	6.	Material	: Body - Carbon steel
			: Stem - Hardened Steel
			: Plug - AISI 316 SS
			: Seat- Stainless steel stellited
	7.	Packing	: Teflon / Grafoil as required
	8.	Yoke	: ASTM A105
	9.	Hand wheel	: Carbon steel
	10.	Design standard	: As per ANSI B 16.34

1.05.12 Stainless Steel Globe Valve

	1.	Reference	: ASTM A-182 F316
	2.	Type	: Globe
	3.	Construction	: Forged Body
	4.	End Connection	: As applicable (eg. ½" Socket Weld etc.)
	5.	Proof Pressure	: 400 Kg/Cm2
	6.	Material	: Body - Stainless steel
			: Stem - Hardened Steel
			: Plug - AISI 316 SS
			: Seat- Stainless steel stellited
	7.	Packing	: Teflon as required
	8.	Yoke	: ASTM A182 F316
	9.	Handwheel	: Carbon steel
	10.	Design standard	: As per ANSI B 16.34

1.05.13 Alloy Steel Globe Valve

	1.	Reference	: ASTM A-182 F22
	2.	Type	: Globe
	3.	Construction	: Forged Body

4.	End Connection	: As applicable (eg. ½" Socket Weld etc.)
5.	Rating	: CL. 2500
6.	Material	: Body - Alloy steel
		: Stem - Hardened Steel
		: Plug - AISI 316 SS
		: Seat- Stainless steel stellited
7.	Packing	: Grafoil as required
8.	Yoke	: ASTM A182 F22
9.	Handwheel	: Carbon steel
10.	Design standard	: As per ANSI B 16.34

1.05.14 Structural Steel

Steel supports for JB's, trays; tubes and related equipments shall not be limited to the following:

a) MS Angle
b) MS Channel
c) I-Beam
d) Hexagonal head Bolt & Nut with washer
e) Foundation Bolt & Nut
f) Expansion Bolt
g) Steel Plates / Flats
h) CRCA sheet
i) 50 NB Pipe
j) Pipe clamps, U Bolts & Nuts
k) Checker plate

1.05.15 Condensate Pot

1.	Reference	: ASTM A182 F22 /ASTM A105
2.	Material	: Alloy steel / carbon steel as per application
3.	Construction	: Drilled from barstock
4.	End connection	: As applicable (e.g 3 nos. ½" socket weld end etc.)

	5.	Accessories	: Vent valves

1.05.16 Instrument Valve Manifold

1.	Type	: Two valve manifold
		: Five valve manifold
2.	Mounting	: Remote 2” Pipe Mounting / Transmitter Rack mounting
3.	Construction	: Single block (bar stock)
4.	Material	: Forged body and bonnet AISI 316 stainless steel
5.	Ports	: Mfg std. (e.g 1/2 " NPT (F) etc.)
6.	Rating	: 420 Kg/Sq. cm at ambient
7.	Operating Temperature	: (-)30 to (+)170 Deg C
8.	Packing	: PTFE Wafer
9.	Seat & Stem	: AISI 316 SS
10.	Plug	: AISI 316 SS free to turn on stem / 17-4 PH
11.	Handle Bar	: AISI 316 SS
12.	Connection	: Straight
13.	Accessories	: Plugs for all ports, Mounting Bracket , bolts , nuts

1.06.00 Pneumatic Hook Up Accessories

1.07.00 Air Header

Technical Particulars	**For Panel**	**For Field**
Material of Construction	: Stainless steel	: Stainless steel
Inlet Connection	: 2" NPT (M)	: 1" NPT (M)
Header Take-off Material	: Stainless steel	: Stainless steel
Take off connection	: 1 / 2” NPT (M)	: 1/ 2” NPT (M)
Take-off Valves Material	: stainless steel	: stainless steel

Tube Take-off	: Tube adapter on valve	: Tube adapter on valve
Drain	: SS drain valve at lowest point	: SS drain valves at lowest point

VOLUME : III-C

SECTION-XIII

TECHNICAL SPECIFICATION

FOR

PROTECTIVE LINING AND PAINTING

SECTION-XIII

TECHNICAL SPECIFICATION

FOR

PROTECTIVE LINING AND PAINTING

C O N T E N T S

SECTION-XIII

TECHNICAL SPECIFICATION

FOR

PROTECTIVE LINING AND PAINTING

1.00.00 INTENT OF SPECIFICATION

1.01.00 This specification addresses the requirements of all labour, material, and appliances necessary with reference to preparations for lining / painting, application as well as finishing of all lining / painting for all mechanical and electrical equipment, piping and valves, structures etc. included under the scope of this Package.

1.02.00 The Bidder shall furnish and apply all lining, primers including wash primers if required, under-coats, finish coats and colour bands as described hereinafter or necessary to complete the work in all respects.

2.00.00 CODES & STANDARDS

2.01.00 The Bidder shall follow relevant Indian and International Standards wherever applicable in cleaning of surface, selection of lining material / paints and their application. The entire work shall conform to the following standards / specifications (latest revision or as specified).

a) SSPC SP 10 / NACE 2 /	:	Near White Blast Cleaning
b) SSPC PA 2	:	Measurement of dry film Coating Thickness with magnetic gauges.
c) ASTM D 4541	:	Method for pull off strength using portable Adhesion Tester.
d) NACE RP 0274 – 2004	:	High-Voltage Electrical Inspection of Pipeline Coatings
e) NACE SP 0188 – 2006	:	Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates

f)	NACE RP 0169 – 2002	:	Control of External Corrosion on Underground or Submerged Metallic Piping Systems
g)	AWWA C 210 – 2007	:	Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
h)	IS 3589:2001 Annexure B	:	Steel Pipes for Water and Sewage Specification.
i)	AWWA C222-2000	:	Polyurethane Coating for the Interior and Exterior of Steel Water Pipe and Fittings.
j)	IS 13213 : 2000	:	Polyurethane Full Gloss Enamel (Two pack)

3.00.00 GENERAL REQUIREMENTS

3.01.00 The steel surface preparation prior to actual commencement of coating shall conform to SSPC SP 10 / NACE 2 / Sa2½ (near white metal) with sand blasting.

3.02.00 The contractor shall submit a detailed written description in the form of a manual covering coating equipment, procedures, materials inspection test, and repair etc. to Owner/Consultant for approval.

3.03.00 The contractor shall also provide copies of test reports from NABL approved laboratory (like National Test House, Kolkata) in support of the paint/primer materials to be used shall conform to the specification requirement.

3.04.00 The contractor shall also provide certificates from paint/primer manufacturer mentioning the batch numbers, date of manufacture and shelf life etc. of the materials to be used. In addition to that Manufacturing Quality Plan (MQP) and Field Quality Plan (FQP) shall also be submitted prior to commencement of supply of material and field application.

3.05.00 Paint/coating application work at site shall be done either by paint manufacturer or by their authorized applicator. The authorized applicator shall have proper training & certification from manufacturer. Applicator shall possess all the necessary specialized equipment and manpower experienced in similar job.

3.06.00 Applied coating shall be tested for dry film thickness, holiday (electrical inspection for continuity) and adhesion as per relevant standard such as SSPC PA 2, NACE RP 0274 and ASTM D 4541.

3.07.00 If necessary, the material may be heated and applied by airless spray / plural component spray system.

3.08.00 Manufacturer's specific recommendation, if any, shall be followed during application of lining / paints.

3.09.00 In areas where there is danger of spotting automobiles or other finally finished equipment or building by wind borne particles from paint spraying, a Purchaser approved method shall be adopted.

3.10.00 The colour scheme of the entire Plant, covered under this specification shall be approved by the Purchaser in advance before application.

3.11.00 All indoor and outdoor piping, insulated as well as uninsulated will have approved colour bands painted on the pipes at conspicuous places throughout the system, as approved by Purchaser.

3.12.00 Inside surfaces of vessels / tanks shall be protected by anticorrosive paints or rubber lining as required / specified elsewhere in the specification. External surfaces of all vessels / tanks shall be protected by anti corrosive painting.

3.13.00 For vessels / tanks requiring lining and epoxy painting all inside surface shall be blast cleaned using non-siliceous abrasive after usual wire brushing.

3.14.00 Natural rubber lining shall be provided on the inside of vessels / tanks as required / specified elsewhere in the specification, in three layers resulting in a total thickness not less than 4.5 mm.

3.15.00 Surface hardness of rubber lining shall be 65 +/- 5 deg. A (shore).

3.16.00 After the lining is completed, the vessels / tanks shall not be subjected to any prolonged exposure to direct sunlight in course of its transportation, erection etc. They shall not be stored in direct sunlight. No further lining or burning shall be carried out on the vessel, after application of the lining.

3.17.00 All lining projecting outside of the vessel shall be protected adequately from mechanical damages during shipment, handling storage etc.

3.18.00 Suitable warnings, indicating the special care that must be taken with respect to these lined vessels shall be stenciled on their outside surface with the letters at least 12 mm high.

3.19.00 All insulated piping shall have aluminium sheet jacketing.

4.00.00 EQUIPMENT, MATERIAL AND SERVICES TO BE FURNISHED BY THE BIDDER

4.01.00 After erection at site, the outside surfaces of all equipment having a shop coat shall be given further priming coat and finished coats of paint as detailed in following clauses. However, if the painting system is such that the shop coat and primer coat to be applied at site are not compatible, then shop coat has to be removed from the surface of equipment before application of primer coat with prior blasting.

All factory finished paints shall be touched up at site as required.

All uninsulated piping shall be finished with final paintings after use of proper wash primer and primer. Aluminium sheet jacketed piping need not be painted. Colour bands of Purchaser's approved shade shall however be applied on jacketed piping near walls or partitions, at all junctions, near valves and all other places as instructed by the Purchaser. All structures shall be painted with approved paint.

4.02.00 Surface Preparation

4.02.01 Unless mentioned otherwise, all rust and mill scale shall be removed by blasting to Sa 2-1/2 Swiss Standard before applying the primer.

4.02.02 Special care shall be taken to remove grease and oil by means of suitable solvents like Trichloroethylene or Carbon Tetrachloride.

4.02.03 The minimum degree of surface preparations for all equipment, piping, fittings, valves, structures etc. shall be "Near White" according to Steel Structure, Painting Council-SSPC-SP-10 before application of any primer/paint.

4.03.00 Painting

4.03.01 Specification for application of paints for external surfaces protection of vessels / tanks / equipment / piping / fittings / valves etc. to be installed indoor shall be as follows :

a) Surface preparation shall be done either manually or by any other approved method.

b) Primer Coat shall consist of one coat (minimum DFT of 50 microns) of chlorinated rubber based zinc phosphate.

c) Intermediate Coat (or Under Coat) shall consist of one coat (minimum DFT of 50 microns) of chlorinated rubber based paint pigmented with Titanium Dioxide.

d) Top Coat shall consist of one coat (minimum DFT of 50 microns) of chlorinated rubber paint of approved shade and colour with glossy finish.

e) Total DFT of paint system shall not be less than 150 microns.

4.03.02 Specification for application of paints for external surfaces protection of vessels / tanks / equipment / piping / fittings / valves etc to be installed **outdoor** shall be as follows :

a) Surface preparation shall be done by means of sand blasting, which shall conform to Sa 2-1/2 Swiss Standard.

b) Primer Coat shall consist of one coat (minimum DFT of 100 microns) of epoxy resin based zinc phosphate primer.

c) Intermediate Coat (or Under Coat) shall consist of one coat (minimum DFT of 100 microns) epoxy resin based paint pigmented with Titanium Dioxide.

d) Top Coat shall consist of one coat (minimum DFT of 75 microns) of epoxy paint of approved shade and colour with glossy finish. Additional one coat (minimum DFT of 25 microns) of Finish Coat of polyurethane shall be provided.

e) Total DFT of paint system shall not be less than 300 microns.

4.03.03 Specification for application of paints for external surfaces protection of steel pipes and fittings which are **buried underground / laid inside a hume pipe & or submerged Under Water and laid under Pipe Trenches** (in road/rail/pipe or trench crossings) shall be as follows :

External surface of the pipe, fittings, specialties etc. handling raw water/clarified water/filter water shall be painted with one coat of two part chemically cured polyurethane primer of min 50 micron dry film thickness followed by three or maximum four coats of two part solvent less polyurethane to build up coating of dry film thickness of 2000 micron including primer coat.

4.03.04 Specification for application of paints for **internal surface protection of large diameter pipes** (sizes above 600 mm NB and above) if any, shall be as follows :

a) All Internal surfaces of steel pipes, fittings, specialties etc. buried underground or located within pipe trenches shall be given epoxy coating to protect them from (except for drinking water service, where the compatible painting shall be so selected to meet relevant quality standards) corrosion.

b) Internal surface of the pipe should be coated with one coat of two part epoxy primer with not less than 50 micron DFT (dry film thickness) followed by two part polyamide cured solvent less epoxy.

c) The minimum dry film thickness (DFT) of internal lining shall be 600 micron.

4.03.05 Specification for application of paints for protection of **internal surfaces of DM Water Storage Tank(s)** shall be as follows :

a) Primer - One coat of epoxy primer containing high level of Zinc Phosphate anticorrosive pigment. Total Dry Film Thickness (DFT) of primer shall not be less than 125 microns.

b) Finish Paint - Three (3) coats Polyamine HB Epoxy Paint. Total Dry Film Thickness (DFT) of finish paint shall not be less than 125 microns per coat.

c) Total thickness of primer and paint should not be less than 500 microns.

4.03.06 All motors, local push button stations, cable racks, structures used for supports etc. are to be painted with acid proof paint.

4.03.07 The following surfaces shall not be painted - stainless steel, galvanized steel, aluminum, copper, brass, bronze and other nonferrous materials.

4.03.08 No painting or filler shall be applied until all repairs, hydrostatic tests and final shop inspection are completed.

4.03.09 All machined surfaces shall have two (2) coats of water repellant grease after thorough cleaning.

5.00.00 COATING PROCEDURE AND APPLICATION

5.01.00 Surface Preparation :

Pipe shall be blast cleaned by sand. The cleanliness achieved prior to application shall be in accordance with the requirement of SSPC SP 10 / NACE 2 / Sa2½ of ISO 8501 (near white metal)

a) The blast pattern or profile depth shall be 40 to 100 micron and shall be measured by dial micrometer.

b) Before sand blasting is started or during blasting or coating, temperature of the pipe surface should be more than 3°C above dew point temperature. Blast cleaned surface should be primed within 4 hours and shall be protected from rainfall or surface moisture and shall not be allowed to flash rust. If the rust occurs, the surface again to be prepared by sand blasting or wire brushing.

5.02.00 Application of Epoxy Coating

a) Coating shall be applied when

i) When the pipe surface temperature shall be atleast 3°C above dew point temperature.
ii) The temperature of mixed coating material and the pipe at the time of application shall not be lower than 10°C or greater that 50°C.

b) Material preparation shall be in accordance with manufacturer's recommendations.

c) Application of epoxy coating system :

The epoxy coating system shall be applied as per recommendation of the manufacturer and shall be applied by airless spray / plural component spray machine. For more than one coat, the second shall be applied with the time limits as recommended by the manufacturer.

5.03.00 Application of PU Coating

a) PU coating shall be applied when the pipe surface temperature atleast 3°C above dew point temperature (when R.H is more than 85%).

b) Material preparation and application shall be done as per manufacturer recommendation.

6.00.00 TEST REQUIREMENTS :

6.01.00 Measurement of dry film thickness

Measurement of dry film thickness of coating : Coating thickness shall be in the range of ±20% and as per SSPC PA 2.

6.01.01 Apparatus / Instrument:-

The instrument used for dry film thickness may be Type 1 pull of gauges or Type 2 electronic gauges.

6.01.02 Procedures:-

a) Number of measurements:
For 100 square feet (9.29 square meters), five (5) spots per test area (each spot is 3.8 cm) in diameter. Three gauge readings per spot (average becomes the spot measurement).

b) If the structure is less than 300 square feet, each 100 square feet should be measured.

c) If the structure is between 300 and 1000 sq ft, select 3 random 100 square feet test areas and measure.

d) For structure exceeding 1000 square feet, select 3 random 100 square feet testing areas for the first 1000 sq ft and select 1 random 100 square feet testing area for each additional 1000 square feet

e) Coating thickness Tolerance: Individual reading taken to get a representative measurement for the spot are unrestricted (usually low or high readings are discarded). Spot measurements (the average of 3 gauge readings) must be within 80% of the minimum thickness and 120% of the maximum thickness. Area measurement must be within specified range.

6.02.00 Electrical Inspection (Holiday) Test

6.02.01 All the coated / lined pipes shall be tested with an approved high voltage holiday detector preferably equipped with an audio visual signaling device to indicate any faults, holes, breaks or conductive particles in the protective coating.

6.02.02 The applied output voltage of holiday detector shall have a spark discharge of thickness equal to at least twice the thickness of the coating to assure adequate inspection voltage and compensate for any variation in coating thickness. The electrode shall be passed over the coated surface at approximately half the spark discharge distance from the coated surface only one time at the rate of approximately 10 to 20m/min. The edge effect shall be ignored. Excessive voltage shall be avoided as it tends to induce holiday in the coated surface thereby giving erroneous readings.

6.02.03 While selecting test voltages, consideration should be given to the tolerance on coating thickness and voltage should be selected on the basis of maximum coating thickness likely to be encountered during testing of a particular pipe.

The testing voltage shall be calculated by using following formula. (as per NACE 0274 : 2004)

Testing Voltage V = 7900 $\sqrt{T}$ ± 10 percent where T is the average coating thickness in mm.

6.02.04 Any audio visual sound or spark leads to indicate pinhole, break or conductive particle.

6.03.00 Adhesion Pull off Test :

After holiday the coated surface is subjected to adhesion pull off test as per ASTMD 4541.

6.03.01 Apparatus / Instrument: Adhesion tester consists of three basic components:

A hand wheel, a black column containing a dragging indicator pin and scale in the middle and a base containing three legs and a pulling “Jaw” at the bottom and also dollies.

6.03.02 Prepare the test surface :

Once test area is selected, test area shall be free of grease, oil, dirt, water. The area should be flat surfaces and large enough to accommodate the specified number of replicate test.

6.03.03 Prepare Dolly (Test Pull Stub) :

The dolly is a round, two sided aluminium fixture. Both sides of the dolly looks same, however, one side sloped on top surface while flat on bottom surface. As the surface of the dolly is polished aluminium, roughen the same using a coarse sand paper.

6.03.04 Select an adhesive:

Use araldite, a 100% solid epoxy adhesive. This adhesive requires at least 24 hours at room temperature to cure.

6.03.05 Attach the dolly to the surface.

a) Using a wooden stick, apply an even layer of adhesive to the entire contact surface area of the dolly.

b) Carefully remove the excessive adhesive by using a cotton swab. Allow the adhesive to fully cure before performing the adhesion test.

c) Attach the dolly to the coated surface and gently push downward to displace any excessive adhesive.

d) Push the dolly inward against the surface, then apply tape across the head of the dolly.

6.03.06 Adhesion Test Procedure

a) Attach the adhesion tester to the dolly by rotating the hand wheel counter clockwise to lower the jaw of the device.

b) Slide the jaw completely under the head of the dolly. Position the three legs of the instruments so that they are sitting flat on the coated surface.

c) Slide the dragging indicator pin on the black column to zero by pushing it downward.

d) Firmly hold the base of the instrument in one hand and rotate the handwheel clockwise to raise the jaw of the device that is attached to the head of the dolly. The dragging indicator pin will move upward on the black column as the force is increased and will hold the reading. Apply the tension using a moderate speed. Continue to increase the tension on the head of the dolly until (a) the minimum PSI/MPa/Kg/cm² required by project specification is exceeded and the test is discontinued, (b) the maximum PSI/MPa/Kg/cm² of adhesion tester has been achieved and dolly is still attached, (c) The force applied by the adhesion tester causes the dolly to dislodge.

e) Read the scale and record the adhesion value.

6.04.00 Coating Repair

Defective Coating shall be repaired in accordance with the following subsections.

6.04.01 Surface Preparation:

Accessible areas of pipe requiring coating repairs shall be cleaned to remove debris and damaged coating using surface grinders or other means. The adjacent coating shall be feathered by sanding, grinding or other method. Accumulated debris shall be removed by blowing with contaminant free air or wiping with clean rags.

6.04.02 Areas not accessible for coating repair such as interior surfaces of small diameter pipe shall be reprocessed and recoated.

6.04.03 Coating Application :

The coating system shall be applied to the prepared areas in accordance with procedure.

6.04.04 Repair Inspection :

Repaired portion shall be electrically inspected using a holiday detector.

6.05.00 Welded Field Joints

6.05.01 Preparation :

The weld joints shall be cleaned so as to be free from mud, oil, grease, welding flux, weld spatter and other foreign contaminants. The cleaned metal surfaces of the weld joint shall then be blasted or abraded using rotary abrading pads. The adjacent liquid Epoxy / PU coating shall be feathered by abrading the coating surface for a distance of 25 mm.

6.05.02 Electrical Inspection :

After curing the coating system applied to the welding joints shall be holiday tested. Any holidays indicated by the detector shall be marked with chalk to identify the area of repair.

7.00.00 INFORMATION/DATA REQUIRED

The Bidder shall submit complete list of paints and primers proposed, giving detail information, such as, chemical composition, drying time etc. and also unit rates for application of each type of paint along with supply shall be furnished.

ANNEXURE-III

1X800 MW KOTHAGUDEM TPS - MILL REJECT HANDLING SYSTEM

PROPOSED SUB-VENDOR LIST (with tentative inspection category)

Sl. No	ITEM/SERVICE	QAP/ INSP.CAT.	Scope of supply/manufacturer	Place	Remarks by BHEL
I	**SELF MFG ITEMS**				
1	Pyrite Hopper	I	Self manufacturer		
2	Blow Tank	I	Self manufacturer		
3	Bunker Discharge Gate (Sector Gate)	I	Self manufacturer		
4	Pressure Relief Valve	I	Self manufacturer		
5	Local Control Panel with accessories	I	Self manufacturer		
6	Mill Reject Conveying fittings/Bends	I	Self manufacturer		
7	Swing Valve(Pneumatic operated)	I	Self manufacturer		
II	**BOUGHT OUT ITEMS**				
A	**MECHANICAL**				
1	Terminal Box	I	BHEL/Customer Approved Fabricators	INDIA	
2	Air Receiver	I	PARKARE	DELHI	
		I	UNITTED ENGG WORKS	NASIK	
		I	INTEGRATED ENGINEERS	PUNE	
		I	TEMASME VESELLEX	NOIDA	
		I	DIAMOND FABRICATIONS	PUNE	
3	DRAIN TRAP	III	SPIRAX MARSHAL	MUMBAI	
		III	GREAVES COTTON	MUMBAI	
		III	TRIDENT	COIMBOITORE	
4	Gate, Globe, Check valves/ NRV - C.I up to 600NB PN16	III	LEADER	JULLANDHAR	
		III	BANKIM	HOWRAH	
		III	H SARKAR	HOWRAH	
		III	KBL	KONDHAPURI	
		III	AV VALVES	AGRA	
5	Gate, Globe, Check valves/ NRV - G.M	III	LEADER	JULLANDHAR	
		III	BOMBAY METALS & ALLOYS (GG)	MUMBAI	
		III	SANT VALVES	JULLANDHAR	
6	Knife Gate/Plate Valve (H/W Operated & Cylinder Optd)	I	FOURESS	MUMBAI	
		I	VASS	CHENNAI	
		I	ORBINOX	COIMBATORE	
7	Ball Valves	III	Weir BDK	HUBLI	
		III	FLOW CHEM	KALOL	
		III	PRECISION ENGG	MUMBAI	
		III	LEADER	JULLANDHAR	
8	Safety Relief Valve	III	LEADER	JULLANDHAR	
		III	KAYSTONE(TYCO FLOW CONTROL)	HALOL	
		III	BHEL	TRICHY	
		III	SPIRAX MARSHAL	AGRA	
9	M.S G.I / ERW PIPES	I	JINDAL	GHAZIABAD	
		I	SURYA ROSHINI	BAHADURGARH	
		II	SAIL	ROURKELA	
		I	WELLSPUN	ANJAR	
		I	INDUS	GB NAGAR	
		II	TISCO	JAMSHEDPUR	
		I	MAHARASHTRA SEAMLESS	MAHARASHTRA	
10	Metallic Expansion Bellow(Metallic)	I	METALLIC BELLOWS	CHENNAI	
		I	SUR INDUSTRIES	KOLKATA	
		I	LONESTAR	CHENNAI	
11	Rupture Disc	II	BS & B SAFETY SYSTEM	CHANNAI	
12	Chain Pulley Block (1 Ton)	II	HERCULES (INDEF)	MUMBAI	
		II	TRACTEL	FARIDABAD	
		II	LIFTING EQUIPMENTS & ACESSORIES	DELHI	
13	Conveying Air Compressor (Screw Type)	I	ELGI EQUIPMENTS LTD	COIMBATORE	
		I	ATLAS COPCO (INDIA) LTD.	PUNE	
		I	INGERSOLL RAND	NEW DELHI	
14	Sump Pump (Water Service)	II	KSB PUMP	PUNE	
		II	MATHER & PLATT	PUNE	
		II	B & C	CHENNAI	
		II	SAM	COIMBOITORE	
		II	KIRLOSKER	PUNE	
		II	FLOWMORE	GHAZIABAD	
		II	WORTHINGTON	GHAZIABAD	
15	Pneumatic Actuator/Cylinder(Metallic)	III	SCHRADDER	MUMBAI	
		III	NUCON	HYDERABAD	
		III	ROTEX	MUMBAI	
		III	VAAS	CHENNAI	
16	GRATING	III	INDIANA	PUNE	
17	Tools & Trackles	III	BRANDED		
18	Steel Plate/ Structure/ Section/ SS liner	III	SAIL		
		III	JSW STEEL LTD.		
		III	TISCO		
		III	ESSAR STEEL		
		III	IISCO		
		III	LLOYDE STEEL INDUSTRIES LTD.		
		III	JINDAL STEEL & POWER LTD.		

		III	RINL	VIZAG	
19	Bag Filter	I	ORIENT FANS (ACCO)	KOLKATA	
		I	THERMAX	PUNE	
		I	FLAKT	MUMBAI	
		I	BATLIBOI	DELHI	
B	**ELECTRICAL & INSTRUMENTATION**				
1	Motor (LT)	I	MARATHON	KOLKATA	
		I	SIEMENS	MUMBAI	
			NGEF	BANGLORE	
		I	KEC	BANGALORE/HUBLI	
		I	CGL	AHMED NAGAR	
		I	ABB	FARIDABAD/BANGLORE	
		I	BBL	MUMBAI	
2	Air Filter/Lubricator/Regulator	III	SHAVONORGAN	MUMBAI	
		III	PLACKA	CHENNAI	
3	Level Probes(RF)/Capacitance type	II	EIP ENVIRO LEVEL CONTROL	NOIDA	
		II	NIVO CONTROL	INDORE	
		III	E&H	GERMANY/AURANGABAD	
		II	FLOW STAR	FARIDABAD	
4	Annunciator	III	IIC	MUMBAI	
		III	PECON	AHEMDABAD	
		III	PROCON	CHENNAI	
5	Solenoid Valves	III	NUCON	HYDERABAD	
		III	JEFFERSON	ARGENTINA	
		III	HARION	GERMANY/AURANGABAD	
		III	ASCO(I)	CHANNAI	
		III	SCHRADER DUNCAN LTD.	MUMBAI	
		III	AVCON CONTROLS	MUMBAI	
		III	ROTEX AUTOMATION	BARODA/VV NAGAR	
6	Pressure Switch, DP Switch/ Temp.Switch	II	SWITZER	CHENNAI	
		II	TRAFAG	RANIPETH	
		II	GAUGE BOURDON (FOR PRESSURE SWITCH)	PANVEL	
		II	ASHCROFT	GANDHINAGAR	
		II	ASHCROFT	USA/GERMANY	
7	Pressure Gauge & DP Gauge	III	GAUGE BOURDON	PANVEL	
		III	MANOMETER INDIA	MUMBAI	
		III	AUXITROL	UK	
		III	BUNDENBURG	UK	
		III	GOA THERMOSTATIC	GOA	
		III	GUCK INDIA	MUMBAI	
		III	WIKA	PUNE	
		III	SWITZER(DP INDICATOR)	CHENNAI	
		III	AN INSTRUMENTS	KOLKATA	
		III	H GURU (SI)	BANGALORE	
8	Temperature Gauge	III	AN INSTRUMENTS	KOLKATA	
		III	WIKA	PUNE	
		III	GIC	MUMBAI/GOA	
		III	BUDENBURG	UK	
		III	GOA THERMOSTATIC	GOA	
		III	H GURU (SI)	BANGALORE	
		III	WAREE	MUMBAI	
9	Pulse Jet Valves	III	ASCO	CHENNAI	
		III	MANIK	CHENNAI	
10	Cable Lug	III	BILLET (3D)	VALSAD	
		III	DOWELLS	MUMBAI	
		III	COMETT	NASIK	
11	Limit Switch	III	JAIBALAJI	CHANNAI	
		III	SIEMENS	MUMBAI	
12	Junction Boxes & Earthing Material ROD, FLAT etc.	III	Customer/BHEL APPROVED VENDOR		
14	INSTRUMENT CABLE	I	DELTON CABLES	BANGLORE	
		I	PARAMOUNT CABLES	FARIDABAD	
		I	POLYCAB	DAMAN	
		I	UNIVERSAL CABLES	SATNA	
		I	NICCO	KOLKATTA	
		I	CORDS	BHIWADI	
		I	INCAB	PUNE	
15	Cable Tray	II	MJ ENGG	DELHI/BHIWADI	
		II	JAMUNA METALS	DELHI/SONEPAT	
		II	INDUSRIAL PERFORATION	KOLKATA	
		II	INAR PROFILES	ANAKAPLLI	
		II	INDIANA	MUMBAI	
		II	TECHNO	CHANDIGARH	
16	Cable Gland	III	COMMET	MUMBAI	
		III	SUNIL & CO	KOLKATA	
		III	ARUN ENGG.	KOLKATA	
		III	QUALITY PRECISION	KOLKATA	
17	Local Panel/LPBS	I	CONTROL DEVICES	KOLKATA	
			PYROTECH	UDAIPUR	
			C&S	NOIDA/HARIDWAR	
			INDUS CONTROL AND APPLIANCE	MUMBAI	
			POSITRONICS	BARODA	

			SWITCHING CIRCUITS	KOLKATA	
			JACKSON	GR. NOIDA	
			JOLLY ENGG.	KOLKATA	
18	FRP JUNCTION BOXES	III	Customer/BHEL APPROVED VENDOR	INDIA	
19	LEVEL INDICATOR/GAUGE	III	SBEM PVT. LTD.	PUNE	
		III	PUNE CONTROL	PUNE	
		III	LEVCON	KOLKATA	
		III	SIGMA	MUMBAI	
		III	DK INSTRUMENTS	KOLKATA	

NOTE: Category of inspection and make shall be subject to customer's approval during detail engineering.

LEGENDS

1. QP/INSPN CATEGORY :

CAT-I : For these items the Quality Plans are approved by Customer and the final acceptance will be on physical inspection witness by Customer.

CAT-II : For these items the Quality Plans approved by Customer. However no physical inspection shall be done by Customer. The final acceptance by Customer shall be on the basis review of documents as per approved QP.

CAT-III : For these items Main Supplier approves the Quality Plans. The final acceptance by Customer shall be on the basis certificate of confonnance by the main supplier

UNIT/WORKS : Place of manufacturing Place of Main Supplier of multi units/works.

NOTE·1

For steel following modalities to be adopted **(Rev.-01)**

a) Steel plate, structural steel and section shall be procured from main producers like SAIL/TISCO/ISSCO/RINL/JINDAL/ESSAR/ISPAT/LLOYD'S STEE;/JSW.

b) Material will be delivered directly from manufacturer's plant/stock yardl godown to Customer project site.

c) Correction of material with MTC will be done by Main Contractor before delivery and Correlated MTC along with delivery challan will be Customer-RIO for issuance of MDCC.

NOTE-2

It that the same Quality Plans as approved for main equipment and identified in the vendor list shall be applicable for the type of control measure i.e. make test/check the procurement of mandatory spares. However, for those spares which are not covered in the approved QP, main supplier shall furnish Certificate of Conformance (COC) along with guarantee and interchangeability certificate duly signed by the main contractor. However, in both cases, the Interchangeability certificate shall be generated by the main item manufacturer, for which the spares are made.

NOTE-3

A) LESS THAN 30 KW:-

Acceptance of Motor less than 30 KW is based on COC of the manufacturer & the contractor confirming as follows:

it is here confirmed that the above mentioned motor/motors was /were manufacture taking care of Customer specific requirements regarding ambient temp., voltage & frequency variation, hot starts, pull out torque, starting KVA/KW, temp. rise , distance between centre of stud & gland plate, space heater and tested in accordance with approved drawing/data sheet

B) 30 KS AND ABOVE & upto 50KW:-

Acceptance of Motor rating between 30 KW & 50 KW is based on Customer review of Routine Test inspection report as per IS 325 witnessed by main contractor along with COC of the manufacturer & the contractor confirming as follows: It is hereby confirmed that the above mentioned motor /motors was/were manufactured taking care of Customer specific requirements regarding ambient temp., voltage & frequency variation, hot starts, pull out torque, starting KVA/KW, temp. rise , distance between centre of stud & gland plate, space heater and tested in accordance with approved drawing/data sheet

ANNEXURE-IV MANDATORY SPARES LIST

S.No.	Equipment Name	Quantity
1	415 Volt Motor (above 30KW Rating upto 200KW)	
1.1	End Shield Cover Driving & Non-Driving End	1Set for each type and rating of Motor
1.2	Driving End & Non-Driving End Bearing	1Set for each type and rating of Motor
1.3	Cooling Fan	1No. for each type and rating of Motor
1.4	Motor Space Heater	1No. for each type and rating of Motor
1.5	Motor Terminal Block	1No. for each type and rating of Motor
1.6	Complete Set of Coupling	1Set for each Application
2	Field Instruments	
2.1	Transmitters/ Gauges/Switches etc. along with relevant accessories	10% of total or at least two (whichever is higher) for each type along with accessories.
2.2	Temperature Element (RTD/Thermo-couple) with thermowell	10% of each type, range and immersion length. Minimum 5 nos.
3	Process Connection Piping (Impulse piping/tubing, sampling piping / tubing & air supply piping as applicable)	
3.1	Valves of all types	10% of each type, class, size & model
3.2	Valve Manifolds (2 way/3 way/5 way)	10% of each type, class, size & model
3.3	Fittings	10% of each type, class, size & model
3.4	Filter Regulators	20% of each model
4	Junction Box	
4.1	Junction box	10% of total quantity for each size but minimum 2 nos.
4.2	Terminals in Terminal blocks	10 nos. of each type

NOTES:	
a)	**Unless stated otherwise, a 'set' means item or sub-items required for each type/ size, range of assembly/ sub- assembly required for complete replacement in one equipment system; it is further intended that the assembly/ sub-assembly which have different orientation (like left hand or right hand, top or bottom), different direction of rotation or mirror image positioning or any other reasons which result in marinating two different sets of spares to be used for subject assembly/ sub assembly, these shall be considered as different type of assembly/ sub assembly.**
b)	**Wherever quantity has been specified as percentage (%), the quantity of mandatory spares to be provided by the vendor shall be the specified percentage (%) of total population required to meet the specification requirements. In case the quantity of mandatory spares so calculated happens to be in fraction, the same shall be rounded off to next higher whole number.**
c)	**Wherever the quantities have been indicated for each type, size, thickness, material, radius, range etc., these shall cover all the items supplied and installed and the breakup of these shall be furnished by the vendor during detail engineering.**
d)	**In case spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder should offer spares applicable to the offered design with quantities generally in line with the approach followed in the above list.**
e)	**Wherever bidder has indicated an item as not applicable, the same will have to be supplied free of cost, in case it is found applicable during detail engineering.**

ANNEXURE - V

VOLUME: IIIE

SECTION-V

LOW PRESSURE PIPING, VALVES AND SPECIALITIES

CONTENT

VOLUME : IIIE

SECTION-V

LOW PRESSURE PIPING, VALVES AND SPECIALTIES

1.00.00 GENERAL INFORMATION

This section covers all the low-pressure piping up to 400mm NB size, associated valves and specialties that include but is not limited to the following systems.

1.01.00 Service Air System - shall consist of distributions service air to different buildings.

1.02.00 Instrument Air System - shall comprise of distribution of instrument quality air to pneumatically operated instruments/ valves/dampers.

1.03.00 Demineralised Water Supply system including hot well make-up water piping from condensate storage tank.

1.04.00 Demineralised Water closed cycle cooling system.

1.05.00 Service water system.

1.06.00 Potable water system.

1.07.00 Any other low pressure piping as found necessary during detail engineering shall also be included.

2.00.00 CODES AND STANDARDS

2.01.00 In addition to the requirements spelt out in Volume IIA, the design, manufacture, inspection and testing of the piping, fittings, valves and specialties covered under this specification shall conform, in general, to the standards and codes (latest edition) mentioned below:

2.01.01	IS-1239 [Part-I & II]	:	Mild steel tubes, tubular and other wrought steel fittings.
2.01.02	IS-3589	:	Electrically welded steel pipes for water, gas and sewage (150 to 2000 mm nominal diameter)
2.01.03	IS-554	:	Dimensions for pipe threads where pressure tight joints are required on the threads.
2.01.04	IS-1363 [Part-I & II]	:	Hexagonal head bolts, screws and nuts (size range M5 M36)

2.01.05	IS-1364	:	Precision and Semi-precision hexagon bolts, screws, nuts and lock nuts (diameter range 6 to 39 mm)
2.01.06	IS-3138	:	Hexagon bolts & nuts (M42 to M150)
2.01.07	IS-5312	:	Swing check type reflux (non-return) valves.
2.01.08	IS-2379	:	Colour code for the identification of pipelines.
2.01.09	IS-2016	:	Plain washers
2.01.10	IS-2712	:	Compressed asbestos fibre jointing
2.01.11	ANSI B-16.5	:	Steel pipe flanges and flanged fittings
2.01.12	ANSI B-16.9	:	Wrought steel Butt welding flanged
2.01.13	ANSI B-16.11 ANSI B-36.10	: :	Forged steel fittings, Socket-welding and Threaded. Steel pipes thickness
2.01.14	API-600	:	Steel gate valves
2.01.15	BS-2633	:	Class I Arc welding of ferrite steel pipe work for carrying fluids.
2.01.16	BS-534	:	Specification for steel pipes and specials for water and sewage.
2.01.17	BS-5351	:	Specification for Ball valves.
2.01.18	AWWA-C-504	:	Specification for Butterfly valves.
2.01.19	AWWA-C-208	:	Dimension for fabricated steel water pipe fittings.

2.02.00 Other international codes and standards may also be offered by bidder. However, same may be subject to acceptance by the Purchaser.

3.00.00 **SCOPE OF WORK**

3.01.00 The equipment and materials to be supplied shall include but not be limited to the following:

a) Supply of all low pressure piping including bends, elbows, tees, branches, laterals, crosses, reducing union, couplings, caps, saddles, shoes, flanges, blank flanges, Y-pieces etc. as required for the piping system under the scope of this section.

b) Matching pipes, matching pieces like reducers/enlargers etc., counter flanges with bolts, nuts, washers, temporary and permanent gaskets, threaded union etc.

c) Supply and machining work of flanges, pipe spools and matching pipes to connect flow measuring orifices/nozzles with the main pipe work.

d) All isolating and regulating valves, non-return valves, steam/air traps, relief/safety valves (wherever applicable), strainers, pressure reducing orifices etc. complete with the counter flanges and matching connecting pieces as required within the entire low pressure piping system.

e) Anchors, hangers and supports, etc. as required. Any platform necessary for maintenance and operation of valve and equipment located 1.5 m above any permanent floor or platform including access ladders, supporting structures etc.

f) All secondary structural steel members required for pipe supports from building steel structures and from embedded steel wherever provided including pipe supports in trenches. However, trench piping should be avoided to the extent possible.

g) Funnels, tundishes for drips and drains including all miscellaneous drain piping and drain piping from tundish outlet up to drain points. All drain and vent lines shall be conveniently terminated to floor drain points/permanent drain trenches.

h) Flanges, counter flanges, blank flanges, bolts, nuts, washers, temporary and permanent gaskets, fasteners caps etc. as required for interconnecting piping, valves & fittings.

i) Cleaning and Painting of all piping, valves & specialties at manufacturer's shop.

3.02.00 Following general requirements shall however be provided

a) Instrument Connections including instruments, root valves, sensing lines etc.

b) Pipe stubs and blanking plates etc. required for chemical cleaning and hydro testing.

For conducting acceptance test, the required pressure, temperature, flow measurement points shall be provided.

3.03.00 All miscellaneous instruments

4.00.00 GENERAL DESIGN AND CONSTRUCTION

4.01.00 General Considerations

4.01.01 The piping systems included in this section shall be designed to operate continuously without replacement during the plant service life of 30 years.

4.01.02 The piping system shall be complete in every detail and in accordance with the highest standard of workmanship.

4.01.03 All design and fabrication shall be in accordance with codes/standards specified.

4.01.04 No pipe work shall be run in trenches carrying electrical cables.

4.01.05 Pipe size above 50 NB shall be shop fabricated and of size 50 NB and below shall be field run.

4.01.06 All piping shall be identified by means of colour strips and by adequate lettering, conveniently spaced and located. Identification colours and lettering shall be as approved.

4.01.07 Air release and drain branches shall be provided wherever necessary depending upon the layout and arrangement so that the drains and air release valves are located for easy operation.

4.01.08 Unless otherwise specified, all pipe work shall be suitable for a minimum pressure of 10.0 kg/sq. cm(g) at 80 deg. C or as required by the design of the different piping system, if higher.

4.01.09 **Drain Pipe Work**

a) Low pressure drains shall have an isolating valve at the point of take-off from the pipe or vessel to be drained, or as near as possible for conventional operation.

b) Unless otherwise stated, all drain piping shall be of 25 mm NB minimum and all vent pipings shall be of 15 mm NB size minimum. For pipes up to 50mm NB, pipe wall thickness shall be as per schedule 80 of ANSI B36.10.

c) Unless otherwise stated, wherever a main or branch of any pipeline is terminated with a valve, such terminal valve shall be provided with a blank flange/blanking cap at the free end.

4.01.10 Specification of pipes used in different services included in the L.P piping section has been detailed in Annexure-I.

4.02.00 **Material Specification**

4.02.01 Materials for pipes and fittings shall be as stipulated in Annexure-I. In case bidder wants to offer alternative piping material, same may be accepted by the Purchaser depending on the merits of alternative material.

4.02.02 Pipe attachments for supports, anchors and restraints, which are coming in direct contact with pipes, shall have similar materials as the piping concerned. All other materials of supports, anchors and restraints shall be of tested quality and as per manufacturer's standards.

4.03.00 **Fabrication**

Except where otherwise specified all piping shall have butt-welded connections with a minimum of flanged joints necessary for maintenance. Where flanges are adjacent to welded fittings, weld neck flanges shall be used.

Branches shall, in general, be formed by welding. Standard fittings may be used in positions and for sizes where approval has been given in detail drawings. Pipe bends and tees shall be truly cylindrical and of uniform section. all welded branches shall be reinforced where needed as per the applicable codes/regulations.

4.03.01 Piping shall be fabricated in the shop in the largest transportable sections to minimize the number of field weld joints. The choice of field weld joints locations shall be based on the traverse of the pipe through walls, floors, sleeves or other restrictive areas. Support attachments for major piping shall be done at shop.

4.03.02 All pipes bends shall be made true to angle with no negative tolerance and shall have a smooth surface free of flat spots, crease and corrugations. A cross section through any bent portion of the pipe shall be true in diameter, within plus or minus 3% of the pipe diameter. Pipe bends shall be made from straight pipe pieces of sufficiently higher thickness so that after thinning, the minimum thickness of bends shall not be less than the minimum thickness required for the straight pipe. Thinning allowance shall be considered as per the relevant code.

4.03.03 For bends in pipes straight piece of pipes shall be bent by the contractor to required bend radius. However, forged bends (Bend radius = 1.5 x pipe diameter) wherever required shall be provided.

4.03.04 The ends of Pipe and welded fittings shall be bevelled according to details shown in the relevant piping code. All welding shall be made in such a manner that complete fusion and penetration are obtained without an excessive amount of filler metal beyond root area. The reinforcement shall be applied in such a manner that it shall have a smooth contour merging gradually with the surface of adjacent pipe and welded fittings. Backing rings shall not be used on any pipe welds, unless otherwise approved by the Engineer.

4.03.05 Cutting and Bevelling

a) Carbon steel piping - End preparation for butt welding shall be done by machining/flame cutting.

b) Socket welding - Socket weld and preparation shall be done by saw or machine cutting.

4.04.00 **Hangers, Supports, Anchors**

Normally pipe supports and anchors shall be selected at those points in the buildings where provision has been made for the loads imposed. The cutting of floor/roof beams or the reinforcement in slabs will not be permitted. Piping attached to a plant item shall be supported in such a way that the weight of the piping is not taken by the plant item.

4.04.01 Support spacing shall be as per good engineering practice. However in no case it shall be less than support spacing stipulated in ANSI B31.1.

4.04.02 Accurate weight balance calculations shall be made to determine the required supporting force at each hanger location and the pipe weight load at each equipment connection.

4.04.03 All large pipes and all long pipes shall have at least two supports each arranged so that any length of pipe or valve may be removed without any additional supports being required.

4.04.04 Support steel shall be of structural quality. Perforated strap, wire or chain shall not be used. Support components shall be connected to support steel by welding, by bolting or by beam clamps. Bolt holes shall be drilled not burned. Support components may be bolted to concrete using approved concrete anchors.

4.05.00 **Valves and Accessories**

4.05.01 General Requirements

a) All valves shall be of approved make and type and shall have cast/forged bodies with covers and glands of approved construction and materials as specified in Annexure-II & III. In general all pumps (other than sump pumps), discharge valves shall be motor operated only. Tank inlet valves shall be motor operated only.

b) Valves and specialties to be supplied under this specification will be used for various air and water services and will be located indoor/outdoor and on horizontal/vertical runs of the pipelines. However, mounting of valves in vertical pipe runs should be avoided as far as possible.

c) All valves shall, unless otherwise stated, have the internal diameter same/as the internal diameter of the pipes to be joined.

d) All valves shall receive tests at manufacturer's or contractor's works in accordance with the specific requirements of the approved Codes of Practice. Valves shall be rising stem or otherwise as approved by the Purchaser.

e) Gate valve and Ball valve have been specified with the intention of achieving isolation and tight shut-off. In full open condition, these valves should offer minimum of resistance to fluid flow.

f) Globe valves have been specified with the intention of achieving good control of fluid passing. The plug and seat will have therefore suitable profiles for obtaining such controlling action.

g) Check valves have been specified in order to prevent reverse flow through them.

h) All valves shall function smoothly without sticking, rubbing or vibration on opening or closing and shall be suitable for most stringent service conditions i.e. flow, temperature and pressure under which they may be required to operate.

i) Material, design, manufacture, testing etc. for all valves and specialties along with the accessories shall conform to the latest editions of codes.

j) By pass valves shall be provided for larger size valves as per standards followed and as felt necessary for smooth and easy operation, even though not specifically mentioned in the specification.

k) All flanged valves and specialties to be supplied under this section shall be provided with two (2) counter flanges, bolts, nuts, washers, gaskets etc.

l) All valves shall be of approved design and manufacture. Where valves are of similar size and type they shall be interchangeable with one another. Valves shall have welded or flanged connections subject to the Purchaser's approval.

m) All valves shall have outside screwed spindles and screwed thread of spindle shall not pass through or into the stuffing box. Where valves are exposed to the weather, protective covers shall be provided for the spindles, which shall be subject to approval.

n) Gate, Globe and Ball valves shall be provided with the following accessories in addition to other standard items:

   i) Hand wheel with embossed open and shut directions.
   ii) Local position indicator.
   iii) Motorised operation as specified by Engineer.

o) Gate valves, in addition shall be provided with following extra features

   i) Bypass valve for larger valves

   ii) Draining arrangement

   iii) Enclosed Gear operators for valves 300 mm size and above for ease in operation.

   iv) Motorised operation as specified by Engineer.

p) All gate and globe valves shall be rising stem type.

q) All valves shall be provided with hand-wheels, chain, operator, extended spindle and floor stand wherever required so that they can be operated manually by a single operator from the nearest operating floor either at a lower or higher elevation as the case may be. If such a valve is provided with integral bypass then similar arrangement shall be done for the bypass valve also.

r) All valves and specialties shall be provided with brass Tag Discs indicating Tag numbers and nomenclature of the valve including duty or service intended and the function of the valves specialties.

s) Stems shall preferably be arranged vertically with gland at the top, however, in no circumstances must the stem be inclined downward from horizontal or gland be at the bottom. Globe valves shall be installed with the pressure under the disc. Valves shall not be fitted in inverted position.

t) Where necessary, for accessibility, grease nipples shall be fitted at the end of extension piping and where possible these shall be grouped together and mounted on a common panel situated at a convenient position. A separate nipple shall be provided to lubricate each point. The Bidder shall supply the first fill of oil or grease for these parts. The Bidder shall supply a suitable manually operated grease gun for the standard type of nipple provided.

u) The spindles for all valves for use outside the building shall have weatherproof protection covers of approved construction.

v) All valves shall be fitted with indicators so that it may be readily seen whether the valves are open or shut. In the case of those valves fitted with extended spindles, indicators shall be fitted both to the extended spindles and to the valve spindles.

w) Plastic or bakelite valve hand wheels will not be accepted.

x) All valves shall be closed by rotating the hand wheel in a clockwise direction when looking at the faces of the hand wheel. The face of each hand wheel shall be clearly marked with the words 'Open' and 'Shut' with arrows adjacent to indicate the direction of rotation to which each refers.

y) Wherever practicable heavy valves of total weight including actuator, drive motor, integral by-pass etc., equal to or greater than 500 kg. shall be provided with suitable lugs to permit direct suspension by hanger rod or direct resting on bottom support, as applicable.

z) Special attention shall be given to the operating mechanism for large size valves in order that quick and easy operation is obtained and maintenance is kept to a minimum.

aa) Eyebolts shall be provided where necessary to facilitate handling heavy valves or parts of valves.

bb) The Bidder shall supply with his bid and in addition during the course of the Contract, comprehensive drawings showing the design of valves, test pressure and working pressure/temperatures. They should include a parts list referring to the various materials used in the valve construction.

cc) All sampling and root valves shall be of integral body bonnet type.

4.05.02 For Design Requirements for different valves refer Annexure-II & III.

4.06.00 **Safety/Relief Valves**

Safety/Relief valves shall be of direct spring loaded type and shall have a tight, positive and precision closing.

All safety valves shall be provided with manual lifting lever.

Valves used for air and any other compressive fluid shall be of pop type.

Safety/Relief valves shall be constructed and adjusted to permit the fluid to escape without increasing the pressure beyond 10% above the set blow off pressure. Valve shall reset at a pressure not less than 2.5% and more than 5% of the set pressure.

Releasing capacity of the safety/relief valves shall be as per the applicable codes and standards and shall be subject to the approval of the Engineer.

The seat and disk of safety valves shall be of suitable material to resist erosion. The seat of valve shall be fastened to the body of the valve in such a way that there is no possibility of the seat lifting.

4.07.00 **Hosepipe and Accessories**

4.07.01 Hose valves for service water system shall be Gate valves and service air system shall be Globe valves.

4.07.02 Hose pipes with fittings for Service Water System:

a) The water hose shall be as per IS-444 (Type-3).

b) Length of each hose shall be 15 metres.

c) For each hose, one end shall be fitted with M.S. female coupling with swiveling nuts and soft seating ring suitable for connection to male end of hose valve and other end shall be made threaded for joining with the swiveling nut of a second hose whereby two hose lengths may be joined.

4.07.03 Hose pipes with fittings for Compressed air System

a) The compressed air hose shall be as per IS-911 (Type 2).

b) The length and type of each end shall be similar to as specified in above clause no. (4.07.02) above.

5.00.00 **DRAWINGS, DATA, INFORMATION & MANUALS**

5.01.00 Drawings, data, Information to be furnished by the Bidder besides those already mentioned in volume : IIA with the offer.

5.01.01 A complete list of all piping and fittings of various sizes with their quantities and details e.g. nominal size, O.D., I.D. (as applicable) thickness, design pressure, design temperature, material of construction/code/standards etc.

5.01.02 A complete list of all valves with their type, quantities & ratings.

5.01.03 Manufacturer's catalogue indicating complete range of available size and rating of pipes & fittings.

5.01.04 Descriptive literature on the manufacturing process and quality control procedures highlighting the manufacturing, fabricating and testing facilities available in the shop.

5.02.00 **After Award of Contract**

Detail drawings including fabrication drawings of all shop fabricated piping system indicating design parameters and complete bill of material (Relevant Standards and grades to be indicated) and information/data pertaining to the hydrostatic and non-destructive test requirements to be submitted progressively.

5.02.01 Detail dimensioned drawing of each valve, specialties, indicating tag no., pressure rating, manufacturing standard, the bill of materials and hydrostatic test pressures. The drawing shall include the end preparation details and shall indicate the position of the hand wheel/operator. Technical particulars of motor operators wherever applicable shall also be indicated.

5.02.02 General arrangement drawing for each hanger/support/anchor etc. indicating identification number, auxiliary supporting structural details, other details & information as required in the specification.

5.02.03 Wiring diagram for all limit switches of motor operated valves.

5.02.04 The loading data required for design of structures shall be furnished well in advance to suit Purchaser's time schedule.

6.00.00 **BROAD GUIDELINES FOR ERECTION AND INSTALLATION OF LP PIPING**

6.01.00 All fittings like "T" pieces, flanges, reducers etc. shall be suitably matched with pipes for welding. The valves will have to be checked, cleaned or overhauled in full or in part before erection, after chemical cleaning and during commissioning.

6.02.00 Adjustments like removal of oval ties in pipes and opening or closing the fabricated bends of high pressure piping to suit the layout shall be considered

part of work and is required to carry out such work as per instruction of Owner, which shall include specified heat-treatment procedures, etc. also wherever required.

6.03.00 Certain adjustments in length may be necessary while erecting high pressure pipelines and the contractor should remove the extra lengths to suit the final layout after preparing edges afresh and adopting specified heat treatment procedures.

6.04.00 Suspension for piping, pressure parts, etc., will be supplied in running lengths, which shall be cut to suitable sizes and adjusted as required.

6.05.00 All the valves, lifting equipments, actuators, power cylinders, etc., shall be serviced and lubricated to the satisfaction of Engineer before erecting the same and also during pre-commissioning. Even after commissioning, the equipments, if there are problems in the operation, they have to be attended to by the Bidder during the tenure of the contract. Welding or jointing of extension spindle for valves to suit the site conditions and operational facility shall be part of erection work.

6.06.00 All tubes and pipes shall be cleaned and blown with compressed air and shown to the engineer before lifting. Bigger size pipes should be cleaned with flexible wire brush, wherever necessary. After cleaning is over the end caps shall be put back in tube openings till such time they are welded to other tubes.

6.07.00 Fine fittings, drain piping, oil systems & other small bore piping have to be routed according to site conditions and hence shall be done only in position. As such, layout of small-bore piping shall be done as per site requirement. There is a possibility of slight change in routing the above pipelines even after completion of erection, which shall be carried out by the Bidder without any extra cost to the Purchaser. Work shall also include fabrication of small bends at site from straight lengths to suit the site conditions.

6.08.00 No temporary supports shall be welded on the pressure parts. Welding of temporary supports, cleats, etc., on the building columns shall also be avoided. In case of absolute necessity, Contractor shall take prior approval from Engineer. Further, any cutting or alteration of member of the structure or platform or other equipments shall not be done without specific prior approval of Engineer.

6.9.00

a) All piping shall be grouped wherever practicable and shall be routed to present a neat appearance.

b) The piping shall be arranged to provide clearance for the removal of equipment for maintenance and for easy access to valves, instruments and other piping accessories required for operational maintenance.

c) Piping shall be routed above ground unless otherwise specifically indicated/ approved by the Engineer. In such special case, the piping may be arranged in trenches, or buried and properly protected as per AWWA Standards.

d) Overhead piping shall have a minimum overhead clearance of 4 meters above walkways and working areas and 7 meters above roadways unless otherwise approved by the Engineer.

e) Drains shall be provided at all low points and vents at high points as per actual layout regardless of whether some have been shown in respective drawings or not. The pipelines shall be sloped towards the drain points.

6.10.00 All drips and drains for piping and equipment whether shown in the drawings or not shall terminate on the ground floor up to station drain unless otherwise specified. Leading such drains up to station drainage is also the responsibility of the Contractor.

ANNEXURE-I

SPECIFICATION OF PIPES FOR DIFFERENT SERVICES

	A		B		C	D
Services	1. Clarified Water piping 2. DMCW piping		1. Drinking/ Potable Water Supply, piping (Clarified water, chlorinated)		1. Demineralised Water, Service and Instrument Air Piping less than and equal to 50 mm NB	1. Demineralised Water, Service and Instrument air piping for sizes equal to greater than 65 mm NB
1.00.00 Material of Pipe	Carbon Steel IS-1239 Heavy Grade upto 150 mm NB and IS-3589 for sizes above 150 mm with minimum pipe thickness of 6 mm.		Carbon Steel as per IS-1239 Heavy Grade for sizes upto 150 mm NB and IS-3589 for sizes above 150 mm NB with minimum pipe thickness of 6 mm. The pipes shall be galvanized as per IS-4736		Stainless Steel as per ASTM A-312 Gr. 304. Size- as per schedule 40 ANSI B36.10	Stainless steel as per ASTM A-312 Gr. 304. Size-upto 150 mm NB as per schedule 10S, ANSI B-36.10.
2.00.00 Construction	ERW / Seamless		ERW / Seamless		ERW	ERW
3.00.00 Joints	Slip-on Flange and butt weld for size 65 mm NB and above and Socket weld joint for size 50 mm NB and below.		Screwed flange for sizes 65 mm NB and above and screwed socket for size 50 mm NB and below.		Socket welded for size 50 NB and below	Slip-on flange and butt weld joint.
4.00.00 Fittings	Pipe Sizes > = 65 mm NB	Pipe Sizes < = 50 mm NB	Pipe Sizes > = 65 mm NB	Pipe Sizes < = 50 mm NB		

	A		B		C	D
Services	1. Clarified Water piping 2. DMCW piping		1. Drinking/ Potable Water Supply, piping (Clarified water, chlorinated)		1. Demineralised Water, Service and Instrument Air Piping less than and equal to 50 mm NB	1. Demineralised Water, Service and Instrument air piping for sizes equal to greater than 65 mm NB
4.01.00 Materials	ASTM-A-234 Gr. WPB	ASTM-A-105	ASTM-A-234 Gr. WPB galvanized as per IS-4736	ASTM-A-105 galvanised as per IS-4736	ASTM-A-182 F304	ASTM-A-351-CF8
4.02.00 Construction	Welded/ Seamless	Forged	Welded/ Seamless	Forged	Forged	Welded/Seamless
4.03.00 Standard	ANSI-B-16.9 for fabricated fitting AWWA-C-208	ANSI-B-16.11	ANSI-B-16.9	ANSI-B-16.11	ANSI-B-16.11	MSS-SP-43
4.04.00 End details	Pipe size >=65mm NB Butt welded as per ANSI-B-16.25	Pipe size <=50 mm NB Socket welded as per ANSI-B-16.11	Pipe size >=65 mm NB Screwed Flanged	Sizes <=50 mm Screwed socketed as per ANSI-B-16.11All fittings shall be galvanized.	Socket welded	Slip - on flanges

	A	B	C	D
Services	1. Clarified Water piping 2. DMCW piping	1. Drinking/ Potable Water Supply, piping (Clarified water, chlorinated)	1. Demineralised Water, Service and Instrument Air Piping less than and equal to 50 mm NB	1. Demineralised Water, Service and Instrument air piping for sizes equal to greater than 65 mm NB
5.00.00 Flanges	150 lb class as per ANSI-B-16.5 complete with nuts, bolts and gaskets	As per ANSI-B-16.5 pressure class 150lbs - galvanised-complete with nuts, bolts and gaskets.	As per ANSI-B-16.5 pressure class 150lb complete with nuts, bolts and gaskets. Material as per class 4.01.00.	150lb class, flat face, as per ANSI-B-16.5 complete with nuts, bolts and gaskets.
Pipes which fall under IS:1239 shall be hydrostatically tested according to the said code, for others refer Section-V, Vol.: II-A.				

ANNEXURE-II

SERVICES OF VARIOUS CATEGORIES OF VALVES

Valve Classification		Service		
A.	Cast iron body Gate/Globe/Check Valve	i)	Service Water	For sizes 65mm NB and above.
		ii)	Clarified Water	
		iii)	Drinking/ Potable Water	
		iv)	Inhibited Demineralised Water	
B.	Stainless steel body/ Gate/Globe /Check/Ball Valve	i)	For Demineralised water	For all sizes
		ii)	Potable/ Drinking Water	For sizes less than and equal to 50 mm NB
		iii)	Service and Instrument Air	For all sizes. Ball valves to be used in air line.
C.	Steel Body valves	i)	Clarified Water	For sizes less than and equal to 50 mm NB
		ii)	Inhibited Demineralised Water for DMCW system	
D.	Cast Iron body butterfly valve	i)	For Demineralised Water	For butterfly valve specification refer Annexure II, Sec.IV of Vol. IIIE. For DM water line rubber lining/ EPDM/equivalent protection to be provided
		ii)	Raw water	
		iii)	Clarified Water	
		iv)	Filtered Water	
		v)	Inhibited Demineralised Water for DMCW system	

ANNEXURE-III

SPECIFICATION OF VALVES

		A. Cast Iron Body Gate/ Globe/Check Valve	B. Stainless steel Body Gate/Globe/Check/Ball Valve	C. Steel Body Gate/ Globe/Check Valve/ Ball Valve
1.00.00	Valve Classification Code	CIGC	SSGC	STGC
2.00.00	Basic Design Code			
	a) Gate	a) i) IS 780 for 50 mm - 300 mm NB ii) IS2906 for 350 mm NB and above or as per MSS-SP-70	a, b, c) ANSI-B-16.34	i) API 600 for 50mm ii) API 602 for size
	b) Globe	b) MSS - SP - 85		b) BS-1873/ANSI-B-16.34
	c) Check	c) IS-5312/MSS - SP -71		c) BS-1868/ANSI B16.34
	d) Ball		d) BS-5351	
3.00.00	Pressure Class	To be suitably chosen considering the pressure requirement. Refer Clause No. 4.01.08 in this regard.		
4.00.00	Construction	Cast body and bonnet / cover	Forged body up to 50mm NB and Cast body above that	Same as Group-B
5.00.00	Material			
5.01.00	Body & Bonnet/ cover	IS 210 Gr. FG 260	ASTM-A-182 F304 for Ball Valves: A351 CF8M for cast body, A 182 F304 for forged body.	ASTM-A-216 Gr. WCB for cast body & ASTM-A-105 for forged body

		A. Cast Iron Body Gate/ Globe/Check Valve	B. Stainless steel Body Gate/Globe/Check/Ball Valve	C. Steel Body Gate/ Globe/Check Valve/ Ball Valve
5.02.00	Trim / Disc.	IS-210 Gr. FG 260	ASTM-A-182 F304 for Gate, Globe, Check valves and 351CF 8M for Ball valves. For DKW system : ASTM-A-182 F6A (min. 250 HB)	13% Cr Steel as per ASTM-A-182 Gr. F6 heat treated and hardened(min 250 NB) for cast body and ASTM-A-105 Hard faced with Stellite (min 350 HB) for forged body
5.03.00	Seating surface	13% Cr steel as per IS 1570	For Ball valves PTFE seats and seals.	13% Cr. Steel as per ASTM-A-182 Gr. F6
6.00.00	End Preparation	Socket welded for size equal to and below 50mm NB and flanged with counter flanges for 65mm NB and above.		
7.00.00	Testing			
	a) Gate	i) As per IS - 780 for 50 mm - 300 mm NB		API-598
		ii) IS-2906 for sizes equal to and above 350 mm NB	As per ANSI B-16.34	
	b) Globe	Hydrostatic Test as per MSS-SP-85		BS-1873
	c) Check	IS-5312/MSS-SP-71		BS--1868

ANNEXURE -VI
DRAWING / DOCUMENT SUBMISSION SCHEDULE

DRAWING/DOCUMENT DISTRIBUTION LIST

All documents & drawings shall be in English and in metric units

SI		DCPL	TSGENCO-EC	TSGENCO -SITE/ DCPL SITE	BHEL SITE	PMG BHEL	PEM/ UNITS/ PSSR	REMARKS
1	Master list of drawings / doc (duly indicating sch of submission)	Soft copy	Soft copy	Soft Copy	-	Soft copy	S	
2	Drawings / doc for Approval/Information (First Submission & After major changes)	Soft copy	Soft copy + 1 print	Soft copy + 1 print	-	Soft copy	S	
3	Return with comments/approval	S	Soft copy	Soft copy	-	Soft copy	Soft copy	
4	Drawings / Documents for approval (second & subsequent submissions till approval)	Soft copy	Soft copy	Soft copy	-	Soft copy	S	
5	Drawings / documents for distribution (Approved by TSGENCO)	1 print + Soft copy	1 print + Soft copy	2 print + Soft copy	6 prints + Soft copy	Soft copy	S	
6	Erection Drawings / documents	-	1 print	3 prints	6 prints	-	S	
7	FINAL Erection / Installation Manual for distribution	-	1 print+ Soft copy	2 prints+ Soft copy	3 prints+ Soft copy	Soft copy	S	
8	As built Drawings / documents	-	1 print+ Soft copy	3 prints+ Soft copy	2 prints+ Soft copy	Soft copy	S (As applicable)	
9	Operation & Maintenance Manual	-	1 print + Soft copy	3 prints+ Soft copy	2 prints+ Soft copy	Soft copy	S	
10	Performance & functional Guarantee test reports	Soft copy	1 print + Soft copy	3 prints + Soft copy	2 prints + Soft copy	Soft copy	S	
11	Type Test Certificate	Soft copy	1 print + Soft copy	Soft copy	Soft copy	Soft copy	S	
12	Commissioning & Performance Procedure Manual	Soft copy	1 print+ Soft copy	3 prints+ Soft copy	2 prints+ Soft copy	Soft copy	S	
13	Project Completion Report	Soft copy	1 print+ Soft copy	3 prints+ Soft copy	2 prints+ Soft copy	Soft copy	S	

NOTES:

1. The above schedule of submission does not include Docs/Drgs. of quality assurance/inspection and delivery/dispatches.
2. Date of submitting soft copy is to be taken as date of submission.
3. S – Source for generation of document.

After final approval, BHEL UNITs/ PEM will provide 1 no. hard copy to TSGENCO, Hyderabad Office and 3 nos. hard copies to Kothagudem Office.

DRAWINGS/DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT (ANNEXURE-VII)

The successful bidder shall submit the following drawings / documents during detail engineering for customer's approval /information:

S. No.	BHEL DRAWING NO.	DRAWING TITLE	SUBMISSION SCHEDULE - WEEK NUMBER FROM DATE OF LOI	CATEGORY
1	PE-V0-410-160-A002	GA OF WATER AND AIR LINE VALVES	12	A-BHEL
2	PE-V0-410-160-A003	G.A., TECHNICAL DATA SHEET OF AIRCOMPRESSOR MOTOR	10	A-CUST
3	PE-V0-410-160-A004	DESIGN PHILOSPHY AND SYSTEM SIZING CALCULATION OF MILL REJECT SYSTEM	4	A-CUST
4	PE-V0-410-160-A005	INSTRUMENT SCHEDULE	10	A-BHEL
5	PE-V0-410-160-A006	P & I DIAGRAM OF MILL REJECT HANDLING SYSTEM	4	A-CUST
6	PE-V0-410-160-A007	DETAILED BOM	20	I-BHEL
7	PE-V0-410-160-A008	GA & DS OF SELF MFG. ITEMS (DENSVEYOR, HOPPER, BNKR DIS. GATE, PRV, ACI BEND, PNEU. PANEL, AIR RECVR, TER. BOX, ETC.)	6	A-CUST
8	PE-V0-410-160-A009	DEMONSTRATION TEST PROCEDURE	20	I-CUST
9	PE-V0-410-160-A010	P & I DIAGRAM OF MRS COMPRESSOR	10	A-CUST
10	PE-V0-410-160-A011	SUB VENDOR LIST WITH INSPECTION CATEGORY	4	A-CUST
11	PE-V0-410-160-A012	WELDING PROCEDURE SPECIFICATION	6	I-CUST
12	PE-V0-410-160-A013	EQPT AND PIPING LAYOUT OF MILL REJECT SYSTEM AND PIPING LAYOUT FROM COMPRESSOR HOUSE	8	A-CUST
13	PE-V0-410-160-A014	LAYOUT OF COMPRESSOR HOUSE	10	A-CUST
14	PE-V0-410-160-A015	QAP OF MS STRUCTURAL STEEL/ PLATES	6	A-BHEL
15	PE-V0-410-160-A016	EARTHING LAYOUT	10	A-CUST
16	PE-V0-410-160-A017	QAP OF SELF MANUFACTURED-CONVEYING VESSEL , PYRITE HOPPER, BUNKER DISCHARGE GATE, PRESSURE RELIEF VALVE, TERMINAL BOX , ACI BEND, AIR RECEIVER , PNEUMATIC PANEL	8	A-CUST

17	PE-V0-410-160-A019	G.A OF MRS BUNKER	6	A-CUST
18	PE-V0-410-160-A020	QAP OF MS ERW PIPE	10	A-BHEL
19	PE-V0-410-160-A021	QP FOR COMPRESSOR	10	A-CUST
20	PE-V0-410-160-A022	TRENCH AND INSERT DETAIL OF MRS	8	A-CUST
21	PE-V0-410-160-A023	QP FOR KNIFE GATE/PLATE VALVE	10	A-BHEL
22	PE-V0-410-160-A024	DESIGN CALCULATION AND STRUCTURAL ARRANGEMENT OF BUNKER AND LOAD DATA OF BUNKER	10	A-CUST
23	PE-V0-410-160-A025	GA OF KNIFE GATE/PLATE VALVE	8	A-BHEL
24	PE-V0-410-160-A026	QP FOR BAG FILTER	10	A-BHEL
25	PE-V0-410-160-A027	G.A OF BAG FILTER	8	A-BHEL
26	PE-V0-410-160-A028	QP FOR METALLIC EXPANSION BELLOW	10	A-BHEL
27	PE-V0-410-160-A030	QP FOR RUPTURE DISC	10	A-BHEL
28	PE-V0-410-160-A031	QP FOR CHAIN PULLEY BLOCK	10	A-BHEL
29	PE-V0-410-160-A032	QP FOR WATER AND AIR LINE VALVES	10	A-BHEL
30	PE-V0-410-160-A033	QP FOR COMPRESSOR MOTOR	10	A-CUST
31	PE-V0-410-160-A034	G.A OF METALLIC EXPANSION BELLOW	8	A-BHEL
32	PE-V0-410-160-A035	G.A. OF RUPTURE DISC.	8	A-BHEL
33	PE-V0-410-160-A036	QAP of INSTRUMENTS (PG/PS/PT/TS/TG/SV)	12	A-BHEL
34	PE-V0-410-160-A037	GA OF CHAIN PULLEY BLOCK	8	A-BHEL
35	PE-V0-410-160-A043	G.A., TECHNICAL DATA SHEET AND FOUNDATION DETAILS OF AIRCOMPRESSOR, GA AND WIRING DIAGRAM FOR LOCAL PANEL OF CONVEYING AIR COMPRESSOR	10	A-CUST
36	PE-V0-410-160-A044	QP FOR SUMP PUMP WITH MOTOR	12	A-BHEL
37	PE-V0-410-160-A045	GA, TECHNICAL DATA SHEET AND WIRING DIAGRAM OF SUMP PUMP	10	A-BHEL
38	PE-V0-410-160-A046	ELECTRICAL LOAD LIST	6	I-BHEL
39	PE-V0-410-160-A047	TECHNICAL DATA SHEET OF TEMPERATURE SWITCH, TEMPERATURE GAUGE, PRESSURE SWITCH, PRESSURE GAUGE,SOLENOID VALVE , LEVEL SWITCH , AIR FILTER REGULATOR	10	A-BHEL

40	PE-V0-410-160-A048	CONTROL WRITE-UP & INTERLOCK & PNEUMATIC CIRCUIT OF CONVEYING VESSEL, BLOCK LOGIC DIAGRAM/CONTROL SCHEME WITH HMI SCREEN & I/O LIST	10	A-CUST
41	PE-V0-410-160-A051	CABLE INTERCONNECTION DIAGRAM	14	I-CUST
42	PE-V0-410-160-A052	PAINTING SCHEDULE	8	I-CUST
43	PE-V0-410-160-A053	PIPING AND VALVE SCHEDULE	8	I-CUST
44	PE-V0-410-160-A054	CABLE SCHEDULE -SIGNAL AND CONTROL	12	I-CUST
45	PE-V0-410-160-A055	OPERATION AND MAINTENANCE MANUAL	24	I-CUST

Notes:

1. The above drawing list is tentative and shall be finalized with the successful bidder after placement of order. While some of the drawings indicated above may not be applicable, some additional drawings may also be required based on scope of work.
2. Drawings shall be prepared in Auto-Cad latest edition. Required no. of hard and soft copies (editable) of the drawings shall be furnished as per requirement specified elsewhere in the specification.
3. Only manual calculation with authentic supporting literature (e.g. extracts of hand Book/ standard/codes) shall be acceptable. All design calculations and drawings shall be in SI system only.
4. Bidder to note that all values/dimensions/elevations etc. without supporting back up data adopted/assumed by the successful bidder (during contract stage) in the design calculation/drawings shall be taken by the customer/owner to be correct unless they are stipulated in the specification. Any problem arising later in this regard shall be made good by the successful bidder at his cost and no extension of time shall be granted for the same.
5. All the drawings and documents including general arrangement drawing, data sheet, calculation etc. to be furnished to the customer during detailed engineering stage shall include / indicate the following details for clarity w.r.t. Inspection, construction, erection and maintenance etc.:-

    a) All drawings and documents shall indicate the list of all reference drawings including general arrangement.

    b) All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow - up view; all major self-manufactured and bought out items shall be labelled and included in BOQ / BOM in tabular form.

    c) Painting schedule shall also be made as a part of general arrangement drawing of each equipment / items indicating at least 3 trade name.

    d) All the drawings required to be furnished to customer during detailed engineering stage shall include technical parameters, details of paints and lubrication, hardness and BOQ / BOM in tabular form indicating all major components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc.

    e) Drawings/ documents to be submitted for purchasers review/ approval shall be under Revision A, B, C… etc. while drawings /documents to be submitted thereafter for customer's approval after purchaser's approval shall be under R-0, 1, 2, 3 ….etc.

6. 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.
7. 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.
8. All drawings shall be prepared as per BHEL's title block and bear BHEL's drawing No.
9. Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's/ Customer's/ Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.
10. Bidder to follow the following the drawing submission schedule:
    - 1st submission of drawings from date of LOI as per the submission schedule.
    - Every revised submission incorporating comments – within 10 days.
    - BHEL/Customer shall furnish their approval/comments within 21 days of submission
    - Bidder to submit revised drawings complete in all respects incorporating all comments. Any incomplete drawing submitted shall be treated as non-submission with delays attributable to bidder's account. For any clarification/ discussion required to complete the drawings, the bidder shall himself depute his personal to BHEL for across the table discussions/ finalizations/ submissions of drawings.

ANNEXURE-VIII

Check List for Operation & Maintenance Manual

Project name :
Project number :
Package Name :
PO reference :
Document number :
Revision number :

Sl.no. & Sections	Description	Tick (√)if included in Manual			Remarks
		Yes	No	Not Applicable	
1.	Cover page				
1.1	Project Name				
1.2	Customer/consultant Name				
1.3	Name of Package				
1.4	Supplier details with phone, FAX ,email address , Emergency Contact number				
1.5	Name and sign of prepared by , checked by & approved by				
1.6	Revision history with approval Details				
2.0	Index				
2.1	showing the sections & related page nos All the pages should be numbered section wise				
3.0	Description of Plant/System				
3.1	Description /write up of operating principle of system equipment/ associated sub-systems & accessories/controls system , operating conditions, performance parameters under normal , start up and special cases				
3.2	Equipment list and basic parameter with Tag numbers				
3.3	Data sheets approved by Customer/for information and catalogues provided by original manufacturer				
3.4	Associated other packages and Interface /terminal points				
3.5	P&ID & Process Diagrams				
3.6	GA Layout drawings, As-built drawings , Actual photograph of items/system (Drawings of A2 & bigger sizes are to be attached in the last)				
3.7	Single line/wiring diagrams				
3.8	Control philosophy /control write-ups				

4.0	Commissioning Activities (if not covered in separate document i.e. erection manual, commissioning manual)				
4.1	Pre-Commissioning Checks				
4.2	handling of items at site				
4.3	Storage at site				
4.4	Unpacking & Installation procedure				
5.0	Operation Guidelines for plant personal/user/operator				
5. 1	Interlock & Protection logic along with the limiting values of protection settings for the equipment along with brief philosophy behind the logic, drawings etc. to be provided.				
5. 2	Start up, normal operation and shut down procedure for equipments along with the associated systems in step by step mode. Valve sequence chart, step list, interlocks etc. with Equipment isolating procedures to be mentioned.				
5. 3	Do's & Don't of the equipments.				
5. 4	Safety precautions to be taken during normal operation. Safety symbols, Emergency instructions on total power failure condition/lubrication failure/any other condition				
5. 5	Parameters to be monitored with normal values and limiting values				
5. 6	Trouble shooting with causes and remedial measures				
5. 7	Routine operational checks, recommended logs & records				
5. 8	Changeover schedule if more than one auxiliary for the same purpose is given				
5. 9	Painting requirement and schedule				
5. 10	Inspection, repair , Testing and calibration procedures				
6.0	Maintenance guidelines for plant personal				
6.1	List of Special Tools and Tackles required for Overhaul/Trouble shooting including special testing equipment required for calibration etc.				
6.2	Stepwise dismantling and re-assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained, clearances etc. to be mentioned. Tolerances for fitment of various components to be given.				

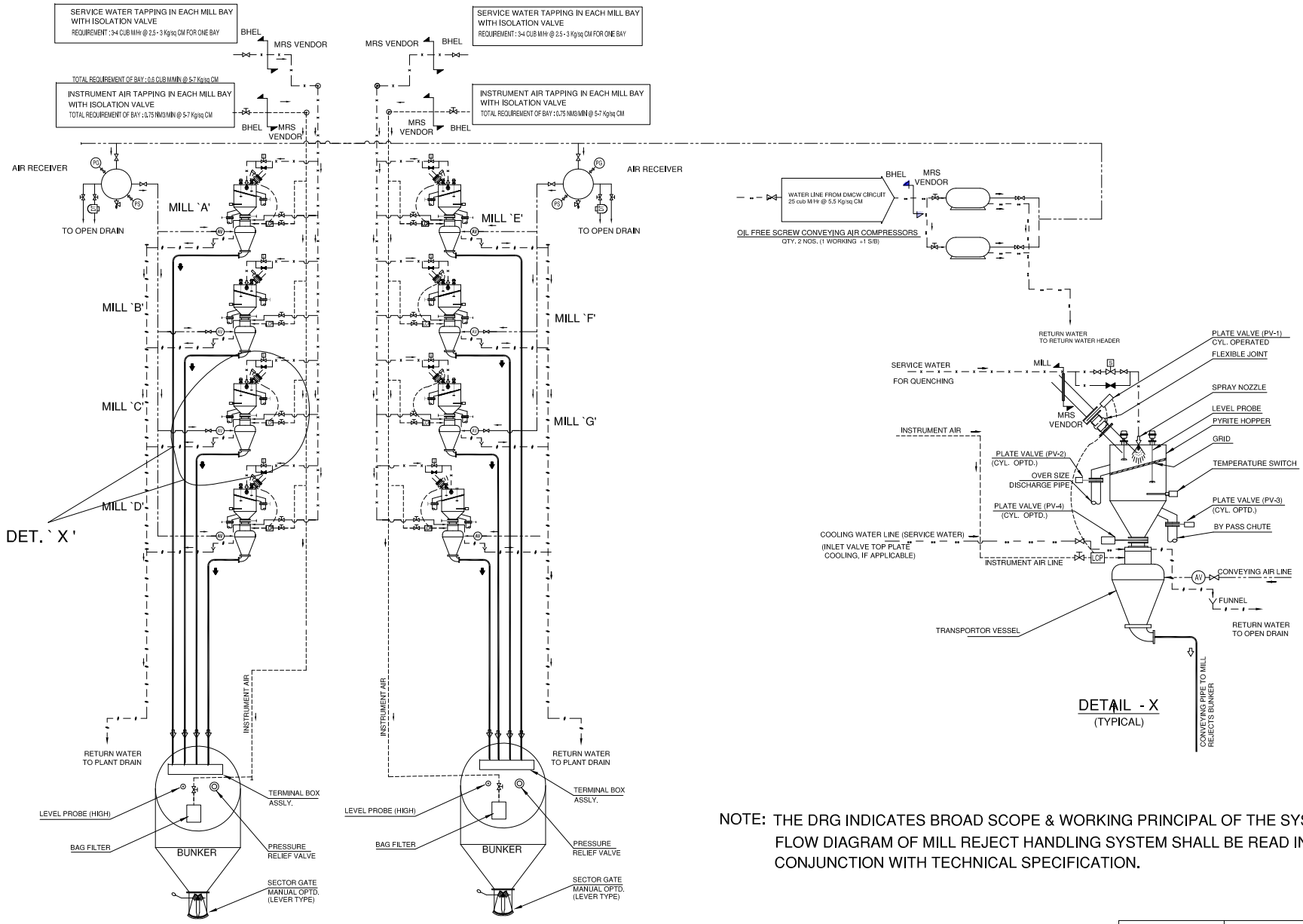
6.3	Preventive Maintenance & Overhauling schedules linked with running hours/calendar period along with checks to be given				
6.4	Long term maintenance schedules especially for structural, foundations etc.				
6.5	Consumable list along with the estimated quantity required during commissioning, normal running and during maintenance like Preventive Maintenances and Overhaul. Storage/handling requirement of consumables/self-life.				
6.6	List of lubricants with their Indian equivalent, Lubrication Schedule, Quantity required for each equipment for complete replacement is to be given				
6.7	List of vendors & Sub-vendors with their latest addresses, service centres ,Telephone Nos., Fax Nos., Mobile Nos., e-mail IDs etc.				
6.8	List of mandatory and recommended spare parts list				
6.9	Tentative Lead time required for ordering of spares from the equipment supplier				
6.10	Guarantee and warranty clauses				
7.0	**Statutory and other specific requirements considerations.**				
8.0	**List of reference documents**				
9.0	**Binding as per requirement**				

Checked by

Dealing Engineer

Key Resource Person

Section Head



NOTE: THE DRG INDICATES BROAD SCOPE & WORKING PRINCIPAL OF THE SYSTEM. FLOW DIAGRAM OF MILL REJECT HANDLING SYSTEM SHALL BE READ IN CONJUNCTION WITH TECHNICAL SPECIFICATION.

CUSTOMER	TSGENCO, HYDERABAD
	1X800 MW KOTHAGUDEM TPS
	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR : PROJECTS ENGG MGMT NEW DELHI
TITLE	SINGLE LINE FLOW DIAGRAM MILL REJECT HANDLING SYSTEM
JOB NO.	410
STATUS	CONTRACT
DISTRIBUTION	
ZONE	
DRAWN	RB
CHECKED	RN
APPRD	GB
CARD CODE	
DRG.NO.	PE-DG-410-160-A001
SHEET NO	1
NO OF SHEETS	1
REV	0

PE-SK-410-160-M001

SKETCH SHOWING MILL REJECT BUNKERS AND MAIN PLANT COMPRESSOR HOUSE

MRS BUNKER

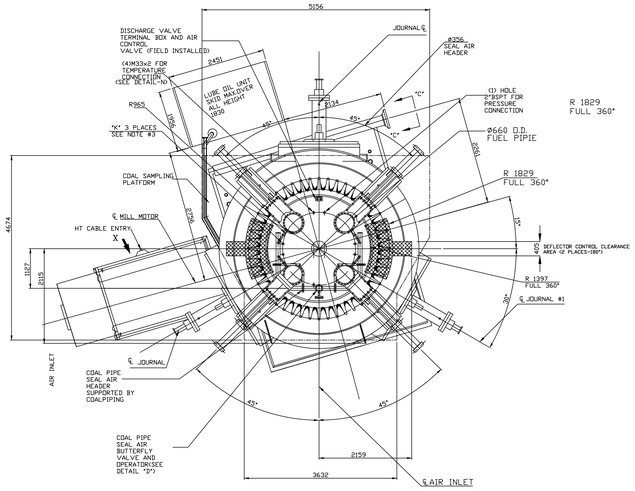
MRS BUNKER

MAIN PLANT COMPRESSOR HOUSE

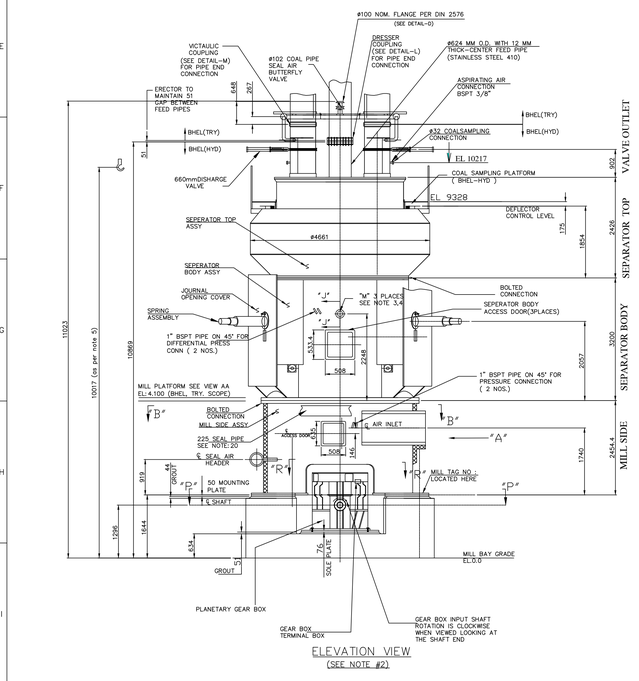
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

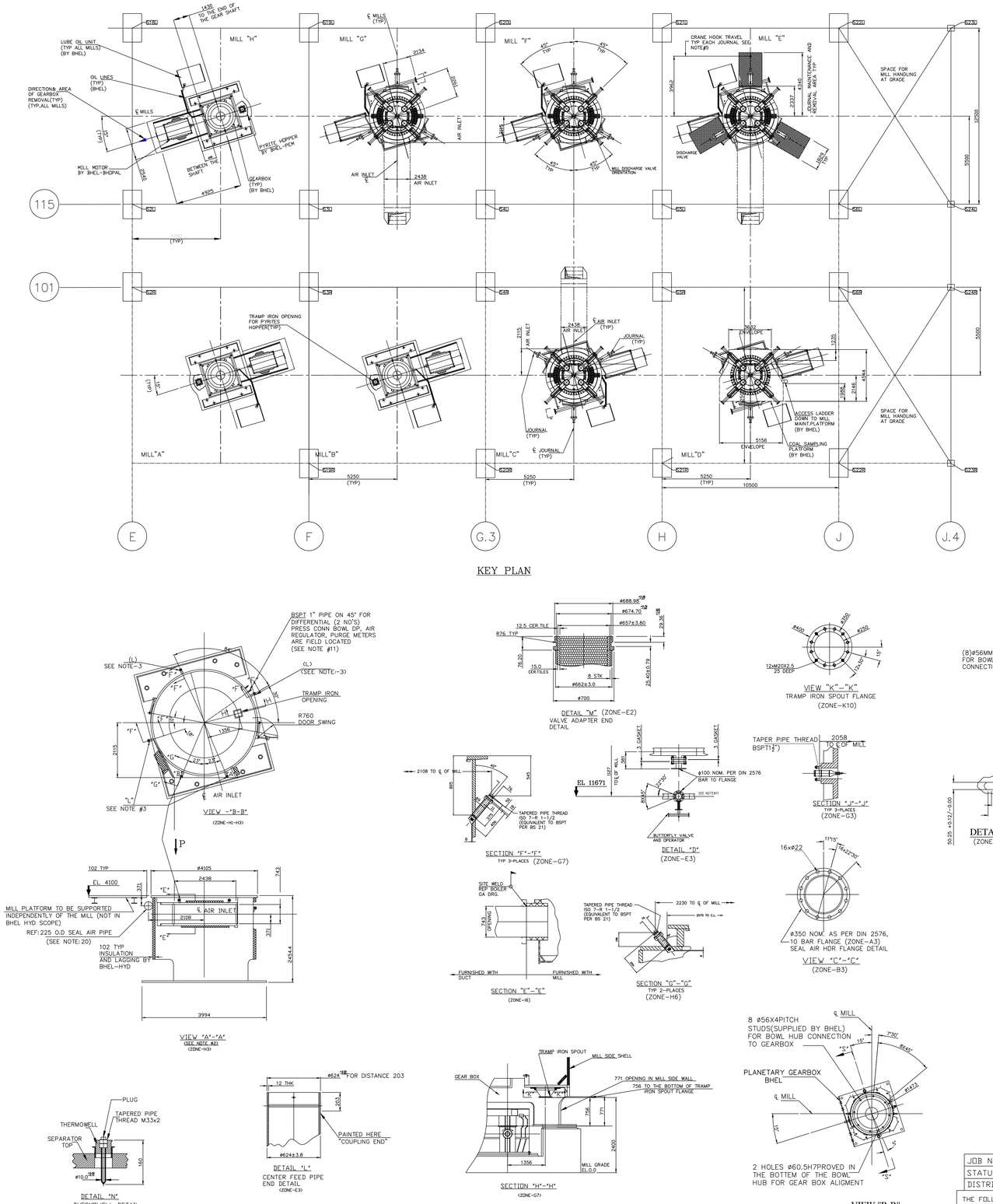
DRG. NO. 0-00-620-87041



PLAN VIEW
(SEE NOTE #2)



ELEVATION VIEW
(SEE NOTE #2)



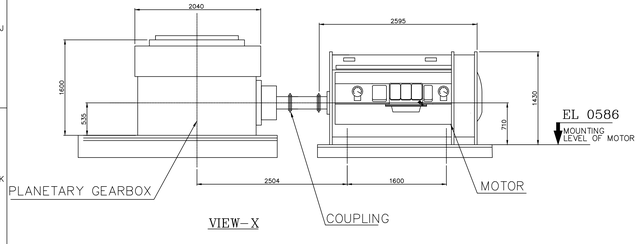
KEY PLAN

NOTES:-

01. ALL DIMENSIONS ARE IN MM.
02. FOR RELATIVE LOCATIONS AND TRUE ORIENTATION OF MILL, MILL PARTS AND EXTERNAL EQUIPMENT SEE KEY PLAN
03. FOR FIRE EXTINGUISHING SYSTEM.
    (3) NOZZLES "H" PIPE THREAD BSPT 1"-SEPARATOR TOP
    (5) NOZZLES "L" PIPE THREAD BSPT 1"-MILL SIDE
    (3) NOZZLES "M" PIPE THREAD BSPT 1"-SEP. BODY
04. ALL CONNECTIONS TO BE AS PER ISO, NOMINAL SIZE IN MM
05. CRANE HOOK TRAVEL FROM GROUND FLOOR TO 19017 SEE ELEVATION VIEW. THE CRANE HOOK MUST TRAVEL 2337 FROM THE ℄ OF THE MILL ALONG THE ℄ OF THE JOURNAL TO 3962 FROM THE ℄ OF THE MILL ALONG THE ℄ OF THE JOURNAL. SEE KEY PLAN.
06. REFER DRG No. 0-00-620-87040 FOR FOUNDATION ARRANGEMENT OF MILL AND MOTOR
07. CABLES & PNEUMATIC AIR CONNECTION ARE TO BE ROUTED SO AS TO HAVE FREE MAINTENANCE AREA AROUND MILL
08. 6MM GAP SHOULD BE MAINTAINED BETWEEN VALVE BODY OUTLET STUB & FUEL PIPE COUPLING JOINTS
09. COOLING WATER AND FIRE QUENCHING WATER INLET LINES SHOULD BE PROVIDED WITH VALVE(BHEL-T/PC SCOPE)
    TERMINAL POINT FOR COOLING WATER INLET/ OUTLET LINES IS LUBE OIL COOLER INLET/ OUTLET FLANGES CONTROL & OF MILL AREA WITH FASTENERS PROVIDED BY BHEL(HYD). FIRE FIGHTING WATER COMPLETE SCOPE IS WITH BHEL TRICHY/ PC-CHENNAI, UPTO THE NOZZLES(REFER NO.9)
10. TWO SETS OF TAPPING POINTS ARE PROVIDED FOR MILL DIFFERENTIAL AIR LINE CONNECTION. ONE SET IS USED
11. STEAM PIPING WITH VALVES FOR MILL FIRE FIGHTING SYSTEM IS IN BHEL-T-PIPING CENTRE SCOPE.
12. PNEUMATIC AIR PIPING WITH ISOLATING VALVES FOR PULVERISED COAL SAMPLING AT TWO PLACES AND MOV OPERATION ARE IN BHEL-T SCOPE.
13. SEAL AIR PIPING WITH VALVE UPTO SEAL AIR HEADER AROUND MILL IS IN BHEL-T SCOPE.
14. PLATFORMS, LADDERS, STAIRCASE, HANDRAILS & EMBEDED PLATES ARE IN BHEL TRICHY. SCOPE.
15. REJECT COLLECTION & HANDLING SYSTEM IS IN BHEL-PEM SCOPE. BHEL-HYD TERMINAL POINT REF. SEC/"H"-"H" & VIEW"K"-"K".
16. REFER BOILER GA DRGS FOR LOCATION AND ORIENTATION OF MILLS.
17. ALL ELEV. INDICATED IN THE DRG ARE WITH RESPECT TO TG BUILDING ESTATION BUILDING GROUND FLOOR LEVEL OF EL.6300M (FINISHED FLOOR LEVEL) WHICH CORRESPONDS TO EL.----- FINISHED FLOOR LEVEL OF BOILER AREA (-)0.200M & OF MILL AREA EL.6300M W.R.T TG HALL.
18. FOR DIRTY AIR PITOT VELOCITY TEST APPROACH PLATFORM, PNEMATIC AIR SUPPLY WITH ISOLATING VALVE SHALL BE IN THE SCOPE OF BHEL TRY AT ALL FOUR CORNERS.
19. CLEARANCE FOR SEAL AIR PIPE MUST BE MAINTAINED IN PLATFORM DESIGN.
20. PROVISION FOR FUTURE ACCOMMODATION OF ROTARY CLASSIFIER SHALL BE KEPT.
21. THE REQUIREMENT OF NFPA-85 HAS BEEN DULY INCORPORATED IN PULVERISER DESIGN.
22. INSTRUMENT AIR PRESSURE FOR MOV CYLINDER SIZING SHALL BE CONSIDERED AS 5 Kg/cm2.

MAJOR WEIGHTS OF BOWL MILL COMPONENTS TABLE

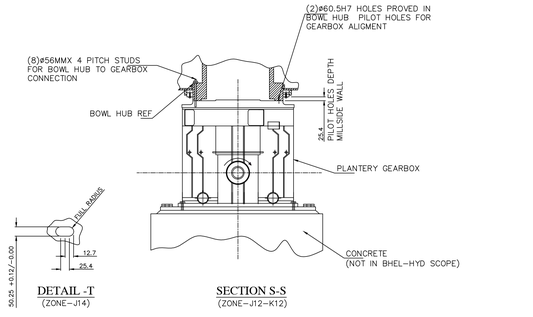
SL NO	COMPONENTS	WEIGHT MT	QTY NO
1	PLANETARY GEARBOX ASSEMBLY	18.60	1
2	MILL SIDE ASSEMBLY	18.82	1
3	BOWL AND BOWL HUB ASSEMBLY	19.60	1
4	SEPARATOR BODY ASSY. W/OUT JOURNALS	21.76	1
5	JOURNAL SHAFT ASSEMBLY WITH GRINDING ROLL (1)	5.76	3
6	JOURNAL HEAD ASSEMBLY (1)	3.44	3
7	JOURNAL OPENING COVER ASSEMBLY WITH SPRING ASSEMBLY (1)	3.91	1
8	SEPARATOR TOP ASSEMBLY	19.05	1
9	MILL DISCHARGE VALVE ASSEMBLY	2.17	1
10	JOURNAL MAINENANCE -JOURNAL TILT OUT -JOURNAL BEARING & END PLAY CHECKING	6.03 6.45	1



VIEW-X

DETAIL "M" (ZONE-E2)
VALVE ADAPTER END DETAIL

VIEW "K"-"K"
TRAMP IRON SPOUT FLANGE
(ZONE-K10)

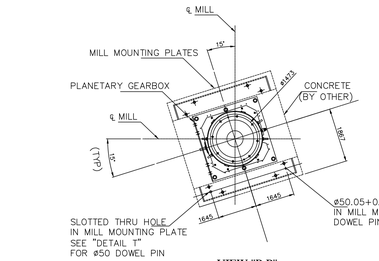


SECTION S-S
(ZONE-J12-K12)

SECTION "F"-"F"
TYP 3-PLACES (ZONE-G7)

DETAIL "D"
(ZONE-E3)

VIEW "C"-"C"
(ZONE-B3)



VIEW "P-P"
(SEE NOTE #2)

DETAIL "N"
THERMOWELL DETAIL
(ZONE-B2)

DETAIL "L"
CENTER FEED PIPE END DETAIL
(ZONE-E3)

VIEW "R-R"
ZONE- H3

PRELIMINARY TENDER DRAWING

REV.	DATE	ALTERED	CHECKED	APPROVED
ZONE				
01	16.05.14	PG	PVSB	MVRM

FOUNDATION HEIGHT REDUCED BY 600 MM

THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED.

1. REF. TO HY0230261 FOR UNSPECIFIED TOLERANCES.
2. CHAMFER M/CD. SHARP EDGES 1.2 TO 1.0 AT 45°.
3. INTERNAL M/CD. CORNER RADII 1 TO 0.7
4. THE SURFACE ROUGHNESS WHERE-EVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUT SIDE THE BACK SLASH GIVEN OR THE TOP MOST RIGHT CORNER OF THE DRG.

JOB NO.
STATUS
DISTRIBUTION

OWNER: TSGENCO

PROJECT: KOTHAGUDEM, UNIT-12, 1x800 MW

BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	UDAY REDDY		05.11.14	
CHD.	RAJESH RANJAN		05.11.14	
APPD.	M V R MURTHY		05.11.14	

DEPT.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
446	NTS	N.A.	N.A.		

DIVN. PROJ. ENGG.

TITLE
GENERAL ARRANGEMENT OF HP 1103 MILL (WITH PLANTERY GEARBOX)

DRAWING NO. 0-00-620-87041 REV. 00

SHEET NO. 01 NO OF SHEETS 01

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

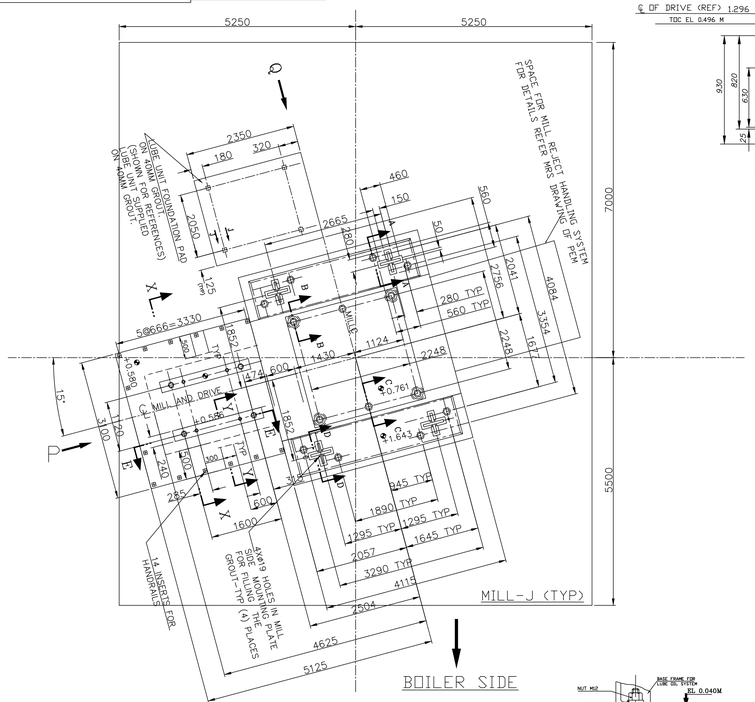
COMP. FILE NAME
REF. DRG. NO.
INVENTORY NO

FIRST ANGLE PROJECTION

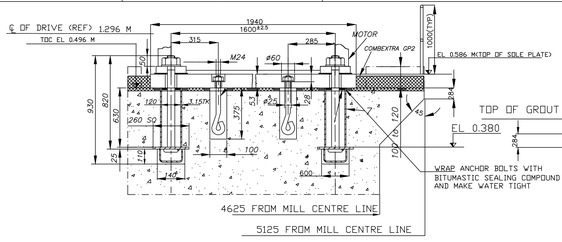
(ALL DIMENSIONS ARE IN mm)

DRG. NO. 0-00-610-87040 SH.01 OF 03

COMPUTER FILE NAME | REF. ORG. NO. | SIGN. AND DATE | INVENTORY NO

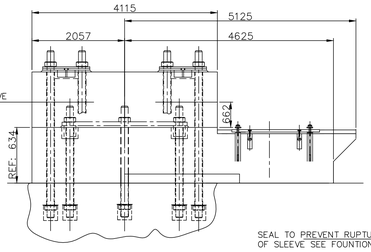


DIMENSIONAL PLAN VIEW

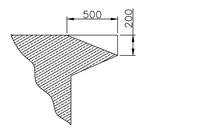


SECTION-E-E

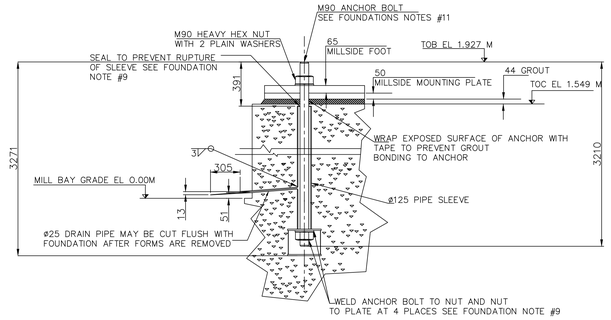
SECTION-X-X



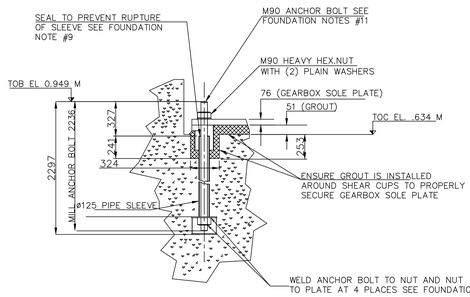
VIEW-Q



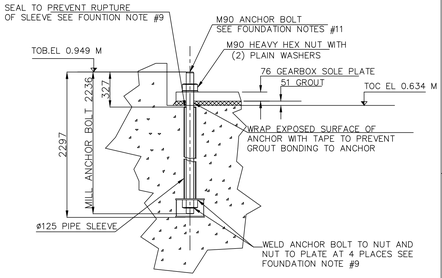
SECTION-Y-Y
(DETAIL FOR CABLE ENTRY)



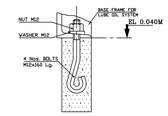
SECTION A-A (8 PLACES)



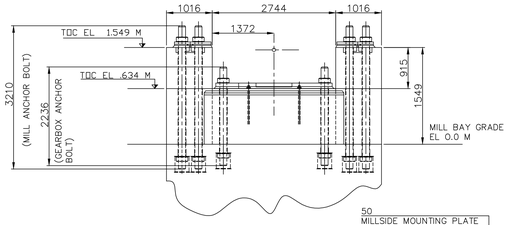
SECTION B-B (4 PLACES)



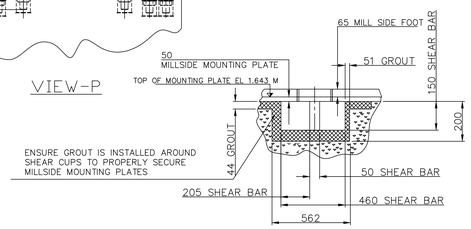
SECTION C-C (2 PLACES)



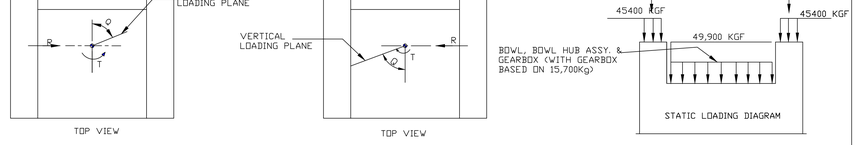
SECTION-JJ
(FOR LUBE OIL UNIT FRAME FIXING (TYPICAL AT 4 PLACES)

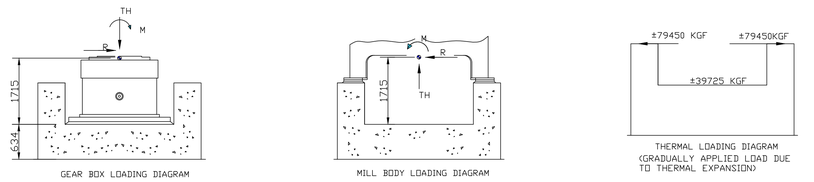


VIEW-P

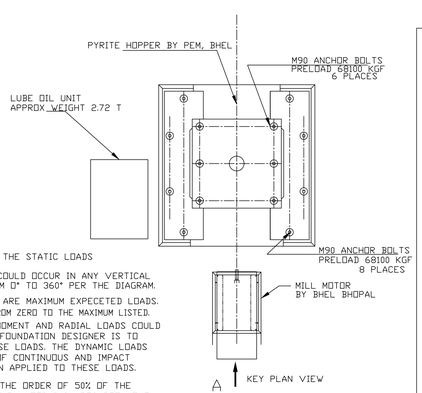


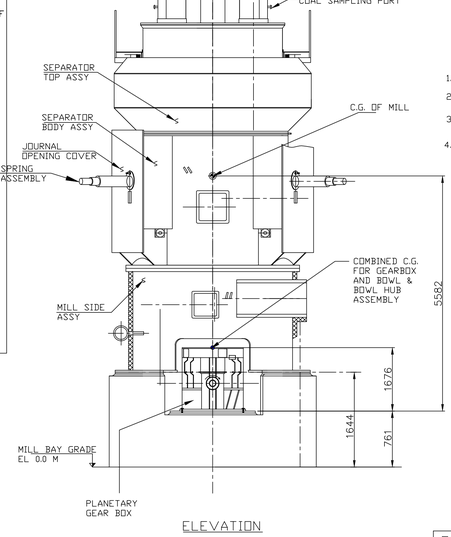
SECTION D-D (4 PLACES)





MAXIMUM DYNAMIC FOUNDATION LOADING (ACTUAL)	
MOMENT (M)	126738 KGM
THRUST (TH)	190680 KGF
RADIAL (R)	38590 KGF
TORQUE (T)	97380 KGM
ANGLE (Q)	0° THRU 360° RANDOM DIRECTION SEE NOTE #2
TORQUE (Tm)	PEAK TORQUE





ELEVATION

MOTOR DATA:-

SUPPLIER	:	B H E L - BHOPAL
RATING	:	696 KW
SPEED	:	985 RPM
FULL LOAD AMP STATOR	:	168 AMP
VOLTAGE 3 PHASE 50 Hz	:	3300 VOLTS
APPROX. WEIGHT OF MOTOR	:	7550 Kgs
APPROX. WEIGHT OF ROTOR	:	1700 Kgs
GD^2 OF ROTOR	:	288 Kgm^2
MAXIMUM FOUNDATION LOAD	:	112 kN- UPWARDS 186 kN- DOWNWARDS
DIRECTION OF ROTATION	:	CLOCKWISE (BI-DIRECTIONAL)

MILL DATA

1. MOTOR SPEED : 985 RPM
2. SPEED OF PULVERIZER : 33 RPM
3. TOTAL WT. OF MILL (EXCLUDING MOTOR) : 140 TONNES.
4. TYPE OF LOAD : MODERATE SHOCK LOAD.

FOUNDATION NOTES:-

1. THIS DRAWING REPRESENTS A SUGGESTED FOUNDATION ARRANGEMENT ONLY. BHEL HYD. IS NOT RESPONSIBLE FOR FOUNDATION DESIGN, PIER TO FOOTING CONNECTION, WORKMANSHOP OR MATERIAL USED. THE FOUNDATION SHOULD BE OF WELL-REINFORCED CONCRETE, DESIGNED IN ACCORDANCE WITH APPLICABLE CODES AND SPECIFICATIONS.
2. ANCHOR BOLTS, NUTS, WASHERS AND SHIMS ARE SUPPLIED BY ALSTOM/BHEL FOR PULVERIZER & GEARBOX.
3. LUBE SKID (TANK) LOCATED NEAR THE MILL WILL REST ON GROUT ABOVE 0.2M FROM THE FINISHED FLOOR.
4. SEE HP 1103 BOWL MILL ARRANGEMENT DRAWING 0-00-620-87041 FOR LOCATION AND ORIENTATION OF MILL FOUNDATION AND LUBE OIL SKID W.R.T. BOILER.
5. TOTAL CIVIL FOUNDATION IS NOT IN THE SCOPE OF BHEL HYD.
6. MOTOR MOUNTING PLATE, FOUNDATION BOLTS, SHIMS, PACKERS, SLEEVE ETC. ARE IN BHEL BHOPAL'S (MOTOR SUPPLIER) SCOPE.
7. THE MASS OF CONCRETE MAKING UP THE FOUNDATION SHOULD BE NOT LESS THAN 3 TIMES THE MASS OF THE PULVERIZER.
8. PULVERISER AND PULVERIZER MOTOR FOUNDATIONS MUST BE ONE HOMEGENEOUS BODY.
9. ALL ANCHOR BOLTS ARE TO BE SET IN PIPE SLEEVES PER SECTIONS "A-A", "B-B" AND "C-C". SLEEVES MUST BE FREE OF WATER, DIRT, GROUT AND OTHER DEBRIS AND SEALED WATER AND DUST TIGHT AT THE TOP WITH SUITABLE MATERIAL. SEAL MUST ALLOW ANCHOR BOLT TO ELONGATE WHEN TENSIONED. ANCHOR BOLTS ARE TO BE WELDED AS SHOWN TO PREVENT ROTATION. THE BOTTOM NUT CAN (TOP PLATE, SHELL AND BOTTOM PLATE) IS TO BE DESIGNED TO PREVENT TURNING OF THE CAN & ANCHOR BOLT IN THE FOUNDATION DUE TO THE TORQUE LOAD GENERATED BY THE TENSIONING OF THE ANCHOR BOLT.
10. FOR REQUIRED CLEARANCES AROUND PIERS, REFER BOWL MILL ARRANGEMENT DRAWING (0-00-620-87041)
11. ANCHOR BOLTS SIZING AND PRELOADING IS BASED ON ANCHOR BOLT MATERIAL OF ASTM A-36/IS 2062.
12. ANCHOR BOLTS SHALL BE WITHIN ±3 MM OF THIER DESIGN LOCATION AT THE TOP OF THE BOLT AND VERTICAL WITHIN 1 mm PER 1 METER
13. THE CONCRETE SURFACES TO BE GROUTED ARE TO BE ROUGHENED TO EXPOSE SOUND AGGREGATE. THE SURFACE PROFILE SHOULD HAVE A ROUGHNESS OF 6 TO 13 (PEAK TO VALLEY MEASUREMENT). THIS CAN BE DONE BY USING A NAIL RAKE PRIOR TO THE CONCRETE HAS CURED BY CHIPPING.
14. ALLOWABLE VERTICAL RIGID BODY FOUNDATION DEFLECTION (SETTLING, START-UP, STEADY-STATE AND SHUT DOWN): 3MM MAXIMUM.
15. ALLOWABLE FOUNDATION BENDING AND TWISTING (SETTLING, START-UP,STEADY-STATE AND SHUT DOWN): 0.13MM PER 3048MM.
16. MAXIMUN ALLOWABLE PIER DEFLECTION:
    - UNISON MOVEMENT ±0.38MM @ TOP OF PIER.
    - OPPOSITE MOVEMENT ±0.38MM @ TOP OF PIER.
17. EL (+/-) 0.0M CORRESPONDS TO RL ---M.
18. THE BOWL MILL FOUNDATION MUST BE DESIGNED AS PER THE LOADING VALUE (STATIC AND DYNAMIC) MENTIONED IN THE DRAWING 00061086050
19. THE MILL & MOTOR FOUNDATION SHALL BE PREFERABLY CONSTRUCTED IN SINGLE POURING OF CONCRETE.
20. MILL MOTOR SOLE PLATE GROUTING TO BE OVER THE ENTIRE CONCERET BECK.

LEGEND:

℄ - LOAD CENTER
KGM - KILOGRAM-METRE
KGF - KILOGRAM-FORCE

NOTES:

1. ALL DYNAMIC LOADS ARE IN ADDITION TO THE STATIC LOADS
2. THE MOMENT (M) AND RADIAL FORCE (R) COULD OCCUR IN ANY VERTICAL PLANE - IE THE ANGLE 'Q' RANGES FROM 0° TO 360° PER THE DIAGRAM.
3. THE LOADS TABULATED IN THIS DRAWING ARE MAXIMUM EXPECETED LOADS. THE LOADS WILL VARY DURING OPERATION FROM ZERO TO THE MAXIMUM LISTED. THE DIRECTION AND MAGNITUDE OF THE MOMENT AND RADIAL LOADS COULD OCCUR IN ANY DIRECTION (NOTE 2). THE FOUNDATION DESIGNER IS TO DESIGN THE FOUNDATION TO HANDLE THESE LOADS. THE DYNAMIC LOADS TABULATED CONSIST OF A COMBINATION OF CONTINUOUS AND IMPACT LOADS, BUT NO IMPACT FACTOR HAS BEEN APPLIED TO THESE LOADS.
4. THE CONTINUOUS DYNAMIC MOMENT IS ON THE ORDER OF 50% OF THE VALUE TABULATED. THE MOMENT VALUE TABULATED INCLUDES BOTH THE NORMAL GRINDING MOMENT AND THE IMPACT MOMENT DUE TO GRINDING TRAMP MATERIAL (NON-COAL MATERIAL, ROCK, IRON, ETC)

THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED.

1. REF. TO HY0230261 FOR UNSPECIFIED TOLERANCES.
2. CHAMFER M/CD. SHARP EDGES 1.2 TO 1.0 AT 45°
3. INTERNAL M/CD. CORNER RADII 1 TO 0.7
4. THE SURFACE ROUGHNESS WHERE-EVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUT SIDE THE BACK SLASH GIVEN OR THE TOP MOST RIGHT CORNER OF THE DRG.

PRELIMINARY TENDER DRAWING

OWNER: TSGENCO

PROJECT: KOTHAGUDEM, UNIT-12, 1x800 MW

BHARAT HEAVY ELECTRICALS LIMITED
HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	UPR		05.11.14	
CHD.	RR		05.11.14	
APPD.	MVRM		05.11.14	

DEPT.	UNTOL. DIMS. GR.		SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEMS
PULV. ENGG. CODE 446	C/M/F		NTS				

TITLE: FOUNDATION PLAN & LOADING HP 1103 MILL (WITH PLANETARY GEAR BOX)

CARD CODE

DRAWING NO. 0-00-610-87040 REV. 00

SHEET NO. 01 NO OF SHEETS 01

REV.	DATE	ALTERED	CHD./APPD.	ZONE

VOLUME – II B

SECTION-D

STANDARD TECHNICAL REQUIREMENTS

1.0 GENERAL

This standard specification covers the design, material of construction, features, manufacture, inspection & testing at VENDOR'S and/or his sub-vendors' works, suitable painting and packing requirements of air receiver

2.0 CODES & STANDARDS

.

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.

3.0 DESIGN AND CONSTRUCTION

3.1 The air receivers shall be vertical self-supporting cylindrical vessels with supporting stands for resting on the civil foundation.

3.2 Other design parameters and design internal pressure of the receiver shall be as per the data specification sheet, if any, enclosed. The receiver shall be designed as per IS:7938.

3.3 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.

3.4 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.

3.5 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.

3.6 All other welding on the air receiver, including filet weld and nozzle connection shall be DP tested as per IS: 2825 (Para 8.7.11).

3.7 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.

3.8 Receivers shall be provided with relief valve of the capacity and set pressure of the same at least 10% above working pressure. 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.

3.9 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.

3.10 The receiver shall be provided with necessary number of nozzles. The orientation of the nozzles shall be subjected to the approval of the Owner.

3.11 Local instruments like pressure gauge, switch and temp. gauge of suitable range shall be supplied. Please refer specification for conveying air compressor for other instrumentation required.

3.12 The vendor will have all welding procedures & welders qualified in accordance with the relevant codes prior to commencing any welding at the works. These tests shall be witnessed by customer/client representative.

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 EQUPIMENT

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 arid polished conforming to IS: 6216 Grade 80 as specified in data sheet 'A'.

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 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:

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

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

DATA SPECIFICATION FOR AIR COMPRESSOR

A.

Performance Specification

Air Delivery	:	Bidder to compute and indicate as per guidelines in this section.
Discharge Pressure	:	- do -
Duty	:	To be designed for continuous load-unload and On-off mode operation.

Parallel operation of one or more compressors shall be possible without any undue vibration and noise.

Noise level	:	Not to exceed 85 dBA at a distance of 1.0 m. from the equipment surface.
Compressed air outlet temp.	:	Limited to 10^{o}C above of inlet cooling water temperature.
Location	:	Indoor

B.

Construction Features

Type of Compressor	:	Indoor, dry type, oil free rotary Screw compressor.
Quantity	:	As indicated in the single line flow diagram
Type of drive	:	Electric Motor
Nos. of starts per Hr.	:	8
Type of Transmission	:	Gear
Anti vibration Arrangement required	:	Yes
Type of Control	:	Dual i.e. both load-unload and auto start/stop
Type of Annunciation	:	Audio-visual
Flange Standard	:	ANSI B16.5

C.

Materials of Construction:

Gear casing, Compressor	:	Cast Iron, GGG 40, DIN 1693
Compressor Casing / Rotor housing		Cast Iron, GGG 40, DIN 1693
Rotors	:	Carbon Steel, Teflon coated, St 50-2, DIN 17100
Bull gear		Low Alloy Steel, 18 Cr Ni Mo 7-6 , EN 10084
Pinion Gear		Low Alloy Steel, 18 Cr Ni Mo 7-6 EN 10084
Timing Gears		Low Alloy Steel, 21 Ni Cr Mo 2-2 EN 10084
Drive shaft	:	Low alloyed steel, 42 Cr Mo S4, EN 10083-1

	Cooler tubes		Stainless Steel, SS - 304
	Bidder shall confirm suitability of MOC considering service requirement e.g. cooling water quality etc.		

D. **Supply of Accessories and Service**

Intake Air Filter with Silencer	:	Yes
Inter Coolers	:	Yes
After Cooler and Moisture Separator	:	Yes
Automatic drain traps	:	Yes
Anti- vibration pads	:	Yes.
All Instruments as specified and as shown in the tender drawing and as required	:	Yes
Coupling guard	:	Yes
Air Receiver	:	Yes
Base Plate	:	Yes
Foundation bolts, nuts, sleeves etc.	:	Yes
Interconnecting pipe work valves & specialties as per scope and as shown in the tender drawing.	:	Yes
Eye bolts, lifting lugs, tools and tackles	:	Yes
Jack bolt in each motor base frame for alignment purpose	:	Yes
Control panel as per specification	:	Yes
Instrument Gauge Panel	:	Yes
Shop painting	:	Yes
Spare parts	:	Yes
Erection Service	:	Yes
Shop testing	:	Yes
Testing at site and commissioning	:	Yes

E.

Testing and Inspection

Material Testing and Identification	:	Required
Radiography Test	:	Yes
Parts to be Tested	:	All Pressure parts and Vessels
Dye Penetration Test	:	Yes
Type of performance test	:	Routine Test
Volumetric and overall efficiency tests and testing for loading / unloading mechanism included in performance test.	:	Yes
Hydrostatic test	:	Yes
Field Performance test	:	Yes
Performance test and Hydrostatic test at site to be witnessed by the Purchaser	:	Yes
Non-destructive test of material	:	Yes
Dynamic balancing test of the rotor	:	Yes
MPI & UT Tests	:	Yes

1.0 GENERAL

This specification covers the PURCHASER'S general requirement of design, materials, constructional features, manufacture, inspection and testing at VENDOR''S works and/or his sub vendor's works of Conveying Vessel and accessories specified hereinafter.

2.0 CODES AND STANDARDS

2.1 The design, material, construction, manufacture, inspection and performance of the Transporter 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.

2.2 The material of construction and other works of the Transporter and accessories shall in general conform to the following standards/codes but will be subjected to any modification and requirement as specified in Section C of Technical Speciation.

i) Transporter Vessel – Mild Steel to IS 2062 (Gr. A min); Construction as per IS-2825 / BS5500/ASME SEC-VIII, Div-1
ii) Material Handling Valve – As indicated in Sec-C of the specification
iii) Flange – MS as per ANSI B 16.5

2.3 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.

3.0 DESIGN REQUIREMENTS

3.1 The dense phase pneumatic conveying system shall be designed for low velocity for conveying of materials as indicated in Section C.

3.2 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.

3.3 The bottom of vessel shall have transition bend and a control air supply system to the side of the conveying vessel.

3.4 Airtight seal system shall be provided between the transporter and the feeding point.

3.5 Transporter shall be equipped with **air strainer** to prevent pipe scale /dirt from causing pressure regulator malfunctioning.

3.6 Automatic drain filter and oil fog lubricator set shall be fitted into the air line to dome valve/metering valve for use with pneumatic controls.

3.7 Any air line stop valve fitted in the air supply line of transporter shall be of ball type to avoid any restriction to air flow, when open.

4.0 CONSTRUCTIONAL FEATURES

4.1 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 shall be airtight/leak proof in fully assembled condition. Conveying vessel shall be designed and tested as per IS 2825 class-III vessel. Temperature of mill reject coming into the conveying vessel shall be considered as 200 °C. Conveying vessel shall be designed for a pressure 10% above the maximum pressure encountered in the vessel. The conveying vessel shall be constructed with tested quality mild steel plates. They shall withstand the abrasive & hot condition of the mill rejects and operating air pressure. The conveying vessel shall be supported independently on steel columns. The vessel shall have suitably located and adequately numbered air connections for supply of compressed air for conveying mill rejects through pipes to overhead bin.

4.2 Dome/Metering valve shall be of manufacturer's standard construction and will be easily openable and closeable type. All joints will be flanged with asbestos free or silicon rubber gaskets suitable for 200 °C.

4.3 All bends will be of long radius cast bends (R = 5D). Conveying pipes will be of mild steel heavy duty type.

5.0 TESTING AND INSPECTION

5.1 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

5.2 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.

5.3 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) Welders 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.

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.

1.0 GENERAL

1.1 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.

2.0 CODES AND STANDARDS

2.1 The design, material, construction, manufacture, 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.

2.2 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 the specification.

a)	Structural steel	:	IS-2062 Gr A (min)
b)	Rolled Steel Beams, Channels and Angle Sections	:	IS-808
c)	Scheme of Symbols for Welding	:	IS-813
d)	Covered Electrodes for Metal Arc Welding of Structural Steel	:	IS-814
e)	Code of practice for use of Metal Arc Welding for general Construction in Mild Steel	:	IS-816
f)	Code of practice for inspection of Welds	:	IS-822
g)	Code of practice for use of structural steel in general building construction	:	IS-800
h)	Dimension for steel plate, sheet and Strip for structural and general Engineering purposes	:	IS-1730
i)	Recommendation for metal arc welding	:	IS-9575

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

3.0 DESIGN REQUIREMENT

3.1 The coal mill reject bunker 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, gratings etc. shall be provided by the bidder.

3.2 The reject bunker shall be complete with twin sector discharge gate, stainless steel liners, flanged connections, platforms, gratings/chequered plates, access staircase, hand railings etc. The equipment shall be designed and equipped for outdoor operation, complete with all accessories.

4.0 CONSTRUCTIONAL FEATURES

4.1 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 surface shall be provided with liner MOC as specified elsewhere in the specification. Explosion diaphragm/Pressure relief valve shall be provided to release air from the bunker in case pressure inside the bunker exceeds 1 .0 kg/cm^2(g)

4.2 Vendor shall furnish all steel work required for support and access for operation and maintenance. This shall include platforms, grating/chequered plates, stairways, hand railings, base plates, foundation bolts etc. Purchaser will provide only the foundation with pockets. The bunker shall have shed over it and shall be provided with monorail & hoist for equipment handling.

4.3 The storage bunker shall be so arranged that any 10 ton capacity truck can be conveniently loaded under it by an operator standing on the platform.

4.4 Access and platform shall be provided with 32 mm thick MS grating & 32 mm MS GI pipe hand railing.

4.5 The storage bunker shall be provided with filter bags as specified elsewhere in the specification. Filter bags shall be suitably treated to minimize the chances of filter catching fire. It shall be possible to plug opening for damaged bag filters, if any, to facilitate un-interrupted operation. 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 provided just above the filter to facilitate individual cleaning of each bag.

4.6 The terminal boxes for terminating reject conveying pipes 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 bunker.

5.0 INSPECTION AND TESTING

5.1 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.

5.2 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.

5.3 Examination of material of construction, verification, correlation and identification with material test certificate.

5.4 Ensuring that the relevant weld procedure and welder qualifications tests are in accordance with fabrication code.

5.5 Inspection during fabrication at appropriate stage including fit up. Witness of dye penetrant 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.

5.6 Any other tests as specified in the fabrication code.

5.7 Dimensional check match marking as per approved drawings.

6.0 SCOPE OF INSPECTION FOR RACK AND PINION GATE

6.1 Examination of materials of construction, verification, correlation/testing and identification of material with test certificate for important items like body, drives, warm shaft, rack & pinion, wheel etc.

6.2 Dye Penetration check on drive shaft & warm shaft as per IS-3658 and there shall be no surface defects.

6.3 Dimensional check

6.4 For chain proof load shall be carried out.

6.5 Hardness of rubber component

6.6 Check for overall dimension, completeness, no load working after assembly.

6.7 Clearing, marking and painting.

Mill Discharge Spout and Pyrite Hopper

- Each coal mill has a discharge spout with a pneumatic 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 a knife gate valve of approved design at the bottom, adequately sized manhole/inspection door, sizing gird and emergency chute with 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 transporter vessel's inlet 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 knife gate valve to transfer mill rejects from pyrite hopper to ground or to Owner's trolley. 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 chocked condition.

- Open & Close Limit switches shall be provided in all 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.
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.

VOLUME-III

DRAWINGS/ DOCUMENTS TO BE SUBMITTED WITH THE BID FOR TECHNICAL EVALUATION

Bidder shall submit the following drawings / documents along with their bid

a) Copy of pre-bid clarifications, if any, duly signed & stamped

b) **Deviation schedule** with reference to specific clauses of the specification along with reason for such deviation and cost-of-withdrawal in the format given with price format.

c) Signed and stamped copy of Compliance cum Confirmation Certificate (Vol-III)

d) Un priced copy of price format indicating quoted/ not quoted against each row/column

e) Filled electrical load list

f) Stamped copy of Electrical Scope between BHEL & Vendor

g) Electrical Equipment Specification for Mill Reject Handling System duly stamped (1 sheet)

Note: OFFER WILL BE CONSIDERED AS INCOMPLETE IN ABSENCE OF ANY OF ABOVE DOCUMENTS. DOCUMENT OTHER THAN ABOVE, IF ANY, SUBMITTED WITH THE OFFER WILL NOT FORM PART OF CONTRACT AND ACCORDINGLY WILL NOT BE CONSIDERED FOR BID EVALUATION.

COMPLIANCE CUM CONFIRMATION CERTIFICATE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate (every sheet) and furnish same with the offer.

a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions other than those mentioned under "exclusion" and those resolved as per 'Schedule of Deviations', if applicable, with regard to same.

b) There are no other deviations w.r.t. specifications other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'.

c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL/ CUSTOMER approval & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. This shall be within the contracted price with no extra implications to BHEL after award of the contract.

d) All drawings/ data-sheets/ calculations etc. submitted along with the offer shall be considered for reference only, same shall be subject to BHEL/ CUSTOMER approval in the event of order.

e) The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified/ intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements then same shall be resolved by the bidder with BHEL during the pre - bid discussions, otherwise BHEL/ Customer's decision shall be binding on the bidder whenever the deficiency is pointed out.

   For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.

f) The commissioning spares shall be supplied on 'As Required Basis' & prices for same included in the base price itself.

g) All sub vendors shall be subject to BHEL/ CUSTOMER approval in the event of order.

h) Guarantee for plant/equipment shall be as per relevant clause of GCC /SCC /Other Commercial Terms & Conditions.

i) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities. This clause will apply in case during site commissioning additional requirements emerges due to customer and/ or consultant's comments. No extra claims shall be put on this account.

j) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's/ Customer's/ Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.

k) As built drawings shall be submitted as and when required during the project execution.

l) The bidder has not tempered with this compliance cum confirmation certificate and if at any stage any tempering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.

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

LIST OF BASIC DRAWINGS

BHEL DRAWING NO.	DRAWING TITLE
PE-V0-410-160-A002	GA OF WATER AND AIR LINE VALVES
PE-V0-410-160-A003	G.A., TECHNICAL DATA SHEET OF AIRCOMPRESSOR MOTOR
PE-V0-410-160-A004	DESIGN PHILOSPHY AND SYSTEM SIZING CALCULATION OF MILL REJECT SYSTEM
PE-V0-410-160-A006	P & I DIAGRAM OF MILL REJECT HANDLING SYSTEM
PE-V0-410-160-A008	GA & DS OF SELF MFG. ITEMS (DENSVEYOR, HOPPER, BNKR DIS. GATE, PRV, ACI BEND, PNEU. PANEL, AIR RECVR, TER. BOX, ETC.)
PE-V0-410-160-A011	SUB VENDOR LIST WITH INSPECTION CATEGORY
PE-V0-410-160-A013	EQPT AND PIPING LAYOUT OF MILL REJECT SYSTEM AND PIPING LAYOUT FROM COMPRESSOR HOUSE
PE-V0-410-160-A014	LAYOUT OF COMPRESSOR HOUSE
PE-V0-410-160-A017	QAP OF SELF MANUFACTURED-CONVEYING VESSEL , PYRITE HOPPER, BUNKER DISCHARGE GATE, PRESSURE RELIEF VALVE, TERMINAL BOX , ACI BEND, AIR RECEIVER , PNEUMATIC PANEL
PE-V0-410-160-A019	G.A OF MRS BUNKER
PE-V0-410-160-A022	TRENCH AND INSERT DETAIL OF MRS
PE-V0-410-160-A024	DESIGN CALCULATION AND STRUCTURAL ARRANGEMENT OF BUNKER AND LOAD DATA OF BUNKER
PE-V0-410-160-A043	G.A., TECHNICAL DATA SHEET AND FOUNDATION DETAILS OF AIRCOMPRESSOR, GA AND WIRING DIAGRAM FOR LOCAL PANEL OF CONVEYING AIR COMPRESSOR
PE-V0-410-160-A048	CONTROL WRITE-UP & INTERLOCK & PNEUMATIC CIRCUIT OF CONVEYING VESSEL, BLOCK LOGIC DIAGRAM/CONTROL SCHEME WITH HMI SCREEN & I/O LIST

Note: Drawings listed above have been identified as basic drawings. During contract engineering stage, approval of these drawings from BHEL/Customer shall be treated as clearance to milestone payment for completion of design & engineering.

1X800 MW TSGENCO KOTHAGUDAM TPS - Mill Reject Handling System

PRICE SCHEDULE - I

MAIN SUPPLY + E&C + MANDATORY SPARES SUPPLY

S.No.	Details of Works or Equipment/System	1	2	3	4	5=Sum (1 to 4)	6	7	8	9	10=Sum (6 to 9)	11	12	13=11+12	14=5+10+13
1.1.0	**Lumpsum prices**	**Total ex-works price for MAIN SUPPLY**	**ED**	**CST**	**FREIGHT**	**FOR SITE (MAIN SUPPLY)**	**Total ex-works price for MANDATORY SPARES SUPPLY**	**ED**	**CST**	**FREIGHT**	**FOR SITE (MANDATORY SPARES SUPPLY)**	**E&C Charges**	**Serivce Tax on E&C**	**Total E&C price**	**GRAND TOTAL**
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, Demonstration 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 Mandatory Spares, erection and commissioning spares, special tools and tackles as required for the total scope defined as per technical specification PE-TS-410-160-A001 taking into account all clarifications, confirmations and agreements till date.														

Notes:

a) ***Bidder to note that Grand 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 as per NIT.***

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) ***Bidder to note that prices indicated in column 13 (Total E&C price) shall be minimum 20 % of (column 5 + column 13), that is SUM of FOR SITE (MAIN SUPPLY) and Total E&C price.***

1X800 MW TSGENCO KOTHAGUDAM TPS - Mill Reject Handling System							
SCHEDULE - II							
MAIN SUPPLY							
		1	2	3	4	5	6=Sum (2 to 5)
S.No.	Details of Works or Equipment/System	Price percentage of total ex-works supply price at column 2 of 1.1.1	Ex-works price	ED	CST	FREIGHT	FOR SITE
1.1.0	**Lumpsum prices**						
1.1.1	Total lumpsum firm price inclusive of all taxes duties and other levies as applicable for design, engineering, manufacturing, inspection and testing, painting, supply/delivery duly packed at project site including freight 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, special tools and tackles as required for the total scope defined as per technical specification PE-TS-410-160-A001 taking into account all clarifications, confirmations and agreements till date.	100%					
1.2.0	**Break - up of Prices given at 1.1.1 above. (To be used during contract execution for payment)**						
1.2.1	Lumpsum firm price for supply of transporter vessel with dome /butterfly/ vertical swing type valve, insert plates and accessories inclusive of all taxes, duties and other levies as applicable .	16.0%					
1.2.2	Lumpsum firm price for supply of Pyrite hopper with level probes, temperature switch, rupture disc, metallic expansion bellow inclusive of all taxes, duties and other levies as applicable .	12.0%					
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	4.0%					
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, bunker discharge gate with accessories inclusive of all taxes duties and other levies as applicable.	28.0%					
1.2.5	Lumpsum firm price for air compressors with drive etc inclusive of all taxes, duties and other levies as applicable	14.0%					
1.2.6	Lumpsum firm price for Air receivers with accessories inclusive of all taxes, duties and other levies as applicable	2.0%					
1.2.7	Lumpsum firm price of pipes for Mill reject conveying inclusive of all taxes, duties and other levies as applicable	6.0%					
1.2.8	Lumpsum firm price of pipes for Compressed air (instrument air and conveying air) & cooling water services etc inclusive of all taxes, duties and other levies as applicable	1.0%					
1.2.9	Lumpsum firm price for Air & Water Line Valves inclusive of all taxes, duties and other levies as applicable	1.0%					
1.2.10	Lumpsum firm price for pneumatically operated knife gate valves for different application inclusive of all taxes, duties and other levies as applicable .	4.0%					
1.2.11	Lumpsum firm price for Alloy C.I bends/ fittings/laterals inclusive of all taxes, duties and other levies as applicable .	6.0%					
1.2.12	Lumpsum firm price for Field instruments, cable glands & lugs, cable trays/conduits(branch) as per specification requirement inclusive of all taxes, duties and other levies as applicable .	2.0%					
1.2.13	Lumpsum firm price of fixed sump pump along with all its control, inclusive of all taxes, duties and other levies as applicable.	1.0%					
1.2.14	Lumpsum price for Mandatory Spares as required, inclusive of all taxes, duties and other levies as applicable.	2.0%					
1.2.15	Lumpsum price for tools and tackels and start-up & commissioning spares as required, inclusive of all taxes, duties and other levies as applicable.	1.0%					
	Total of 1.2.1 to 1.2.14 (Should match with 1.1.1).The break up prices indicated under this head are for internal use only & NOT for any comparision purpose. However, these prices shall be used for making adjustment for any scope variation during contract stage.	**100.0%**					
NOTE:	**Price percentage given under column 1 are fixed and any variation in same found after price bid opening shall be adjusted accordingly.**						

1X800 MW TSGENCO KOTHAGUDAM TPS - Mill Reject Handling System				
SCHEDULE - III				
	ERECTION AND COMMISSIONING			
		1	2	3=1+2
S.No.	Details of Works or Equipment/System	E&C Charges	Serivce Tax on E&C	Total E&C price
1.1.0	**Lumpsum prices**			
1.1.1	Total lumpsum firm price inclusive of all taxes duties and other levies as applicable for unloading, storage and handling at site, design & construction of structural and minor civil works at site etc.,erection and commissioning, trial run at site, Demonstration 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 as required for the total scope defined as per technical specification PE-TS-410-160-A001 taking into account all clarifications, confirmations and agreements till date.			
1.2.0	**Break - up of Prices given at 1.1.1 above. (To be used during contract execution for payment)**			
1.2.1	Lumpsum firm price for supply of transporter vessel with dome /butterfly/ vertical swing type valve, insert plates 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, metallic expansion bellow 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, bunker discharge gate 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 inclusive of all taxes, duties and other levies as applicable			
1.2.8	Lumpsum firm price of pipes for Compressed air (instrument air and conveying air) & cooling water services etc inclusive of all taxes, duties and other levies as applicable			
1.2.9	Lumpsum firm price for Air & Water Line Valves inclusive of all taxes, duties and other levies as applicable			
1.2.10	Lumpsum firm price for pneumatically 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, cable glands & lugs, cable trays/conduits(branch) as per specification requirement inclusive of all taxes, duties and other levies as applicable .			
1.2.13	Lumpsum firm price of fixed sump pump along with all its control, inclusive of all taxes, duties and other levies as applicable.			
	Total of 1.2.1 to 1.2.13 (Should match with 1.1.1)			

1X800 MW TSGENCO KOTHAGUDAM TPS - Mill Reject Handling System							
SCHEDULE - IV							
MANDATORY SPARES SUPPLY							
		1	2	3	4	5	6=Sum (2 to 5)
S.No.	Details of Works or Equipment/System	Total Quantity	Ex-works price	ED	CST	FREIGHT	FOR SITE
	Lumpsum prices						
A	Total lumpsum firm price inclusive of all taxes duties and other levies as applicable for supply of Mandatory Spares as required for the total scope defined as per technical specification PE-TS-410-160-A001 taking into account all clarifications, confirmations and agreements till date.	1 Set					
B	**Break - up of Prices given at S.No.A above**						
1	415 Volt Motor (above 30KW Rating upto 200KW)						
1.1	End Shield Cover Driving & Non-Driving End	1Set for each type and rating of Motor					
1.2	Driving End & Non-Driving End Bearing	1Set for each type and rating of Motor					
1.3	Cooling Fan	1No. for each type and rating of Motor					
1.4	Motor Space Heater	1No. for each type and rating of Motor					
1.5	Motor Terminal Block	1No. for each type and rating of Motor					
1.6	Complete Set of Coupling	1Set for each Application					
2	Field Instruments						
2.1	Transmitters/ Gauges/Switches etc. along with relevant accessories	10% of total or at least two (whichever is higher) for each type along with accessories.					
2.2	Temperature Element (RTD/Thermo-couple) with thermowell	10% of each type, range and immersion length.					
		Minimum 5 nos.					
3	Process Connection Piping (Impulse piping/tubing, sampling piping / tubing & air supply piping as applicable)						
3.1	Valves of all types	10% of each type, class, size & model					
3.2	Valve Manifolds (2 way/3 way/5 way)	10% of each type, class, size & model					
3.3	Fittings	10% of each type, class, size & model					
3.4	Filter Regulators	20% of each model					
4	Junction Box						
4.1	Junction box	10% of total quantity for each size but minimum 2 nos.					
4.2	Terminals in Terminal blocks	10 nos. of each type					
	Total of 1.1 to 4.2 (Should match with S.No.A). However , the break up prices indicated under this head are for internal use only & NOT for any comparision purpose & or making adjustment for scope variation.						
NOTES:							
a)	**Unless stated otherwise, a 'set' means item or sub-items required for each type/ size, range of assembly/ sub- assembly required for complete replacement in one equipment system; it is further intended that the assembly/ sub-assembly which have different orientation (like left hand or right hand, top or bottom), different direction of rotation or mirror image positioning or any other reasons which result in marinating two different sets of spares to be used for subject assembly/ sub assembly, these shall be considered as different type of assembly/ sub assembly.**						
b)	**Wherever quantity has been specified as percentage(%), the quantity of mandatory spares to be provided by the vendor shall be the specified percentage (%) of total population required to meet the specification requirements. In case the quantity of mandatory spares so calculated happens to be in fraction, the same shall be rounded off to next higher whole number.**						
c)	**Wherever the quantities have been indicated for each type, size, thickness, material, radius, range etc, these shall cover all the items supplied and installed and the breakup of these shall be furnished by the vendor during detail engineering.**						
d)	**In case spares indicated in the list are not applcable to the particular design offered by the bidder, the bidder should offer spares applicable to the offered design with quantities genaerally in line with the approach followed in the above list.**						
e)	**Wherever bidder has indicated an item as not applicable, the same will have to be supplied free of cost, in case it is found applicable during detail engineering.**						

SCHEDULE -V

1X800 MW TSGENCO KOTHAGUDAM TPS - Mill Reject Handling System

Mode: Pneumatic Conveying

Sl.No.	Description / Item	Working	Standby	Power Consumption (KW) (at motor input terminal)	Duty Factor	Total Power Consumption (KW)
1	**2**	**3**	**4**	**5**	**6**	**7 = 3 x 5 x 6**
1	Conveying Air Compressor	1	1		1.00	
					Total KW	
Notes						
1	**If the actual power consumption exceeds the guaranteed power consumption, liquidated damages shall be payable by the Contractor at the rate of Rs 2,00.000/- per KW excess power consumption, over the base guaranteed figure indicated by him in his bid. Such liquidated damages may be recovered by the Owner by deduction from the contract price or by enforcing the contract performance guarantee or in any other manner deemed fit by the Owner. For this purpose, the drives of standby equipment shall not be considered.**					
2	**Power consumption (KW) of air compressors shall be measured at motor input terminals when operating at the rated capacity and pressure and performed on test rig at the vendor's works and actual motor shall be used for this purpose.**					
3	**For bid evaluation purpose on account of guaranteed auxiliary power consumption over base auxilliary power figure mentioned below, the same shall be loaded at the rate of Rs. 2,00,000/- per KW for the differential power consumption.**					
4	**Base aux power figure is 90 KW at duty factor 1.00.**					

SCHEDULE-VI: DEVIATION SHEET (COST OF WITHDRAWAL)

PROJECT:- 1X800 MW TSGENCO KOTHAGUDAM TPS

PACKAGE:- MILL REJECT HANDLING SYSTEM

TENDER ENQUIRY REFERENCE:-

NAME OF VENDOR:-

SL NO	VOULME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF WITHDRAWL OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWL OF DEVIATION IS APPLICABLE	NATURE OF COST OF WITHDRAWL OF DEVIATION (POSITIVE/ NEGATIVE)	REASON FOR QUOTING DEVIATION
TECHNICAL DEVIATIONS									
COMMERCIAL DEVIATIONS									

PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE

NAME	**DESIGNATIONS**	**SIGN & DATE**	

NOTES:

1. For self manufactured items of bidder, cost of withdrawl of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.
2. For directly dispatchable items, cost of withdrawl of deviation will be applicable on the basic price including taxes, duties & freight.
3. All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.
4. Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of
5. Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawl of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.
6. Bidder shall furnish price copy of above format along with price bid.
7. The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
8. Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
9. For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/ E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawl of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawl of deviation shall be taken as NIL.
10. Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
11. All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.
12. Cost of withdrawl is to be given seperately for each deviation. In no event bidder should club cost of withdrawl of more than one deviation else cost of withdrawl of such deviations which have been clubbed together shall be considered as NIL.
13. In case nature of cost of withdrawl (positive/negative) is not specified it shall be assumed as positive.
14. In case of descrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.