1231	Dimensions of three phase foot mounted induction motors
IS: 8789	Values of performance characteristics for three phase induction motors
IS: 13555	Guide for selection and application of 3-phase A.C. induction motors for different types of driven equipment
IS: 2148	Flame proof enclosures for electrical appliance
IS: 5571	Guide for selection of electrical equipment for hazardous areas
IS: 12824	Type of duty and classes of rating assigned
IS: 12802	Temperature rise measurement for rotating electrical machines
IS: 12065	Permissible limits of noise level for rotating electrical machines
IS: 12075	Mechanical vibration of rotating electrical machines

In case of imported motors, motors as per IEC-34 shall also be acceptable.

3.0

DESIGN REQUIREMENTS

3.1

Motors and accessories shall be designed to operate satisfactorily under conditions specified in data sheet-A and Project Information, including voltage & frequency variation of supply system as defined in Data sheet-A

3.2

Motors shall be continuously rated at the design ambient temperature specified in Data Sheet-A and other site conditions specified under Project Information  
Motor ratings shall have at least a 15% margin over the continuous maximum demand of the driven equipment, under entire operating range including voltage & frequency variation specified above.

3.3


Starting Requirements

3.3.1


Motor characteristics such as speed, starting torque, break away torque and starting time shall be properly co-ordinated with the requirements of driven equipment. The accelerating torque at any speed with the minimum starting voltage shall be at least 10% higher than that of the driven equipment.


3.3.2


Motors shall be capable of starting and accelerating the load with direct on line starting without exceeding acceptable winding temperature.

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		<b>VOLUME NO. : II-B</b>
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<p>The limiting value of voltage at rated frequency under which a motor will successfully start and accelerate to rated speed with load shall be taken to be a constant value as per Data Sheet - A during the starting period of motors.</p> <p>3.3.3 The following frequency of starts shall apply</p> <ul style="list-style-type: none"> <li>i) Two starts in succession with the motor being initially at a temperature not exceeding the rated load temperature.</li> <li>ii) Three equally spread starts in an hour the motor being initially at a temperature not exceeding the rated load operating temperature. (not to be repeated in the second successive hour)</li> <li>iii) Motors for coal conveyor and coal crusher application shall be suitable for three consecutive hot starts followed by one hour interval with maximum twenty starts per day and shall be suitable for minimum 20,000 starts during the life time of the motor</li> </ul> <p>3.4 <b>Running Requirements</b></p> <p>3.4.1 Motors shall run satisfactorily at a supply voltage of 75% of rated voltage for 5 minutes with full load without injurious heating to the motor.</p> <p>3.4.2 Motor shall not stall due to voltage dip in the system causing momentary drop in voltage upto 70% of the rated voltage for duration of 2 secs.</p> <p>3.5 <b>Stress During bus Transfer</b></p> <p>3.5.1 Motors shall withstand the voltage, heavy inrush transient current, mechanical and torque stress developed due to the application of 150% of the rated voltage for at least 1 sec. caused due to vector difference between the motor residual voltage and the incoming supply voltage during occasional auto bus transfer.</p> <p>3.5.2 Motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.</p> <p>3.6 Maximum noise level measured at distance of 1.0 metres from the outline of motor shall not exceed the values specified in IS 12065.</p> <p>3.7 The max. vibration velocity or double amplitude of motors vibration as measured at motor bearings shall be within the limits specified in IS: 12075.</p> <p>4.0 <b>CONSTRUCTIONAL FEATURES</b></p> <p>4.1 Indoor motors shall conform to degree of protection IP: 54 as per IS: 4691. Outdoor or semi-indoor motors shall conform to degree of protection IP: 55 as per IS: 4691 and shall be of weather-proof construction. Outdoor motors shall be installed under a suitable canopy</p> <p>4.2 Motors upto 160KW shall have Totally Enclosed Fan Cooled (TEFC) enclosures, the method of cooling conforming to IC-0141 or IC-0151 of IS: 6362.</p> <p>Motors rated above 160 KW shall be Closed Air Circuit Air (CACA) cooled</p> <p>4.3 Motors shall be designed with cooling fans suitable for both directions of rotation.</p>		




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<p>4.4. Motors shall not be provided with any electric or pneumatic operated external fan for cooling the motors.</p> <p>4.5. Frames shall be designed to avoid collection of moisture and all enclosures shall be provided with facility for drainage at the lowest point.</p> <p>4.6. In case Class 'F' insulation is provided for LV motors, temperature rise shall be limited to the limits applicable to Class 'B' insulation. In case of continuous operation at extreme voltage limits the temperature limits specified in table-1 of IS:325 shall not exceed by more than 10°C.</p> <p>4.7 <b>Terminals and Terminal Boxes</b></p> <p>4.7.1 Terminals, terminal leads, terminal boxes, windings tails and associated equipment shall be suitable for connection to a supply system having a short circuit level, specified in the Data Sheet-A.</p> <p>Unless otherwise stated in Data Sheet-A, motors of rating 110 kW and above will be controlled by circuit breaker and below 110 kW by switch fuse-contactor. The terminal box of motors shall be designed for the fault current mentioned in data sheet "A".</p> <p>4.7.2 unless otherwise specified or approved, phase terminal boxes of horizontal motors shall be positioned on the left hand side of the motor when viewed from the non-driving end.</p> <p>4.7.3 Connections shall be such that when the supply leads R, Y &amp; B are connected to motor terminals A B &amp; C or U, V &amp; W respectively, motor shall rotate in an anticlockwise direction when viewed from the non-driving end. Where such motors require clockwise rotation, the supply leads R, Y, B will be connected to motor terminals A, C, B or U W &amp; V respectively.</p> <p>4.7.4 Permanently attached diagram and instruction plate made preferably of stainless steel shall be mounted inside terminal box cover giving the connection diagram for the desired direction of rotation and reverse rotation.</p> <p>4.7.5 Motor terminals and terminal leads shall be fully insulated with no bar live parts. Adequate space shall be available inside the terminal box so that no difficulty is encountered for terminating the cable specified in Data Sheet-A.</p> <p>4.7.6 Degree of protection for terminal boxes shall be IP 55 as per IS 4691.</p> <p>4.7.7 Separate terminal boxes shall be provided for space heaters.. If this is not possible in case of LV motors, the space heater terminals shall be adequately segregated from the main terminals in the main terminal box. Detachable gland plates with double compression brass glands shall be provided in terminal boxes.</p> <p>4.7.8. Phase terminal boxes shall be suitable for 360 degree of rotation in steps of 90 degree for LV motors.</p> <p>4.7.9 Cable glands and cable lugs as per cable sizes specified in Data Sheet-A shall be included. Cable lugs shall be of tinned Copper, crimping type.</p> <p>4.8 Two separate earthing terminals suitable for connecting G.I. or MS strip grounding conductor of size given in Data Sheet-A shall be provided on opposite sides of motor frame. Each terminal box shall have a grounding terminal.</p> <p>4.9 <b>General</b></p>		

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<p>4.9.1 Motors provided for similar drives shall be interchangeable.</p> <p>4.9.2 Suitable foundation bolts are to be supplied alongwith the motors.</p> <p>4.9.3 Motors shall be provided with eye bolts, or other means to facilitate safe lifting if the weight is 20Kgs. and above.</p> <p>4.9.4 Necessary fitments and accessories shall be provided on motors in accordance with the latest Indian Electricity rules 1956.</p> <p>4.9.5 All motors rated above 30 kW shall be provided with space heaters to maintain the motor internal air temperature above the dew point. Unless otherwise specified, space heaters shall be suitable for a supply of 240V AC, single phase, 50 Hz.</p> <p>4.9.6 Name plate with all particulars as per IS: 325 shall be provided</p> <p>4.9.7 Unless otherwise specified, the colour of finish shall be grey to Shade No. 631 and 632 as per IS:5 for motors installed indoor and outdoor respectively. The paint shall be epoxy based and shall be suitable for withstanding specified site conditions.</p> <p><b>5.0 INSPECTION AND TESTING</b></p> <p>5.1 All materials, components and equipments covered under this specification shall be procured, manufactured, as per the BHEL standard quality plan No. PED-506-00-Q-006/0 and PED-506-00-Q-007/2 enclosed with this specification and which shall be complied.</p> <p>5.2 LV motors of type-tested design shall be provided. Valid type test reports not more than 5 year shall be furnished. In the absence of these, type tests shall have to be conducted by manufacturer without any commercial implication to purchaser.</p> <p>5.3 All motors shall be subjected to routine tests as per IS: 325 and as per BHEL standard quality plan.</p> <p>5.4 Motors shall also be subjected to additional tests, if any, as mentioned in Data Sheet A.</p> <p><b>6.0 DRAWINGS TO BE SUBMITTED AFTER AWARD OF CONTRACT</b></p> <p>a) OGA drawing showing the position of terminal boxes, earthing connections etc.</p> <p>b) Arrangement drawing of terminal boxes.</p> <p>c) Characteristic curves: (To be given for motor above 55 kW unless otherwise specified in Data Sheet).</p> <p>i) Current vs. time at rated voltage and minimum starting voltage.</p> <p>ii) Speed vs. time at rated voltage and minimum starting voltage.</p> <p>iii) Torque vs. speed at rated voltage and minimum voltage. For the motors with solid coupling the above curves i), ii), iii) to be furnished for the motors coupled with driven equipment. In case motor is coupled with mechanical equipment by fluid coupling, the above curves shall be furnished with and without coupling.</p> <p>iv) Thermal withstand curve under hot and cold conditions at rated voltage and max. permissible voltage.</p>		


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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, MICC, 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 turned copper lugs for power cables 3. Solder less crimping type heavy duty copper lugs for control cables. 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.
7	Conduit and conduit accessories for cabling between equipments supplied by vendor	Vendor	Vendor	
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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## STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR

## PACKAGE : MILL REJECT SYSTEM

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
12	Mandatory spares	Vendor	-	Vendor to quote as per specification.
13	Recommended O & M spares, E & C spares, erection & maintenance tools & tackle.	Vendor	-	
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 & J) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for C & J 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 regular 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)



	3X660 MW LALITPUR STPP	SECTION: C
	<b>SPECIFIC TECHNICAL REQUIREMENTS (C&amp;I) MILL REJECT HANDLING SYSTEM</b>	
<p><b>Specific Technical Requirements (C&amp;I):</b></p> <p>1.0 Mill Reject Handling System shall be operated from plant DCS through operator work stations located in central control room. In addition provision of local operation from local control panel shall also be provided.</p> <p>2.0 Bidder to provide one no local control panel for mill reject system of each Mills and each pyrite hoppers. This local panel will act as interface between the DCS and the field devices for commands &amp; feedbacks.</p> <p>3.0 Local Control Panel for Compressors of Mill Reject Handling System shall be provided with command &amp; feedback interface with plant DCS. In addition provision of local operation (START/STOP) from local control panel shall also be provided.</p> <p>4.0 Bidder to include VMS for HT drives, if any.</p> <p>5.0 Bidder to include all the instruments (PG, PS, LS, TS, FS etc.) required for the package along with fittings, accessories and valve manifold.</p> <p>6.0 The solenoid operated valves/ damper/gates shall have limit switches for open/ close feedback. Solenoid valve shall be rated either for 220V DC or 24 V DC only.</p> <p>7.0 The junction boxes for termination of instruments /actuator limit switches/ solenoid valve limit switches etc are in bidder's scope.</p> <p>8.0 230 VAC UPS supply shall be provided by BHEL at a single point. Further distribution to various instruments shall be in Bidder's scope. Bidder to include necessary power distribution board in his scope. Any power supply other than the above, if required by any instrument/device, has to be derived by the Bidder from the above supply and all necessary hardware for the same shall be in bidder's scope. Bidder to furnish UPS power requirement along with the bid.</p> <p>9.0 The make/model of various instruments/items/systems shall be subject to approval of owner/purchaser during detailed engineering stage. No commercial implication in this regard shall be acceptable. In case of any conflict and repetition of clauses in the specification, the more stringent requirements among them are to be complied with.</p> <p>10.0 <b>All field instrument , local panel / cabinet enclosures shall be IP-65</b></p> <p>11.0 In case of any contradiction most stringent clause/condition shall prevail.</p>		

	<b>3X660 MW LALITPUR STPP</b>	<b>SECTION: C</b>
	<b>SPECIFIC TECHNICAL REQUIREMENTS (C&amp;I) MILL REJECT HANDLING SYSTEM</b>	
12.0	<p>Drawings/Documents and data to be furnished after award of the contract:</p> <ul style="list-style-type: none"> <li>• Control &amp; operational write-up for the system</li> <li>• Recommended control scheme/ logic diagram</li> <li>• Process manuscript for implementation in DCS</li> <li>• List of Drives ( Solenoid valves etc)</li> <li>• I/O list</li> <li>• GA drawings of local panel.</li> <li>• Power requirement.</li> <li>• Local control panel and field instruments quality plan.</li> <li>• Local control panel &amp; instruments data sheet.</li> <li>• JB grouping document.</li> <li>• Cable schedule and cable interconnection drawing.</li> <li>• Instrument schedule</li> <li>• Any other document decided during detailed engineering.</li> </ul>	

	3X660 MW LALITPUR STPP	SECTION: C
	SPECIFIC TECHNICAL REQUIREMENTS (C&I) MILL REJECT HANDLING SYSTEM	
<p style="text-align: center;"><b><u>SPECIFICATION FOR</u></b> <b><u>MEASURING INSTRUMENTS,</u></b> <b><u>CONTROL VALVES</u></b> <b><u>&amp;</u></b> <b><u>FLOW ELEMENTS</u></b></p>		

	<b>3X660 MW LALITPUR STPP</b>	SECTION: C
	<b>SPECIFIC TECHNICAL REQUIREMENTS (C&amp;I) MILL REJECT HANDLING SYSTEM</b>	
<p><b>Field Instruments</b></p> <p><b>Pressure Indicators</b> Direct reading, pipe mounted Pressure gauges of Stainless Steel (epoxy coated), with 6 inch phenolic dial (white dial with black numerals), 316 SS Bourdon tube, AISI 304 movements and micrometer type adjustable aluminium pointer an accuracy of <math>\pm 0.5\%</math> of span including accessories like siphons for steam services, snubbers for pump discharge applications and chemical diaphragm for corrosive and oil services and name plate, etc. Material of accessories shall be SS. IP65 or equivalent degree of protection for enclosure. Over range protection shall be 50% above maximum pressure. Armoured capillary of 15 M shall be provided as required.</p> <p><b>Pressure Switches</b> Non indicating type, field mounted Pressure Switches of aluminium casing (epoxy coated), and 316 SS element and accuracy of <math>\pm 1\%</math> of span, including accessories like siphons for steam services, snubbers for pump discharge applications and chemical diaphragm for corrosive and oil services, name plate &amp; mounting brackets. Material of accessories shall 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> <p><b>Pressure Transmitters (SMART)</b> Micro-processor based indicating type (LCD display), rack mounted with accuracy of <math>\pm 0.075\%</math> of span, external zero and span adjustment, self-diagnostics, temperature sensor for compensation. Power supply 24 V DC; output signal of 4-20 mA DC. IP 65 or equivalent degree of protection. Aluminum housing with epoxy coating, 316 SS sensing element. Accessories like snubbers for pump discharge applications and chemical diaphragm with 15 m PVC covered SS armoured capillary for corrosive and oil services, three way manifold, name plate etc. Material for accessories shall be SS. HART protocol output shall be available in each transmitter.</p> <p><b>Differential Pressure Indicators</b> Direct reading type, pipe mounted, bellows or diaphragm operated differential pressure indicators; SS housing with (epoxy coated), six (6) inch dial (white dial with black numerals), with micrometer type pointer, 316 SS pressure element; an accuracy of <math>\pm 0.5\%</math> 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 &amp; name plate, mounting brackets, etc. Material of accessories shall be SS. IP 65 or equivalent degree of protection. Over range protection shall be 50% above maximum pressure.</p>		

	3X660 MW LALITPUR STPP	SECTION: C
	<b>SPECIFIC TECHNICAL REQUIREMENTS (C&amp;I) MILL REJECT HANDLING SYSTEM</b>	
<p><b>Differential Pressure Switches</b> Bellows or diaphragm operated indicating field mounted type; aluminium casing (epoxy coated); 316 SS pressure element nylon movement; an accuracy of +/-1% of span within 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, name plate &amp; mounting brackets, etc. Material of accessories shall be SS. Auto reset micro switch with tamper proof external 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 +/- 0.5% FSR.</p> <p><b>Differential Pressure Transmitters (SMART)</b> Micro-processor based indicating type (LCD display), rack mounted with accuracy of +/-0.075% of span, external zero and span adjustment. Self diagnostics, temperature sensor for compensation. Power supply 24 V DC; output signal of 4-20 mA DC. IP 65 or equivalent degree of protection. Aluminum housing with epoxy coating, haste alloy sensing element. Accessories like snubbers for pump discharge applications, chemical diaphragm with 10 m PVC covered SS armoured capillary for each limb for corrosive and oil services and 5 way manifold &amp; name plate, etc. Material for accessories shall be SS. Accuracy : +/-0.25% of FSR or better". Repeatability : +/-0.05% of FSR or better. Linearity : +/-0.1% of FSR or better. Hysteresis : +/-0.1% of FSR or better. Remote communication with field communicator/ control system. HART protocol shall be available in each transmitter.</p> <p><b>Thermometers</b> Indicating type, field mounted, filled system with SS capillary with SS armour and six (6) inch dial (white dial with black numerals with micrometer pointer) housed in aluminium casing (epoxy coated) with an accuracy of +/-1% of span, response time of 2-4 seconds, auto temperature calibration, linear calibration over the range and SS bulb with 316 SS thermowell having a process connection of M33 x 2 thread or 150 RF flanged. Material of accessories (name plates, mounting brackets, etc.) shall be SS. IP 65 or equivalent degree of protection for enclosure. Thermowell with Hex head bar stock assembly. The thermowell construction shall meet the ANSI 19.3-1994 (latest) requirements.</p> <p><b>Thermowells</b> Pipe/equipment mounted temperature test wells of 316 SS with a process connection of M33x2 thread or 150 RF flanged. Accessories like name plate, plug with chain, etc. shall be provided. Material of accessories shall be SS. Thermowell shall be hex head of barstock assembly. In case flanged wells are required for any specific application, the same shall be supplied as required. The thermowell construction shall meet the ANSI 19.3 (latest) requirements.</p>		

	<b>3X660 MW LALITPUR STPP</b>	SECTION: C
	<b>SPECIFIC TECHNICAL REQUIREMENTS (C&amp;I) MILL REJECT HANDLING SYSTEM</b>	
<p><b>Temperature Switch</b>  Non-indicating type, field mounted, filled system with ten (10) metre SS capillary with SS armour housed in Aluminium casing (epoxy coated) with an accuracy of +/- 1% span, auto temperature calibration, linear calibration over the range and SS bulb with 316 SS thermowell having a process connection of M33x2 thread or 150 RF flanged. The thermowell construction shall meet the ANSI 19.3 (latest) requirements. Micro switch with reset type with tamper proof externally adjustable set values with 2 SPDT contacts rated for 0.2 A, 220V DC. IP 65 or equivalent degree of protection for enclosure. Thermowell with hex head bar stock assembly. Material of accessories (name plates, mounting brackets, etc.) shall be SS. Scale shall be provided for setting. Repeatability shall be +/- 0.5% of full scale. Wherever the ambient temperature shall approximate or exceed the switch set point, temperature switches designed for cross ambient operation shall be used.</p> <p><b>Thermocouple Assembly</b>  Duplex , K - Type with accuracy of +/-0.5% of span, response time of 2 to 6 sec, Spring loaded mineral insulated thermocouple assembly with 316 SS thermowell housed aluminium casing (epoxy coated) having a process connection of M33 x 2 thread or 150 RF flanged. Material of accessories (name plate, etc.) shall be SS. IP 65 or equivalent degree of protection for enclosure. Thermowell with hex head (with screwed cover &amp; SS chain) bar stock assembly with ungrounded junction. For metal temperature measurement, thermocouple pads weldable to M.S pipes shall be provided with 15 m thermocouple extension wires. Element size shall be 18 AWG. Insulation resistance at 540 Deg C shall not be less than 5 M ohms. Temperature devices provided with thermowells shall be calibrated with the associated thermowell as an assembly. The thermowell construction shall meet the ANSI 19.3 (latest) requirements. All pent house thermocouples shall be supplied with 15mts flexible extension length. All bed thermocouples shall have solid tungsten carbide or SS440 protecting sheath. Both elements of the thermocouple shall be wired to JB.</p> <p><b>Resistance Temperature Detectors (RTD)</b>  Duplex type, PT – 100, with accuracy of +/-0.5% of span, response time 1-2 secs; 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 (name plate, etc.) shall be SS. Thermowell with hex head with screwed cover &amp; SS chain, barstock assembly. Element lead size shall be 18 AWG. The insulation resistance at 540 Deg C 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 thermowells meeting ANSI 19.3 (latest) requirements. Both the elements of the RTD shall be wired to JB.</p>		

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**SMART Temperature Transmitters**  
Non-Indicating type, field mounted temperature transmitters with an accuracy of +/-0.075%, ref. junction compensation, span/zero adjustment, burn out protection upscale, input/output isolation, circuit ungrounded, ambient temperature error 0.1%/10 Degree C to provide linear output of 4-20 mA DC (2 wire system). NEMA 4 or equivalent degree of protection for enclosure. Material of accessories (name plate, mounting brackets, etc.) shall be SS. Power supply : 24 V DC. Housing shall be aluminium alloy. Stability : +/-0.25% of FSR for 6 months.

**Level Gauges**  
Tubular type level gauges for low pressure upto 7 kg /sq.cm & 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.) shall be SS. Tubular glass OD shall be 5/8". Vent & drain valves shall be provided. Connection shall be screwed or flanged (ANSI class 150 RF). Enclosure shall be IP 65.

**Level Switches**  
External cage magnetic float operated level switches for tanks and vessels and top mounted level switches for sumps and underground tanks. The top mounted level switches shall be supplied with still tubes to suit the requirement. Micro switch with 2 SPDT contacts rated for 0.2 A, 220 V DC. Material of float & float chord shall be 316 SS & cage material shall be fabricated steel and the material of accessories shall 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. Conductivity type electronic Probe type level switches shall be supplied for Drain pots and for sump level. The required pressure vessel assembly for mounting probes are included in the scope.

**LEVEL SWITCH (RF TYPE)**

Housing for probe head	Cast Aluminium
Enclosure protection for probe head	IP66
Material of probe	SS316
Housing of electronic controller	Cast Aluminium
Enclosure protection for electronic controller	IP 66
No/ type of contact	2 nos SPDT
Contact rating	60 V DC, 6 VA or more
Supply voltage for Electronic controller	230 VAC

**Displacement type Level Transmitter**  
Displacement type level transmitters of float length of 14 inches or 32 inches with an accuracy of +/-0.5% of span, 4-20 mA DC output (2 wire system), +24 V DC supply, isolated and ungrounded electrical circuits, zero adjustment (100% of sensing element) for control application and measurement purposes for all services of condensate and drains, particularly where two phases of steam and water are

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present. IP 65 or equivalent degree of protection for enclosure. Displacer / float material of 316SS. The material of accessories shall be SS.

**Guided Wave Radar Type Level Transmitter**

Guided wave radar type level transmitters shall be provided for level measurements of the vessel under vacuum or low pressure applications.

Type	Guided wave Radar
Principle	TDR (Time domain reflectometry)
Probe Type & Material	Coaxial, SS316/316L. If required probe shall be suitable for overfill prevention.
Signal o/p	4-20mA with HART signal suitable for overfill prevention
Display	Integral
Power supply	24 VDC
Accuracy	5mm
Electromagnetic compatibility and Amdt	Shall meet EN 61326-1 (1997) A1, class A equipment/EN 50081-2 & EN 50082-2
Mounting	External cage mounting

The transmitters shall be provided with IP-65 protection class with durable corrosion resistant coating.

The transmitters shall be able to provide digital signals super imposed on 4-20 mA signal as per HART protocol.



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	<b>SPECIFIC TECHNICAL REQUIREMENTS (C&amp;I) MILL REJECT HANDLING SYSTEM</b>	
<b>Ultrasonic Type Level Transmitter</b>		
<b>Sl no.</b>	<b>Features</b>	<b>Essential/Minimum requirement</b>
1.	Type of transmitter	Non contact Microprocessor based 2 wire type HART protocol compatible Ultrasonic transmitter
2.	Output signal	Galvanically isolated 4-20 mA DC (Analog) along with superimposed digital signal ( based on HART protocol)
3.	Sensor accuracy	+/- 0.5 % of calibrated span
4.	Sensor repeatability	3 mm or better
5.	Power supply	24 V DC +/- 10%
6.	Temperature compensation	To be provided within transducer
7.	Configuration	Sensor unit and Electronic units are to be separate. It shall be possible to mount the Electronic unit at a remote accessible location from the transducer. All cables and weather proof fitting to interconnect transducer to electronic unit shall be provided by Bidder.
8.	Housing	Weather proof as per IP-65 with durable corrosion resistant coating
9.	Calibration	Through HART communicator
10.	Zero & span adjustment	Continuous, tamper proof, remote as well as manual adjustability from instrument. It shall be possible to calibrate the instrument without any level in the tank/ sump etc.
11.	Sensor material	Corrosion resistant material to suit individual application requirement
12.	False signal tolerance	Transmitter shall be capable of ignoring false echoes from internal tank/ sumps

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13. obstructions	such as pipes, heating coils or agitators blades. Also transmitter shall be adjustable damping circuitry	
14. Range	Range of transmitter shall be capable of covering the complete level span of tank taking care of blocking distance, frequency attenuation due to surface, obstruction, vapors etc	
15. Display	Minimum 4 character display with integral keypad, access protected by user code	
16. Diagnostics	Loss of echo alarm etc	
17. Load impedance	500 ohms minimum	
18. Electrical connection	Plug & socket	
19. Accessories direct	All weather canopy for protection from sunlight and rain	
All mounting hardware and accessories required for erection and commissioning . Mounting material shall be SS316		
<b>Flow Glasses</b> Online flow glasses for pipe size up to 6" with a rotary wheel (not a flapper type) suitable for installation on vertical or horizontal pipe lines, material Pyrex tempered glass. Body material shall be carbon steel, rotor & wetted parts shall be bronze. The material of accessories shall 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.		
<b>Flow Switches</b> Indicating, Differential pressure, flapper type on line flow switches for line sizes up to 80 mm with an accuracy of +/-0.5% of span and dial size of min. 50 mm having 316 SS flapper/SS 316 bellows housed in die cast aluminium. Micro switch with adjustable range with 2 SPDT contacts rated for 0.2 A, 220 V DC. IP 65 or equivalent degree of protection for enclosure. The material of accessories shall be SS. Repeatability shall be +/-0.5% of span.Over range protection shall be 50% above maximum flow. Setting shall be tamper proof external adjustment & scale shall be provided for setting. Range spring & orifice plate shall be SS 316 for DP		

	<b>3X660 MW LALITPUR STPP</b>	SECTION: C
	<b>SPECIFIC TECHNICAL REQUIREMENTS (C&amp;I) MILL REJECT HANDLING SYSTEM</b>	
<p>type. NPT for sizes below 2" &amp; for sizes above 2" ANSI 150 RF shall be provided. Accessories like name plate, mating flanges with gaskets, bolts &amp; nuts, pipe assembly with orifice plate, etc. 5 way mani-fold, pipe, fittings (DP type), etc. shall be supplied.</p> <p><b>Flow Elements</b> 316 SS 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; Beta ratio of 0.5 &amp; 0.7. Element material of SS 316. The material of accessories shall be SS. Refer to Table-5 for provision of flow elements. 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 &amp; not less than 6 mm thick for pipe diameter &gt; 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 separately. Butt welded edges shall be prepared as per ANSI 16.25 &amp; flanged connections shall be as per ANSI 16.5 standards. Orifice assembly complete with nipples &amp; valves to be supplied by Bidder shall be one metre long with ANSI class 150 RF SS flanges at the ends including gaskets, bolts &amp; nuts. Isolating valves shall have SW end connection. Accessories like name plate, gaskets, bolts &amp; nuts, reservoirs (condensing chambers), 6 nos. shut off valves per assembly, nipple, welding adapters, etc. shall be supplied.</p> <p><b>Junction Boxes (JB)</b> All JB's shall be Galvanised, Die cast Aluminium. Wall/column mounted junction boxes having 32 (2x16) terminals and cable entry only at the bottom and sealed with fire proof compound; Screwed terminal type; IP 65 or equivalent degree of protection for enclosure. Separate terminal blocks shall be used for analog and digital signal and also for signals with different voltages. Removable gland plate shall be supplied. JB shall have single lockable door with gasket, able to open side ways, with common keys. Painting inside shall be glossy white &amp; outside - IS-5 shade 631. Shield bus for screw connection shall be provided. Terminal size shall be suitable for 0.5 sq.mm to 2.5 sq.mm wire. Terminal blocks shall be vertical. JB shall have provision to add 10% additional terminals. Accessories like metal tag (SS), clamps, fixtures, bolts (SS), nuts (SS), gaskets (neoprene), lock &amp; key, fire proof compound for sealing, etc. shall be supplied. The grouping of instruments in JB's is subject to Purchaser's approval. All the field Junction boxes shall have single doors and provision for locking. The doors shall not have screwed type of locking, but turnable hinge based. The JB's are subject to approval prior to manufacturing All JB's shall be provided with individual canopies to avoid ingress of water. All the TB's used shall be 6.6polymide to withstand corrosion and the metallic portion shall be coated against rust / corrosion. All should be of bottom cable entry type.</p>		

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	<b>SPECIFIC TECHNICAL REQUIREMENTS (C&amp;I) MILL REJECT HANDLING SYSTEM</b>	
<p><b>Local Control Box</b>  All LCBs shall be galvanized. Column mounted type; suitable for outdoor location, IP-65 enclosure; made of cold rolled steel with sheet material with thickness of 3mm; bottom cable entry; fluorescent lighting; with 12nos relays, mounted inside; 110V, 1ph control supply, SPDT contacts of relays wired to the terminals; 2 spare relays to be mounted and wired. LCBs shall be provided for all sump pumps. All the field LCBs shall have double doors and provision for locking. The doors shall not have screwed type of locking, but turnable hinge based. The LCBs are subject to approval prior to manufacturing All LCBs shall be provided with individual canopies to avoid ingress of water. All the TBs used shall be 6.6polymide to withstand corrosion and the metallic portion shall be coated against rust / corrosion. In each LCB, suitable AC/DC Voltmeter shall be provided to check the Field Interrogation voltage.</p> <p><b>Local Panels</b>  All the local panels shall be galvanised. Indoor/Outdoor located, free standing vertical type local panels with 3 mm thick sheet material of cold rolled steel; anti-vibration pads of 15 mm thick; fluorescent lighting; Double doors with neoprene gaskets at every 1.5 m; blower &amp; 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. Fluorescent lamp 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. &amp; short description of service engraved. These shall be phenolic overlays(1.6 mm thick), black background with white lettering &amp; 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 AC, 1P, 50 c/s &amp; 110 V AC, 1P, 50 c/s. Panel shall be delivered totally wired. All instruments, inserts and annunciation windows shall be mounted &amp; wiring connections at these hardwares shall be terminated at site by Bidder. Quantity shall be as required. All the Terminal Blocks shall be rust proof and corrosive resistant for outdoor mounted panels. Terminal Blocks housing material shall be 6.6 polyamide and metallic portion shall be coated against rust/corrosion.</p>		



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	<b>SPECIFIC TECHNICAL REQUIREMENTS (C&amp;I) MILL REJECT HANDLING SYSTEM</b>	
<p><b>Vibration Monitoring System</b> Vibration pickup with sensitivity of minimum 15 mv/mm/ second, degree of protection IP65. Vibration pickups shall be provided for X or Y directions; velocity pickup for low speed; accelero-meter pickup for high speed. Microprocessor based control room mounted vibration monitoring system shall be provided. The vibration system shall provide isolated one (1) 4-20 mA DC output and 2 nos. SPDT alarm contacts for high and v.high conditions. In addition, the vibration system shall provide raw signals from the transducers to carryout all signal analysis in Vibration Analysis system for analysing &amp; diagnosis of machine faults.</p> <p><b>Control Valves</b> Multistage, anticavitation, Balanced, modulating, globe type, cage guided, single ported, diaphragm type of actuator with hand wheel, SMART Pneumatic positioner, air filter regulator, air lock device, solenoid valve and limit switches and position transmitters completely tubed with junction box. Pneumatic Positioner shall be suitable for accepting 4-20mADC signal. Pneumatic (copper) tubing complete with accessories, fittings, Positioners shall be provided with input/output/bypass gauges. Local position indicator &amp; LVDT type position transmitter with 2 wire, 4-20mA DC output. All limit switches/position transmitters, E/P converter signals etc., shall be wired out to external block of actuator and respective junction boxes. Control valves shall be sized to have an opening of 15% at minimum flow condition and 85% at maximum flow condition. Noise level shall not exceed 85 dB at a distance of about 1.5 M from the valve. In case of predicted noise level above 85dBA, suitable low noise trim shall be provided. Noise reduction shall achieved through an inherent Trim design and not through external means. Leakage class for double seated valve shall not exceed 0.05%, and single seated valve shall not exceed 0.01%. Either extended type bonnet or cooling fin type bonnet shall be provided for service above 200 Degree C and for other service the bonnet type shall be standard. The end connections shall be socket welded for sizes below 50 NB and butt welded for sizes 50 NB and above. Flanged connection shall be provided for DM water services, with suitable rubber lined interfaces. Water seal shall be provided for valves that could be subjected to below atmospheric conditions. Generally stem and guide material (trim) shall be SS 316 stellited, and plug and seat material shall be 17-4 PH SS, except for specific applications like DM water, HP bypass services. Refer to Table-6 for selection of control valve body material and actuator type. The noise abatement shall be obtained by valve body and trim design and not by use of silencer. The trims supplied shall be suitable for quick changing. Actuator housing shall be of pressed steel construction. Trim exit velocity shall not exceed 30 m /sec for critical control valves. The normal flow shall not be more than 62.5% of the CV for 100% valve opening. The action of valves on failure of operating media shall be determined by the process requirements with regard to safe operation and emergency shut down requirements In Vibration prone areas, positioners shall be located away from the control valve/damper and location shall be approved by</p>		

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	<b>SPECIFIC TECHNICAL REQUIREMENTS (C&amp;I) MILL REJECT HANDLING SYSTEM</b>	
<p>PURCHASER/ENGINEER. Position transmitter shall be non-contact type. The control valve design shall be suitable for the required fail-safe conditions, of process/equipment. The valves shall be supplied and commissioned as per the fail</p> <p>safe philosophy required for the process. Wherever the required turndown is not possible with a standard single valve, specially designed trims shall be customised and used. Pressure regulators upstream of control valves would not be envisaged. All final Control elements (Control valves &amp; control dampers) shall be with pneumatic or electric actuators. All actuators would be sized so that the final control elements operate properly even when the upstream pressure exceeds 110% of maximum value. Pneumatic actuators would be provided with air failure lock and remote release, limit switches, adjustable minimum and maximum stops, load position indicators, positioners, non-contact type electronic position transmitters and</p> <p>solenoid valves in accordance with the system requirements Control valve sizing shall be accompanied with data sheets. Following tests shall be carried out for Control valves.</p> <ul style="list-style-type: none"> <li>a) 100% radiography tests</li> <li>b) Magnetic Particle Inspection.</li> <li>c) Hydrostatic test.</li> <li>d) CV test etc.</li> </ul> <p><b>Specifications of SMART Positioners of Control Valves.</b></p> <p>Positioner shall be microprocessor based with digital communication by means of HART protocol. Positioner has to be 2-wire, 4-20 mA loop powered by the control system and capable of split ranging operation. The SMART positioner shall be suitable for both single acting and double acting actuators. The SMART positioner shall be fully modular in construction with Encapsulated printed wiring board and pressure gauges inside the positioner cover to protect from transit/site damage. SMART positioner shall preferably be of the same make as the Control Valve, to ensure repeatability in Calibration, serviceability and proper maintenance of the Control System. SMART positioner shall be a Double stage positioner. The first stage of the positioner shall be typically a flapper-nozzle that serves as a high-gain pre-amplifier. This sensitivity shall be maintained over a wide range of dynamic conditions. Second stage shall be a power amplifier that provides power to drive the actuator. Preferably this shall be a pneumatic relay. Spool Driven type SMART positioners are not preferred due to Higher Dead Band and Poor responsiveness. The SMART positioner shall have pressure sensors to measure the pneumatic outputs to the actuator. The control algorithm for the positioner shall use feedback signal from the motion of the pneumatic relay beam instead of pressure feedback to minimize pneumatic related effects and for stable and smooth response of the control valve. The SMART positioner shall have user adjustable tuning sets</p>		

	<b>3X660 MW LALITPUR STPP</b>	<b>SECTION: C</b>
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<p>to identify the optimum tuning for the total valve assembly. SMART Positioner with HART Communication facility shall communicate all the valve diagnostics to DCS. The Vibration effect when unmounted and mounted on actuator shall be :</p> <ul style="list-style-type: none"> <li>• Less than 1.0% of output span per SAMA PMC31.1 section 5.3, Cond.3</li> <li>• No significance resonance when tested per SAMA PMC31.1 Section 5.3, Cond. 3.</li> </ul> <p>The electrical housing shall be designed to meet NEMA 4X, IEC 60529 IP66.</p> <p><b>Terminal Block (TB):</b> Cage clamp type, 1100 V AC grade, vertically mounted, size of 0.5 sq.mm to 1.5 sq.mm for instrument wires and 1.5 sq.mm to 2.5 sq.mm for control wires. Clearance between TBs shall be 150 mm and between TB and bottom plate shall be 250 mm, flame resistant, non-hygroscopic, decarbonised. Insulation between adjacent terminals or between terminals &amp; frame work shall be 2 KV RMS for 1 minute . Power supply and signal TB shall be separate. Signals shall be grouped in TBs in the same order as that in field junction box so as to provide neat cable layout and wiring. High voltage and low voltage signals shall be provided on separate TBs, which are mounted separately. TBs housing material shall be 6.6 polyamide and metallic portion shall be coated against corrosion. There shall be no double decker terminals.</p> <p><b>Termination Details</b> Maximum of 2 wires shall be terminated per terminal. Wiring raceways, straps shall be flame retardant. All wiring shall be ferruled.(printed Partex type ferrule shall be used)Wires carrying power and signal wires shall be routed in separate raceways. Accessories like MCB, cable support fuses, etc. shall be supplied. Cable entries shall be cemented with fire proof compound.</p> <p><b>Air Filter Regulator (AFR)</b> Constant bleed type AFR with an accuracy of +/-0.1%, inlet pressure range of 5-8 kg /sq.cm and suitable spring ranges (AFR) for use with positioners in control valves, control damper, E/P convertors and shut off valves, transmitter purging lines etc; Filtering particles above five microns having phosphor bronze filter element. Material of accessories shall be SS. Built in blow down valve shall be provided. AFR shall have automatic drain feature. All accessories shall be supplied. Degree of protection shall be IP65.</p> <p><b>Position Transmitters</b> 24VDC operated Non contact LVDT type with 4-20 mA DC 2 wire system with an accuracy of <math>\pm 1\%</math>; range adjustment and zero adjustment to be provided; IP65 degree of protection for casing. The output shall be linear. All accessories shall be SS.</p>		



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<p><b>Solenoid Valves</b>  Direct operated solenoid valves, pilot operated for higher sizes with shut of class (leakage) VI, body material of bronze, plunger material of 316 SS rated for continuous duty. IP 65 class for enclosure. Insulation class of 'F' for the solenoid. Body ratings shall suit the pressure and temperature conditions. Solenoid valve shall be rated either for 220V DC or 24 V DC only.</p> <p><b>ERECTION HARDWARE/INSTRUMENT PIPING</b></p> <p>All junction boxes, transmitter racks, cubicles, enclosures, local panels, marshalling panels, pneumatic and process hook up hardware's and other erection materials and accessories including I&amp;C Earthing system (separate electronic and frame earth) including cables etc. as required are included in Bidder's scope.</p> <p>Impulse pipes, fittings and air supply and signal piping/tubing shall be supplied for all the instruments under the scope of this specification. The selection criteria for size, material &amp; rating depending upon service conditions is detailed in TABLE-1 of this specification.</p>		





SPEC NO : TCE.6071A-C-500-001		<b>TATA CONSULTING ENGINEERS LIMITED</b> <b>3 X 660 MW Super Critical TPP at Lalitpur, Uttar Pradesh</b>		VOLUME - V SECTION: TABLE-1 SHEET 1 of 7
		<b>SIZE, MATERIAL &amp; RATING FOR IMPULSE PIPES / TUBES &amp; FITTINGS</b>		

SL.NO.	DESCRIPTION	DRAWING REFERENCE	QUANTITY IN METERS	REMARKS
1	TUBING FOR PRESSURE, DIFFERENTIAL PRESSURE, LEVEL AND FLOW TRANSMITTERS		As Required	SEE NOTE-1
	TUBING SPECIFIED IS FOR TUBING INSIDE THE TRANSMITTER RACK, AFTER THE BULK HEAD, FROM THE PROCESS TAP POINT UPTO THE TRANSMITTER RACKS, THE CORRESPONDING PIPES SPECIFIED SHALL BE CONSIDERED.		As Required	
2	PIPING FOR PRESSURE, DIFFERENTIAL PRESSURE & LEVEL INDICATORS AND LOCAL INSTRUMENTS		As Required	SEE NOTE 1&7
3	TUBING FOR ANALYTICAL INST. SAMPLE LINES.		As Required	SEE NOTE 5&8
4	VALVES, FITTINGS AND OTHER HARDWARES		As Required	
5	STAINLESS STEEL TUBING FOR INSTRUMENT AIR SUPPLY/ SIGNAL AIR LINES		As Required	SEE NOTE-6
6	INSTRUMENT AIR IN THE RACK FOR PURGE ETC.		As Required	
7	SEAL POTS		As Required	
8	CONDENSATE POTS FOR STEAM SERVICE		As Required	
NOTES	1. BIDDER SHALL SUPPLY IMPULSE PIPING/TUBING AS REQUIRED INCLUDING VALVES, FITTINGS AND OTHER HARDWARE REQUIRED TO MAKE THE INSTALLATION COMPLETE			
	BIDDERS SHALL PAINT THE IMPULSE PIPES / TUBES WITH BLUE COLOUR FOR WATER APPLICATIONS AND GREY COLOUR FOR AIR APPLICATIONS.			
	2. FOR IMPULSE PIPES / TUBES AND FITTINGS, IBR CERTIFICATE SHALL BE OBTAINED AND ISOMETRIC DRAWINGS SHALL BE FURNISHED BY VENDOR			
	3. ANY FITTINGS OTHER THAN SPECIFIED BUT REQUIRED TO COMPLETE THE INSTALLATION SHALL ALSO BE INCLUDED. VENDOR IS NOT RELIEVED OF THIS RESPONSIBILITY.			
	4. BIDDER TO SUBMIT LIST OF INSTALLATIONS AND COMMISSIONS FOR THE MAKE AND TYPE OF IMPULSE PIPES/TUBES & FITTINGS OFFERED & USER'S CERTIFICATE.			
	5. BIDDER SHALL PROVIDE THERMAL INSULATION FOR SAMPLING PIPES FOR THE PURPOSE OF PERSONNEL PROTECTION SO THAT THE TEMP. OUTSIDE THE INSULATION IS < 60°C. THIS SHALL BE LIGHTLY BONDED MINERAL WOOL.			
	6. TUBING SHALL BE COMPLETE WITH UNION CONNECTIONS AND END FITTINGS AT SUPPLY ENDS AND RECEIVING ENDS. ALL FITTINGS SHALL BE STAINLESS STEEL COMPRESSION TYPE FITTINGS.			
	7. ALL LOCAL PRESSURE INDICATORS & SWITCHES SHALL BE INSTALLED AT A CONVENIENT LOCATION ON THE NEAREST FLOOR.			
	8. BIDDER SHALL PROVIDE CHILLED WATER LINE WITH INSULATION FROM THE CHILLED WATER HEADER FOR SAMPLE CONDITIONING REQUIREMENTS			

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SPEC NO : TCE.6071A-C-500-001		TATA CONSULTING ENGINEERS LIMITED 3 X 660 MW Super Critical TPP at Lalitpur, Uttar Pradesh				VOLUME - V SECTION: TABLE-1 SHEET 2 of 7	
		SIZE, MATERIAL & RATING FOR IMPULSE PIPES / TUBES & FITTINGS					
A - SIZE, MATERIAL & RATING FOR IMPULSE PIPE/TUBE AND FITTINGS							
SL. NO.	SERVICE	SIZE		IMPULSE TUBE MATERIAL (REF.SL.NO. 1) IN SH.NO. 1)	IMPULSE PIPE MATERIAL (REF. SL.NO. 2) IN SH.NO. 1)	IMPULSE LINE FITTING MATERIAL	INSTRUMENT S VALVES MATERIAL
		PIPE	TUBE				
1.	MAIN STEAM / SATURATED STEAM.	SCH.XXS 21.34 mm OD	12.7 mm 00X1.65 MM THK	SS 316	ASTM-A-335-Gr-P-22 (ALLOY STEEL)	ASTM-A-182-Gr-F-22 9000 LBS.	ASTM-A-182-Gr-F-22 2500 SPL.CLASS
2.	HOT REHEAT/ EXTRACTION TO HPH	SCH.80 21.34 mm OD	12.7 mm 00X1.65 MM THK	SS 316	ASTM-A-335-Gr-P-22 (ALLOY STEEL)	ASTM-A-182-Gr-F-22 3000 LBS	ASTM-A-182-Gr-F-22 1500 LBS
3.	COLD REHEAT/ EXTRACTION STEAM/HEATE R DRAINS/CONDENSEN -SATE SYSTEM; AUX. STEAM	SCH.80 21.34 mm OD	12.7 mm 00X1.65 MM THK	SS 316	ASTM-A-106-Gr-B (CARBON STEEL)	ASTM-A-105-Gr-II 3000 LBS	ASTM-A-105-Gr-II 400 LBS
4.	BOILER FEED PUMP DISCHARGE SYSTEM	SCH.160 21.34 mm OD	12.7 mm 00X1.65 MM THK	SS 316	ASTM-A-106-Gr-B (CARBON STEEL)	ASTM-A-105-Gr-II 9000 LBS	ASTM-A-105-Gr-B 2500 LBS
5.	WATER SYSTEM	SCH.80 21.34 mm OD	12.7 mm 00X1.65 MM THK	SS 316	ASTM-A-106-Gr-B (CARBON STEEL)	ASTM-105-Gr-II 3000 LBS	ASTM-A-62 BRONZE BODY 150 LBS
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SPEC NO : TCE.6071A-C-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b> <b>3 X 660 MW Super Critical TPP at Lalitpur, Uttar Pradesh</b>	VOLUME - V SECTION: TABLE-1 SHEET 3 of 7
	<b>SIZE, MATERIAL &amp; RATING FOR IMPULSE PIPES / TUBES &amp; FITTINGS</b>	

A- SIZE, MATERIAL & RATING FOR IMPULSE PIPE/TUBE AND FITTINGS							
SL. NO	SERVICE	SIZE		IMPULSE TUBE MATERIAL (REF. SL.NO. 1 IN SH.NO. 1)	IMPULSE PIPE MATERIAL (REF. SL.NO. 2 IN SH.NO. 1)	IMPULSE LINE FITTING MATERIAL ANSI RATING	INSTRUMENT S VALVES MATERIAL ANSI RATING
		PIPE	TUBE				
6.	LDO SYSTEM; LUBE OIL SYSTEM	SCH.80 21.3 mm OD	-	SS 316	ASTM-A-106-Gr-B (CARBON STEEL)	ASTM-A-105-Gr-II 3000 LBS.	ASTM-A-105-Gr-II 150 LBS
7.	INSTRUMENT AIR SYSTEM	SCH.40 21.3 mm (PIPE THROUGH-OUT)	12.7 MM ODx1.65 mm THK	SS 316	IS 1239 HEAVY CLASS (GALVANISED)	ASTM-A-105-Gr-II 3000 LBS	ASTM-B-62-Gr-II 150 LBS
8.	SERVICE AIR SYSTEM	SCH.40 21.3 mm OD	12.7 MM ODx1.65 mm THK	SS 316	IS 1239 HEAVY CLASS (BLACK)	ASTM-A-105-Gr-II 3000 LBS	ASTM-A-105-Gr-II 150 LBS
9.	BOILER FLUE GAS/AIR SYSTEM	SCH.8021.3 mm OD (PIPE THROUGH-OUT)		SS 316	ASTM-A-106-Gr-B (CARBON STEEL)	ASTM-A-105-Gr-II 3000 LBS	ASTM-A-105-Gr-II 150 LBS



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SPEC NO : TCE.6071A-C-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b> <b>3 X 660 MW Super Critical TPP at Lalitpur, Uttar Pradesh</b>	VOLUME - V SECTION: TABLE-1 SHEET 4 of 7
	<b>SIZE, MATERIAL &amp; RATING FOR IMPULSE PIPES / TUBES &amp; FITTINGS</b>	


A- SIZE, MATERIAL & RATING FOR IMPULSE PIPE/TUBE AND FITTINGS							
S.No	SERVICE	SIZE		IMPULSE TUBE MATERIAL (REF. SL.NO. 1 IN SH.NO. 1)	IMPULSE PIPE MATERIAL (REF. SL.NO. 2 IN SH.NO. 1)	IMPULSE LINE FITTING MATERIAL ANSI RATING	INSTRUMENT S VALVES MATERIAL ANSI RATING
		PIPE	TUBE				
10.	VACUUM	SCH. 40 21.3 mm OD	12.7 mm ODX1.65 mm THK	SS 316	ASTM-A-106- Gr-B (CARBON STEEL)	ASTM-A-105- Gr-II 3000 LBS.	ASTM-A-105- Gr-II 150 LBS
11.	MAKE UP WATER SYSTEM	SCH. 40 21.3 mm OD	12.7 mm ODX1.65 mm THK	SS 316	ASTM-A-312- TP-316 (STAINLESS STEEL)	ASTM-A-182- Gr-IF6a 3000 LBS.	ASTM-A-182- Gr-F6a 150 LBS
12.	SAMPLING SYSTEM	21.3 MM ODX2.77 MM THK * (PIPE THROUGH HOUT)		SS 316	ASTM-A-312- TP-316 (STAINLESS STEEL)	AS APPLICABLE TO SERVICE UNDER SL.NO. 1 TO 12.	

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SPEC NO : TCE.6071A-C-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b> <b>3 X 660 MW Super Critical TPP at Lalitpur, Uttar Pradesh</b>	VOLUME - V SECTION: TABLE-1 SHEET 5 of 7
	<b>SIZE, MATERIAL &amp; RATING FOR IMPULSE PIPES / TUBES &amp; FITTINGS</b>	
<p>NOTES:</p> <p>1.0 IMPULSE PIPE THICKNESS SHALL BE SELECTED AS PER ANSI B 36.10 BASED ON THE SCHEDULE INDICATED AGAINST EACH SERVICE.</p> <p>* - There Are 4 Samples; Minimum 150mts Tube (½") To Be Considered For Each Sample.</p> <p>2.0 WHEREVER IMPULSE TUBES ARE PROVIDED, ALL THE FITTINGS REQUIRED FOR THESE SHALL BE SS 316.</p> <p><b>IMPULSE LINE/TUBE FITTINGS &amp; ACCESSORIES</b></p> <p>1.0 NIPPLE SHALL BE PROVIDED FOR ROOT VALVE SIZE MORE THAN ½ INCH AND THENIPPLE SIZE SHALL BE SAME AS THE ROOT VALVE SIZE. REDUCER/ADAPTER SHALLBE PROVIDED TO SUIT INSTRUMENT CONNECTION, WHERE NIPPLE, ROOT VALVE SIZEIS MORE THAN ½ INCH.</p> <p>2.0 BULK HEAD FITTING SOCKET WELDED TYPE TO BE PROVIDED AT INSTRUMENT RACK/ENCLOSURE.</p> <p>3.0 <u>FITTINGS :</u></p> <p>3.1 ALL FITTINGS EXCEPT THE LAST FITTING CONNECTING TO THE INSTRUMENT SHALL BE SOCKET WELDED. THE SIZE OF THE FITTINGS SHALL BE SAME AS THE IMPULSE LINE SIZE.</p> <p>3.2 THE FITTING CONNECTING TO THE INSTRUMENT SHALL HAVE A SIZE AND THREAD TO SUIT THE INSTRUMENT CONNECTION</p> <p>4.0 <u>DRAIN:</u></p> <p>4.1 DRAIN SHALL BE PROVIDED FOR ALL WATER/STEAM AND NON-INFLAMMABLE/NON-CORROSIVE FLUIDS ONLY.</p>		
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SPEC NO : TCE.6071A-C-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b> <b>3 X 660 MW Super Critical TPP at Lalitpur, Uttar Pradesh</b>	VOLUME - V SECTION: TABLE-1 SHEET 6 of 7
	<b>SIZE, MATERIAL &amp; RATING FOR IMPULSE PIPES / TUBES &amp; FITTINGS</b>	
<p>5.0 <u>DRAIN VALVE</u></p> <p>5.1 TWO NUMBERS OF GLOBE DRAIN VALVES SHALL BE FOR PROCESS CONDITIONS OF 425°C OR 62 BAR AND HIGHER.</p> <p>5.2 ONE NUMBER GLOBE DRAIN VALVE SHALL BE PROVIDED FOR PROCESS CONDITIONS OF LESS THAN 425°C AND 62 BAR.</p> <p>5.3 THE VALVE SIZE SHALL BE SAME AS IMPULSE PIPING/TUBING SIZE</p> <p>6.0 <u>FUNNEL WITH DRAIN HEADER:</u></p> <p>6.1 THIS SHALL BE PROVIDED IN THE RACKS FOR BLOWING/DRAINING OUT THE PROCESSFLUID IN THE IMPULSE TUBINGS.</p> <p>6.2 THE SIZE OF THE DRAIN HEADER SHALL BE 1".</p> <p>6.3 WHEN INSTRUMENTS ARE MOUNTED LOCAL TO THE TAPPING POINT AND ARE NOT MOUNTED IN THE RACK, OR PANEL OR ENCLOSURE. THE DRAINS SHALL BE CONNECTED TO THE NEAREST FLOOR LEVEL OR PLANT DRAIN.</p> <p>7.0 <u>INSTRUMENT:</u></p> <p>7.1 TYPE OF THE VALVE SHALL BE NEEDLE VALVE WITH BUILT IN DRAIN VALVE.</p> <p>7.2 SIZING OF THE VALVE SHALL BE ½".</p> <p>8.0 <u>RIGHT/LEFT THREADED FITTINGS :</u></p> <p>8.1 THIS SHALL BE PROVIDED FOR INSTALLATION/REMOVAL OF INSTRUMENTS WITHOUT DISTURBING THE TUBING/PIPING.</p> <p>9.0 A SUITABLE ADAPTER SHALL BE PROVIDED TO INSTALL THE INSTRUMENTS ON ½" RIGHT-LEFT THREADED FITTING</p>		
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SPEC NO : TCE.6071A-C-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b> <b>3 X 660 MW Super Critical TPP at Lalitpur, Uttar Pradesh</b>	VOLUME - V SECTION: TABLE-1 SHEET 7 of 7
	<b>SIZE, MATERIAL &amp; RATING FOR IMPULSE PIPES / TUBES &amp; FITTINGS</b>	
<p>10.0 A ½" VENT LINE WITH A ½" ISOLATION VALVE SHALL BE PROVIDED IN THE INSTRUMENT RACK FOR AIR AND COMPRESSIBLE FLUIDS OR OTHERWISE IF THE INSTALLATION CALL FOR EG., FOR LIQUID SERVICE WHERE THE TRANSMITTER IS LOCATED AT A HIGHER ELEVATION THAN THE TAPPING POINT.</p> <p>11.0 FOR AIR/FLUE GAS MEASUREMENT A DRAIN POT WITH PLUG SHALL BE PROVIDED IN PLACE OF DRAIN VALVES.</p> <p>12.0 <u>PURGING SYSTEM</u></p> <p>12.1 THIS SHALL BE PROVIDED FOR FLUE GAS MEASUREMENTS</p> <p>12.2 INSTRUMENT AIR CONNECTION SHALL BE PROVIDED AT EACH INSTRUMENT FOR AIR &amp; FLUE GAS SERVICE FOR CONTINUOUS PURGING.</p> <p>12.3 ONE AIR FILTER REGULATOR, PURGE ROTAMETER AND A BLOW DOWN DEVICE PER INSTRUMENT SHALL BE PROVIDED IN THE TRANSMITTER RACK.</p> <p>12.4 THE PURGE LINE SHALL BE CONNECTED TO EACH INSTRUMENT THROUGH A ½" ISOLATING VALVE.</p> <p>13.0 THE FOLLOWING MINIMUM TESTS SHALL BE CONDUCTED FOR IMPULSE TUBES AND FITTINGS</p> <ul style="list-style-type: none"> <li>a) HYDROSTATIC PRESSURE TEST</li> <li>b) HELIUM LEAK TEST FOR THE ASSEMBLY.</li> <li>c) TENSILE PULL TEST</li> <li>d) STEAM CYCLE / THERMAL SHOCK TEST</li> </ul> <p>ETC., ALL OTHER STANDARD TESTS AS REQUIRED BY PURCHASER.</p>		
	ISSUE R0	

	TITLE:		BHEL DOCUMENTS NO.: PE-TS-375-160-A001	
	TECHNICAL SPECIFICATION FOR		VOLUME II-B	
	MILL REJECT HANDLING SYSTEM		SECTION -C	
	3 X 660 MW Super Critical TPP at LALITPUR, Uttar Pradesh		REV. NO. 00	DATE: 07/08/2012
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**ANNEXURE-3  
DATA SHEET-A**




	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR</b> <b>MILL REJECT HANDLING SYSTEM</b>  <b>3 X 660 MW Super Critical TPP at LALITPUR, Uttar Pradesh</b>	BHEL DOCUMENTS NO.: PE-TS-375-160-A001	
		VOLUME <b>II-B</b>	
		SECTION -C	
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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	:	3 x100% (2W+1S) compressors non lubricated reciprocating compressor
4.	Capacity of mill reject silo	:	55 T each i.e. 16 Hours storage capacity with all mills in a bay with worst coal at 100% BMCR
5.	Dust loading condition of outlet air	:	50 mg/NM <sup>3</sup>
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 densenveyor	:	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 <sup>3</sup> for volumetric calculation 2400 Kg/M <sup>3</sup> 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 discharge hopper (pyrite hopper)	:	Pneumatically cylinder operated knife edge gate valve at mill oulet-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 Pneumatic optd KGV Oversize with Pneumatic optd KGV with Limit switch)
20.	Bends/ Fittings/ Laterals	:	Alloy CI to 400 BHN



	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR</b> <b>MILL REJECT HANDLING SYSTEM</b>  <b>3 X 660 MW Super Critical TPP at LALITPUR, Uttar Pradesh</b>	BHEL DOCUMENTS NO.: PE-TS-375-160-A001	
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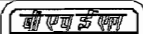
**PYRITE HOPPER  
DATA SHEET -A**

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)
<b>4.0</b>	<b>MATERIAL OF CONSTRUCTION AND THICKNESS HAVE: -</b>		
5.1	Pyrite hopper Plates	mm	10 mm thick. MS as per IS: 2062 Gr. A/B (Min) with sizing grid
5.2	Density of rejects Metric Tonnes/m <sup>3</sup> ----		1.6 for Volume Calculation 2.4 for Structural Load calculation
5.3	Inlet valve to pyrite hopper	----	Pneumatically operated KGV with expansion joint
5.4	Valves at <ul style="list-style-type: none"> <li>Maintenance valve</li> <li>Over size chute</li> <li>Emergency chute</li> </ul>		Manual operated KGV Pneumatic operated KGV Pneumatic operated KGV
5.5	Min. instruments required	----	Two nos. of level switches (High/High-High) One (1) no of temperature switch
5.6	Explosion vent	----	Rupture Disc type, one no per Hopper.
5.6	Water Spraying arrangement with Solenoid Valve	----	Yes (Manual isolation & bypass valve also to be provided)

	TITLE:  <b>TECHNICAL SPECIFICATION FOR MILL REJECT HANDLING SYSTEM</b>  <b>3 X 660 MW Super Critical TPP at LALITPUR, Uttar Pradesh</b>	BHEL DOCUMENTS NO.: PE-TS-375-160-A001	
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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 <sup>3</sup> for weigh purpose 1.6 T/m <sup>3</sup> 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 Valve / cone valve as per manufacturing proven design. :	Plate valve/ Dome Valve/ Butterfly

	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR</b> <b>MILL REJECT HANDLING SYSTEM</b>  <b>3 X 660 MW Super Critical TPP at LALITPUR, Uttar Pradesh</b>	BHEL DOCUMENTS NO.: PE-TS-375-160-A001	
		VOLUME <b>II-B</b>	
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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	To store mill rejects for 16 hours with all mills operating at worst coal firing at 100% BMCR.
4.0	Number of outlet	-----	One
5.0	Minimum free board	mm	500
6.0	<b>MATERIAL OF CONSTRUCTION AND THICKNESS OF: -</b>		
6.1	Bunker Plates	mm	10mm thk. MS plates (min) as per IS: 2062 Gr. A/B
6.2	Liners	mm	8 mm thk. SAIL HQARD/ TISCRAI on conical portion of bunker.
6.3	Discharge gate	----	Twin Sector gates Cast Iron IS210/ MS to IS 2062 with TISCRAI/ SAIL HARD Liner, Min 400 BHN. ( <b>Pneumatic operated</b> )
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 <sup>3</sup>	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/m<sup>3</sup> with air to cloth ratio 1.5m/ min


	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR</b> <b>MILL REJECT HANDLING SYSTEM</b>  <b>3 X 660 MW Super Critical TPP at LALITPUR, Uttar</b> <b>Pradesh</b>	BHEL DOCUMENTS NO.: PE-TS-375-160-A001	
		VOLUME <b>II-B</b>	
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**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


	<b>DATA SHEET FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE</b>		SPECIFICATION NO.:	
			VOLUME	
			SECTION	
			REV. NO.	DATE:
			SHEET 1 OF 2	
Data Sheet No.: PE-DC-999-145-026-A				
TECHNICAL REQUIREMENTS FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE (TO BE FILLED BY PURCHASER)				
TO BE FILLED-UP /CONFIRMED BY BIDDER				
<b>GENERAL</b>	MANUFACTURER			
	MODEL NUMBER			
<b>TECHNICAL</b>	SENSING ELEMENT		<input type="checkbox"/> BOURDON <input type="checkbox"/> DIAPHRAGM (BOURDON FOR HIGH PRESS AND DIAPHRAGM FOR LOW PRESS APPLICATION)	
	MATERIAL		SENSING ELEMENT – AISI 316 SS MOVEMENT – AISI 304 SS CASING – <input type="checkbox"/> DIE CAST AL <input checked="" type="checkbox"/> SS	
	ENCLOSURE		CLASS: <input type="checkbox"/> IP-55 <input checked="" type="checkbox"/> IP-65 <input type="checkbox"/> EXPL PROOF PAINT: <input type="checkbox"/> ENAMEL <input type="checkbox"/> EPOXY	
	DIAL		SIZE: 150 MM COLOR: WHITE NUMERALS: BLACK SCALE: LINEAR, 270° ARC GRADUATED IN METRIC UNITS	
	CASE		COLOUR : BLACK	
	SPAN/ ZERO ADJUSTMENT		INT. MICRO SCREW	
	RANGE SELECTION		SHOULD COVER 125% OF OPERATING PARAMETER	
	OVER RANGE PROTECTION		1.5 TIMES OF FSD	
	BLOW OUT DISC		REQUIRED	
	SWITCHING FACILITY (IF APPLICABLE)		NOT REQUIRED	
	TYPE		<input type="checkbox"/> MICRO SWITCH <input type="checkbox"/> OTHER	
	NO. / TYPE OF CONTACTS		2 NOS. SPDT	
CONTACT RATING		5A 230V AC, 0.25A 220V DC		
SETTING RANGE		FIELD ADJUSTABLE OVER FULL RANGE		
REPEATABILITY		± 1% OF FSR		
POWER SUPPLY		<input type="checkbox"/> 230V AC <input type="checkbox"/> 110V AC		
<b>PERFORMANCE</b>	ACCURACY		± 0.5% OF SPAN	
<b>CONNECTION</b>	PROCESS		<input type="checkbox"/> M20 x 1.5 (M) <input type="checkbox"/> 1/2" NPT (M) <input checked="" type="checkbox"/> 1/4" NPT (F) <input type="checkbox"/> OTHER	
	LOCATION		BOTTOM	
<b>ACCESSORIES</b>	NAME PLATE / METAL TAG		SS	
	OTHER		SIPHON FOR STEAM, SNUBBER FOR PUMP DISCHARGE, CHEMICAL SEAL DIAPHRAGM FOR CORROSSIVE, OIL SERVICES and SLURRY APPLICATION TO BE PROVIDED	
<b>OTHER REQUIREMENT</b>	INSTRUMENT LIST		INSTRUMENT LIST COMPRISING OF TAG NO., SERVICE, DESIGN/OPERATING PRESSURE & TEMPERATURE TO BE ATTACHED	
<b>QUALITY REQUIREMENT</b>	CHECK LIST FOR PG/DPG		REFER CHECK LIST NO PE-CL-999-145-026-0	


	<b>TECHNICAL REQUIREMENTS FOR PRESSURE /DIFFERENTIAL PRESSURE SWITCH (Mechanical Auxiliary Packages)</b>		SPECIFICATION NO.:	
			VOLUME	
			SECTION	
			REV. NO.	DATE:
			SHEET 1 OF 2	
Data Sheet No.: PE-DC-999-145-I031-0A				
TECHNICAL REQUIREMENT FOR PRESSURE / DIFFERENTIAL PRESSURE SWITCH (TO BE FILLED BY PURCHASER )			TO BE FILLED BY THE BIDDER	
<b>GENERAL</b>	MANUFACTURER			
	MODEL NUMBER			
<b>TECHNICAL</b>	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 WITH EPOXY COATING		
	ENCLOSURE	<input type="checkbox"/> IP-55 <input checked="" type="checkbox"/> IP-65 <input type="checkbox"/> EXPL. PROOF		
	SWITCH TYPE	<input type="checkbox"/> MICRO <input type="checkbox"/> ENCLOSURE HERMETICALLY SEALED		
	SWITCH CONTACT	TWO NOS. SPDT		
	SWITCH RATING	5A 230V AC, 0.25A 220V DC		
	SET POINT	ADJUSTABLE THROUGHOUT THE RANGE		
	DIFFERENTIAL	<input type="checkbox"/> FIXED <input checked="" type="checkbox"/> ADJUSTABLE OVER WIDE RANGE		
	MOUNTING	<input checked="" type="checkbox"/> DIRECT <input type="checkbox"/> PANEL OR RACK		
	OVER RANGE PROTECTION	150% OF FSD		
	<b>PERFORMANCE</b>	REPEATABILITY	± 0.5 %	
	DIAPHRAGM SEAL	DIAPHRAGM WITH CHEMICAL SEAL FOR CORROSSIVE & OIL SERVICES TO BE PROVIDED		
	NAME PLATE/METAL TAG	SS		
<b>CONNECTION</b>	PROCESS	1/2" NPT (F) AT BOTTOM		
	ELECTRICAL	WITH CABLE GLAND TO SUIT CABLE OF MAXIMUM o.d. 17.5 MM.		
<b>OTHER REQUIREMENT</b>	INSTRUMENT SCHEDULE	INSTRUMENT LIST COMPRISING OF TAG NO., SERVICE, RANGE, MEDIUM, STATIC PRESSURE, DESIGN/OPERATING PRESSURE & TEMPERATURE TO BE ATTACHED		
<b>QUALITY REQUIREMENT</b>	CHECKLIST FOR PS/DPS	REFER CHECK LIST NO. PE-CL-999-145-I031-0		




	<b>DATA SHEET FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER</b>			SPECIFICATION NO.:	
				VOLUME	
				SECTION	
				REV. NO.	DATE:
				SHEET 1 OF 2	
TAG No. .... Qty.....			Data Sheet No.: PES-145-01-DS1-0		
<b>Data Sheet A &amp; B</b>					
DATA SHEET-A FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER (TO BE FILLED BY PURCHASER)				DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
<b>GENERAL</b>	MANUFACTURER				
	MODEL NUMBER				
<b>TECHNICAL</b>	TYPE (SMART TRANSMITTER-HART COMPATIBLE)		<input type="checkbox"/> INDUCTANCE <input type="checkbox"/> CAPACITANCE <input type="checkbox"/> STRAIN GAUGE <input type="checkbox"/>		
	POWER SUPPLY		24V DC		
	TRANSMITTER MEASUREMENT		<input type="checkbox"/> PRESSURE <input checked="" type="checkbox"/> DIFF. PRESSURE		
	OUTPUT SIGNAL		4-20 mA		
	NO. OF WIRE		TWO		
	ACCURACY		± 0.25% OF FSR		
	LINEARITY, HYSTERESIS AND DEAD BAND		± 0.1% OF SPAN		
	REPEATABILITY		± 0.05% OF SPAN		
	STABILITY		± 0.25 % OF SPAN OR BETTER FOR 6 MONTHS		
	SENSITIVITY		± 0.05% OF SPAN		
	MATERIAL				
	A)	BODY	ALUMINIUM HOUSING (Epoxy Coated)		
	B)	ELEMENT	HASTELLOY		
	C)	SEAL	TEFLON		
	CONTINUOUSLY ADJUSTABLE SPAN AND ZERO ADJUSTMENT PROVIDED		<input type="checkbox"/> YES <input type="checkbox"/> NO		
	MOUNTING		<input type="checkbox"/> WALL/PIPE STAND <input checked="" type="checkbox"/> TRANSMITTER RACK		
	ENCLOSURE		NEMA-4 X / IP-67		
	TURN DOWN RATIO		40:1		
	INSULATION RESISTANCE		TO BE SPECIFIED BY BIDDER		
	ZERO SUPPRESSION RANGE		TO BE SPECIFIED BY BIDDER		
	ZERO ELEVATION RANGE		TO BE SPECIFIED BY BIDDER		
	INTEGRAL INDICATOR(LCD TYPE)		<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
	TRANSMITTER SHALL BE ABLE TO DRIVE OUTPUT IMPEDANCE OF 500 OHMS.		YES		
	ZERO DRIFT		< 0.1%		
	SPAN DRIFT		< 0.1%		
	MANIFOLD				
DIFFERENTIAL PRESSURE MEASUREMENT		5 WAY			
CABLE ENTRY DETAIL		SUITABLE FOR DIA OF 17.5 mm			
<b>NAME SIGNATURE DATE</b>	<b>PREPARED BY</b>		<b>CHECKED BY</b>		<b>COMPANY SEAL</b>  <b>NAME SIGNATURE DATE</b>

	<b>SPECIFICATION SHEET FOR MOTORISED VALVE ACTUATOR</b>		SPECIFICATION NO.: PE-ID-375-145-I902	
			VOLUME II B	
			SECTION D	
			REV. NO. 00	DATE: 03.10.11
			SHEET 2	OF 7
TAG No :- Qty :-.....Nos.....				
<b>Data Sheet A &amp; B</b>				
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
<b>GENERAL *</b>	* PROJECT	3X660 MW LALITPUR TPP		
	OFFER REFERENCE			
	* TAG NO. SERVICE			
	* DUTY	<input type="checkbox"/> ON / OFF <input type="checkbox"/> INCHING		
	* LINE SIZE (inlet/outlet): MATERIAL			
	* VALVE TYPE	<input type="checkbox"/> GLOBE <input type="checkbox"/> GATE <input type="checkbox"/> REG. GLOBE <input type="checkbox"/> BUTTERFLY		
	* OPENING / CLOSING TIME	..... SECONDS		
	* WORKING PRESSURE	..... KG/SQ.CM.		
	AMBIENT CONDITION	SHALL BE SUITABLE FOR CONTINUOUS OPERATION UNDER AN AMBIENT TEMP. OF 0-55 DEG C AND RELATIVE HUMIDITY OF 0-95%		
	VALVE SEAT TEST PRESS	BIDDER TO SPECIFY		
	REQUIRED VALVE TORQUE	BIDDER TO SPECIFY		
	ACTUATOR RATED TORQUE	BIDDER TO SPECIFY		
<b>CONSTRUCTION AND SIZING</b>	CONSTRUCTION	TOTALLY ENCLOSED, WEATHER PROOF		
	MECHANICAL POSITION INDICATOR	TO BE PROVIDED FOR 0-100% TRAVEL		
	BEARINGS	DOUBLE SHIELDED, GREASE LUBRICATED ANTI-FRICTION.		
	GEAR TRAIN FOR LIMIT SWITCH/TORQUE SWITCH OPERATION	METAL (NOT FIBRE GEARS). SELF-LOCKING TO PREVENT DRIFT UNDER TORQUE SWITCH SPRING PRESSURE WHEN MOTOR IS DE-ENERGIZED.		
	SIZING	OPEN/CLOSE AT RATED SPEED AGAINST DESIGNED DIFFERENTIAL PRESSURE AT 90 % OF RATED VOLTAGE. FOR ISOLATING SERVICE THREE SUCCESSIVE OPEN-CLOSE OPERATIONS OR 15 MINS. WHICHEVER IS HIGHER. . For regulating service 150 starts/Hr min.		
<b>HANDWHEEL</b>	* REQUIRED	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
	* ORIENTATION	<input type="checkbox"/> TOP MOUNTED <input type="checkbox"/> SIDE MOUNTED		
	TO DISENGAGE AUTOMATICALLY DURING MOTOR OPERATION.			
<b>ELECTRIC ACTUATOR</b>	ACTUATOR MAKE/MODEL	BIDDER TO SPECIFY		
	MOTOR MAKE / MODEL / TYPE / RATING (KW)	BIDDER TO SPECIFY		
	MOTOR TYPE	SQUIRREL CAGE INDUCTION MOTOR, STARTING CURRENT LIMITED TO SIX TIMES THE RATED CURRENT.		
	ACTUATOR WIRING DIAGRAM & No.	<input checked="" type="checkbox"/> ENCLOSED (3-V-MISC-24227)		
	COLOUR SHADE	<input checked="" type="checkbox"/> GREY ENAMEL PAINT (SHADE 631 AS PER IS.5) OR EQUIVALENT <input type="checkbox"/> .....		
	SHAFT RPM	BIDDER TO SPECIFY		
	OLR SET VALUE	BIDDER TO SPECIFY		
	STARTING / FULL LOAD CURRENT	BIDDER TO SPECIFY		
	NO. OF REV FOR FULL TRAVEL	BIDDER TO SPECIFY		
	@ PWR SUPP TO MTR / STARTER	415V±10%, 3PH, AC, 50Hz±5%, 10%(ABSOLUTE) COMBINED VOLTAGE & FREQUENCY VARIATION		
	@ CONTROL VOLTAGE REQUIREMENT	110V AC- TO BE DERIVED FROM THE POWER SUPPLY TO THE STARTER		
	@ ENCLOSURE CLASS OF MOTOR	<input type="checkbox"/> IP 65 <input checked="" type="checkbox"/> IP 67 <input type="checkbox"/> FLAME PROOF TOTALLY ENCL, SELF VENTILATED.		

	<b>SPECIFICATION SHEET FOR MOTORISED VALVE ACTUATOR</b>		SPECIFICATION NO.: PE-ID-375-145-I902		
			VOLUME II B		
			SECTION D		
			REV. NO. 00	DATE: 03.10.11	
		SHEET 3		OF 7	
TAG No :- Qty :-.....Nos.....					
<b>Data Sheet A &amp; B</b>					
DATA SHEET-A (TO BE FILLED BY PURCHASER)				DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
	@ INSULATION CLASS	<input type="checkbox"/> CLASS-B <input checked="" type="checkbox"/> CLASS-F WITH TEMPERATURE RISE LIMITED TO CLASS-B			
	@ CONTINUOUS OPERATION TIME	S2-15 MINUTES			
	@ POWER CABLE TYPE / SIZE	LATER (TO BE PROVIDED IN THE CONTRACT STAGE)			
	@ CONTROL CABLE TYPE / SIZE	LATER (TO BE PROVIDED IN THE CONTRACT STAGE)			
	@ WINDING TEMP PROTECTION	<input checked="" type="checkbox"/> THERMOSTAT <input type="checkbox"/> THERMISTOR WITH SWITCHING UNIT <input checked="" type="checkbox"/> 3 Nos., 1 IN EACH PH <input type="checkbox"/> ONE			
	SINGLE PHASE / WRONG PHASE SEQUENCE PROTECTION	REQUIRED			
<b>INTEGRAL STARTER</b>	INTEGRAL STARTER	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	TYPE OF SWITCHING DEVICE	<input checked="" type="checkbox"/> CONTACTORS <input type="checkbox"/> THYRISTORS			
	TYPE	<input checked="" type="checkbox"/> CONVENTIONAL <input type="checkbox"/> SMART (NON-INTRUSIVE)			
	IF SMART				
	a) SERIAL LINK INTERFACE	<input type="checkbox"/> INTEGRAL <input type="checkbox"/> FIELD MOUNTED			
	b) SERIAL LINK PROTOCOL	<input type="checkbox"/> FOUNDATION FIELD-BUS <input type="checkbox"/> PROFI-BUS <input type="checkbox"/> TCP/IP <input type="checkbox"/> .....			
	c) SERIAL LINK MEDIA	<input type="checkbox"/> TWISTED PAIR Cu-CBL <input type="checkbox"/> CO-AXIAL Cu-CBL <input type="checkbox"/> OFC			
	d) HAND HELD PROGRAMMER	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	e) MASTER STATION (See note-10)	<input type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	f) MASTER STN INTRFACE WITH DCS	<input type="checkbox"/> REQUIRED MODBUS <input type="checkbox"/> TCP/IP			
	g) DETAILS OF SPECIAL CABLE	<input type="checkbox"/> ENCLOSED <input type="checkbox"/> NOT REQUIRED			
	WIRING DIAGRAM & No.	<input checked="" type="checkbox"/> BIDDER TO ENCLOSE <input type="checkbox"/> ENCLOSED			
	STEP DOWN CONT. TRANSFORMER	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	OPEN / CLOSE PB	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	STOP PB	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	INDICATING LAMPS	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	LOCAL REMOTE S/S	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	STATUS CONTACTS FOR MONITORING	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	INTEGRAL STARTER DISTURBED SIGNAL	REQUIRED(O/L RELAY OPERATED, CONT./POWER SUPPLY FAILED,S/S IN LOCAL, THERMOSTAT TRIP, TORQUE SWITCH (OPTD MID WAY)			
<b>INTERPOSING RELAY (Applicable for Integral Starter)</b>	INTERPOSING RELAY	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED			
	INTERPOSING RELAY (QUANTITY)	<input checked="" type="checkbox"/> 2 NOS. <input type="checkbox"/> 3 NOS.			
	DRIVING VOLTAGE	<input checked="" type="checkbox"/> 20.5 – 24V DC <input type="checkbox"/> _____ V DC			
	DRIVING CURRENT	<input checked="" type="checkbox"/> 125 mA MAX <input type="checkbox"/> _____ mA MAX			
	LOAD RESISTANCE	<input checked="" type="checkbox"/> > 192 ohms - < 25 K ohms <input type="checkbox"/> > _____ ohms - < _____ ohms			
<b>TORQUE SWITCH (Not Applicable for Smart Actuator)</b>	MECHANICAL LATCHING DEVICE	<input checked="" type="checkbox"/> REQUIRED(REFER NOTE-6)			
	MFR & MODEL NO.	BIDDER TO SPECIFY			
	OPEN / CLOSE	<input checked="" type="checkbox"/> 1 No. <input type="checkbox"/> 2Nos. / <input checked="" type="checkbox"/> 1 No. <input type="checkbox"/> 2Nos			
	CONTACT TYPE	2 NO + 2 NC			
	RATING	5A, 240 V AC / 0. 5A, 220 V DC			
	ENCLOSURE	IP 66			
	CALIBRATED KNOBS(OPEN&CLOSE TS)	REQUIRED FOR SETTING DESIRED TORQUE			
	ACCURACY	±3% OF SET VALUE			
<b>LIMIT SWITCH (Not Applicable for Smart Actuator)</b>	MFR & MODEL NO.	BIDDER TO SPECIFY			
	OPEN : INT : CLOSE	<input type="checkbox"/> 1 No. <input checked="" type="checkbox"/> 2 Nos.	2 Nos. (ADJ.)	<input type="checkbox"/> 1 No. <input checked="" type="checkbox"/> 2Nos.	

	<b>SPECIFICATION SHEET FOR MOTORISED VALVE ACTUATOR</b>		SPECIFICATION NO.: PE-ID-375-145-I902	
			VOLUME II B	
			SECTION D	
			REV. NO. 00	DATE: 03.10.11
		SHEET 4	OF 7	
TAG No :- Qty :-.....Nos.....				
<b>Data Sheet A &amp; B</b>				
DATA SHEET-A (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
<b>POSITION TRANSMITTER</b>	CONTACT TYPE	2 NO + 2 NC		
	RATING (AC / DC)	5A, 240 V AC / 0. 5A,220 V DC		
	ENCLOSURE CLASS	IP 66		
	POSITION TRANSMITTER	<input checked="" type="checkbox"/> REQUIRED <input type="checkbox"/> NOT REQUIRED		
	MFR & MODEL NO.	BIDDER TO SPECIFY		
	TYPE	<input checked="" type="checkbox"/> ELECTRONIC (2-WIRE) CONTACTLESS (LVDT TYPE) <input type="checkbox"/> ELECTRONIC (2 WIRE) R/I CONVERTER		
	SUPPLY	<input checked="" type="checkbox"/> 24V DC <input type="checkbox"/> .....		
	OUTPUT	<input checked="" type="checkbox"/> 4-20mA		
<b>TERMINAL BOX</b>	ACCURACY	± 1% FS		
	ENCLOSURE CLASS	IP 65		
	MOTOR TERMINAL BOX	REQUIRED		
	ACTUATOR TERMINAL BOX	REQUIRED		
	ENCL CLASS MTR T.B. / ACTUATOR T.B.	<input type="checkbox"/> IP65 <input checked="" type="checkbox"/> IP67..... <input type="checkbox"/> IP65 <input checked="" type="checkbox"/> IP67.....		
	@ EARTHING TERMINAL	PROVIDED		
	PLUG & SOCKET(9 PIN) (FOR COMM, LS/TS FEED BACK, PoT)	<input type="checkbox"/> REQUIRED <input checked="" type="checkbox"/> NOT REQUIRED <input type="checkbox"/> 2 NOS. <input type="checkbox"/> .....		
	<b>CABLE GLANDS</b>	@ POWER CABLE GLAND	SIZE : TO BE FURNISHED LATER	
@ SPACE HEATER CABLE GLAND		SIZE : TO BE FURNISHED LATER		
OTHER CONTROL CABLE GLANDS		QUANTITY & SIZE : TWO (SIZE TO BE FURNISHED LATER)		
<b>SPACE HEATER</b>	@ SPACE HEATER	REQUIRED		
	@ POWER SUPPLY	240V AC SINGLE PHASE		
	@ RATING	BIDDER TO SPECIFY		
<b>WEIGHT</b>	TOTAL WEIGHT (ACTUATOR + ACCESSORIES)	BIDDER TO SPECIFY		_____ Kg.
<b>NOTES:</b> <ol style="list-style-type: none"> <li>SCOPE: DESIGN, MANUFACTURE, INSPECTION, TESTING AND DELIVERY TO SITE OF ELECTRIC ACTUATOR FOR INCHING OR OPEN / CLOSE DUTY.</li> <li><b>CODES &amp; STANDARDS:</b> DESIGN AND MATERIALS USED SHALL COMPLY WITH THE RELEVANT LATEST NATIONAL AND INTERNATIONAL STANDARD. AS A MINIMUM, THE FOLLOWING STANDARDS SHALL BE COMPLIED WITH: IS-9334, IS-2147, IS-2148, IS-325, IS-2959, IS-4691, IS-4722 AND IEC 34-1.</li> <li>TEMPERATURE RISE SHALL BE RESTRICTED TO 70 DEG. C FOR AMBIENT TEMPERATURE OF 50 DEG C.</li> <li>CABLE GLANDS OF DOUBLE COMPRESSION TYPE HEAVY DUTY BRASS MACHINE FINISHED &amp; NICKEL CHROME PLATED CONFORMING TO BS:6121 SHALL BE PROVIDED.</li> <li>THE MAKE OF THE MOTOR WILL BE AS PER APPROVED VENDOR LIST.</li> <li>THE TORQUE SWITCHES SHALL BE PROVIDED WITH MECHANICAL LATCHING DEVICE TO PREVENT OPERATION WHEN UNSEATING FROM THE END POSITIONS. THE LATCHING DEVICE SHALL UNLATCH AS SOON AS THE VALVE LEAVES THE END POSITION. IF SUCH PROVISION IS NOT POSSIBLE, THE TORQUE SWITCHES SHALL BE BYPASSED BY END-POSITION LIMIT SWITCHES WHICH OPENS ON VALVE LEAVING END POSITION. THESE LIMIT SWITCHES ARE ADDITIONAL TO THE NUMBER OF LIMIT SWITCHES SPECIFIED ELSEWHERE.</li> <li>THE MOTOR SHALL OPERATE SATISFACTORILY UNDER THE +/- 10% SUPPLY VOLTAGE VARIATION AT RATED FREQUENCY, -5% TO +5% VARIATION IN FREQUENCY AT RATED SUPPLY VOLTAGE, SIMULTANEOUS VARIATION IN VOLTAGE &amp; FREQUENCY THE SUM OF ABSOLUTE PERCENTAGE NOT EXCEEDING 10%.</li> <li>THE MOTOR SHALL BE SUITABLE FOR DIRECT ON LINE STARTING.</li> </ol>				
<b>NAME</b>  <b>SIGNATURE</b>  <b>DATE</b>	<b>PREPARED BY</b>  KANISHKA TIWARI	<b>CHECKED BY</b>  SURESH SHARMA	<b>APPROVED BY</b>  DIPESH PALIT	COMPANY SEAL  <b>NAME</b>  <b>SIGNATURE</b>  <b>DATE</b>
	03.10.2011	03.10.2011	03.10.2011	
NOTES* = TO BE FILLED BY MPL (LEAD AGENCY).      @ = TO BE FILLED BY ES				



	<b>TITLE:</b> <b>TECHNICAL SPECIFICATION FOR MILL REJECT HANDLING SYSTEM</b>  3 X 660 MW Super Critical TPP at LALITPUR, Uttar Pradesh	BHEL DOCUMENTS NO.: PE-TS-375-160-A001	
		VOLUME <b>II-B</b>	
		SECTION -C	
		REV. NO. 00	DATE: 07/08/2012
		Page	

**FLOW DIAGRAM  
(ANNEXURE-4)**

**LEGEND:**

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

**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 OTHER UNIT ALSO.

**DETAIL - X (TYPICAL)**

CONVEYING PIPE TO MILL  
REJECTS BUNKER  
RETURN WATER TO OPEN DRAIN  
INSTRUMENT AIR LINE  
PLATE VALVE (HAND WHEEL OPTD.)  
OVER SIDE DISCHARGE PIPE  
PLATE VALVE (HAND WHEEL OPTD.)  
TEMPERATURE SWITCH  
GRID  
LEVEL PROBE  
PRATE HOPPER  
SPRAY NOZZLE  
F. EXH. CONT.  
PLATE VALVE (OVL. OPERATED)

**LEGEND:**

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

**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 OTHER UNIT ALSO.

**DETAIL - X (TYPICAL)**

CONVEYING PIPE TO MILL  
REJECTS BUNKER  
RETURN WATER TO OPEN DRAIN  
INSTRUMENT AIR LINE  
PLATE VALVE (HAND WHEEL OPTD.)  
OVER SIDE DISCHARGE PIPE  
PLATE VALVE (HAND WHEEL OPTD.)  
TEMPERATURE SWITCH  
GRID  
LEVEL PROBE  
PRATE HOPPER  
SPRAY NOZZLE  
F. EXH. CONT.  
PLATE VALVE (OVL. OPERATED)

**LEGEND:**

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

**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 OTHER UNIT ALSO.

**DETAIL - X (TYPICAL)**

CONVEYING PIPE TO MILL  
REJECTS BUNKER

TRANSPORT VESSEL

RETURN WATER TO OPEN DRAIN

CONVEYING AIR LINE

PLATE VALVE (HAND WHEEL OPTD.)

OVER SIDE DISCHARGE PIPE

PLATE VALVE (HAND WHEEL OPTD.)

TEMPERATURE SWITCH

GRID

LEVEL PROBE

PREHEATER

SPRAY NOZZLE

PLATE VALVE (HAND WHEEL OPTD.)

RETURN WATER TO OPEN DRAIN

PLATE VALVE (HAND WHEEL OPTD.)

RETURN WATER TO OPEN DRAIN

COMMON CONVEYING AIR COMPRESSOR (COMMON FACILITY FOR PLANT)

WATER LINE FROM LOW DRAIN (WATER TO SOLENOID OPND. VALVE)

**LEGEND:**

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

**DETAIL - X (TYPICAL)**

**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 OTHER UNIT ALSO.


**LEGEND:**

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

**DETAIL - X (TYPICAL)**

**NOTES**

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

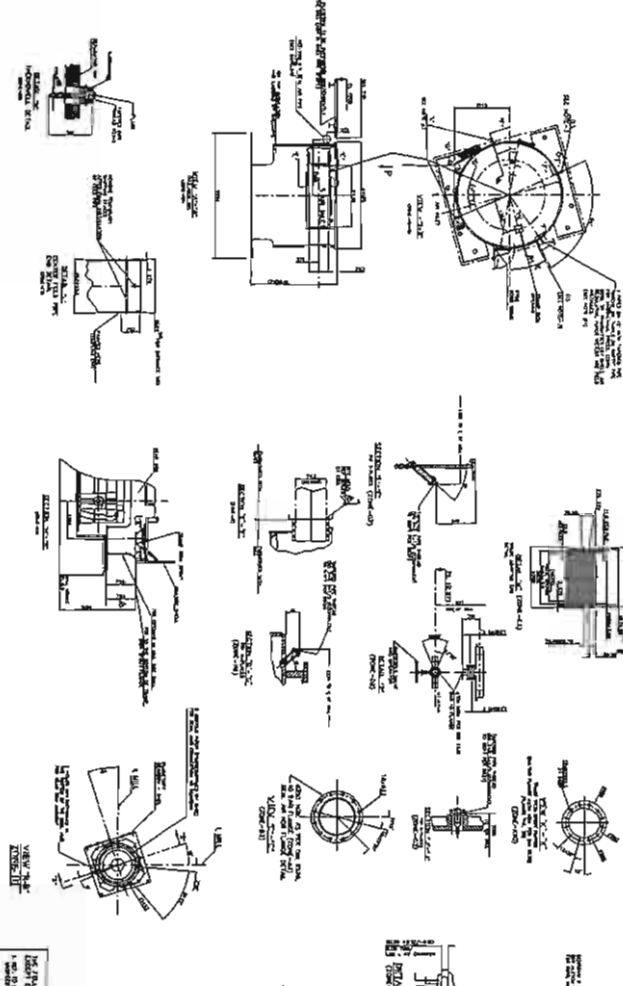
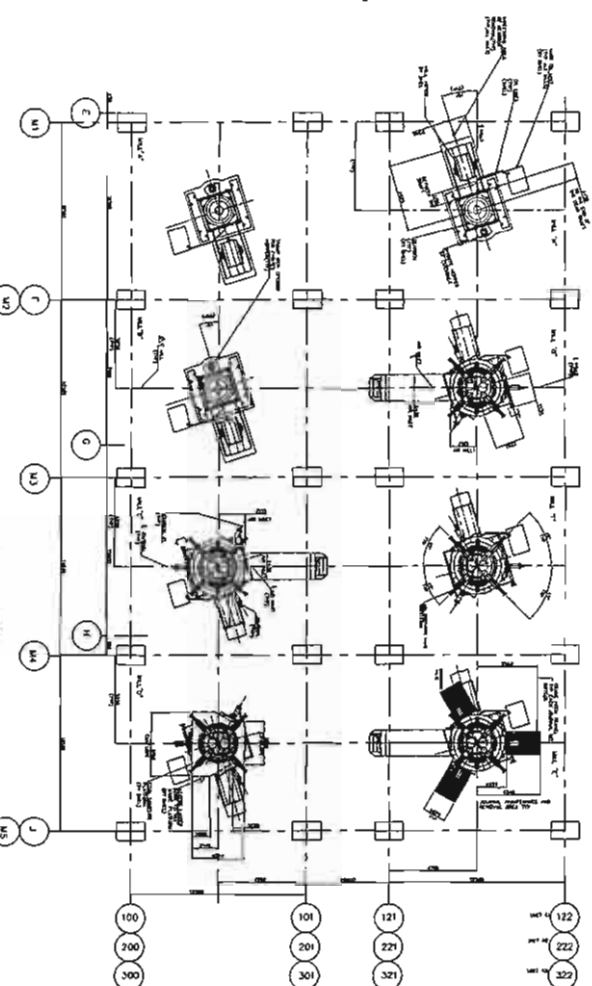
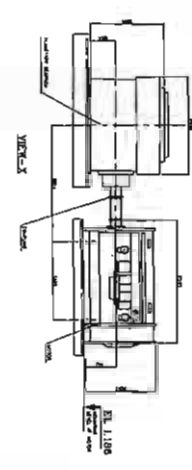
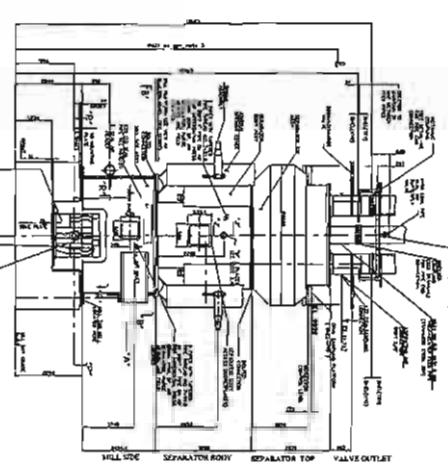
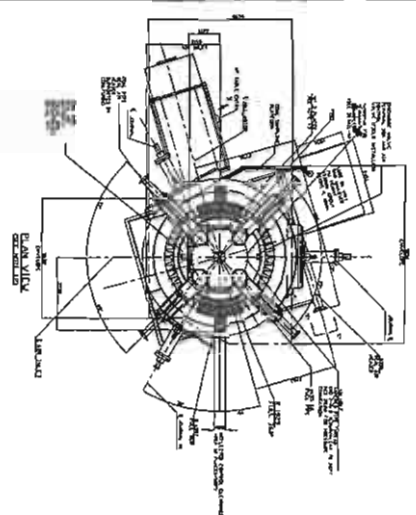
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	<b>TECHNICAL SPECIFICATION FOR</b>		<b>VOLUME II-B</b>	
	<b>MILL REJECT HANDLING SYSTEM</b>		<b>SECTION -C</b>	
	<b>3 X 660 MW Super Critical TPP at LALITPUR, Uttar Pradesh</b>		REV. NO. 00	DATE: 07/08/2012
			Page	

**LAYOUT FOR MILL REJECT SYSTEM  
(ANNEXURE-5)**



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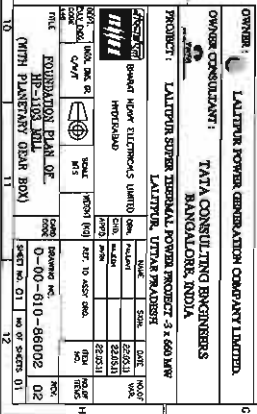


Sl. No.	Chemical	Weight (g)	Vol. (ml)
1	Acetic acid	10.0	50
2	NaCl solution	10.0	50
3	NaOH and NaCl, 100 g/lit. aq. soln.	10.0	50
4	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
5	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
6	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
7	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
8	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
9	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
10	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
11	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
12	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
13	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
14	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
15	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
16	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
17	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
18	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
19	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
20	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
21	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
22	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
23	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
24	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
25	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
26	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
27	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
28	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
29	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
30	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
31	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
32	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
33	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
34	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
35	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
36	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
37	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
38	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
39	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
40	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
41	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
42	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
43	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
44	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
45	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
46	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
47	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
48	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
49	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
50	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
51	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
52	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
53	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
54	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
55	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
56	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
57	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
58	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
59	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
60	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
61	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
62	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
63	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
64	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
65	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50
66	EDTA-2Na 0.05% aq. soln. 1000 ml	10.0	50

DATE	DESCRIPTION	AMOUNT	BALANCE
1900	Jan 1		100.00
1901	Jan 1		100.00
1902	Jan 1		100.00
1903	Jan 1		100.00
1904	Jan 1		100.00
1905	Jan 1		100.00
1906	Jan 1		100.00
1907	Jan 1		100.00
1908	Jan 1		100.00
1909	Jan 1		100.00
1910	Jan 1		100.00
1911	Jan 1		100.00
1912	Jan 1		100.00
1913	Jan 1		100.00
1914	Jan 1		100.00
1915	Jan 1		100.00
1916	Jan 1		100.00
1917	Jan 1		100.00
1918	Jan 1		100.00
1919	Jan 1		100.00
1920	Jan 1		100.00
1921	Jan 1		100.00
1922	Jan 1		100.00
1923	Jan 1		100.00
1924	Jan 1		100.00
1925	Jan 1		100.00
1926	Jan 1		100.00
1927	Jan 1		100.00
1928	Jan 1		100.00
1929	Jan 1		100.00
1930	Jan 1		100.00
1931	Jan 1		100.00
1932	Jan 1		100.00
1933	Jan 1		100.00
1934	Jan 1		100.00
1935	Jan 1		100.00
1936	Jan 1		100.00
1937	Jan 1		100.00
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1940	Jan 1		100.00
1941	Jan 1		100.00
1942	Jan 1		100.00
1943	Jan 1		100.00
1944	Jan 1		100.00
1945	Jan 1		100.00
1946	Jan 1		100.00
1947	Jan 1		100.00
1948	Jan 1		100.00
1949	Jan 1		100.00
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1953	Jan 1		100.00
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1962	Jan 1		100.00
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1964	Jan 1		100.00
1965	Jan 1		100.00
1966	Jan 1		100.00
1967	Jan 1		100.00
1968	Jan 1		100.00
1969	Jan 1		100.00
1970	Jan 1		100.00
1971	Jan 1		100.00
1972	Jan 1		100.00
1973	Jan 1		100.00
1974	Jan 1		100.00
1975	Jan 1		100.00
1976	Jan 1		100.00
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1979	Jan 1		100.00
1980	Jan 1		100.00
1981	Jan 1		100.00
1982	Jan 1		100.00
1983	Jan 1		100.00
1984	Jan 1		100.00
1985	Jan 1		100.00
1986	Jan 1		100.00
1987	Jan 1		100.00
1988	Jan 1		100.00
1989	Jan 1		100.00
1990	Jan 1		100.00
1991	Jan 1		100.00
1992	Jan 1		100.00
1993	Jan 1		100.00

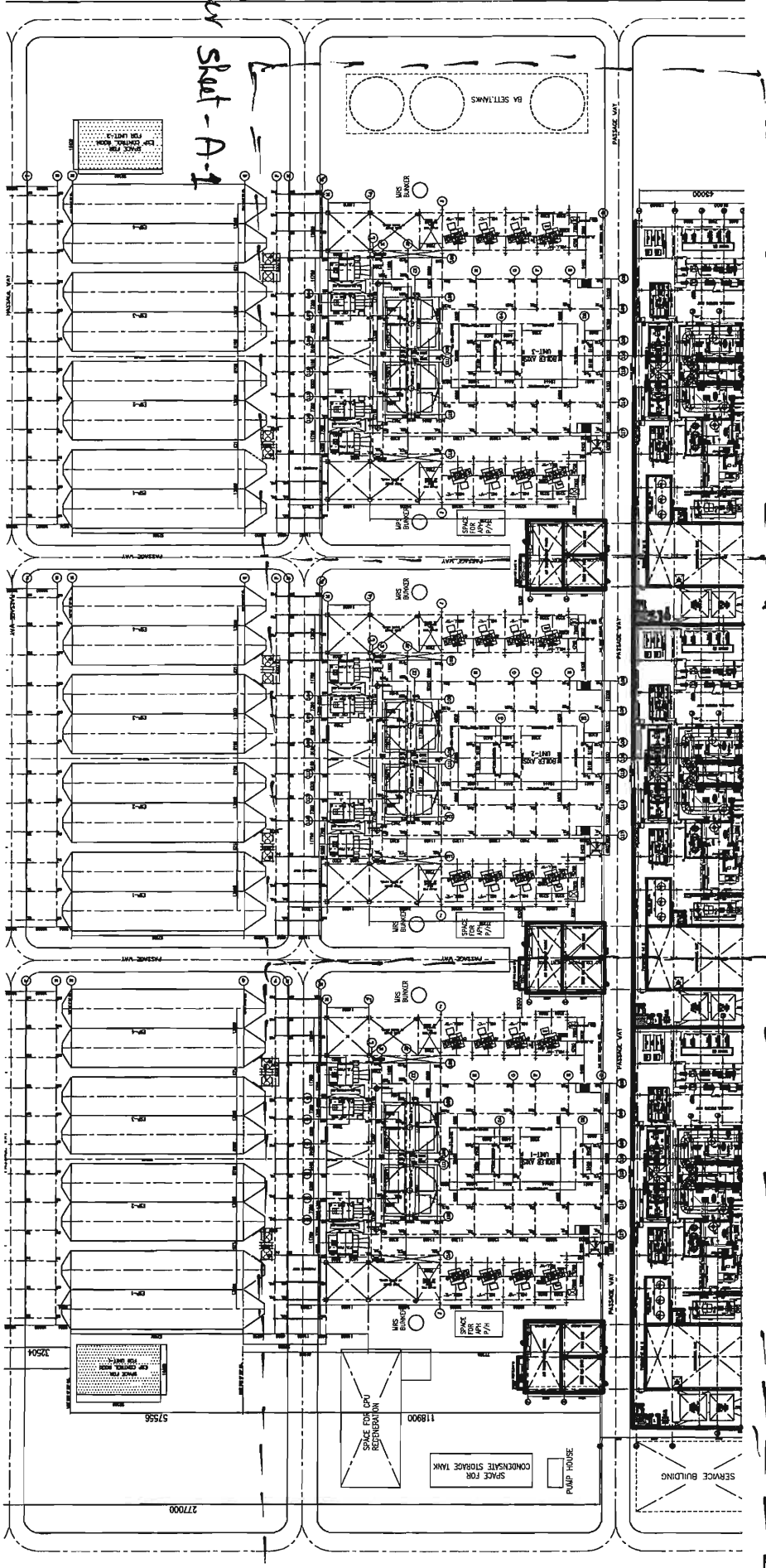
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Inventory No.	DATE AND DATE	REF. AND NO.	COMPOSER'S NAME
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Refer Sheet-A-1

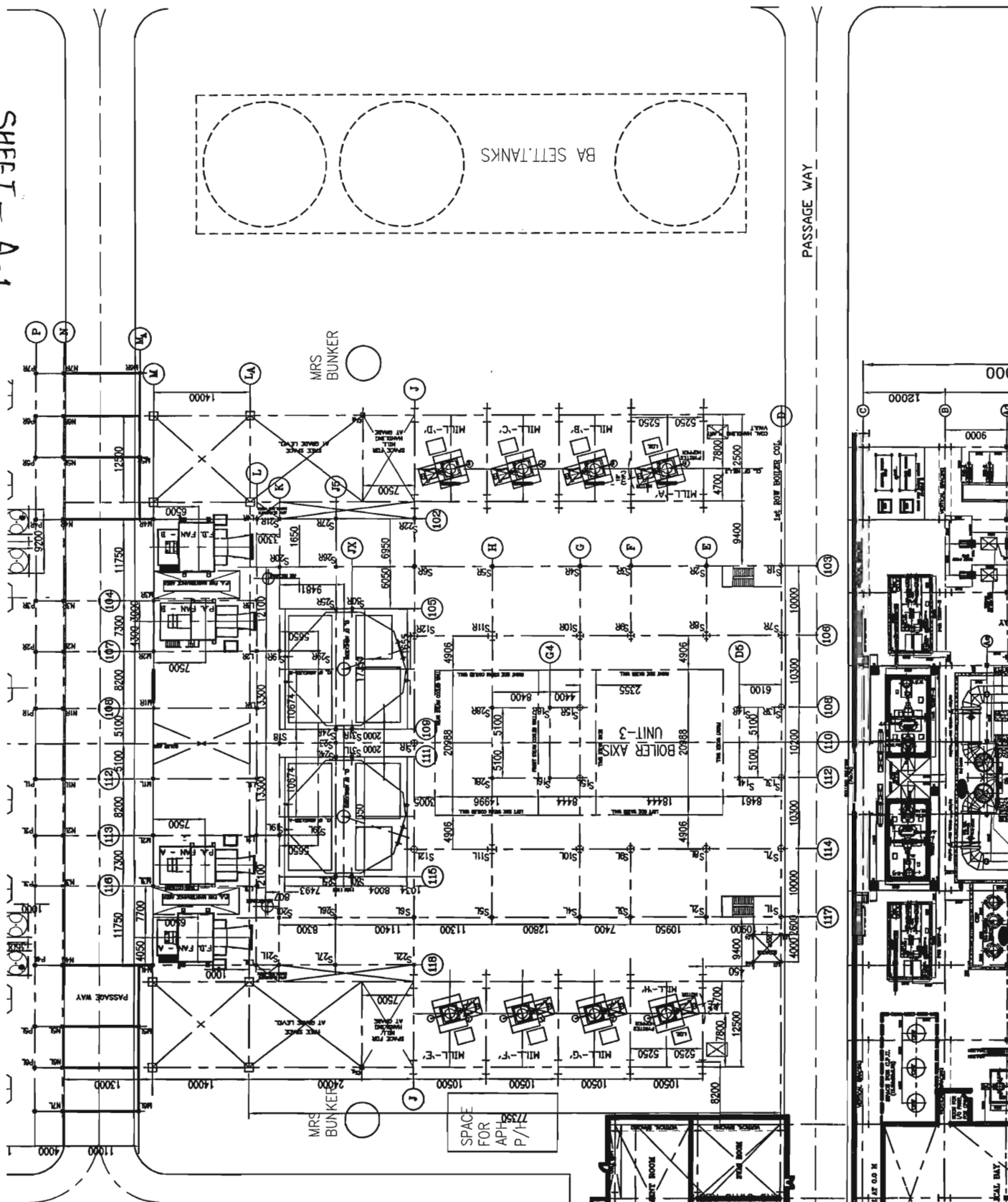
Refer Sheet-A-2

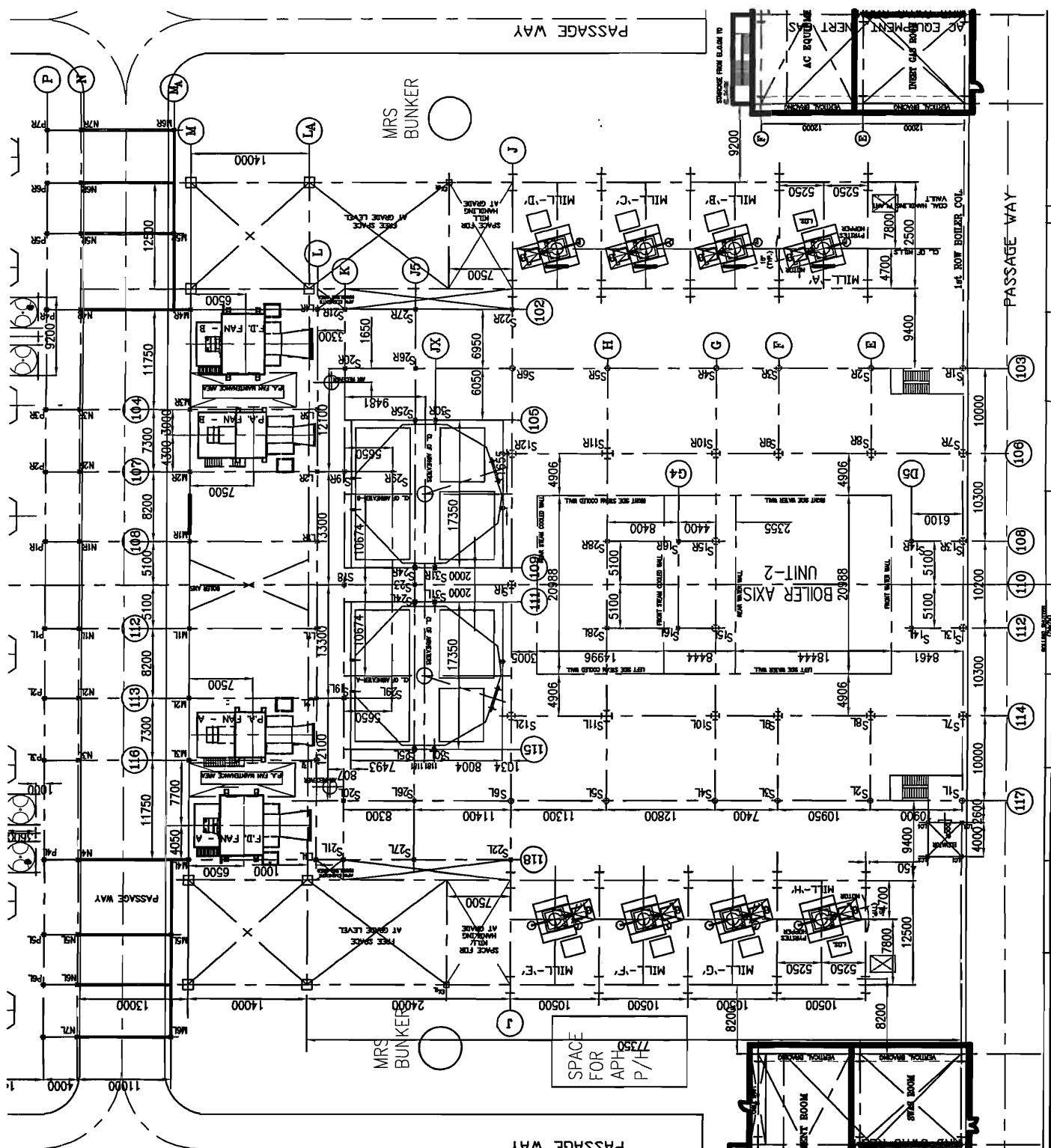


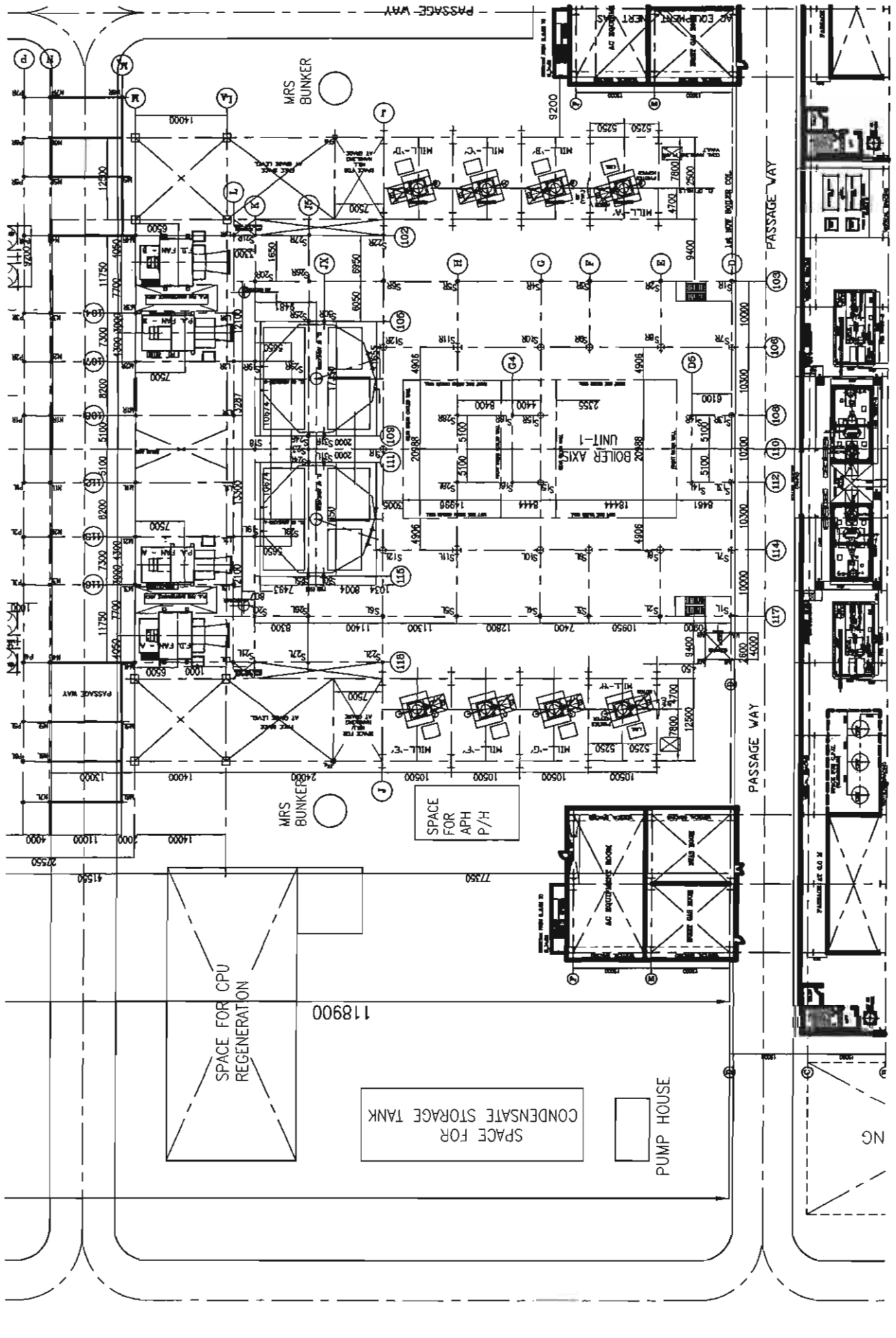
Sheet-1.

Refer Sheet-A-3

SHEET - A-1







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# ICATION FOR LING SYSTEM

TPP at LALITPUR, Uttar  
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BHEL DOCUMENTS NO.: PE-TS-375-160-A001

VOLUME II-B

SECTION -C

REV. NO. 00

DATE: 07/08/2012

Page

## QUALITY PLAN (ANNEXURE-6)

Manufacturer's Name & Address :			MANUFACTURING QUALITY PLAN				Project :						
Item : MS Plates & Structures			QP No. : 0		BHEL Ref. :								
Sub-System :			Date :		Contract No.:								
Page No. : 1 of 1			Page No. : 1 of 1		Contractor : BHEL SUB-CONTRACTOR-								
Sl. No.	Components & Operations	Characteristic/Item	Class	Type/method of check	Extent of Check	Reference Document	Acceptance	Format of Record			Agency		Remarks
1	2	3	4	5	6	7	8	9	D	P	W	V	11
RAW MATERIAL													
1	Steel Plates	Chemical composition and Mechanical test	Major	Review of correlated MTC	One/each	IS:2062	IS:2062	M/gr. TC	/	3			2.1
2		Visual and dimensional Check	Major	Visual and measurement	100%	M/gr. TC	M/gr. TC IS 1852	M/gr. TC	/	3	2.1		Refer Note Below
3		Identification / Marking	Major	Co-relation establish	100%		AS per manufacturer practice	AS per manufacturer practice IS 2062	/	3	2	1	
			LEGEND :						BHEL Doc. No. PE-QP-279-166-A801			Rev. 0	
			1 - BHEL / CUSTOMER		P - Agency Performing the Test								
			2 - VENDOR		W - Agency Witnessing the Test								
			3 - Manufacturer		V - Agency Verifying the Test								
			CR - Critical Characteristics										
			MA - Major Characteristics										
			MI - Minor Characteristics										
MANUFACTURER/ SUBCONTRACTOR			CONTRACTOR						REVIEWED BY		NAME & SIGNATURE OF APPROVING AUTHORITY		
SIGNATURE													

11 In case material is despatched directly from SAIL/TISCO plant/stockyard or procured from dealer against co-related T C's witnessing by BHEL is waived off and material will be accepted based on MTC of SAIL/TISCO.

12 In case material is procured from dealer and co-related T C's are not available, check on 100% quantity of plates will be performed on sample drawn from each plate at NABL certified/ approved laboratory or any govt approved laboratory for chemical & physical properties. However dimensional check shall be witnessed by BHEL.

13 There will not be any inspection by CUSTOMER.



S/Contractor :- Manufacturer :-		Manufacturing Quality Plan Item :- Rupture Disc QAP No. :- LOI Nos:-				Project:- Package :- Mill Rejects System Client :-									
Contractor :- M/s BHEL		Consultant :-				Format of Records									
Characteristics		Classification		Type of Check		Quantum of Check		Reference Documents		Acceptance Norms		Agency for Checking		Remarks	
3		4		5		6		7		8		9		10	
2															
1	<b>Materials</b> -> Rupture Disc Material	Physical & Chemical Properties	Major	Chemical Analysis, YTS & UTS	1 per Heat	ASTM A240 Type - 304 / Approved Data Sheet / Drg.	ASTM A240 Type - 304 / Approved Data Sheet	MTC	✓	V	V	V	V	V	V
2	<b>Final Inspection</b> -> Dimension -> Burst Test of Rupture Disc	Measurement Functional	Major Major	Measurement 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 / Burst Test Certificate	✓	P	P	P	P	P	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															

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



S/Contractor :- Manufacturer :-			Manufacturing Quality Plan Item :- Bag Filter (Without Enclosure) QAP No. :- LOI Nos.:-				Project:- Package :- Mill Rejects System Client :-			
Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Consultant :-		
1	2	3	4	5	6	7	8	9	10	11
								TYPE	ID	Remarks
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 / 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.	✓	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	✓	V	V
1.3	Solenoid Valves	Functional	Major	Operational	100%	Approved Drawing / Appr. Data Sheet	Approved Drawing / Appr. Data Sheet	✓	P	V
1.4	Sequence Controller	Functional	Major	Operational	100%	Approved Drawing / Appr. Data Sheet	Approved Drawing / Appr. Data Sheet	✓	P	V
1.5	Filter Bags (Make :- Charnihar / Supreme)	Physical	Major	Visual / Measurement	100%	Approved Drawing / Appr. Data Sheet	Approved Drawing / Appr. Data Sheet	✓	P	V
2	In Process									
2.1	Manifold	Dimensional & Visual	Minor	Dimensional & Visual	100%	As per Mfr's Drg.	As per Mfr's Drg.	✓	P	V
2.2		Welding	Major	DPT on Final Weld	100%	ASTM E-165	No Defect	✓	P	V
2.3		Hydro Test for 30 Minutes	Major	Leakage	100%	Appr. Data sheet	No Leakage	✓	P	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	<u>Final Inspection</u>											
3.1	Assembly	Dimensional	Major	Measurement	100%	Appr. Drawing	Appr. Drawing	IR	✓	P	W	V
	\$-> Pneumatic Test at 1.1 times W/Pressure	Pne. test \$of Manifold in Assly. Functional Test of Pulsing System	Major	Leakage by soap solution	100%	Appr. Data Sheet	No Leakage	IR	✓	P	W	V
			Major	Pulse Sequence	100%	Appr. Data sheet / Testing Procedure	Appr. Data sheet / Testing Procedure	IR	✓	P	W	V
4	<u>Painting</u>	Measurement & Visual	Major	DFT / Finish	100%	Appr. Painting Schedule	Appr. Painting Schedule	IR	✓	P	-	-
TESTING PROCEDURE TO BAG FILTER												
1-> Functional test through compressed air , Sequential pulsing through valves and sequential controller on No - Load Condition to be conducted.												
2-> The Soenoid 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.												
Manufacturer / Sub Vendor		LEGENDS:-					For Client Use:-		Document No.:-			
		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										
SIGNATURES		Contractor	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/Contractor :- Manufacturer :-		Manufacturing Quality Plan Item :- ACI Bends QAP No. :- LOI Nos:-				Project:- Package :- Mill Rejects System Client :-				
Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Consultant :- Format of Records	Agency for Checking	Remarks
1	2	3	4	5	6	7	8	9	10	11
					Contractor :- M/s BHEL					
					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	Mfg's Standard	Mfg's Standard	MTC	✓	P
2.2	Leakage	Hydro Test	Major	Pressure Test	100%	Approved Drg / Data Sheet	No Leakage	IR	✓	P
2.3	Dimension	Dimension	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	✓	P
2.4	Hardness	Hardness	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR/TC	✓	P
					<b>LEGENDS:-</b> 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 <b>P-&gt;Perform, V-&gt; Verification, W-&gt; Witness</b>					
Manufacturer / Sub Vendor					For Client Use:-					
SIGNATURES					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/Contractor :-		Manufacturing Quality Plan				Project:-					
Manufacturer :-		Item :- Knife Gate Valve [Manual / Pneumatic]				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			
1	Raw Material / Bought Out's										
1.1	Body	Chemical & Mechanical	Major	Foundry TC	1 per Heat	Relevant IS / Appr. Drg / Data Sheet	Relevant IS / Appr. Drg / Data Sheet	TC	✓ P/V	V	
1.2	Gate	do	Major	Lab Analysis	1 per lot	do	do	Mill / Lab TC	✓ P/V	V	
1.3	Stem (For Manual Valve)	do	Major	Lab Analysis	1 per batch	do	do	do	✓ P/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	
2	In - Process Inspection										
2.1	Body, Gate	Dimensional	Major	Measurement	100%	Mfr's Drawing	In-Process Insp. Record	-	P	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	
3	Final Inspection										
3.1	Assembled Valve	Dimension	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	✓ P	W	BHEL / Vendor/CLIENT to Witness 10 % of Quantity.
3.2	do	Function	Major	Operation	100%	Smooth Operation	Smooth Operation	IR	✓ P	W	
3.3	do	Seat Leakage	Major	Hydro Static Test #	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	✓ P	W	
		<b>LEGENDS:-</b>				For Client Use:-		Document No.:-			
		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									
Manufacturer / Sub Vendor		Contractor									
SIGNATURES											

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


S/Contractor :-		Manufacturing Quality Plan				Project:-				
Manufacturer :-		Item :- Compressor				Package :- Mill Rejects System				
		QAP No. :-				Client :-				
		LOI Nos:-								
Sl. No.	Components / Operations	Characteristics	Classification	Type of Check	Quantum of Check	Reference Documents	Acceptance Norms	Consultant :-	Remarks	
1	2	3	4	5	6	7	8	9	10	
								TYPE	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	
1.2	Frame Head	do	Major	do	do	do	do	do	✓ P/V V	
1.3	Outer Head	do	Major	do	do	do	do	do	✓ P/V V	
1.4	Crank Shaft	do	Major	do	do	do	do	do	✓ P/V V	
1.5	Connecting Rod	do	Major	do	do	do	do	do	✓ P/V V	
1.6	Temp. Switch	Mfr's TC	Major	Visual Review	100%	do	do	do	✓ V V	
1.7	Control Panel	Mfr's TC	Major	Visual Review	100%	do	do	do	✓ 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	
2.2	After Cooler	Leak Tightness	Major	Hydro Static Test	100%	Approved Drg / Data Sheet	No Leakage	IR	✓ P V	
3	Final Inspection									
3.1	After Cooler	Dimension / Visual	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	✓ P W	
3.2	Control Panel	Dimension / Visual	Major	Measurement	100%	Approved Drg / Data Sheet	Approved Drg / Data Sheet	IR	✓ P W	
3.3	Compressor Assly	Nozzle Test (Mech. Run Test)	Major	Performance	100%	Approved Drg / BS Data Sheet / Part-2	Approved Drg / Data Sheet	IR	✓ P W	
		<b>LEGENDS:-</b>				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								
SIGNATURES										
Note :- In case of any difference in parameters specified in Drawing / Data Sheet & QAP, Value specified in Drg / Data Sheet shall be Final										Name & Signature of Approving Authority with Seal



S/Contractor :-		Manufacturing Quality Plan					Project:- Package :- Mill Rejects System Client :-					
Manufacturer :-		Item :- Sump Pump QAP No. :- LOI Nos:-					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
Raw Material / Bought Out's												
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	
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	<b>Final Inspection</b>												
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	-	-	
				<b>LEGENDS:-</b>				For Client Use:-					
				Records identified by ✓ shall be essentially included in QA documentation. TC- Test Certificate, IR - Insp. Report									
Manufacturer / Sub Vendor				M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N -> CLIENT									
<b>SIGNATURES</b>				P->Perform, V-> Verification, W-> Witness									
				Contractor									
				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/Contractor :-		Manufacturing Quality Plan Item :-EXPANSION BELOW QAP No. :- LOI Nos:-			Project:- Package :- Mill Rejects System Client :-				
Manufacturer :-		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									M	C	K
1	<u>Raw Material</u>										
1.1	Bellows	physical & Chemical	Major	Lab Analysis	1 per Heat	AS204 TP304/ Approved Drg.	AS204 TP304/ Approved Drg.	✓	V	V	V
1.2	Flanges/ End Pipe	physical & Chemical	Major	Lab Analysis	1 per lot	IS 2062 / Approved Drg.	IS 2062 / Approved Drg.	✓	V	V	V
2	<u>In - Process Inspection</u>										
2.1	Bellows & Pipe ** For Bellows	Dimension Soundness Weld of L-Seam	Major Of major	Measurement DPT *(Before & After Forming)	100% 100%	Approved Drg. ASTM E- 165	Approved Drg. No Cracks/ Linear Indication	✓ IR	P P	V V	V V
3	<u>Final Inspection</u>										
3.1	Assembly	DP Test of Fillet Weld of Bellows to Pipe & Pipe to Flange	Major	visual	100%	ASTM E-165	No Crack / Linear Indication	✓	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	P P	W W	W W
		Spring Rate Test (Axial )	Critical	Stiffness Test	100%	EJMA / Data Sheet	EJMA / Data Sheet	✓	P	W	W
		Deflection	Critical	Deflection Test	100%	EJMA / Data Sheet	EJMA/Data Sheet	✓	p	W	W
3.30	Painting	Visual/ Measurement	Major	DFT	100%	Approved Painting Schedule	Approved Painting Schedule	✓	p	-	-
		<b>LEGENDS:-</b>				For Client Use:-					
		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							
<b>SIGNATURES</b>						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

S/Contractor :-		Manufacturing Quality Plan			Project:-				
Mfr:-		Item :- Local Panels			Package :- Mill Rejects System				
Works:-		QAP No.			Client :-				
LOI Nos:-		Contractor :- M/s BHEL			Consultant :-				
Sl. No.	Components / Operations	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
1	<b>Materials</b> CRCA Sheet	Major	Visual	100%	Appr. Drg / IS: 513	Appr. Drg / IS: 513	IR	-	-
	Chem. & Physical.	Major	Chem. & Physical.	100%	Do	Do	TC	✓	V
	Thickness	Major	Measurement	100%	App. Drawing	App. Drawing	IR/TC	✓	V
2	<b>Bought outs</b> Verification of type, size & Make of FLV unit, PS, PS, SV	Major	Visual	100%	Appr. Drawing / Data Sheet	Approved Drawing / Data Sheet	IR/TC	✓	V
3	<b>Painting</b> Pre Treatment 7 tank process	Major	DFT / Shade / Finish	100%	Appr. Painting Schedule	Appr. Painting Schedule	IR/TC	✓	V
4	<b>Final Inspection</b>	Major	Visual	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	✓	W
	Dimension	Major	Measurement	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	✓	W
	Check for Pneumatic Circuit	Major	Visual	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	✓	W
	Check for Wiring / Mountings / Terminations	Major	Visual / Continuity	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	✓	W
	Functional Check for Solenoid Valve	Major	Functional	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	✓	W
5	<b>QA Documents</b> Review	Major	Verification	100%	Appr. Drawing / Data Sheet	Appr. Drawing / Data Sheet	IR/TC	✓	W
		<b>LEGENDS:-</b> 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.:-		
Manufacturer / Sub Vendor		Contractor							
SIGNATURES									
Name & Signature of Approving Authority with Seal									

SI/Contractor :-		Manufacturing Quality Plan				Project:- Package :- Mill Rejects System Client :-				
Mfr:- Works:-		Item :- Transport vessel QAP No. LOI Nos:-				Contractor :- M/s BHEL				
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
Raw Materials										
1.1	Dome & dome Valve Body	Dimensions Surface Defects Physical Check Chemical Check	Major	Measurement Visual TS & Hardness	100% 100% 1/Heat	App. Drg. / Data Sheet / Standard	App. Drg. / Data Sheet / Standard	- - TC	- - P P PV PV V V	- - - - - -
1.2	Plates for Vessel	Dimensions Surface Defects Physical Check Chemical Check	Major	Measurement Visual TS & Elongation	100% 1/Heat	App. Drg. / Data Sheet / IS Standard	App. Drg. / Data Sheet / IS Standard	- - TC	- - P P PV PV V V	- - - - - -
1.3	Insert Seal	Surface Defects Physical Check Chemical Check	Major	Measurement Visual	1/Heat 100%	Mfr's Drg. / Std	Mfr's Drg. / Std	- - TC	- - P P PV PV V V	- - - - - -
1.4	Shaft	Hardness Physical Check Chemical Check	Major	Measurement TS & Elongation Chemical Comp.	1/Lot 1/Heat 1/Heat	App. Drg. / IS Std.	App. Drg. / IS Std.	IR TC	- P PV PV V V	- - - - - -
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	PV PV PV PV 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	-	-	-
2.4	Hydrotest of Vessel	Soundness / Leakage	Major	Visual, Hydro Pressure Test	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	PV W	W
Final Inspection										
3.1	Final Assy	Completeness & Dimension	Major	Visual / Measurement	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	PV W	W
3.2	Run Test / Performance	Operation of Dome Valve	Minor	Visual, 5 times Cycle operation	100%	Mfr's Standard	Mfr's Standard	IR	PV W	W
3.3	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	PV W	W
QA Documentation										
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan	-	PV V	V
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										
Manufacturer / Sub Vendor		Contractor		Document No.						
SIGNATURES		Name & Signature of Approving Authority with Seal								

SI/Contractor :-			Manufacturing Quality Plan			Project :- Mill Rejects System		
Mfr:- Works:-			Item :- Pyrite Hopper			Client :-		
QAP No. LOT Nos			Contractor :- M/s BHEL					
Sl. No.	Components / Operations	Characteristics Checked	Category	Type/Method of Check	Quantum of Check	Reference Documents	Acceptance Norms	Format of Records
1	2	3	4	5	6	7	8	9
TYPE								
ID M C N								
10								
11								
Remarks								
1	Raw Materials							
1.1	Plates for Body	Dimensions	Major	Measurement	100%	App. Drg. / Data Sheet / IS Standard	App. Drg. / Data Sheet / IS Standard	-
		Surface Defects		Visual	100%			-
		Physical Check		TS & Elongation	1/Heat			-
		Chemical Check		Chemical Comp.				-
1.2	Spray Nozzle	Surface Defects	Major	Visual	100%	Mfr's Drg. / IS Standard	Mfr's Drg. / IS Standard	-
		Chemical Check		Chemical Comp.	1/Lot			-
		Dimensions		Measurement	100%			-
2	In-Process Insp.							
2.1	Welders & Welding	WPS / PQR / WPQ	Major	Procedure / Qualification	100%	ASME sec - IX	ASME sec - IX	WPS / PQR
		Welding Defects		DPT on Root run	100%	ASTM E-165	ASTM E-165	IR
				DPT on Final run	10%	ASTM E-165	ASTM E-165	IR
2.2	Fabrication	Fit up, Marking, Cutting, Grinding	Minor	Visual, Measurement	100%	Mfr's Standard	Mfr's Standard	-
3	Final Inspection							
3.1	Final Asly	Completeness & Dimension	Major	Visual	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR
3.2	Painting	Finish / DFT	Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR
4	QA Documentation							
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan	-
				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				
Manufacturer / Sub Vendor				Contractor				
SIGNATURES				Document No.:-				
				For Client Use:-				
				Name & Signature of Approving Authority with Seal				


SI/Contractor :-		Manufacturing Quality Plan				Project:- Package :- Mill Rejects System Client :-					
Mfr:-		Item :- Terminal Box QAP No. :- LOI Nos:-				Contractor :- M/s BHEL					
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	M	C	K
1	Raw Materials										
1.1	Plates for Body	Dimensions Surface Defects Physical Check Chemical Check	Major	Measurement Visual TS & Elongation 1/Heat Chemical Comp.	100% 100% 1/Heat	App. Drg. / Data Sheet / IS Standard	App. Drg. / Data Sheet / IS Standard	- - MTC MTC	- - P/V P/V	- - V V	- - - Welders to be approved by BHEL / KPCL
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% 100%	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 P	V V W -	- - - If Applicable
2.2	Flange Machining and Drilling	Dimensions	Major	Measurement	100%	Mfr/Appr. Drg	Mfr/Appr. Drg	IR	-	-	-
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	-	-	-
2.4	Fabrication	Fit up, Marking, Cutting, Grinding	Minor	Visual, Measurement	100%	Mfr's Standard	Mfr's Standard	-	-	-	-
3	Final Inspection										
3.1	Final Assy	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	-
4	QA Documentation										
4.1	TC & IR	Completeness	Major	Verification & approval	100%	App. Quality Plan	App. Quality Plan	-	P/V	V	V
<b>LEGENDS:-</b> 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											
Manufacturer / Sub Vendor		Contractor				Name & Signature of Approving Authority with Seal					
SIGNATURES						Document No.:-					


SI/Contractor :-			Manufacturing Quality Plan			Project:-														
Mfr:- Works:-			Item :- Bunker Discharge Gate			Package :- Mill Rejects System														
QAP No. :-			Contractor :- M/s BHEL			Client :-														
LOI Nos:-			Reference Documents			Consultant :-														
Category			Type/Method of Check			Acceptance Norms														
Characteristics Checked			Quantum of Check			Format of Records														
3			4			5														
2			6			7														
1			8			9														
10			11			12														
1			Raw Materials			TYPE			D			M			C			K		
1.1 Plates for Body			Major			Measurement			100%			App. Drg. / Data			TC			V		
1.2 Shaft			Major			Visual			100%			App. Drg. / Data			TC			V		
1.3 Cylinder / Actuator			Major			Visual			100%			App. Drg. / Data			TC			V		
2			In - Process Insp.			Procedure / Qualification			100%			ASME sec - IX			WPS / PQR			V		
2.1 Welders & Welding			Major			DPT on Root run			100%			ASTM E-185			IR			V		
3			Final Inspection			Visual			100%			App. Drg. / Data			IR			V		
3.1 Final Assy			Major			Visual			100%			App. Drg. / Data			IR			V		
3.2 Operation with job / shop actuator			Major			Visual			100%			App. Drg. / Data			IR			V		
3.3 Painting			Major			Visual			100%			App. Drg. / Data			IR			V		
4			QA Documentation			Verification & approval			100%			App. Quality Plan			App. Quality Plan			V		
4.1 TC & IR			Major			Verification & approval			100%			App. Quality Plan			App. Quality Plan			V		
LEGENDS:-			Records identified by V 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			Document No.:-			Document No.:-					
Manufacturer / Sub Vendor			Contractor			Name & Signature of Approving Authority with Seal			Name & Signature of Approving Authority with Seal			Name & Signature of Approving Authority with Seal			Name & Signature of Approving Authority with Seal					





S/Contractor :-		Manufacturing Quality Plan				Project:- Package :- Mill Rejects System Client :-				
Mfg:- Works:-		Item :- Pressure Relief Valve QAP No. : LOI Nos:-				Contractor :- M/s BHEL				
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
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. / IS Standard	App. Drg. / Data Sheet / IS Standard	- - MTC MTC	- - P 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% 100% 100%	ASME sec - IX ASTM E-165 ASTM E-165 Mfr's Standard	ASME sec - IX ASTM E-165 ASTM E-165 Mfr's Standard	WPS / PQR IR IR -	P P V V -	Welders to be approved by BHEL / KPCL V V -
2.2	Fabrication	Fit up, Marking, Cutting, Grinding	Minor	Visual, Measurement	100%					
3	Final Inspection									
3.1	Final Assy	Completeness & Dimension Finish / DFT	Major	Visual	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	P W	W
3.2	Painting		Major	Visual, Measurement	100%	App. Painting Schedule	App. Painting Schedule	IR	P 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
		<b>LEGENDS:-</b>				<b>Document No.:-</b>				
		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								
Manufacturer / Sub Vendor		Contractor								
SIGNATURES						Name & Signature of Approving Authority with Seal				


S/Contractor :-		Manufacturing Quality Plan				Project:- Package :- Mill Rejects System Client :-								
Mfg:- Works:-		Item :- Air Receiver QAP No. :- LOI Nos:-				Contractor :- M/s BHEL								
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	D	M	C	K	11
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	App. Drg. / Data Sheet / IS Standard	App. Drg. / Data Sheet / IS Standard	- - TC	- - TC	- - TC	P P P/V	- - V	- - V	
1.2	Formed Dished End	Dimensions Thickness/Thinning DPT of Knuckle	Major	Measurement Measurement DPT Test	100% 100% 100%	App. Drg. / Data Sheet ASTM E-165	App. Drg. / Data Sheet ASTM E-165	IR IR TC	- - TC	- - TC	P P P/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 W V	V V W 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%	Mir's Standard / Approved Drg.	Mir's Standard / Approved Drg.	IR	-	-	P	-	-	
3	Final Inspection													
3.1	Final Assy	Completeness & Dimension	Major	Visual / Measurement	100%	App. Drg. / Data sheet	App. Drg. / Data sheet	IR	-	-	P/V	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	
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	
				LEGENDS:-				For Client Use:-				Document No.:-		
				Records identified by ✓ shall be essentially included in QA documentation. TC-> Test Certificate , IR - Inspection Report										
Manufacturer / Sub Vendor				M-> Manufacturer/Sub Contractor, C-> Contractor (BHEL) or their nominated agency & N-> CLIENT										
SIGNATURES								Name & Signature of Approving Authority with Seal						

		QUALITY PLAN		CUSTOMER :		PROJECT		SPECIFICATION :		
		BIDDER/		BIDDER/		TITLE		NUMBER :		
		VENDOR		VENDOR		TITLE		TITLE		
		SYSTEM		SYSTEM		QUALITY PLAN		SECTION		
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY	VOLUME III REMARKS
1	2	3	4	5	6	7	8	9	10	11
1.0	FABRICATION	1. DIMENTION 2.ALIGNMENT 3. FINISH SURFACE DEFECT	MA MA MA	MEASUREMENT MEASUREMENT & VISUAL VISUAL	100% 100% 100%	APPD. DRG. -DO- -DO-	APPD. DRG. -DO- -DO-	INSPC. -DO- -DO-	2 2 2	- - -
2.0	SURFACE PREPARATION & PRE-TREATMENT	1. PROCESS PARAMETERS SOLUTION STRENGTH TEMPERATURE DIPPING TIME ETC.	CR	PROCESS	PERIODIC	MFR.STD./ BHEL SPEC. RELV. IS	MFR. STD./ BHEL SPEC RELV. IS	LOG BOOK	2	-
3.0	PRIMER & PAINTING (SPRAYED & STOVED)	2. SURFACE CONDITION 1. SURFACE FINISH & COVERAGE 2. FILM THICKNESS 3. SHADE 4. ADHESION	MA MA MA MA MA	VISUAL VISUAL MEASUREMENT VISUAL CROSSOUT TYPE	100% 100% SAMPLE -DO- -DO-	-DO- -DO- -DO- -DO- -DO-	-DO- -DO- -DO- -DO- -DO-	-DO- -DO- -DO- -DO- -DO-	2 2 2 2 2	- - - - -
BHEL		PARTICULARS		BIDDER/VENDOR						
		NAME								
		SIGNATURE								
		DATE								
										BIDDER/VENDORS COMPANY SEAL

<div></div> <div>QUALITY PLAN</div> <div>SHEET 2 OF 2</div>		CUSTOMER :		PROJECT		SPECIFICATION :						
		BIDDER/ VENDOR SYSTEM		TITLE		NUMBER :						
		NUMBER PED-506-00-Q-003/01		ITEM ELECTRICAL IN-PROCESS		SECTION						
		VOLUME III		REMARKS		AGENCY		P		W		V
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD				
1	2	3	4	5	6	7	8	9	10			
4.0	MOUNTING OF VARIOUS ITEMS	1. RIGIDITY	MA	VISUAL	100%	MANUFACTURE DRAWING	MANUFACTURE DRAWING	LOG BOOK				
		2.THICKNESS	MA	VISUAL	100%	-DO-	-DO-	-DO-	2	-	-	
		3. CORRECTNESS & COMPLETENESS	MA	VISUAL	100%	APPD. DRG.	APPD. DRG.	-DO-	2	-	-	
5.0	MARKING/LABELLING	4. ACCESSIBILITY	MA	VISUAL	100%	-DO-	-DO-	-DO-	2	-	-	
		1. CORRECTNESS	MA	VISUAL	100%	-DO-	-DO-	-DO-	2	-	-	
		2. ADHESION/ FIXING	MA	VISUAL	100%	-DO-	-DO-	-DO-	2	-	-	
6.0	PRE-FINAL INSPECTION	1. ALIGNMENT	MA	VISUAL	100%	BHEL SPEC. & RELV. STD.	BHEL SPEC. & RELV. STD.	TEST CERT.	2	-	-	
		2. PERFORMANCE	MA	ELECTRICAL	100%	-DO-	-DO-	-DO-	2	-	-	
		3. IR & HV	MA	ELECTRICAL	100%	-DO-	-DO-	-DO-	2	-	-	
BHEL		PARTICULARS		BIDDER/VENDOR								
		NAME										
		SIGNATURE										
		DATE										
				BIDDER'S/VENDORS COMPANY SEAL								


		QUALITY PLAN		CUSTOMER :		PROJECT TITLE		SPECIFICATION : NUMBER :	
SHEET 1 OF 9		BIDDER/ VENDOR		SYSTEM		QUALITY PLAN		TITLE	
COMPONENT/OPERATION		CHARACTERISTIC CHECK		CAT.		TYPE/ METHOD OF CHECK		EXTENT OF CHECK	
SL. NO.		3		4		5		6	
1		2		3		4		5	
1.0		RAW MATERIAL & BOUGHT OUT CONTROL		MA		VISUAL		100%	
1.1		SHEET STEEL, PLATES, SECTION, EYEBOLTS		MA		MEASUREMENT		SAMPLE	
1.2		HARDWARES		MA		MECH. TEST		-DO-	
1.3		CASTING		MA		VISUAL		100%	
1.4		PAINT & VARNISH		MA		VISUAL		100% CONTINUOUS	
BHEL		PARTICULARS		BIDDER/VENDOR		7		8	
NAME		SIGNATURE		DATE		9		10	
BIDDER'S/ VENDORS COMPANY SEAL									


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

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


CUSTOMER :		PROJECT		SPECIFICATION :	
BIDDER/ VENDOR		TITLE		NUMBER :	
SYSTEM		QUALITY PLAN		SPECIFICATION :	
CAT.		ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV & MV)		TITLE	
SHEET 4 OF 9		REFERENCE DOCUMENT		SECTION	
CHARACTERISTIC CHECK		ACCEPTANCE NORM		VOLUME III	
COMPONENT/OPERATION		EXTENT OF CHECK		REMARKS	
TYPE/ METHOD OF CHECK		P		W	
4		5		10	
3		6		11	
2		7		9	
1		8		3	
1.10		MA		Log Book	
3.DIMENSIONS		-DO-		3	
1.WAKE & TYPE		MANFR'S DRG./ APPROVED DATASHEET		3	
2.DIMENSIONS		100%		3	
3.SURFACE FINISH		MEASUREMENT		3	
1.11		MA		BHDL DATA SHEET BEARING MANUF'S CATALOGUES	
SLIP RING (WHEREVER APPLICABLE)		100%		3	
1.SURFACE COND.		VISUAL		3	
2.DIMENSIONS		MEASUREMENT		3	
3.TEMP.WITH-STAND CAPACITY		ELECT.TEST		3	
4.HV/IR		-DO-		3	
1.12		MA		MANUF'S DRG./ SPEC.	
OIL SEALS & GASKETS		100%		3	
1.MATERIAL OF GASKET		VISUAL		3	
2.SURFACE COND.		VISUAL		3	
3.DIMENSIONS		MEASUREMENT		3	
BIDDER/VENDOR		BIDDER/VENDOR		BIDDER/VENDOR	
NAME		SIGNATURE		BIDDER/SAVENDORS COMPANY SEAL	
DATE					




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


		CUSTOMER :				PROJECT		SPECIFICATION :			
QUALITY PLAN		BIDDER/ VENDOR		TITLE		QUALITY PLAN		NUMBER :			
SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
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SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
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SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
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SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
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SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
SHEET 6 OF 9		BIDDER/ VENDOR		TITLE		QUALITY PLAN		SPECIFICATION :			
SHEET 6 OF 9											


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

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


		<b>QUALITY PLAN</b>		CUSTOMER :		PROJECT TITLE		SPECIFICATION : NUMBER :			
				BIDDER/ VENDOR :		QUALITY PLAN NUMBER PED-506-00-Q-007, REV-03		SPECIFICATION : TITLE			
SL. NO.	COMPONENT/OPERATION	SHEET 9 OF 9	CHARACTERISTIC CHECK	SYSTEM CAT.	TYPE/METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	SECTION AGENCY	VOLUME III REMARKS
1	2	3	4	5	6	7	8	9	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, AGENCY (1) SHALL MEAN BHEL AND CUSTOMERS BOTH TOGETHER.</p> <p><u>Legends for Inspection agency</u></p> <p>1. BHEL/CUSTOMER</p> <p>2. VENDOR (MOTOR MANUFACTURER)</p> <p>3. SUB-VENDOR (RAW MATERIAL/COMPONENTS SUPPLIER)</p> <p>P. PERFORM</p> <p>W. WITNESS</p> <p>V. VERIFY</p>											
BHEL		PARTICULARS		BIDDER/VENDOR							
		NAME									
		SIGNATURE									
		DATE									
BIDDER'S/VENDORS COMPANY SEAL											




		QUALITY PLAN		CUSTOMER :		PROJECT		SPECIFICATION :											
SHEET 2 OF 2		BIDDER/ :		VENDOR :		TITLE		NUMBER :											
COMPONENT/OPERATION		CHARACTERISTICS		CAT.		EXTENT OF CHECK		TYPE/METHOD OF CHECK		REFERENCE DOCUMENT		ACCEPTANCE NORM		FORMAT OF RECORD		AGENCY		REMARKS	
SL. NO.	1	2	3	4	5	6	7	8	9	10	11	P	W	V					
4.0	MOUNTING OF VARIOUS ITEMS	1. RIGIDITY	MA	VISUAL	100%	MANUFACTURE DRAWING	LOG BOOK												
		2. THICKNESS	MA	VISUAL	100%	-DO-	-DO-												
		3. CORRECTNESS & COMPLETENESS	MA	VISUAL	100%	APPD. DRG.	-DO-												
		4. ACCESSIBILITY	MA	VISUAL	100%	-DO-	-DO-												
5.0	MARKING/LABELLING	1. CORRECTNESS	MA	VISUAL	100%	MANUFACTURE DRAWING	LOG BOOK												
		2. ADHESION/ FIXING	MA	VISUAL	100%	-DO-	-DO-												
		3. IR & HV	MA	ELECTRICAL	100%	APPD. DRG.	-DO-												
6.0	PRE-FINAL INSPECTION	1. ALIGNMENT	MA	VISUAL	100%	MANUFACTURE DRAWING	LOG BOOK												
		2. PERFORMANCE	MA	ELECTRICAL	100%	-DO-	-DO-												
		3. IR & HV	MA	ELECTRICAL	100%	APPD. DRG.	-DO-												
BHEL		PARTICULARS		BIDDER/VENDOR															
		NAME																	
		SIGNATURE																	
		DATE																	
																BIDDER'S/VENDORS COMPANY SEAL			


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



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

		<b>CHECK LIST FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE (Mechanical Auxiliary Packages)</b>		SPECIFICATION NO.:			
				VOLUME			
				SECTION			
				REV. NO.	DATE:		
				SHEET 2	OF 2		
Data Sheet No.: PE-CL-999-145-1026-0							
SL NO	TESTS/CHECKS	QUANTM OF CHECK	REFERENCE DOC. ACCEPTANCE NORMS	AGEN CY			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		
<b>LEGEND:</b> M: MANUFACTURER/ SUB CONTRACTOR, C: CONTRACTOR/ NOMINATED INSP AGENCY, B: BHEL. P: PERFORM, W: WITNESS, V: VERIFICATION.							
<b>NOTE:</b> CONTRACTOR TO PROVIDE COMPLIANCE CERTIFICATE FOR TESTS/CHECKS VERIFIED BY CONTRACTOR AND SUBMIT THE SAME ALONGWITH TEST CERTIFICATES TO BE VERIFIED BY BHEL.							

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	<b>CHECK LIST FOR PRESSURE / DIFFERENTIAL PRESSURE TRANSMITTER (Mechanical Auxiliary Packages)</b>	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE:
		SHEET 3 OF 3	
Data Sheet No.. PE-CL-999-145-1026-0			

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


## LEGEND:


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

## NOTE:

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

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

 <b>MANUFACTURING QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)</b>		<b>QUALITY PLAN NO.: PE-QP-375-145-I 006</b>																			
		<b>VOLUME</b>																			
		<b>SECTION</b>																			
		<b>REV. NO. 01 DATE: 30.01.2012</b>																			
<b>Sl. No.</b>		<b>Component / operation</b>		<b>Characteristics Checked</b>		<b>* Category</b>		<b>Type/Method of Check</b>		<b>Extent of Check</b>		<b>Reference documents</b>		<b>Acceptance Norms</b>		<b>Format of Records</b>		<b>Agency \$</b>		<b>Remarks</b>	
<b>1.0 MATERIAL</b>																					
1.1		Body & Bonnet casting / forgings, plug, stem.		1. Physical, Chemical properties		MA		Physical, Chemical tests		One/Heat(H.T. Batch)		Approved drg. / data sheet / BHEL specn.		Approved drg. / data sheet / BHEL specn.		Test Certificate		3		2,1	
				2. Heat Treatment		MA		Review of H.T. Chart		Each H.T.		Approved drg. / data sheet / BHEL specn.		Approved drg. / data sheet / BHEL specn.		Test Certificate		3/2		1 IBR Certification (if applicable) to be verified by BHEL	
				3. Internal quality of castings		MA		RT for Body & UT for Bonnet(NDT)		100%		ASME B 16.34		ASME B 16.34		Test Report / FILM		3/2		1 Only for rating ANSI 900 and above. Applicable for Body and Bonnet only. For Lower rating only if called for in specification.	
				4. Surface Quality		MA		1. Visual		100%		MSS-SP-55		MSS-SP-55		Test Certificate		3/2		2,1	
								2. MT/PT		100%		ASME B 16.34		ASME B 16.34		Test Certificate		3		1 After Machining on machined surface only	
				5. Pressure test for shell		MA		Hyd. Test		100%		ISA-S-75.19/ ASME B 16.34		ISA-S-75.19/ ASME B 16.34		Test Certificate		2		1 For Body & Bonnet after machining	


  
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<b>LEGEND:</b> * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics		RT- Radiographic Test UT - Ultrasonic Test		PT - Dye penetrant Test MT- Magnetic Test		\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.		1 - BHEL 2 - Vendor 3 - Sub-vendor		4-LPGCL	
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THIS QUALITY PLAN IS APPLICABLE FOR 3X660 MW LALITPUR STPP.

DOC. NO. PE-QP-375-145-I006

**LPGCL QP No.- BE-LAL-QMV-101-M-0008**

 PEM :: C&I		MANUFACTURING QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)							QUALITY PLAN NO.: PE-QP-375-145-I 006 VOLUME SECTION REV. NO. 01 DATE: 30.01.2012 SHEET 2 OF 6			
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	
1.2	Diaphragm	1. Surface Quality 2. Hardness 3. Endurance / Life cycle	MA	Visual Measurement Cyclic test 10,000 cycles	100% 100% One / Type	Mfr. standard Mfr. standard 10,000 cycles / Mfr. standard.	Mfr. standard Mfr. standard No damage	Test Certificate Test Certificate Test Certificate	3/2 3/2 3/2	---	2,1 2,1 2,1	
1.3	Spring	1. Composition 2. Mech. Properties 3. Performance	MA	Chemical-Analysis Mech. Test 1. Stiffness ratio 2. Scragging 3. Cyclic test (Endurance) 4. Dimension (Measurement)	One sample / Heat One sample / Heat 100% 100% One / type	Material spec. / Mfr. standard Material spec. / Mfr. standard Material spec. / Mfr. standard Material spec. / Mfr. standard 10,000 cycles	Material spec. / Mfr. standard Material spec. / Mfr. standard Material spec. / Mfr. standard Material spec. / Mfr. standard Material spec. / Mfr. standard	Test Certificate Test Certificate Test Certificate Test Certificate Test Certificate	3 3 3 3 3	---	2,1 2,1 2,1 2,1 2,1	
1.4	Electrical items [Limit switches, Solenoids, Position Transmitter(if provided externally)]	1. Routine Test 2. Degree of protection	MA	HV, IR, Continuity function IP/NEMA Tests	100% One sample / type	Rele. Standards Rele. Standards Approved Data sheet	Rele. Standards Rele. Standards Approved Data sheet	Test Certificate Type Test Certificate	3 3 3	---	2,1 2,1 2,1	In case TC is not available, Actual test shall be conducted


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 CATEGORY- I  
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<b>LEGEND:</b> * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics	RT- Radiographic Test UT - Ultrasonic Test	PT - Dye penetrant Test MT- Magnetic Test	\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.	1 - BHEL 2 - Vendor 3 - Sub-vendor	4-LPGCL
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THIS QUALITY PLAN IS APPLICABLE FOR 3X660 MW LALITPUR STPP.

DOC. NO. PE-QP-375-145-1006  
 LPGCL QP No.- BE-LAL-QMV-101-M-0008

<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;">   <b>MANUFACTURING QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)</b> </div> <div style="text-align: right;"> <b>QUALITY PLAN NO.: PE-QP-375-145-I 006</b>  VOLUME  SECTION  REV. NO. 01 DATE: 30.01.2012  SHEET 3 OF 6 </div> </div>										
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$ P W V	Remarks
1.5	Pressure Gauges	1. Performance	MA	Review of calibration certificates	100%	Mfr. Standard	Mfr. Standard	Test Certificate	3 --- 2,1	
		2. Marking	MA	Visual	100%	Mfr. standard	Mfr. standard	Records	3 --- 2,1	
2.0	<b>IN PROCESS INSPECTION</b>									
2.1	Body & Bonnet after machining, Plug with actuator stem	1. Surface flaws	MA	Visual & MT/PT	100% (on accessible surfaces)	ASME B 16.34	ASME B 16.34	Test Records	2 --- 1	Butt weld ends shall be included.
		2. Dimensional checks	MA	Measurement	100%	Mfr. Standard	Mfr. Standard	Records	2 --- 1	
		3. Hard facing (wherever applicable)	MA	Hardness Measurement	One sample/Lot	Mfr. Standard	Mfr. Standard	Records	2 --- 1	
2.2	Lapping	Machining surface contact	MA	Blue Matching	One sample/lot	-----	Proper Physical Contact	Test Records	2	
3.0	<b>TESTS ON COMPLETED VALVE</b>									
3.1	Actuator Chamber	Leakage & Strength	MA	Pneumatic test	100%	Mfr. Standard	No Leakage	Test Certificate	2 1 1	Refer Note-4
3.2	Body	Leakage and Pressure test (Body Mount Leakage)	MA	Hydro test	100%	ISA - S-75.19	No Leakage	Test Certificate	2 1 1	Refer Note-4
3.3	Seat leakage test for completed valve	Seat Leakage	MA	Pneumatic Test	100%	FCI-70.2	FCI-70.2	Test Certificate	2 1 1	Refer Note-4
4.0	<b>OPERATION TEST ON COMPLETED VALVE (Final inspection)</b>	1. Valve Travel	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2 1,4 1,4	Refer Note-4
		2. Opening/Closing time	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2 1,4 1,4	Refer Note-4

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

RT - Radiographic Test  
UT - Ultrasonic Test

PT - Dye penetrant Test  
MT - Magnetic Test

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

1 - BHEL  
2 - Vendor  
3 - Sub-vendor

4-LPGCL


THIS QUALITY PLAN IS APPLICABLE FOR 3X660 MW LALITPUR STPP.

DOC. NO. PE-QP-375-145-I006

LPGCL QP No.- BE-LAL-QMV-101-M-0008

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CATEGORY - I  
This approval of this drawing / document does not relieve the contractor, of his contractual obligations, mentioned elsewhere in the contract document.

<div style="display: flex; justify-content: space-between;"> <div>  <p>PEM :: C&amp;I</p> </div> <div style="text-align: center;"> <b>MANUFACTURING QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)</b> </div> <div> <p>QUALITY PLAN NO.: PE-QP-375-145-I 006</p> <p>VOLUME</p> <p>SECTION</p> <p>REV. NO. 01 DATE: 30.01.2012</p> <p>SHEET 4 OF 6</p> </div> </div>										
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency \$ P W V	Remarks
3.	Linearity/cam characteristic		MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2 1,4 1,4	Refer Note-4
4.	Repeatability		MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2 1,4 1,4	Refer Note-4
5.	Hysteresis		MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2 1,4 1,4	Refer Note-4
6.	Sensitivity		MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2 1,4 1,4	Refer Note-4
7.	Accuracy (Overall)		MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Report	2 1,4 1,4	Refer Note-4
8.	Control Valve characteristics / CV Test		MA	♦ Measurement (Press. vs. discharge and opening 0-100% in steps of 10%)	One per type	As per specs/ Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Test Certificate	2 1,4 1,4	♦ Size = Body & port size Or Body size & CV for non std port. Refer Note 1.
9.	Operation of limit switch & solenoids and other accessories		MA	Function	100%	Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Test Report	2 1,4 1,4	On assembled valve Refer Note-4
10.	Overall dimensions		MI	Visual and dimensional	100%	Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Records	2 1,4 1,4	Refer Note-4
11.	Pre defined valve position in case of air failure		MA	Visual	100%	As per spec & Appd drg	As per spec & Appd drg	Test Certificate	2 1,4 1,4	
12.	Cleanliness, painting, stamping (for direction of flow), Tag No.		MA	Visual and dimensional	100%	Approved drg. / data sheet	As per specs/ Approved drg. / data sheet	Test Certificate	2 1,4 1,4	

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<b>LEGEND:</b> * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics	RT - Radiographic Test UT - Ultrasonic Test	PT - Dye penetrant Test MT- Magnetic Test	\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.	1 - BHEL 2 - Vendor 3 - Sub-vendor 4-LPGCL
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THIS QUALITY PLAN IS APPLICABLE FOR 3X660 MW LALITPUR STPP.

LPGCL QP No.- BE-LAL-QMV-101-M-0008

DOC. NO. PE-QP-375-145-I006




 <b>MANUFACTURING QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)</b>		QUALITY PLAN NO.: <b>PE-QP-375-145-I 006</b>																					
		VOLUME																					
		SECTION																					
		REV. NO. 01					DATE: 30.01.2012																
		SHEET 5					OF 6																
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												
<b>5.0 AUXILIARY ITEMS</b>																							
5.1	Positioner	Overall leakage after assembly including Nozzles leakage	MA	Leak Test (in the steady state input signal)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	1	Overall leakage including tubing											
5.2	Air filter regulator	1. Normal air consumption	MA	Measurement	Each type	Mfr. Standard	No leakage	Test Certificate	3/2	---	1												
		2. Overall leakage	MA	Visual (soap solution)	100 %	Mfr. Standard	No leakage	Test Certificate	3/2	---	1												
5.3	Air lock relay	Performance Test	MA	Leakage test	100%	Mfr. Standard	No leakage	Test Certificate	3/2	---	1												
5.4	Electronic position transmitter(not applicable if provided integral to smart positioner)	1. Accuracy	MA	Operation	100%	Approved data sheet /	Approved data sheet /	Test Certificate	2	1	1	On completed valve											
5.5	Current to Pneumatic converter(not applicable for smart positioner)	1. Physical Verification Make/Model	MA	Visual	100%	Approved drg. / data sheet	Approved drg. / data sheet	Test Certificate	2	---	2,1												
<div style="display: flex; align-items: center;">  <div style="border: 1px solid black; padding: 5px; text-align: center;"> <b>LPGCL</b>  <b>APPROVED</b>  <b>CATEGORY- I</b> </div> </div> <p style="font-size: small; margin-top: 5px;">This approval of this drawing / document does not relieve the contractor of his contractual obligations, mentioned elsewhere in the contract document.</p>																							
													2. Degree of Protection	MA	IP/NEMA test	Each type	Relevant Standard	Relevant Standard	Test Certificate	3	---	2,1	
													3. Linearity	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1	
													4. Hysteresis	CR	Measurement	100%	Approved drg. / data sheet / BHEL specn.	Approved drg. / data sheet / BHEL specn.	Inspection Report	2	---	1	
<b>LEGEND:</b> * CR - Critical characteristics      RT- Radiographic Test      PT - Dye penetrant Test      \$ P - Agency Performing the Test.      1 - BHEL MA - Major characteristics      UT - Ultrasonic Test      MT- Magnetic Test      W - Agency Witnessing the Test.      2 - Vendor MI - Minor characteristics      - Minor characteristics      V - Agency Verifying the Test.      3 - Sub-vendor																							

THIS QUALITY PLAN IS APPLICABLE FOR 3X660 MW LALITPUR STPP.


DOC. NO. PE-QP-375-145-I006

LPGCL QP No.- BE-LAL-QMV-101-M-0008

 <b>MANUFACTURING QUALITY PLAN FOR CONTROL VALVE (PNEUMATIC)</b>		QUALITY PLAN NO.: <b>PE-QP-375-145-I 006</b>											
		VOLUME											
		SECTION											
		REV. NO. 01					DATE: 30.01.2012						
		SHEET 6					OF 6						
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		
5.6	Smart Positioner (As Applicable)	1. Physical Verification Make/Model 2. Degree of Protection 3. Linearity 4. Hysteresis 5. Calibration with Hand Held Communicator	MA MA CR CR MA	Visual IP/NEMA test Measurement Measurement Measurement	100% Each type 100% 100% Each type	Approved drg. / data sheet Relevant Standard Approved drg. / data sheet / BHEL specn. Approved drg. / data sheet / BHEL specn. Approved data sheet / Mfr. Standard	Approved drg. / data sheet Relevant Standard Approved drg. / data sheet / BHEL specn. Approved drg. / data sheet / BHEL specn. Approved data sheet / Mfr. Standard	Test Certificate Test Certificate Inspection Report Inspection Report Test Certificate	2 3 2 2 2	---	2,1 2,1 1 1 1		
6.0	PAINTING	Soundness of Painting	MA	Visual and Measurement	100%	BHEL specn. / Mfr. Standard	BHEL specn. / Mfr. Standard	Inspection Report	2	---	1	1	Refer Note-2
7.0	PACKING	Soundness of Packing against transit damage	MA	Visual	100%	Mfr. Standard	Mfr. Standard	Inspection Report	2	---	---	---	Refer Note-3

**NOTES:**

- Cv test will be conducted one per type for all tags. For Cv test, 4 types of control valves preferably TAG NO. CDV10/12/14, CDV22/25, DRV2/8 AND FDV14, shall be selected and witnessed by LPGCL/BHEL. Cv test shall be conducted at IIT/FCRI/any govt. approved laboratory.
- In the absence of BHEL spec. for painting, vendor to obtain BHEL's approval on their painting specification / procedure.
- Sea worthy packing, if applicable.
- The quantum of check shall be 100% for manufacturer and 10% for BHEL/BHEL nominated inspection agency.
- IBR certificates in Form III-C shall be submitted if called for in the specification/datasheet.
- Copies of all TC's (Test Certificates) for materials duly correlated with Heat Nos., TC's for electrical items and mechanical tests(Leak/Operation) shall be submitted to BHEL for verification and acceptance.

LEGEND: *		CR - Critical characteristics	RT - Radiographic Test	PT - Dye penetrant Test	\$	P - Agency Performing the Test.	1 - BHEL	4-LPGCL
	MA - Major characteristics	UT - Ultrasonic Test	MT - Magnetic Test	W - Agency Witnessing the Test.		2 - Vendor		
	MI - Minor characteristics			V - Agency Verifying the Test.		3 - Sub-vendor		
THIS QUALITY PLAN IS APPLICABLE FOR 3X660 MW LALITPUR STPP.								
DOC. NO. PE-QP-375-145-I006								
LPGCL QP No.- BE-LAL-QMV-101-M-0008								
 <b>LPGCL</b>								
<b>APPROVED</b>								
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LEGEND. \* CR - Critical characteristics  
MA - Major characteristics  
MI - Minor characteristics

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 PEM :: C&I		MANUFACTURING QUALITY PLAN FOR FLOW NOZZLE ASSEMBLY										QUALITY PLAN NO.: PE-QP-375-145-1005 VOLUME SECTION REV. NO. 00 DATE: 22.09.2011 SHEET 2 OF 3		
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency <sup>s</sup>			Remarks		
									P	W	V			
2.5	Machining 1. Flow Nozzle (machined)	3 Heat Treatment	MA	Review of HT Chart	100%	ASME SEC. VIII	ASME SEC. VIII	HT Chart	3/2	2	1	100% by Vendor, 10% by BHEL		
		1. Dimensions	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Inspection report	3/2	2	1			
		2. Profile	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Inspection report	3/2	2	1			
		3. Surface finish	MA	Visual	100%	-----	Mirror finish.	Inspection report / Mfd Records	3/2	2	1			
3.0	ROUTINE TEST	1. Machining of pipe ID	MA	Measurement	100%	Approved drgs/data sheets	Approved drg. / data sheet	Inspection report	3/2	2	1			
		2. Dimensions	MA	Measurement	100%	Approved drg. / data sheet	Approved drg. / data sheet	Inspection report	3/2	2	1			
		3. Surface flaw on weld edge preparation (for shop welding)	MA	Penetrant Test	100%	ASTM 165/ IS-3658	ASTM 165/ IS-3658	Inspection report / TC	3/2	2	1			
		4. IBR Clearance	MA	Review	100%	IBR Compliance	IBR Compliance	Form III C	3/2		1			
		1. Leak tightness	CR	Hydraulic test (1.5 times Design pressure)	100%	Approved drg/data sheet	No Leakage	Test Certificate	3/2	2,1	---	Minimum time duration of test shall be ½ hours.		

LEGEND: * CR MA MI	- Critical characteristics - Major characteristics - Minor characteristics	\$ P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.	1 - BHEL 2 - Vendor 3 - Sub-vendor	cat-1 Rev-01 
	* CR MA MI		1 - BHEL 2 - Vendor 3 - Sub-vendor	cat-1 Rev-01 

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MANUFACTURING QUALITY PLAN FOR FLOW NOZZLE ASSEMBLY										QUALITY PLAN NO.: PE-QP-375-145-1005	
VOLUME										SECTION	
REV. NO. 00 DATE: 22.09.2011										SHEET 3 OF 3	
Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency <sup>1</sup>	Remarks	
									P W V		
		2. Calibration	CR	Measurement	1 per type per size	—	Tech Spec.	Test Certificate	2 — 1	Refer note-4	
4.0	FINAL ASSEMBLY	1. Marking – Tag No., direction of flow 2. Workmanship, surface flaw on weld edge preparation on end of pipe (for site welding) 3. Dimensions and end connection	MI MA MA	Visual Visual Penetrant test Measurement	100% 100% 100%	Approved drg/data sheet ASTM165 / IS: 3658 Approved drg/data sheet	Approved drg/data sheet No Surface Flaw Approved drg/data sheet	Inspection report Test Certificate / Inspection report Inspection Report	2 — 1 3/2 2 1 3/2 2 1	Refer Note-2 before dispatch	
5.0	PACKING & DISPATCH	Soundness of Packing against transit damage	MA	Visual	100%	Technical spec./ Good Commercial Practice	Technical spec./ Good Commercial Practice	Inspection Report	2 — —	Refer Note-5	

NOTE:

1. Test Certificates to be verified by BHEL at final inspection stage.
2. Minimum 2 coats of primer paint to be applied before dispatch.
3. In case of NTPC / LLOYDS / BHEL qualified welders available, then prequalification and WPS, PQR not required, only TC to be verified.
4. CALIBRATION Test to be carried out at IIT-DELHI / IIT- MUMBAI / FCRI or BHEL approved laboratory.
5. Sea Worthy packing, if applicable
6. Qualification records of the Vendors can be verified.

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<p>LEGEND: * CR - Critical characteristics MA - Major characteristics MI - Minor characteristics</p>	<p><b>LPGCL</b></p>	<p>P - Agency Performing the Test. W - Agency Witnessing the Test. V - Agency Verifying the Test.</p>	<p>1 - BHEL 2 - Vendor 3 - Sub-vendor</p>
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MANUFACTURING QUALITY PLAN FOR FLOW ORIFICE PLATE										
QUALITY PLAN NO.: PE-QP-375-145-1024										
VOLUME										
SECTION										
REV. NO. 00 DATE: 22.09.2011										
SHEET 1 OF 2										
Sl. No.	Component / operation	Characteristics Checked	Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency <sup>3</sup> P W V	Remarks
1.0	MATERIAL									
1.1	Orifice Plate	1. Physical, Chemical properties	MA	Physical, Chemical Tests	One / Plate OR One/ Heat	Approved drg. / data sheet / BHEL Spec.	Approved drg. / BHEL Spec.	Lab Report	3/2	2,1 IBR certification (if applicable) to be verified by BHEL
		2. Dimensions	MA	Measurement	100%	Approved drg.	Approved drg.	Inspection report	3/2	1
		3. Surface condition	MA	Visual	100%	---	Mirror Finish	Inspection report / Mfg Records	3/2	1
1.2	Flanges									
	A. Forgings	1. Chemical/Mech Properties, UT & Heat Treatment	MA	Chem & Mech UT test	Sample	Material Spec as per ASTM A 388 for UT	ANSI B 16.34	MTC, UT cert, HT cert	3/2	1
	B. Machining	2. Dimensions	MA	Measurement	100 %	Approved drg. / data sheet /	Approved drg. / data sheet /	Inspection report	3/2	1
2.0	IN PROCESS									
2.1	Machine	1. Dimension	MA	Measurement	100%	Approved drg.	Approved drg.	Inspection report	3/2	2,1* 2 * Witness by BHEL during final inspection
		2. Surface finish	MA	Visual	100%	---	Mirror Finish	Inspection report	3/2	2,1* 1
		3. Surface flaw on machined surface	MA	Penetrant test	100%	ASTM 165 / IS:3658	No surface flaw	Inspection report / Test Certificate	3/2	2,1* 1

LEGEND

- CR - Critical characteristics
- MA - Major characteristics
- MI - Minor characteristics

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1 - BHEL

2 - Vendor

3 - Sub-vendor

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DATE: 22.09.2011

BY: [Signature]

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MANUFACTURING QUALITY PLAN FOR FLOW ORIFICE PLATE										QUALITY PLAN NO.: PE-QP-375-145-1024			
										VOLUME			
										SECTION			
										REV. NO. 00		DATE: 22.09.2011	
										SHEET 2		OF 2	
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	ASSEMBLY and FINAL INSPECTION	1. Overall dimensions 2. Marking, Tag no. Direction of flow 3. Calibration 4. Painting	MA	Measurement Visual Performance Test Visual	100% 100% One per type 100%	Approved drg. Approved drg/Data Sheet — Technical spec. / Mfd Std	Approved drg. Approved drg./ Data Sheet Tech Spec. As per drg Painting schedule	Inspection report Inspection Report TC Inspection Report /Mfd Record	3/2 3/2 3/2 3/2	2.1 2 — —	— 1 1 1		
4.0	PACKING	Soundness of Packing against transit damage	MA	Visual	100%	Tech Spec / Good Commercial practice	Tech Spec / Good Commercial practice		3/2	—	—		


NOTE:

1. Test Certificates to be verified by BHEL at final inspection stage.
2. Minimum 2 coats of primer paint to be applied before dispatch.
3. CALIBRATION Test to be carried out at IT-DELHI / IT- MUMBAI / FCRI or BHEL approved laboratory.
4. Sea Worthy packing, if applicable

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LPGCL NO. 1001

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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	TITLE:		BHEL DOCUMENTS NO.: PE-TS-375-182-A001	
	<b>TECHNICAL SPECIFICATION FOR</b>		VOLUME <b>II-B</b>	
	<b>MILL REJECT HANDLING SYSTEM</b>		SECTION -D	
	<b>3 X 660 MW Super Critical TPP at LALITPUR, Uttar Pradesh</b>		REV. NO. 0.0	DATE: 20-07-2012
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**SECTION-D**  
**(GENERAL TECHNICAL REQUIREMENT)**



	TITLE:		BHEL DOCUMENTS NO.: PE-TS-375-182-A001	
	<b>TECHNICAL SPECIFICATION FOR</b>		<b>VOLUME II-B</b>	
	<b>MILL REJECT HANDLING SYSTEM</b>		<b>SECTION -D</b>	
	<b>3 X 660 MW Super Critical TPP at LALITPUR, Uttar Pradesh</b>		REV. NO. 0.0	DATE: 20-07-2012
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# SECTION-D1

(GENERAL TECHNICAL REQUIREMENT FOR MECHANICAL)

	TITLE:		BHEL DOCUMENTS NO.: PE-TS-375-182-A001	
	<b>TECHNICAL SPECIFICATION FOR</b>		<b>VOLUME II-B</b>	
	<b>MILL REJECT HANDLING SYSTEM</b>		<b>SECTION -D</b>	
	<b>3 X 660 MW Super Critical TPP at LALITPUR, Uttar Pradesh</b>		REV. NO. 0.0	DATE: 20-07-2012
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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>MILL REJECT HANDLING SYSTEM</b>		<b>SECTION -D</b>	
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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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	<b>MILL REJECT HANDLING SYSTEM</b>		SECTION -D	
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### 3. Compressed Air Line Valves

- Remote actuated main valves on compressed air pipe lines shall be pilot operated solenoid operated 100% leak proof valve.
- 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.
- Pneumatic actuators shall be completely enclosed type, double acting. The pneumatic cylinders for operation of valves shall be selected considering (5) Kg/cm<sup>2</sup> pressure. However maximum pressure available may be 7 Kg/Cm<sup>2</sup>. 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.
- 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.
- 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

- 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.
- Supply pressure of compressed air shall be in the range of 5-7 kg/cm<sup>2</sup>(g). Suitable pressure adjustment device shall be provided by the Bidder before each conveying vessel to obtain the required pressure in the conveying vessel.
- 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.
- 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.
- 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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	<b>TECHNICAL SPECIFICATION FOR MILL REJECT HANDLING SYSTEM</b>		VOLUME <b>II-B</b>	
			SECTION -D	
	3 X 660 MW Super Critical TPP at LALITPUR, Uttar Pradesh		REV. NO. 0.0	DATE: 20-07-2012
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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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	<b>MILL REJECT HANDLING SYSTEM</b>		SECTION -D	
	3 X 660 MW Super Critical TPP at LALITPUR, Uttar Pradesh		REV. NO. 0.0	DATE: 20-07-2012
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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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	3 X 660 MW Super Critical TPP at LALITPUR, Uttar Pradesh		REV. NO. 0.0	DATE: 20-07-2012
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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 / Cm<sup>2</sup> 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:

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

#### Pressure Switches (Individual for each function).


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

#### Temperature Indicators

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

#### Temperature Switches / Temperature Controllers

- 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.
- At discharge of each compressor (before air receiver).
- 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/cm<sup>2</sup> (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 be 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 be 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 (NM<sup>3</sup>/min/M<sup>2</sup>) 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/Nm<sup>3</sup> 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.



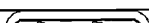
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## D INSPECTION AND TESTING

- 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 <sup>2</sup> (g)	15-20	20-30	25-35
Pressure above 2kg/cm <sup>2</sup> (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/cm<sup>2</sup>(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/cm<sup>2</sup> (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 (Trolley mounted) (5 m<sup>3</sup>/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.

	<b>TITLE</b>  <b>TECHNICAL SPECIFICATION FOR</b> <b>MILL REJECT HANDLING SYSTEM</b> <b>CHAIN PULLEY BLOCK WITH GEARED PULLEY</b>	SPECIFICATION NO. PE-TS-367-160-A001	
		VOLUME II-B	
		SECTION D	
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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 2 unit as per criteria mentioned elsewhere in the specs. There shall be total 3 nos (2W+1SB) compressors for 3X660 MW plant.
8. Refer **Annexure A** and **Annexure B** for additional points to be taken care of by bidder.



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**SUB VENDOR LIST  
(ANNEXURE-7)**

	PROJECT :3x660 MW TPP, HNPCL VIZAG TPS CONTRACTOR :BHEL - PEM  PACKAGE: MILL REJECT 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	Coimboitore

PROJECT :3x660 MW TPP, HNPCL VIZAG TPS CONTRACTOR :BHEL - PEM PACKAGE: MILL REJECT SYSTEM		LIST OF SUB-VENDORS	
SL. NO.	ITEMS	PROPOSED SUPPLIER	PLACE
		FOURESS	Mumbai

	PROJECT :3x660 MW TPP, HNPCL VIZAG TPS CONTRACTOR :BHEL - PEM PACKAGE: MILL REJECT SYSTEM	<b>LIST OF SUB-VENDORS</b>	
SL. NO.	ITEMS	PROPOSED SUPPLIER	PLACE
		LEADER AUDCO(L & T)	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 SAIL	GHAZIABZD BAHADURGARH 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


	PROJECT :3x660 MW TPP, HNPCL VIZAG TPS CONTRACTOR :BHEL - PEM  PACKAGE: MILL REJECT SYSTEM	<b>LIST OF SUB-VENDORS</b>	
SL. NO.	ITEMS	PROPOSED SUPPLIER	PLACE
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	CHENNAI  MUMBAI
		EIP ENVIRO LEVEL CONTROL	NOIDA

PROJECT :3x660 MW TPP, HNPCL VIZAG TPS CONTRACTOR :BHEL - PEM PACKAGE: MILL REJECT SYSTEM		LIST OF SUB-VENDORS	
SL. NO.	ITEMS	PROPOSED SUPPLIER	PLACE
3	Level Probes(RF)	NIVO CONTROL	INDORE


PROJECT :3x660 MW TPP, HNPCL VIZAG TPS CONTRACTOR :BHEL - PEM PACKAGE: MILL REJECT SYSTEM		LIST OF SUB-VENDORS	
SL. NO.	ITEMS	PROPOSED SUPPLIER	PLACE
		EIP BULK CONTROL	DELHI
4	Annunciators	IIC PECON PROCON	MUMBAI AHMEDABAD CHENNAI
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
8	Temp Gauge	GENERAL INSTRUMENT BELLS CONTROLS AN INSTRUMENTS H. GURU SOUTH INDIA	MUMBAI / GOA KOLKATA MUMBAI / GOA BANGALORE
9	Pulse Valves (Solenoid Valve)	Asco	CHENNAI
10	Control Panels & JB'S *	KRYPTON CONTRONICS	NEW DELHI NOIDA
11	Cable Gland	SUNIL & CO. ARUP ENGG.	KOLKATA KOLKATA


	PROJECT :3x660 MW TPP, HNPCL VIZAG TPS CONTRACTOR :BHEL - PEM PACKAGE: MILL REJECT SYSTEM	<b>LIST OF SUB-VENDORS</b>	
SL. NO.	ITEMS	PROPOSED SUPPLIER	PLACE
11	Cable Gland	QUALITY PRECISION COMMET	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
15	Temperature Switch	SWITZER INDFOS IND.	CHENNAI GHAZIABAD
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.			



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### PAINTING SCHEME DETAILS (ANNEXURE-8)

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<b>bajaj Industries Ltd.</b>	<b>PAINTING</b>	 <b>TATA</b>																						
<p>16.1.0 <u>SCOPE</u></p> <p>16.1.1 This section covers the painting requirements for the power plant equipment, structures, piping etc. and any other surface required to be painted.</p> <p>16.2.0 <u>CODES AND STANDARDS</u></p> <p>Painting of equipment will be carried out as per the specifications indicated below and will conform to the relevant IS specification for the material and workmanship.</p> <p>The following Indian Standards may be referred to for carrying out the painting job:</p> <table> <tr> <td>IS:5</td> <td>Colours for ready mixed paints and enamels</td> </tr> <tr> <td>IS:1303</td> <td>Glossary of terms relating to paints</td> </tr> <tr> <td>IS:2379</td> <td>Colour code for identification of pipelines</td> </tr> <tr> <td>IS:1477</td> <td>Code of practice for painting of ferrous metals in buildings (Parts I &amp; II)</td> </tr> <tr> <td>IS:2524</td> <td>Code of practice for painting of non-ferrous metals in buildings (Parts I &amp; II)</td> </tr> <tr> <td>IS:6278</td> <td>Code of practice for white washing and colour washing</td> </tr> <tr> <td>IS:3140</td> <td>Code of practice for painting asbestos cement building products</td> </tr> <tr> <td>IS:158</td> <td>Ready mixed paint, brushing, bituminous, black, lead free, acid, alkali, water and heat resisting</td> </tr> <tr> <td>IS: 2074</td> <td>Ready mixed paint, air drying, red Oxide Zinc Chrome, priming</td> </tr> <tr> <td>IS: 104</td> <td>Ready mixed paint, brushing, Zinc Chrome, priming</td> </tr> <tr> <td>IS: 2932</td> <td>Enamel, synthetic, exterior (a) undercoating (b) finishing specification.</td> </tr> </table> <p>16.3.0 <u>PREPARATION OF SURFACES</u></p> <p>All surfaces to be painted will 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 will 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 will be resorted to only in such areas where other methods specified above have not achieved the desired results. Cleaning with solvents will be adopted only after written approval of the Purchaser/Consultant.</p>			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:6278	Code of practice for white washing and colour washing	IS:3140	Code of practice for painting asbestos cement building products	IS:158	Ready mixed paint, brushing, bituminous, black, lead free, 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 specification.
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16.4.0 PRIMER PAINTS (P)

Primer paints will be applied only on dry and clean surfaces:

16.4.1 Primer paint P1: (Epoxy based)

A two pack air drying epoxy polyamide resin based red oxide - zinc phosphate (primer):

Epoxy content (% wt)	15 to 18
Air drying time	About 30 minutes (touch dry) Overnight (hard dry)
Dry film thickness (OFT/coat)	30 microns (min)
Temperature resistance	Up to 120 deg. C dry heat

16.4.2 Primer paint P2 (Epoxy based)

A two pack air drying epoxy polyamide with zinc dust of at least 92% zinc dust on the dry film.

Epoxy content (% wt)	8 to 10
Air drying time	About 10 minutes (touch dry) 2 hours (hard dry)
Dry film thickness (OFT/coat)	40 microns (min)
Temperature resistance	Up to 300 deg. C dry heat


16.4.3 Primer paint P3 (Ethyl zinc silicate, EZS, based)


A two pack heavy duty zinc dust rich silicate primer:

Total solids (% wt)	84 + or - 2
Air drying time	16 hours
Density	3.07 +/- 0.005
Dry film thickness (OFT/coat)	60 microns (min)
Temperature resistance	Up to 450 deg. C dry heat

16.4.3.1 Primer Paint P4

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<p>Double boiled linseed oil as per IS - 77: specification for linseed oil, boiled for paints.</p> <p>16.4.3.2 Primer Paint P5 In organic Zinc silicate with suitable air drying time. 40 microns per coat.</p> <p>16.4.3.3 Primer Paint P6 Red oxide Zinc phosphate as per IS 12744 with OFT 30 microns per coat.</p> <p>16.4.3.4 Primer paint P7 Red oxide Zinc chromate as per IS 2704 with OFT 30 microns per coat.</p> <p>16.4.4 Intermediate <u>paints</u> (I) These paints will be applied over primer coats as an intermediate layer to provide weatherproof seal of primer coats.</p> <p>16.4.5 Intermediate <u>paint</u> (II) A two pack air drying high build epoxy resin based paint with MIO.</p> <table border="1"> <tr> <td>Air drying time</td> <td>6 to 8 hours (touch dry) 7 days (full cure)</td> </tr> <tr> <td>Dry film thickness (OFT/coat)</td> <td>100 microns</td> </tr> <tr> <td>Temperature resistance</td> <td>Up to 180 deg. C dry heat</td> </tr> <tr> <td>Compatible with</td> <td>Primer P1 and P2</td> </tr> </table> <p>16.5.0 FINISH PAINT Finish paint coats will be applied over primer coats and intermediate coats after proper cleaning and touch up of primed coats.</p> <p>16.5.1 Finish <u>paint</u> F1 A two pack air drying epoxy polyamide enamel suitably pigmented.</p> <table border="1"> <tr> <td>Air drying time</td> <td>2 to 3 hours (touch dry) 7 days (full cure)</td> </tr> <tr> <td>Dry film thickness (OFT/coat)</td> <td>40 microns</td> </tr> <tr> <td>Temperature resistance</td> <td>Up to 130 deg. C dry heat</td> </tr> <tr> <td>Compatible with</td> <td>Primers and Intermediate paint</td> </tr> <tr> <td>Colour</td> <td>Generally all shades</td> </tr> </table>			Air drying time	6 to 8 hours (touch dry) 7 days (full cure)	Dry film thickness (OFT/coat)	100 microns	Temperature resistance	Up to 180 deg. C dry heat	Compatible with	Primer P1 and P2	Air drying time	2 to 3 hours (touch dry) 7 days (full cure)	Dry film thickness (OFT/coat)	40 microns	Temperature resistance	Up to 130 deg. C dry heat	Compatible with	Primers and Intermediate paint	Colour	Generally all shades
Air drying time	6 to 8 hours (touch dry) 7 days (full cure)																			
Dry film thickness (OFT/coat)	100 microns																			
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Dry film thickness (OFT/coat)	40 microns																			
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Compatible with	Primers and Intermediate paint																			
Colour	Generally all shades																			
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#### 16.5.2 Finish paint F2

A single pack synthetic rubber based enamel paint.

Air drying time	2 hours (touch dry) 24 hours (hand dry)
Dry film thickness (OFT/coat)	25 microns
Temperature resistance	Up to 200 deg. C dry heat
Compatible with	No primers
Colour	Generally all shades

#### 16.5.3 Finish paint F3

A Single pack heat resistant silicon resin based with leafing Aluminium.

Air drying time	3 to 4 hours (Touch dry), 24 hours (hard dry)
Dry film thickness (OFT/coat)	20 microns (min)
Temperature resistance	Up to 400 deg. C dry heat
Compatible with	No primer paint except P3
Colour	Smooth Aluminium

#### 16.5.4 Finish Paint F4


Heat resistant Alumina Paint IS 13183 Gr II, OFT 20 microns per coat.

#### 16.5.5 Finish Paint F5

- Heat resistant Silicone Aluminium Paint with suitable air drying time as per IS 13183 Gr I, 25 microns per coat.

- 16.5.6 The colour / shade will be as approved by the Purchaser/ Consultant. After cleaning the dust on the dried up primer, first coat of synthetic enamel will 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 will be applied.

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16.5.7 Equipment no. and the name of the equipment will be painted on the surface of the equipments on visible locations. Service of the Pipe/Line designation with arrow identification for the direction of flow will be painted on all pipes at visible locations at an interval of 20 metres. Wherever pipelines are insulated, the service of the piping and arrow mark will be painted over the clad surface.

16.6.0 SUGGESTED COLOUR CODES FOR PAINTING


Sl. No.	Item/service	Colour	Is-5	Colour (band)	Is-5
1.0	Structures, platforms, galleries, ladders and handrails	Dark Admiralty Grey	632	-	-
2.0	Boiler casing, ESP and ducting	Nut Brown	413	-	-
3.0	Fans, pumps, motors,	Light Grey	631	-	-
4.0	Tanks (without insulation and cladding)				
4.1	Outdoor, Stand pipes, vent pipes	Aluminum	-	-	-
4.2	Indoor	Aluminum	-	-	-
5.0	Vessels & all other proprietary equipment (without insulation & cladding)	Light grey	631	-	-
6.0	Switchgear	Light grey	631	-	-
7.0	Control & relay panels	Light grey	631/7078 of IS 1650	-	-
8.0	Turbine	Golden Yellow	356	-	-
9.0	Generator & exciter	Light grey	631	-	-
10.0	Transformers	Dark Admiralty Grey	632	-	-
11.0	Machinery guards	Signal red	537	-	-

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bajaj Industrihan Ltd.		PAINTING				 <b>TATA</b>

Sl. No.	Item/service	Colour	Is-5	Colour (band)	Is-5
12.0	Piping (without insulation and cladding)				
12.1	Water System				
a)	Boiler feed	Sea green	217	-	-
b)	Condensate	Sea green	217	Light brown	410
c)	D M Water	Sea Green	217	Light orange	557
d)	Soft water	Sea green	217	French blue	166
e)	Bearing cooling water	Sea green	217	French blue	166
f)	Service & clarified water	Sea green	217	French blue	166
g)	Raw water	Sea green	217	White	-
h)	Cooling water	Sea green	217	French blue	166
i)	Dust suppression system and plant cleaning water	Sea green	217	-	-
12.2	Compressed Air System				
a)	Service air	Sky Blue	101	-	-
b)	Instrument air	blue	101	White	-
12.3	Oil system				
a)	Fuel oil	Light brown	410	French	166
b)	Light oil	Dark Brown	412	Brilliant green	221
c)	Lubricating oil	Light brown	410	Light grey	631
d)	Control oil	Light brown	410	Light orange	557

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SPEC NO: TCE.6071A-C-500-001	TATA CONSULTING ENGINEERS LIMITED 3 X 660 MW Super Critical TPP at Lalitpur, Uttar Pradesh				VOLUME -II SECTION: C16 SHEET 7 OF 16
bajaj Industrihan Ltd.	PAINTING				

Sl. No.	Item/service	Colour	Is-5	Colour (band)	Is-5
e)	Transformer oil	Light brown	410	Light orange	557
12.4	Gas system				
a)	Hydrogen	Canary yellow	309	Post office red	538
b)	Carbon dioxide	Canary yellow	309	Light grey	631
12.7	Vacuum pipes	Sky blue	101	Black	-
12.8	Fuel pipes (coal)	Light brown	410	-	-
12.9	Drainage	Black	-	-	-
12.10	Stand pipes and all Vent pipes	Aluminum	-	-	-

Notes:

1. This colour code basically refers to IS:2379 for piping with necessary modifications.
2. Where band colour is specified, same will be provided at 10 meter intervals on long uninterrupted lines and also adjacent to valves and junctions.

**16.7.0 PAINT APPLICATION**

16.7.1 Paint will be applied in accordance with manufacturer's recommendations. The work will generally follow IS 1477 (Part II) for jobs carried out in India and SSPC-PA-I or DIN 55928 or equivalent for jobs carried out outside India.

16.7.2 Paint will not be applied when the ambient temperature is 5 deg. C and below. Also paint will not be applied in rain, wind, fog or at relative humidity of 80% and above.

16.7.3 Each coat of paint will be continuous, free of pores and of even film thickness without thin spots.


16.7.4 Each coat of paint will be dry sufficiently before application of next coat.


16.7.5 The Contractor will furnish paint manufacturer's test report or technical data sheet pertaining to the paint selected. The data sheet will indicate among other things the relevant standards, if any, composition in weight percent of pigments, vehicles, additives, drying time, viscosity, spreading rate, flash points, methods of application quality of surface preparation required, corrosion resistance properties and color.


16.7.6 Painting scheme

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SPEC NO: TCE.6071A-C-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b> 3 X 660 MW Super Critical TPP at Lalitpur, Uttar Pradesh	VOLUME -II SECTION: C16 SHEET 8 OF 16
bajaj Industries Ltd.	PAINTING	
<p>16.7.6.1 Type of paint products like P1, P2, P3, P4, P5, P6, P7, 11, F1, F2, F3, F4 &amp; F5 has been specified elsewhere in the specification.</p> <p>16.7.6.2 For a complete painting scheme of any item being painted, all types of paints are to be procured from the same manufacturer as approved by the Purchaser.</p> <p>16.7.7 <u>Legend</u></p> <p>Sa - 2.5 - The quality of surface cleaning, i.e 95 % of the surface area is free from all rust, mill scales and visible residues, foreign materials etc.</p> <p>SP - surface preparation quality</p> <p>2P1 - Two (2) coats of primer paint type P1</p> <p>111 - One (1) coat of intermediate paint type 11</p> <p>2F1 - Two (2) coats of finish paint type F1</p> <p>DFT - Dry film thickness</p> <p>CRT - Clean and retouch.</p>		
		ISSUE RO

SPEC NO: TCE.6071A-C-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b> 3 X 660 MW Super Critical TPP at Lalitpur, Uttar Pradesh		VOLUME -II SECTION: C16 SHEET 9 OF 16																																						
bajaj Industrials Ltd.	PAINTING		 <b>TATA</b>																																						
<p>The painting scheme to be followed for various equipment / structures is briefly given below for guidance to the Contractor.</p> <p style="text-align: center;"><b>Table-I</b> <b>Painting Scheme (Steam Generator and auxiliaries)</b></p> <table border="1"> <thead> <tr> <th rowspan="2">Sl. No.</th> <th rowspan="2">Description</th> <th colspan="2">Painting scheme</th> <th rowspan="2"></th> </tr> <tr> <th>At shop</th> <th>At site</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Steel structure</td> <td>SP-Sa 2 ½ 2P1 + 1 II</td> <td>2F1</td> <td>240</td> </tr> <tr> <td>2</td> <td>Mechanical equipment (temperature not over 80 deg. C) Both static and rotary equipment for indoor or outdoor duty</td> <td>SP-Sa 2 ½ 2P1 + 1 II</td> <td>2F1</td> <td>240</td> </tr> <tr> <td>3a</td> <td>Pipes with hot surfaces (Temperature up to 400 degree C)</td> <td>SP-Sa 2 ½ 2P5</td> <td>2F4</td> <td>130</td> </tr> <tr> <td>3b</td> <td>Equipment with hot surfaces and non insulated ducts (temperature up to 400 Deg. C)</td> <td>SP - St3</td> <td>2F3</td> <td>40</td> </tr> <tr> <td>4</td> <td>Equipment with hot surfaces (temperature above 400 Deg. C)</td> <td>SP - St3</td> <td>2F4</td> <td>50</td> </tr> <tr> <td>5</td> <td>Insulated pipe/duct works</td> <td>SP - St3 2 P6</td> <td>2F4  Final painting shall be done over the cladding. In case of aluminium cladding, final painting will not be required.</td> <td>60 for aluminium cladding and 110 for cladding with other than aluminium.</td> </tr> </tbody> </table>					Sl. No.	Description	Painting scheme			At shop	At site	1	Steel structure	SP-Sa 2 ½ 2P1 + 1 II	2F1	240	2	Mechanical equipment (temperature not over 80 deg. C) Both static and rotary equipment for indoor or outdoor duty	SP-Sa 2 ½ 2P1 + 1 II	2F1	240	3a	Pipes with hot surfaces (Temperature up to 400 degree C)	SP-Sa 2 ½ 2P5	2F4	130	3b	Equipment with hot surfaces and non insulated ducts (temperature up to 400 Deg. C)	SP - St3	2F3	40	4	Equipment with hot surfaces (temperature above 400 Deg. C)	SP - St3	2F4	50	5	Insulated pipe/duct works	SP - St3 2 P6	2F4  Final painting shall be done over the cladding. In case of aluminium cladding, final painting will not be required.	60 for aluminium cladding and 110 for cladding with other than aluminium.
Sl. No.	Description	Painting scheme																																							
		At shop	At site																																						
1	Steel structure	SP-Sa 2 ½ 2P1 + 1 II	2F1	240																																					
2	Mechanical equipment (temperature not over 80 deg. C) Both static and rotary equipment for indoor or outdoor duty	SP-Sa 2 ½ 2P1 + 1 II	2F1	240																																					
3a	Pipes with hot surfaces (Temperature up to 400 degree C)	SP-Sa 2 ½ 2P5	2F4	130																																					
3b	Equipment with hot surfaces and non insulated ducts (temperature up to 400 Deg. C)	SP - St3	2F3	40																																					
4	Equipment with hot surfaces (temperature above 400 Deg. C)	SP - St3	2F4	50																																					
5	Insulated pipe/duct works	SP - St3 2 P6	2F4  Final painting shall be done over the cladding. In case of aluminium cladding, final painting will not be required.	60 for aluminium cladding and 110 for cladding with other than aluminium.																																					
				<div style="border: 1px solid black; padding: 2px; text-align: center;"> ISSUE RO </div>																																					

SPEC NO: TCE.6071A-C-500-001	<b>TATA CONSULTING ENGINEERS LIMITED</b> 3 X 660 MW Super Critical TPP at Lalitpur, Uttar Pradesh	VOLUME -II SECTION: C16 SHEET 10 OF 16
<b>bajaj industries ltd.</b>	<b>PAINTING</b>	

For other items of this package EXCLUDING steam generator and auxiliaries:

Sl. No.	Description	Painting scheme		Total DFT in Microns
		At shop	At site	
1	Steel structure	SP-Sa 2 ½ 2P1 + 1 11	2F1	240
2	Mechanical equipment (temperature not over 80 deg. C) Both static and rotary equipment for indoor or outdoor duty	SP-Sa 2 ½ 2P1 + 1 11	2F1	240
3	Equipment with hot surfaces (temperature up to 400 Deg. C)	SP-Sa 2 ½ 2P2	2F2	130
4	Equipment with hot surfaces (temperature up to 400 Deg. C)	SP-Sa 2 ½ 2P3	2F2	160
5.	Non insulated pipe/duct works			
i)	Temperature not over 80 Deg. C	SP-Sa 2 ½ 2P1 + 1 11	2F1	240
ii)	Temperature up to 200 Deg.C	SP-Sa 2 ½ 2P2	2F2	130
iii)	Temperature up to 400 Deg.C	SP-Sa 2 ½ 2P3	2F3	160
6	Insulated pipe/duct works	SP-Sa 2 ½	2 F2	130
	2 coats primer suitable for intended temperature application as per the manufacturer's recommendation. The primers selection shall be done generally in line with the contract laid down in clauses above.		Final painting shall be done over the cladding. In case of aluminium cladding, final painting will not be required.	

Note:1 For crane girders, one coat of primer will be applied during manufacturing. Second coat of primer followed by two (2) coats of finish paint shall be applied after erection.

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bajaj Industrials Ltd.	PAINTING	

Table -II  
Painting Scheme (Metallic Structural Works)



Surfaces to be painted	Surface preparation	Painting scheme		
		Primer at shop	Interm. at shop	Finishing at site
1) carpentry anchor plates and pipeline support				
- Outside	Sa 2.5	2P1	111	2F1
- Inside	Sa 2.5	2P1	111	2F1
2) bridge crane				
- Structure for beams	Sa 2.5	P1 + P1(s)	111 (s)	2F1
- Trolley	Sa 2.5	2P1	111	2F1
3) hoists and monorails				
- Monorails	Sa 2.5	2P1	111	2F1
- Hoists	Sa 2.5	2P1	111	2F1

S =SITE

Table -II  
Painting Scheme (Thermal cycle)

S.No.	Surface to be painted	Surface preparation	Painting scheme		
			Primer at shop	Interm. at shop	Finishing at site
1	Insulated pipe line and valves				
1.1	Steam	SA 2.5	2P1/2P2/2P3	-	-
1.2	Feed water	SA 2.5	2P1/2P2/2P3	-	-

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	<b>PAINTING</b>	

S.No.	Surface to be painted	Surface preparation	Painting scheme		
			Primer shop	at Interm. shop	Finishing at site
2	Deaerator and feed tank				
2.1	Inside	SA 2.5	—	—	—
2.2	Outside (deaerator)	SA 2.5	2P3	—	—
2.3	Outside (feed tank)	SA 2.5	2P2	—	—
3	Heat exchanger				
3.1	Inside	SA 2.5	—	—	—
3.2	Outside	SA 2.5	2P1	111	—
4	Heater				
4.1	Inside	SA 2.5	—	—	—
4.2	Outside	SA 2.5	2P2/2P3	—	—
5	Pumps	SA 2.5	2P1/2P2	111	2F1/2F2
6	Vent				
6.1	Non insulated pipeline and valves	SA 2.5	2P1/2P2/2P3	—	2F1/2F2/2F3
7	Drains, pipeline and valves traps etc				
7.1	Insulated	SA 2.5	2P1/2P2/2P3	—	—
7.2	Non insulated	SA 2.5	2P1/2P2/2P3	—	2F2
8	Tanks				
8.1	Outside	SA 2.5	2P1/2P2	—	—
8.2	Inside	—	—	—	—

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<b>bejay Industries Ltd.</b>	PAINTING	

TABLE -II

PAINTING SCHEME  
(OIL + OIL CYCLE)

SURFACES TO BE PAINTED	SURFACE PREPARATION	PAINTING SCHEME		
		PRIMER AT SHOP	INTERM. AT SHOP	FINISHING AT SITE
1) CLEAN / DIRTY OIL TANK				
- INSIDE	SA 2.5	2P4	--	--
- OUTSIDE	SA 2.5	2P1	111	2F1
2) PIPE LINE AND VALVES				
- OUTSIDE	SA 2.5	2P1/2P2	111	2F1/2F2
- INSIDE	--	--	--	--
3) PUMPS				
- PUMPS	SA 2.5	2P1	111	2F1
4) FILTERS				
- OUTSIDE	SA 2.5	2P1/2P1	111	2F1/2F2
- INSIDE	--	--	--	--
5) HEAT EXCHANGERS				
- INSIDE	--	--	--	--
- OUTSIDE	SA 2.5	2P1	2F1	--


S =SITE

TABLE -II

PAINTING SCHEME  
(CIRCULATING WATER, CHEMICALS AND SERVICE WATER)

SURFACES TO BE PAINTED	SURFACE PREPARATION	PAINTING SCHEME		
		PRIMER AT SHOP	INTERM. AT SHOP	FINISHING AT SITE

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bajaj Industries Ltd.	<b>PAINTING</b>	 <b>TATA</b>


SURFACES TO BE PAINTED	SURFACE PREPARATION	PAINTING SCHEME		
		PRIMER AT SHOP	INTERM. AT SHOP	FINISHING AT SITE
1) CONDENSER - INSIDE - OUTSIDE	SA 2.5 SA 2.5	-- 2P1	-- 111	-- 2F1
- WATER BOX AND TUBE SHEET	SA 2.5	As per clause 1.19 in data sheet-A in Section D1.2		
2) PUMPS - PUMPS	SA 2.5	2P1	111	2F1
3) PIPELINE AND VALVES - INSIDE - OUTSIDE (OVER GROUND)	SA 2.5 SA 2.5	-- 2P1	-- 111	-- 2F1
4) AIR EJECTORS - INSIDE - OUTSIDE	-- SA 2.5	-- 2P1	-- 111	-- 2F1

TABLE-II

**PAINTING SCHEME  
(DEMINERALISED WATER)**

SURFACES TO BE PAINTED	SURFACE PREPARATION	PAINTING SCHEME		
		PRIMER AT SHOP	INTERM. AT SHOP	FINISHING AT SITE
1) TANK - INSIDE	SA 2.5	2P6 (S)	111(S)	--

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bajaj industries ltd.	PAINTING	 <b>TATA</b>

SURFACES TO BE PAINTED	SURFACE PREPARATION	PAINTING SCHEME		
		PRIMER AT SHOP	INTERM. AT SHOP	FINISHING AT SITE
- OUTSIDE	SA 2.5	2P5(S)	111(S)	2F1
2) PIPELINE AND VALVES	-	-	-	-
- INSIDE	SA 2.5	2P1	111	2F1
- OUTSIDE				
3) PUMPS				
- PUMPS	SA2.5	2P1	111	2F1

S = SITE

TABLE-II

## PAINTING SCHEME (AIR CYCLE)

SURFACES TO BE PAINTED	SURFACE PREPARATION	PAINTING SCHEME		
		PRIMER AT SHOP	INTERM. AT SHOP	FINISHING AT SITE
1) PIPE LINE AND VALVES (SA)				
- OUTSIDE	SA 2.5	2P1	111	2F1
- INSIDE	-	-	-	-

TABLE-II


PAINTING SCHEME FOR STRUCTURE STEEL / PIPING AND OTHER ITEMS  
WHICH WILL BE FABRICATED AT SITE

Sl. No.	Description	Painting scheme	Total DFT in
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bajaj Industries Ltd.	PAINTING	 <b>TATA</b>

		Before erection	After erection	Microns
1	Steel structure	SP-Sa 2 ½ 2P1 + 1 11	2F1	240
2	Piping	SP-Sa 2 ½ 2P1 + 1 11	2F1	240
3	Tanks(outer) CST	SP-Sa 2 ½ 2P7 + 111	2F1	240
4	Tanks(inner) CST	SP-Sa 2 ½ 2P6 + 1 11	2F1	240
5	Tanks(outer) OM water	SP-Sa 2 ½ 2P7 + 111	2F1	240
6	Tanks(inner) OM water	SP-Sa 2 ½ 2P6 + 1 11	2F1	240

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	TITLE:		BHEL DOCUMENTS NO.: PE-TS-375-182-A001	
	<b>TECHNICAL SPECIFICATION FOR</b>		VOLUME <b>II-B</b>	
	<b>MILL REJECT HANDLING SYSTEM</b>		SECTION -D	
	3 X 660 MW Super Critical TPP at LALITPUR, Uttar Pradesh		REV. NO. 0.0	DATE: 07-08-2012
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**DRAWING DOCUMENTS DISTRIBUTION SCHEDULE  
(ANNEXURE-9)**


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bajaj Industrihan Ltd.		SCHEDULE OF DOCUMENT DISTRIBUTION				 <b>TATA</b>	

SL NO	PARTICULARS	BHL Office	BHL Site	Consultant's Design Office	Consultant's Site Office	Vendor
<b>CORRESPDENCE</b>						
1.	BHL TO VENDOR	S	1	1	1	0
2.	CONSULTANT TO VENDOR	1	1	S	1	0
3.	VENDOR TO BHL	0	1	1	1	S
4.	VENDOR TO CONSULTANT	1	1	0	1	S
<b>VENDOR DRAWINGS FOR APPROVAL</b>						
1.	FIRST ISSUE	SC+2P	-	SC+4P	-	S
2.	COMMENTS ON DRAWINGS	SC or 1P	-	S	-	SCor 1P
3.	FINAL APPROVED	SC+ 1P	2P	SC+4P	2P	S
<b>VENDOR DRAWINGS FOR INFORMATION</b>						
1.	FIRST ISSUE	SC	-	SC+4P	-	S
2.	COMMENTS ON DRAWINGS, IF ANY	SC or 1P	-	S	-	SCor 1P
3.	FINAL DRAWING	SC+ 1P	2P	SC+4P	2P	S
<b>MANUFACTURING</b>						
1.	TEST REPORTS	0+1	-	2	-	S
<b>INSTRUCTION MANUALS</b>						
1.	PRELIMINARY	2	1	2	1	S
2.	FINAL	4	4	1	1	S
<b>LEGEND</b>						
1.	O: ORIGINAL					
2.	S:SOURCE					
3.	P: PRINT					
4.	SC : SOFT COPY					


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	TITLE:		BHEL DOCUMENTS NO.: PE-TS-375-182-A001	
	<b>TECHNICAL SPECIFICATION FOR</b>		<b>VOLUME II-B</b>	
	<b>MILL REJECT HANDLING SYSTEM</b>		<b>SECTION -D</b>	
	<b>3 X 660 MW Super Critical TPP at LALITPUR, Uttar Pradesh</b>		REV. NO. 0.0	DATE: 07-08-2012
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**PLOT PLAN  
(ANNEXURE-10)**

	TITLE: <b>TECHNICAL SPECIFICATION FOR            MILL REJECT HANDLING SYSTEM</b> <b>3 X 660 MW Super Critical TPP at LALITPUR, Uttar            Pradesh</b>		BHEL DOCUMENTS NO.: PE-TS-375-182-A001	
			VOLUME <b>II-B</b>	
			SECTION -D	
			REV. NO. 0.0	DATE: 07-08-2012
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### VOLUME-III


	TITLE:		BHEL DOCUMENTS NO.: PE-TS-375-182-A001	
	<b>TECHNICAL SPECIFICATION FOR</b>		<b>VOLUME II-B</b>	
	<b>MILL REJECT HANDLING SYSTEM</b>		SECTION -D	
	<b>3 X 660 MW Super Critical TPP at LALITPUR, Uttar Pradesh</b>		REV. NO. 0.0	DATE: 07-08-2012
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## DATA SHEETS

	<b>TITLE</b> <b>MILL REJECT HANDLING SYSTEM</b> <b>TECHNICAL SPECIFICATION</b> <b>STORAGE BUNKER</b> <b>DATA SHEET - B</b>	SPECIFICATION NO. PE-TS-375-160-A001	
		VOLUME-III	
		SECTION	
		REV 0	DATE 12.07.2012
		SHEET 1	OF 1


<b><u>STORAGE BUNKER</u></b>			
<b>S.NO</b>	<b>DESCRIPTION</b>	<b>UNIT</b>	<b>DATA/PARTICULARS</b>
1.0	Quantity	-----	
2.0	Material Handled	-----	
3.0	Capacity Tones	-----	
4.0	No of outlet	-----	
5.0	<b>MATERIAL OF CONSTRUCTION &amp; THICKNESS</b>		
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		

	<b>TITLE</b>  <b>MILL REJECT DNSEVEYOR AND ACCESSORIES</b>  <b>DATA SHEET - B</b>	SPECIFICATION NO. PE-TS-375-160-A001	
		VOLUME -III	
		SECTION D	
		REV 0	DATE
		SHEET 1 OF 1	


<b><u>DENSEVEYOR/TRANSPORTOR) AND ACCESSORIES</u></b>		
<b>S.NO</b>	<b>DESCRIPTION</b>	<b>DATA/PARTICULARS</b>
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 <sup>3</sup> /min)	:
9	Pressure of air supply required(Kg/cm <sup>2</sup> )	:
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	Spec. No.: PE-TS-375-160-A001	
	COMPRESSED AIR SYSTEM	Volume III	SUB SECTION DM8
	DATA SHEET 'B'	Sheet 1 of 3 (R-0)	


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 <sup>3</sup> /min	
1.02.02	Discharge Pressure at Compressor HP outlet	Kg/cm <sup>2</sup>	
1.02.03	Void		
1.02.04	Capacity considering design ambient condition (FAD)	M <sup>3</sup> /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-375-160-A001	
	<b>COMPRESSED AIR SYSTEM</b>	Volume III	SUB SECTION DM8
	<b>DATA SHEET 'B'</b>	Sheet 2 of 3 (R-0)	


<b>1.03.00</b>	<b>Material of Construction</b>		
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		
<b>2.00.00</b>	<b>INTAKE AIR FILTER &amp; SILENCER</b>		
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		
<b>3.00.00</b>	<b>Air Receivers</b>		
3.01.00	Capacity	M <sup>3</sup>	
3.02.00	Numbers offered	Nos	
3.03.00	Design Code		
3.04.00	Design Pressure	Kg/cm <sup>2</sup>	
3.05.00	Material of Construction		
<b>4.00.00</b>	<b>Intercooler, Aftercooler &amp; Heat Exchangers</b>		
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	

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-375-160-A001	
	COMPRESSED AIR SYSTEM		Volume III	SUB SECTION DM8
	DATA SHEET 'B'		Sheet 3 of 3 (R-0)	


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 Valves 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						

	<b>TITLE</b> <b>MILL REJECT HANDLING SYSTEM</b> <b>BAG FILTER</b> <b>DATA SHEET - B</b>	SPECIFICATION NO. PE-TS-375-160-A001	
		VOLUME -III	
		SECTION	
		REV 0	DATE
		SHEET 1 OF 1	

<b><u>BAG FILTER</u></b>		
<b>S.NO</b>	<b>DESCRIPTION</b>	<b>DATA/PARTICULARS</b>
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 <sup>3</sup> )	:
12	Pressure and quantity of I.A. air supply required (Kg/cm <sup>2</sup> )	:
13	Spare filtration area provided	:

	<b>TITLE</b>  <b>MOTOR</b>  <b>DATA SHEET - C</b>	<b>SPECIFICATION NO.</b> PE-TS-375-160-A001
		<b>VOLUME</b> II B
		<b>SECTION</b> D
		<b>REV</b> NO. 00 <b>DATE</b> 09.07.12
		<b>SHEET</b> 1 OF 2

S. No.	Description	Data to be filled by successful bidder
<b>A.</b>	<b>General</b>	
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>B.</b>	<b>Design and Performance Data</b>	
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	

<b>NAME OF VENDOR</b>			<b>SEAL</b>	<b>REV.</b>	
<b>NAME</b>	<b>SIGNATURE</b>	<b>DATE</b>			

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	<b>TITLE</b>  <b>MOTOR</b>  <b>DATA SHEET - C</b>	<b>SPECIFICATION NO.</b> PE-TS-375-160-A001
		<b>VOLUME</b> II B
		<b>SECTION</b> D
		<b>REV NO. 00</b> <b>DATE 09.07.12</b>
		<b>SHEET</b> 2 <b>OF</b> 2

S. No.	Description	Data to be filled by successful bidder
	c) At starting	
<b>C.</b>	<b>Constructional Features</b>	
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)	
<b>D.</b>	<b>Characteristic curves/ drawings</b> (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	

<b>NAME OF VENDOR</b>			<b>SEAL</b>	<b>REV.</b>	
<b>NAME</b>	<b>SIGNATURE</b>	<b>DATE</b>			

### GUARANTEED POWER CONSUMPTION FORMAT

**Design, engineering, manufacturing, supply of material, fabrication, inspection, testing at manufacture's/ sub-vendor's works, painting, forwarding, delivery, complete erection & commissioning of Mill Reject System for 3X660 MW LALITPUR.**

#### 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 MRS compressor	2	1		0.66	
TOTAL						

#### NOTE

- 1.0 Estimated power consumption (EPC) figure for the system (for working drives only) has been considered as 204 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 2.41 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 2.41 lac per additional KW shall be levied on vendor.

PEM-6666-0



<b>TITLE</b> TECHNICAL SPECIFICATION FOR MILL REJECT HANDLING SYSTEM	SPECIFICATION NO. PE-TS-375-160-A001	
	VOLUME III	
	SECTION D	
	REV 00	DATE 07.08.12
	SHEET 1 OF 6	

**PRE-BID CLARIFICATION SCHEDULE**

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

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





## TECHNICAL SPECIFICATION FOR MILL REJECT HANDLING SYSTEM

VOLUME III

SECTION D

REV 00

DATE	07.08.12
------	----------

SHEET 2 OF 6

[illegible]

The bidder hereby certifies that above mentioned are the only deviations from 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-375-160-A001

VOLUME III

SECTION D

REV 00

DATE 07.08.12

SHEET 3 OF 6

**INSTRUMENT AIR REQUIREMENT\***

S. No.	Description	Requirement (m <sup>3</sup> / min & Pressure)	Intermittent/ Continuous
01			
02			
03			
04			
05			
06			

**SERVICE WATER REQUIREMENT\***

S. No.	Description	Requirement (m <sup>3</sup> / min & Pressure)	Intermittent/ Continuous
01			
02			
03			
04			
05			
06			

**EQUIPMENT WATER REQUIREMENT\***

S. No.	Description	Requirement (m <sup>3</sup> / 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



TITLE

TECHNICAL SPECIFICATION FOR  
MILL REJECT HANDLING SYSTEM

SPECIFICATION NO. PE-TS-375-160-A001

VOLUME III

SECTION D

REV 00

DATE 07.08.12

SHEET 4 OF 6

## LIST OF START UP &amp; COMMISSIONING SPARES

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

SIGNATURE: \_\_\_\_\_

NAME: \_\_\_\_\_

DESIGNATION: \_\_\_\_\_

COMPANY: \_\_\_\_\_

DATE: \_\_\_\_\_

COMPANY SEAL



TITLE

TECHNICAL SPECIFICATION FOR  
MILL REJECT HANDLING SYSTEM

SPECIFICATION NO. PE-TS-375-160-A001

VOLUME III

SECTION D

REV 00

DATE 07.08.12

SHEET 5 OF 6

**LIST OF SPECIAL MAINTENANCE TOOLS & TACKLES\***

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



TITLE

TECHNICAL SPECIFICATION FOR  
MILL REJECT HANDLING SYSTEM

SPECIFICATION NO. PE-TS-375-160-A001

VOLUME III

SECTION D

REV 00

DATE 07.08.12

SHEET 6 OF 6

### LIST OF RECOMMENDED SPARES FOR 3 YEARS OF TROUBLE FREE OPERATION

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

SIGNATURE: \_\_\_\_\_

NAME: \_\_\_\_\_

DESIGNATION: \_\_\_\_\_

COMPANY: \_\_\_\_\_

DATE: \_\_\_\_\_

COMPANY SEAL

3x660 MW LPGCL LALITPUR STPS - 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	<b><u>Lumpsum prices</u></b>								
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-375-160-A001 taking into account all clarifications, confirmations and agreements till date.								
	<b>Notes:</b>								
a)	<b><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 &amp; instrumentation.</i></b>								
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.								

3x660 MW LPGCL LALITPUR STPS - 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	<b><u>Break - up of Prices given at 1.1.1 above.</u></b>								
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 levels as applicable.								

3x660 MW LPGCL LALITPUR STPS - 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
1.2.13	Lumpsum firm price of trolley mounted sump pump along with all its control, inclusive of all taxes, duties and other levies as applicable.								
1.2.14	Lumpsum firm price for Start-up & commissioning spares (Annexure I) as required inclusive of all taxes, duties and other levies as applicable .								
1.2.15	Lumpsum price for special Maintenance tools and tackels as per annexure II inclusive of all taxes, duties and other levies as applicable.								
1.2.16	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)								
	<b>Total of 1.2.1 to 1.2.16 ( Should match with 1.1.1). However , the break up prices indicated under this head are for internal use only &amp; NOT for any comparison purpose &amp; or making adjustment for scope variation.</b>								
<b>1.3.0</b>	<b>Unit Prices (To be used for adjustment against any scope variation and information)</b>								
1.3.1	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 )								
1.3.2	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 )								
1.3.3	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, solenoide, Limit switch required.)								
1.3.4	Unit price of manually operated knife gate valve (size 200 NB) inclusive of all taxes, duties and other levies as applicable								
<b>1.4.0</b>	<b>Optional price</b>								
1.4.1	VOID								



[illegible]



