PEM :: C&I

STANDARD QUALITY PLAN FOR PROGRAMMABLE LOGIC CONTROLLER

QUALITY PLAN NO.:	**PE-QP-999-145-I036___**
VOLUME	IIB
SECTION	D
REV. NO.	01 DATE: 24.08.2007
SHEET	1 OF 8

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $			Remarks
									P	W	V	
1.0	**Materials /Components**											
1.1	Panels & Control Desks	Physical Inspection for Dimensions, Painting, Cutouts, Lifting / Locking Arrangements, Components, Drawing Pocket, Mounting accessories, Plinth & AV Pads, Cable Gland Plates, Hardwares, Hinges, Louvers & Filters, Fans & Panel Lamps	MA	Visual	100%	Contract specifications, Approved GA Drawings, BOQ	As per ref documents. No physical damage.	BHEL Quality Inspection Report.	3/2	2	1	
1.2	Power Supply/Packs, Battery & Battery charger, Transformer, UPS.	Physical Inspection Physical Damages Dimensions Mounting Accessories	MA	Visual	100%	Contract specifications, BOQ.	As per reference documents, Test Report	BHEL Quality Inspection Report.	3/2	2	1	
1.3	Indicating Lamp, Annunciator, Meters, Transducers, Signal Converters, Instruments, Single Loop Controllers	Physical Verification Physical Damages Dimensions Accessories	MA	Visual	100%	Contract specifications, BOQ.	As per ref documents No physical damage. Test/ Calibration report.	BHEL Quality Inspection Report	3/2	2	1	
1.4	PLC processors, I/O modules, Power Supply modules, Communication modules, Mounting Racks, Ethernet	Physical Inspection • Identification Labels • Physical Damages • Quantity • Spare Capacity	MA	Visual	100%	Product Catalogue, Data sheets, Approved Configuration diagram, BOQ	As per ref documents. Test Certificates	BHEL Quality Inspection Report.	3/2	2	1	

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

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STANDARD QUALITY PLAN
FOR
PROGRAMMABLE LOGIC CONTROLLER

QUALITY PLAN NO.:	**PE-QP-999-145-I036___**
VOLUME	IIB
SECTION	D
REV. NO.	01 DATE: 24.08.2007
SHEET	2 OF 8

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

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STANDARD QUALITY PLAN FOR PROGRAMMABLE LOGIC CONTROLLER

QUALITY PLAN NO.:	**PE-QP-999-145-I036___**
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SHEET	3 OF 8

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

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1 - BHEL 2 - Vendor 3 - Sub-vendor

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $			Remarks
									P	W	V	
3.0	**Factory Acceptance Test (FAT)**											
3.1	Input Output Functional Verification	I/O configuration, I/O operation	MA	Visual/ Eletrical	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	
3.2	Processor Verification	Processor configuration, Powering up, standby operation (as applicable) and Loading	MA	Visual	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	
3.3	Power Supply Module Verification	Redundancy Operation	MA	Electrical	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	
3.4	Communication System Verification	Redundancy operation of Communication System, Measurement of Response Time, Communication with third party system	MA	Electrical	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	
3.5	Diagnostic Verification	Self Diagnostic features of PLC system	MA	Visual	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	
3.6	Control Panel/Desk Verification	Operation of PLC driven annunciation system, Mosaic, Push buttons & selector switches, Indicating lamps	MA	Visual	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	
3.7	Software Verification	(i) Control Logics (ii) Engineering Features (iii) HMI Features	MA	Visual	100%	FAT Procedure	AS per FAT	BHEL Quality Inspection Report.	2	1	1	

LEGEND: * CR - Critical characteristics; MA - Major characteristics; MI - Minor characteristics
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FACTORY ACCEPTANCE TEST (FAT) PROCEDURE

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

a) Technical Specification of PLC.

b) PLC System Configuration

c) General Assembly Drawings.

d) Panel Wiring Diagrams.

e) Bill of Quantity for PLC System.

f) Logic Diagram.

g) HMI Schematics.

h) Input / Output List.

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

APPLICABLE TEST PROCEDURE:

1. Input/Output Functional Verification.

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

2. Processor Verification

PLC Configuration drawing to be referred for ascertaining

i) Redundancy

ii) Type (Hot or Cold)

Both the processors are to be checked for healthiness in case of redundant configuration as per vendor's standard practice. In case of hot redundancy, switchover of control from primary processor to standby processor shall be demonstrated for uninterrupted control and data processing as per vendor's standard practice. Switchover shall be witnessed, by manual power off or resetting the Primary CPU or simulating failure of primary processor. Checking should be by witnessing the lighting up of Processor's LEDs as per manufacturer's product standard.
Vendor shall demonstrate, as per Vendor's standard practice, adequate Loading (Spare Capacity) of Processors, as mentioned in contract specs. This shall be done, by simulating worst load operation of fully integrated PLC system.

3. Power Supply Module Verification

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

4. Communication System Verification

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

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

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

5. Diagnostic Verification

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

6. Control Panel /Desk Verification

i) PLC driven annunciation system should be checked by alarm signal simulation.

ii) Push Button and selector switch operation should be checked by verification of corresponding change of status of Data Base point.

iii) Indicating lamp / MIMIC should be checked by corresponding Data Base point simulation.

7. Software Verification

i). Control Logics:– Software switches, lamps and Analog sources shall be used for simulation of field conditions .Control logics shall be checked for its correct functionality as per approved logic schemes

ii). Engineering features:-
a) Online changing of parameters, set points.
b) Online modification in Control Logic Diagrams.
c) Online configuration of Graphics, Trends, Logs, HSR.

iii). HMI features:-
Check for configuration & operation of Graphics, Trends, Logs, HSR and Alarms, in the form of Displays and Printouts, by simulation of Inputs as per approved documents.

8. Burn in Elevated Temperature test

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

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

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

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

CHAPTER

DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT

LIST OF DELIVERABLES OF PEM - C&I DEPARTMENT FOR MRHS (INCLUDING COMPRESSED AIR SYSTEM FOR MRHS) (1 X 500 MW FGUTPP)

DOCUMENT NUMBER PE-GL-401-145-I100 SHEET 1 of 1

Sl.No.	DRAWING NO.	DRAWING/DOCUMENT TITLE	CATEGORY
1	PE-V0-401-160-I901	CONTROL & OPERATIONAL WRITE-UP FOR THE SYSTEM	A
2	PE-V0-401-160-I902	CONTROL SCHEME/LOGIC DIAGRAM OF OVERALL SYSTEM(TO BE IMPLEMENTED IN DDCMIS)	A
3	PE-V0-401-160-I903	CONTROL SCHEME/LOGIC DIAGRAM FOR AIR COMPRESSORS(TO BE IMPLEMENTED IN MP/PLC)	A
4	PE-V0-401-160-I904	HMI PICTURES/PLANT SCHEMATICS	A
5	PE-V0-401-160-I905	INSTRUMENT SCHEDULE	A
6	PE-V0-401-160-I906	I/O LIST (ANALOG & BINARY)	A
7	PE-V0-401-160-I907	DRIVE LIST/SOLENOID/ACTUATOR VALVE LIST WITH LOCATION DATA	A
8	PE-V0-401-160-I908	FIELD JB TERMINATIONS	A
9	PE-V0-401-160-I909	DATASHEETS FOR INSTRUMENTS, JBs, etc.	A
10	PE-V0-401-160-I910	QUALITY PLANS (INSTRUMENTS,PLC,LCP,JB etc.)	A
11	PE-V0-401-160-I911	THERMOWELL SIZING CALCULATION(IF APPLICABLE)	A
12	PE-V0-401-160-I912	LOCAL CONTROL PANELS GA/LAYOUT, DATASHEETS, WIRING DIAGRAM,BOQ	A
13	PE-V0-401-160-I913	CABLE SCHEDULE & INTERCONNECTION	A
14	PE-V0-401-160-I914	ANNUNCIATION & SOE LIST	A
15	PE-V0-401-160-I915	PLC DATASHEET, GA/LAYOUT, BOQ, WIRING DIAGRAM, I/O LIST, DRIVE LIST, CABLE SCHEDULE & INTERCONNECTION, ANNUNCIATION LIST, HMI PICTURES/PLANT SCHEMATICS	A
16	PE-V0-401-160-I916	24V DC POWER SUPPLY SYSTEM DATASHEET, GA/LAYOUT, WIRING DIAGRAM	A
17	PE-V0-401-160-I917	SOFT SIGNAL EXCHANGE LIST (IN EDN FORMAT ENCLOSED IN THE SPECIFICATION)	A

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

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

OPC COMMUNICATION DETAILS

Vendor Name :	
System Name	
Vendor Software details :	
Operating System	
OS Details :	
Workgroup Name:	
Domain Name:	
Third party system is acting as	
Client:	
Server:	
Protocol details	
Client	
OPC DA:	
OPC H D A:	
OPC A&E:	
Server	
OPC DA:	
OPC H D A:	
OPC A&E:	
Host Details:	
Redundancy Supported:	
Primary Host Details:	
Name:	
IP Address:	
Sub Net Mask:	
Redundant Host Details (If Required)	
Name:	
IP Address:	
Sub Net Mask:	
Prog ID Details	
Syntax:	
CLS ID Details (If Required)	
File to be imported:	
Third party User account Details	
User Name:	
Password:	
User Name:	
Password:	

NOTE: 1) Availability of read/write permission to data on which read/write operation required from Honeywell
2) Permission to create one of the OPC user on 3rd party OPC server machine (Dcom settings)

OPC DATA INPUT FORMAT (FORMAT FOR SOFT SIGNAL EXCHANGE BETWEEN MP/ PLC & DDCMIS)

OPC Server IP Address
OPC Server Name

Group No	Tag No	OPC Name in Server	Description	R/W	Type of Signal	Engg Unit	Range
1	1						
	2						
	3						
	4						
2	1						
	2						
	3						

Remote Registration File - File to be sent
and also to be copied in OPC PC under c:\custom\opc
one file for each OPC device to be interfaced

Enter only Numbers under Group No and Tag No in ascending order
OPC Name is reference name by which client will access data
Description is details of a tag
R/W is read or Write or both Function
Type of signal is information type
Ex Process Parameter(Analog value) etc
or Process Status (Digital Value)
Engg units if applicable
Range if applicable
Provide Technical Manual
Reqd. Contents : This document must provide an overview of the device including its intended use(a general technical,communication & electrical details)

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 receiversIS: 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: 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.

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	
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

1.0 GENERAL

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

2.0 CODES & STANDARDS

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

a) IS:5456 Code of practice for testing pf positive displacement type air compressors and exhauster.

b) IS:5727 Glossary of terms relating to compressors and exhauster.

c) IS:6206 Guide for selection, installation and maintenance of air compressors.

2.2 The material of various components shall conform as specified in Data Sheet-A and where not specified, the material shall conform to the applicable IS / BS / ASTM / DIN Standards.

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

3.0 DESIGN AND CONSTRUCTION

3.1 Air Compressors of reciprocating type shall be designed for continuous operation to satisfy the conveying air requirement for fail safe operation.

3.2 The design, manufacture and performance of air compressors shall comply with the requirements of latest applicable Indian / British American / DIN standards.

3.3 The compressors shall be water cooled, non lubricated type along with all accessories as specified in the data sheet - A. Intercoolers/ aftercoolers, if provided, shall also be of water cooled, shell – tube construction.

3.4 The compressors shall be designed to ensure trouble free operation with min. vibration and noise. Multiple cylinders, if employed, shall be arranged in such a way as to ensure min. unbalance.

3.5 The wall thickness of the compressor cylinder shall be selected to withstand highest internal pressure and at the same time shall allow a number of reborings.

3.6 The crank case shall be provided with oil level dip stick, breather and drain plug.

3.7 Any oil adhering to the piston rod shall be wiped-off by suitable wiper ring, suitable collars shall also be fixed on the piston rod between the packing and wiper rings so that any trickling oil flow can be stopped from moving towards the cylinder.

3.8 Suction and discharge valves shall be suitable for quick opening and closing in conformity with the rotating speed of the crank shaft. Valves shall have large effective areas permitting low air velocity along with cushioning arrangement to minimise shock. Valve discs shall be of stainless steel (containing 15% or more chromium) heat treated, tempered and ground. The valve seats, guides & springs shall be of hardened stainless steel.

3.9 Crankshaft, crank pin piston pin bearings shall be of antifriction or journal type depending on manufacturer's standard practice.

3.10 Splash or forced feed type of lubrication shall be provided for all bearings and sliding components.

3.11 The air receiver shall be sized that even in the event of total stoppage of air flow from the compressor, operation of conveying is not stopped for 2 cycle time duration.

3.12 Drive motor shall be connected to the air compressor directly or through V-belt or any other suitable type of power transmission system as specified in the data sheets. Shafts should be coupled through heavy-duty flexible coupling in case of direct drive.

3.13 The power rating of the drive shall be selected such that a min. margin of 15% is available over the total input power required at compressor drive shaft at the rated condition. Total input power shall include air compression power plus any power consumed in auxiliaries etc., (if any), when the driver is not directly coupled to compressor, due account shall be made for losses in power transmission in addition to the above 15% extra margin.

4.0 MATERIAL OF CONSTRUCTION

The material of construction for various parts of package air compressors shall be as follows:-

a) Compressor cylinder :CI ,IS- 210, grade FG-260
b) Piston :Aluminum
c) Piston rod :EN-8 as per BS -970
d) Connecting rod :Forged steel as per IS-1875 Cl IV
e) Piston ring :Teflon with 25-30% carbon.
f) Crank case :CI , IS-210 Grade FG-260
g) Suction and delivery valves :S.S as per EN-56 of BS-970
h) Air receiver :MS as per IS (2062)
i) For other parts :As per latest IS/BS/ASTM/AIS/ equivalent standards depending upon the parts

5.0 INSTRUMENTATION AND ACCESSORIES

The conveying air compressor and drive shall be supplied completed with the following instrumentation and accessories as minimum.

a) Discharge air pressure gauge
b) Pressure switch to control actuation of compressor drive motor.
c) Starter for drive motor.
d) Pressure relief valve
e) Drain valve
f) Delivery valve

6.0 INSPECTION & TESTING

6.1 The manufacturer shall conduct all tests to ensure that the equipment finished shall conform to the requirements of this specification and in compliance with requirements of applicable codes & standard.

6.2 All materials used for conveying air compressor and drive shall be of tested quality. Materials shall be tested as per the relevant standards and test certificates shall be made available to the purchaser.

6.3 Test at Shop:

a) All pressure parts shall be subjected to hydraulic testing at a pressure twice the maximum design pressure or 150% of design pressure whichever is more for a period not less than one (1) hour.

b) Assembled receiver shall he hydraulically tested at a pressure twice the maximum working pressure or 150% of the design pressure and the test pressure shall be maintained for at least 30 minutes. All joints shall be gently hammered during the test.

c) Pneumatic test at design pressure shall also be carried out.

7.0 PAINTING

7.1 All parts of air compressors with drive shall be painted as specified in Data Sheet-A or as per the specification furnished elsewhere.

7.2 Before transportation of the equipment necessary cleaning, flushing etc, shall be done shop coats of rust inhibiting paints, lacquers etc., shall be applied to various parts as necessary.

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 Denseveyor, 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.

DATA SHEET

S. No.	Parameter	Description
1	Quantity of material to be conveyed per hour by each denseveyor	650 Kg
2	Capacity of denseveyor envisaged	Adequately sized to meet above requirement
3	Air supply pressure available	Bidder to Decide
4	Any Cooling envisaged for dome valve & quantity of cooling water	Bidder to Decide
5	Distance over which material is to be conveyed	Refer Layout 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 data sheet A of Section-D.

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. The bunker-supporting column shall be so spaced to have a clear road access of 5.0 m width & clear headroom of 5.5 m.

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 pneumatic cylinder operated plate/ dome type valve of approved design at the bottom, adequately sized manhole/inspection door, impingement deflector plate, sizing gird and emergency chute with pneumatic operated Knife gate valve and reject quenching arrangement (water spray) shall be provided. Any platform/ structural support (as per IS 2062 Gr A/B) required to maintain the above equipment before pneumatically operated plat / dome valve. Necessary explosion vent (rupture disc with MOC SS 304/316) of proven design shall be provided in each pyrite hopper.

- Each emergency chute shall be provided with a pneumatic operated gate valve to transfer mill rejects from pyrite hopper to ground or to Owner's trolley. The gates shall be of robust construction and suitable for trouble free operation. The lever/gear wheel arrangement for manual operation shall be designed such that minimum effort is required to operate the gate. Necessary access and platform shall be provided. Limit switches shall be provided to indicate the valve position on control panel.

- Each pyrite hopper shall be provided with two level switches – one to start the operating sequence and the other to indicate the hopper above grid chocked condition.

- Open & Close Limit switches shall be provided in all manual and pneumatic KGVs and these limit switches shall be interlocked with MRS control system. Solenoid box cum local control panel shall be provided. Same shall house system start stop, vessel pressure indication, probe over ride, purge button so that system can be locally operated. 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. M.S. bars IS with clear opening of 40 mm x 40 mm.

VOLUME-III

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.

	TITLE	SPECIFICATION NO.
	MILLL REJECT HANDLING SYSTEM	VOLUME-III
	TECHNICAL SPECIFICATION	SECTION
	MILL REJECT HANDLING SYSTEM	**REV** 0
	DATA SHEET – B	SHEET 1 OF 1

S.NO	*DESCRIPTION*		*DATA/PARTICULARS*
1	Type of pneumatic conveying system	:	Dense Phase
2	Material and thickness of conveying vessel	:	
3	Size and material of vessel inlet valve	:	
4	Compressor parameters (Nm3/min and kg/sqm)		:
5.	Air Receiver capacity and qty	:	
6	Capacity of Vessel (Water filled cap.)	:	
7	Conveying Pipe size	:	
8.	Air Booster offered, size and qty	:	
	:		

	TITLE	SPECIFICATION NO.
BHEL	MOTOR DATA SHEET - C	VOLUME III SECTION D REV NO. 00 DATE 20.07.14 SHEET 1 OF 2

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

NAME OF VENDOR			SEAL	REV.	
NAME	SIGNATURE	DATE			

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

LOAD TITLE	RATING (KW / A)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/ INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONTROL CODE	REMARKS	LOAD No.
	NAME PLATE	MAX. CONT. DEMAND (MCR)		RUNNING	STANDBY								SIZE CODE	NOs				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

ANNEXURE-II

NOTES: 1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)

2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (cc): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V

: ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTER CONTROLLED)

	LOAD DATA (ELECTRICAL)	JOB NO.	401	ORIGINATING AGENCY		PEM (ELECTRICAL)	
		PROJECT TITLE	1 X 500 MW UNCHAHAR TPP	NAME		DATA FILLED UP ON	
		SYSTEM	MRS	SIGN.		DATA ENTERED ON	
		DEPTT. / SECTION	ELECTRICAL	SHEET 1 OF 1	REV. 00	DE'S SIGN. & DATE	

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

INSTRUMENT AIR REQUIREMENT*

S. No.	Description	Requirement (m^3/ min & Pressure)	Intermittent/ Continuous
01	First Column of each Bunker Bay	1.2. @ 5-7Kg/Sq.cm	Intermittent
02			
03			
04			
05			
06			

SERVICE WATER REQUIREMENT*

S. No.	Description	Requirement (m^3/ min & Pressure)	Intermittent/ Continuous
01	First Column of each Bunker Bay	6-8 M.Cub/Hr. @ 2.5-3Kg/Sq.cm	
02			
03			
04			
05			
06			

EQUIPMENT WATER REQUIREMENT*

S. No.	Description	Requirement (m^3/ min & Pressure)	Intermittent/ Continuous
01	5M from Main Compressor House	20 M.Cub/Hr. @ 5Kg/Sq.cm	
02			
03	Note:Pressure &Temperature drop limited 10MWC & 10 degree		
04			
05			
06			

SIGNATURE:_____

NAME:_____

DESIGNATION:_____

COMPANY: _____

COMPANY SEAL

DATE:_____

LIST OF START UP & COMMISSIONING SPARES

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

SIGNATURE:_____

NAME:_____

DESIGNATION:_____

COMPANY: _____

DATE:_____

COMPANY SEAL

LIST OF SPECIAL MAINTENANCE TOOLS & TACKLES*

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

*** Bidders need to fill this list <u>ONLY IF</u> the Tools are <u>SPECIAL</u> in nature.**

SIGNATURE:_____

NAME:_____

DESIGNATION:_____

COMPANY:_____

DATE:_____

COMPANY SEAL

LIST OF RECOMMENDED SPARES FOR 3 YEARS OF TROUBLE FREE OPERATION

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

SIGNATURE:_____

NAME:_____

DESIGNATION:_____

COMPANY: _____

DATE:_____

COMPANY SEAL

ANNEXURE-VI

DRAWINGS/ DOCUMENTS TO BE SUBMITTED WITH THE BID

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

a) Major process/equipment related details in the format given under Vol-III
b) Utility requirement in the format given under Vol-III (Stamped & Signed)
c) List of special maintenance tools & tackles, if any in the format given under vol-III.
d) Copy of Electrical Scope between BHEL & Vendor duly stamped
e) Electrical Equipment Specification for Mill Reject Handling System duly stamped
f) Electrical load list
g) **Deviation schedule** with reference to specific clauses of the specification along with reason for such deviation in the format given under Vol-III
h) Un priced copy of price format indicating quoted/ not quoted against each row/column
i) Copy of pre-bid clarifications, if any, duly signed & stamped
j) Signed/Stamped copy of Compliance cum Confirmation Certificate (Vol-III)

OFFER WILL BE CONSIDERED AS INCOMPLETE IN ABSECE OF ANY OF ABOVE DOCUMENTS. P& I DIAGRAM TO BE FURNIHSED WITH THE BID WILL BE REVIWED ONLY FOR UNDERSTANDING THE SCOPE OF WORK & OPERATION PHILOSPPHY. THIS SHALL BE FINALIZED DURING DETAIL ENGINEERING WITHOUT ANY COMMERCIAL. DELIVERY IMPLICATION.

DOCUMENT OTHER THAN ABOVE, IF ANY, SUBMITTED WITH THE OFFER WILL NOT FORM PART OF CONTRACT AND ACCORDINGLY WILLNOT BE CONSIDERED FOR BID EVALUATION.

MILL REJECT HANDLING SYSTEM (PNEUMATIC CONVEYING SYSTEM)					
Sl. No.	**Description**	**NTPC DRG.No.**	**BHEL DRG. N0.**	**Category**	**Submission schedule in weeks from LOI**
1	DESIGN PHILOSPHY AND SYSTEM SIZING CALCULATION OF MILL REJECT SYSTEM		PE-V0-401-160-A100	APPROVAL	3
2	P & I DIAGRAM OF MILL REJECT HANDLING SYSTEM		PE-V0-401-160-A101	APPROVAL	3
3	P & I DIAGRAM OF COMPRESSOR		PE-V0-401-160-A102	APPROVAL	9
4	EQPT AND PIPING LAYOUT OF MILL REJECT SYSTEM AND PIPING LAYOUT FROM COMPRESSOR HOUSE		PE-V0-401-160-A150	APPROVAL	7
5	LAYOUT OF COMPRESSOR HOUSE		PE-V0-401-160-A151	APPROVAL	9
6	CABLE TRAY, EARTHING LAYOUT		PE-V0-401-160-A152	APPROVAL	9
7	TRENCH AND INSERT DETAIL OF MRS		PE-V0-401-160-A154	APPROVAL	7
8	DESIGN CALCULATION AND STRUCTURAL ARRANGEMENT OF BUNKER AND LOAD DATA OF BUNKER		PE-V0-401-160-A155	APPROVAL/ INFORMATION	9
9	G.A OF BUNKER		PE-V0-401-160-A200	APPROVAL	5
10	GA AND DATA SHEET OF SELF MANUFACTURED ITEMS e.g. CONVEYING VESSEL , PYRITE HOPPER, BUNKER DISCHARGE GATE, PRESSURE RELIEF VALVE, ACI BEND, PNEUMATIC PANEL, AIR RECEIVER		PE-V0-401-160-A201	INFORMATION	5
11	GA OF KNIFE GATE/PLATE VALVE		PE-V0-401-160-A202	INFORMATION	7
12	G.A OF BAG FILTER		PE-V0-401-160-A203	INFORMATION	7
13	G.A. OF METALLIC EXPANSION BELLOWS		PE-V0-401-160-A204	INFORMATION	7
14	G.A. OF RUPTURE DISC.		PE-V0-401-160-A205	INFORMATION	7
15	GA OF CHAIN PULLEY BLOCK		PE-V0-401-160-A206	INFORMATION	7
16	G.A., TECHNICAL DATA SHEET AND FOUNDATION DETAILS OF AIR COMPRESSOR, GA AND WIRING DIAGRAM FOR LOCAL PANEL OF CONVEYING AIR COMPRESSOR		PE-V0-401-160-A207	APPROVAL	9
17	GA OF WATER AND AIR LINE VALVES		PE-V0-401-160-A208	APPROVAL	11
18	GA, TECHNICAL DATA SHEET AND WIRING DIAGRAM OF SUMP PUMP		PE-V0-401-160-A209	INFORMATION	9
19	ELECTRICAL LOAD LIST		PE-V0-401-160-A210	INFORMATION	5
20	TECHNICAL DATA SHEET OF TEMPERATURE SWITCH, TEMPERATURE GAUGE, PRESSURE SWITCH, PRESSURE GAUGE, SOLENOID VALVE , LEVEL SWITCH , AIR FILTER REGULATOR		PE-V0-401-160-A211	INFORMATION	9
21	G.A., TECHNICAL DATA SHEET OF AIR COMPRESSOR MOTOR		PE-V0-401-160-A212	APPROVAL	9
22	CONTROL WRITE-UP & INTERLOCK & PNEUMATIC CIRCUIT OF CONVEYING VESSEL, BLOCK LOGIC DIAGRAM/CONTROL SCHEME WITH HMI SCREEN & I/O		PE-V0-401-160-A213	APPROVAL	9
23	TECHNICAL DATA SHEET OF CABLE TRAY		PE-V0-401-160-A214	APPROVAL	9
24	TECHNICAL DATA SHEET OF CABLES(IF APPLICABLE)		PE-V0-401-160-A220	APPROVAL	11
25	CABLE INTERCONNECTION DIAGRAM		PE-V0-401-160-A221	INFORMATION	13
26	PAINTING SCHEDULE		PE-V0-401-160-A250	INFORMATION	7
27	PIPING AND VALVE SCHEDULE		PE-V0-401-160-A251	INFORMATION	7
28	INSTRUMENT SCHEDULE		PE-V0-395-160-A252	INFORMATION	9
29	CABLE SCHEDULE -POWER, SIGNAL AND CONTROL		PE-V0-401-160-A253	INFORMATION	11
30	DETAILED BOM		PE-V0-401-160-A254	INFORMATION	18
31	P G TEST PROCEDURE		PE-V0-401-160-A255	APPROVAL	18
32	OPERATION AND MAINTENANCE MANUAL		PE-V0-401-160-A256	INFORMATION	23
QUALITY PLANS					
33	SUB VENDOR LIST WITH INSPECTION CATEGORY		PE-V0-401-160-A300	APPROVAL	3
34	WPS		PE-V0-401-160-A301	APPROVAL	5
35	MS STRUCTURAL STEEL/ PLATES		PE-V0-401-160-A303	APPROVAL	5
36	SELF MANUFACTURED-CONVEYING VESSEL , PYRITE HOPPER, BUNKER DISCHARGE GATE, PRESSURE RELIEF VALVE, TERMINAL BOX , ACI BEND, AIR RECEIVER , PNEUMATIC PANEL		PE-V0-401-160-A304	APPROVAL	7
37	MS ERW PIPE		PE-V0-401-160-A305	APPROVAL	5
38	COMPRESSOR		PE-V0-401-160-A306	APPROVAL	9
39	KNIFE GATE/PLATE VALVE		PE-V0-401-160-A307	APPROVAL	9

40	BAG FILTER		**PE-V0-401-160-A308**	APPROVAL	9
41	METALLIC EXPANSION		**PE-V0-401-160-A309**	APPROVAL	9
42	BELLOWS		**PE-V0-401-160-A310**	APPROVAL	9
43	RUPTURE DISC		**PE-V0-401-160-A311**	APPROVAL	9
44	CHAIN PULLEY BLOCK		**PE-V0-401-160-A312**	APPROVAL	9
45	WATER AND AIR LINE VALVES		**PE-V0-401-160-A313**	APPROVAL	9
46	COMPRESSOR MOTOR		**PE-V0-401-160-A314**	APPROVAL	9
47	INSTRUMENTS (PG/PS/PT/TS/TG/SV)		**PE-V0-401-160-A315**	APPROVAL	11
48	CABLE TRAY		**PE-V0-401-160-A316**	APPROVAL	11
49	TYPE TEST CERTIFICATE/PROCEDURE FOR MOTORS(IF APPLICABLE)		**PE-V0-401-160-A317**	APPROVAL	9
50	TYPE TEST CERTIFICATE/PROCEDURE FOR CABLES(IF APPLICABLE)		**PE-V0-401-160-A318**	APPROVAL	9
51	QAP OF CABLES(IF APPLICABLE)		**PE-V0-401-160-A319**	APPROVAL	11
52	SUMP PUMP WITH MOTOR		**PE-V0-401-160-A320**	APPROVAL	9

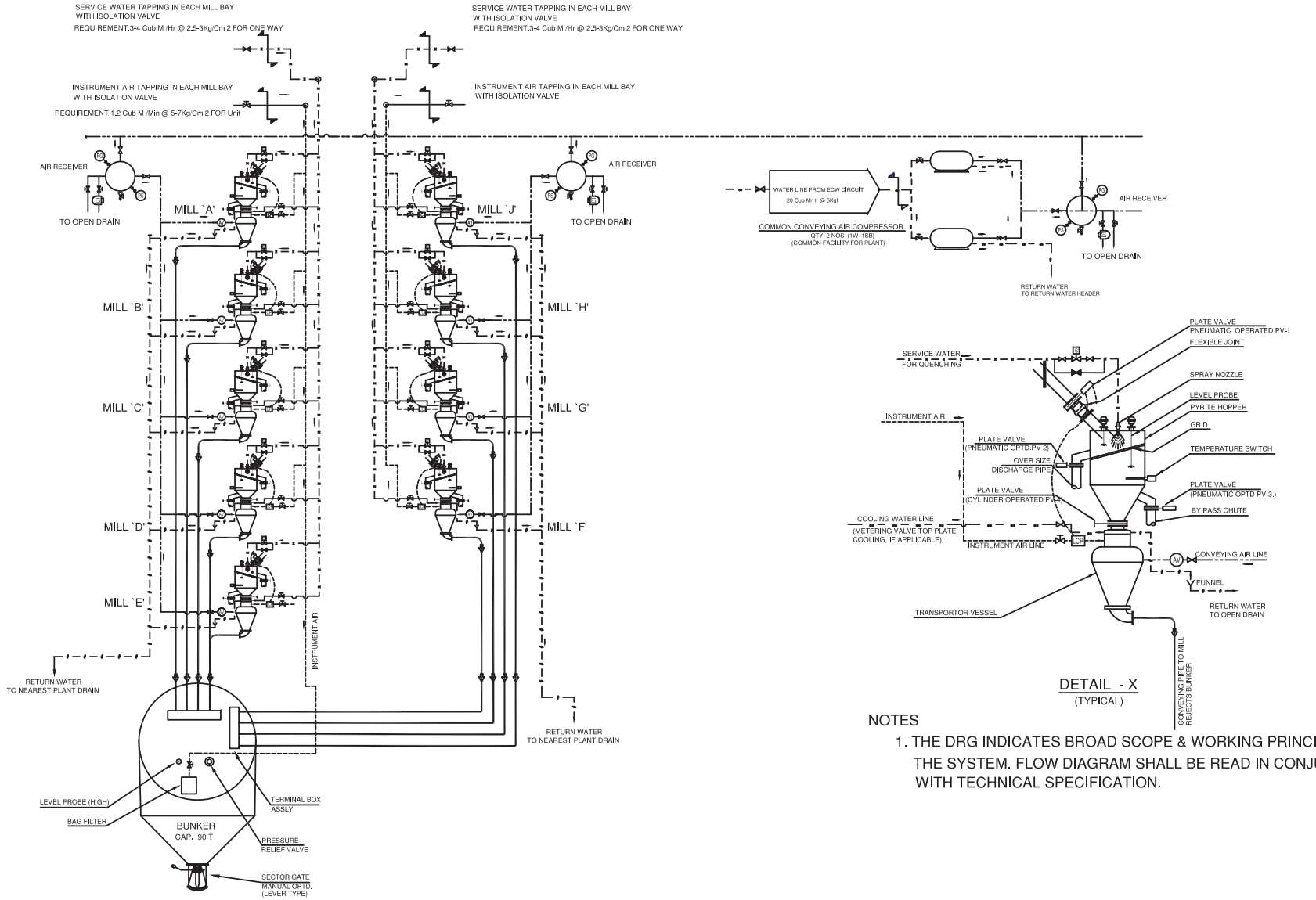
Notes:

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.
- 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.



DETAIL - X
(TYPICAL)

NOTES

1. THE DRG INDICATES BROAD SCOPE & WORKING PRINCIPAL OF THE SYSTEM. FLOW DIAGRAM SHALL BE READ IN CONJUNCTION WITH TECHNICAL SPECIFICATION.

LEGEND:-

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

S.No.	DATE	DESCRIPTION	BY	CHD	APD

REVISIONS

PROJECT: FEROZE GANDHI UNCHAHAR THERMAL POWER PROJECT STAGE-IV 1X500MW

OWNER: NTPC Limited

CONSULTANT: NTPC BHEL Power Projects Private Limited (A Joint Venture Company of NTPC & BHEL) Y.S.R. Puram, Village Mamnavaram, Sri Kalahasti Mandal, Dist. Chittoor - 517620 (A.P.)

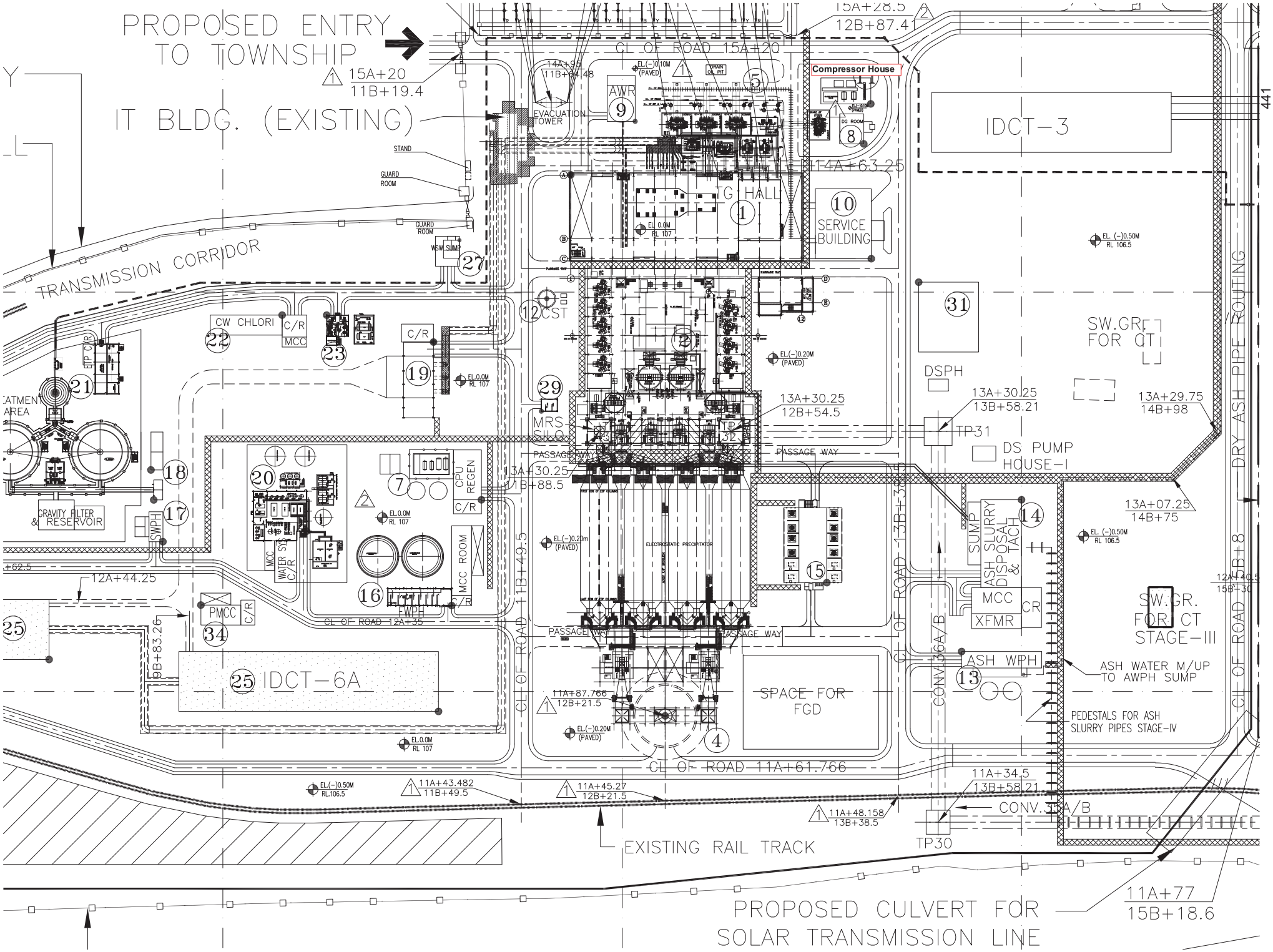
CONTRACTOR: BHARAT HEAVY ELECTRICALS LTD PEM NOIDA

JOB NO. 401
STATUS CONTRACT
DISTRIBUTION

TITLE: SINGLE LINE FLOW DIAGRAM FOR MILL REJECT HANDLING SYSTEM

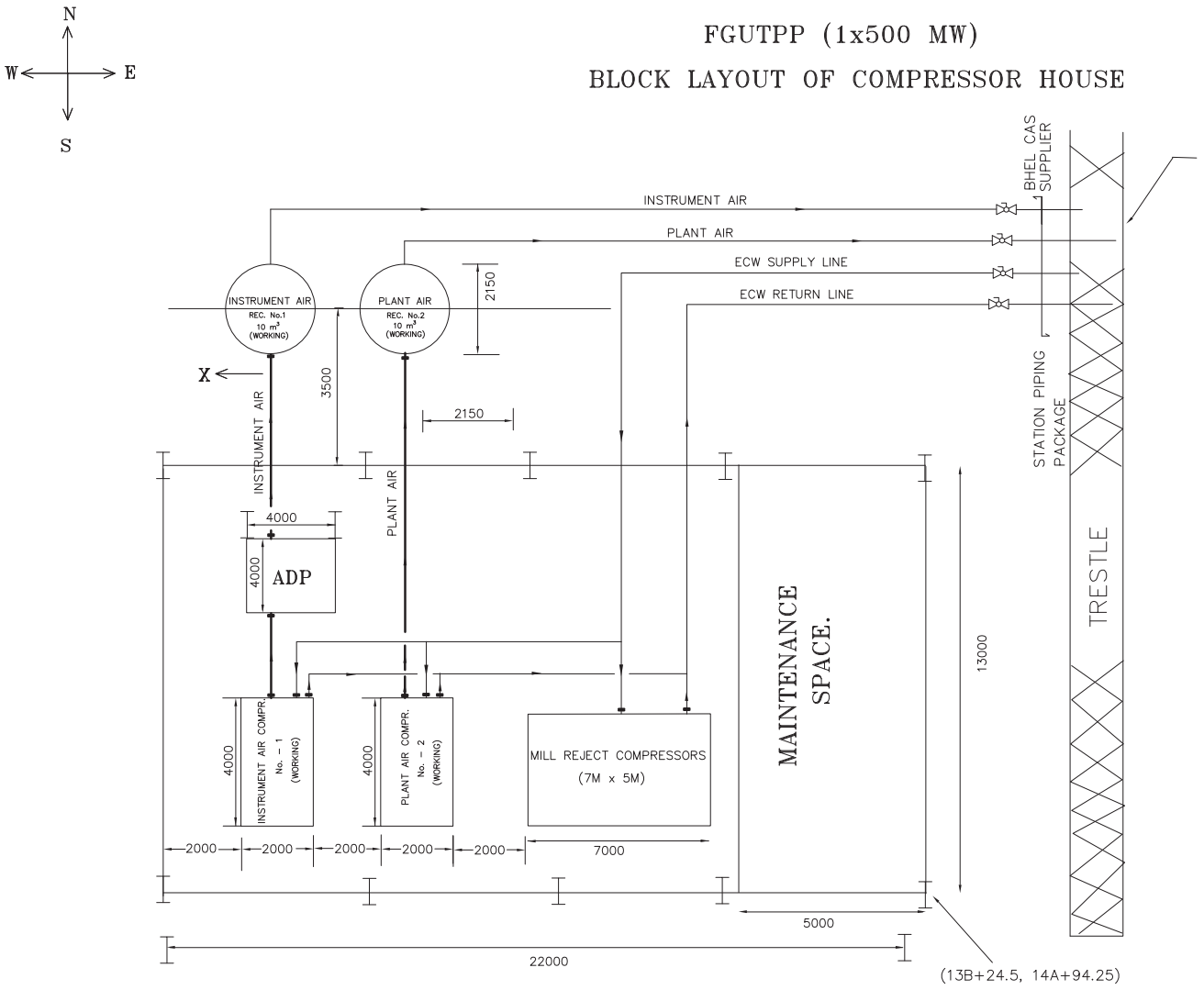
DRAWING NO. PE-W3-401-160-A001

SHEET 1 OF 1 REV. 0


PROPOSED ENTRY TO TOWNSHIP
15A+20
11B+19.4
IT BLDG. (EXISTING)
TRANSMISSION CORRIDOR
CL OF ROAD 15A+20
15A+28.5
12B+87.41
Compressor House
IDCT-3
14A+63.25
TG HALL
SERVICE BUILDING
AWR
EVACUATION TOWER
STAND
GUARD ROOM
GUARD ROOM
WSW. SUMP
CW CHLORI
C/R
MCC
CST
DSPH
13A+30.25
12B+54.5
TP31
DS PUMP HOUSE-I
13A+29.75
14B+98
SW.GR. FOR CT
PASSAGE WAY
MRS SILO
13A+30.25
11B+88.5
CPU REGEN
ELECTROSTATIC PRECIPITATOR
SUMP
ASH SLURRY DISPOSAL & TACH
13A+07.25
14B+75
GRAVITY FILTER & RESERVOIR
SWPH
MCC ROOM
MCC
XFMR
CR
12A+44.25
PMCC
CL OF ROAD 12A+35
CL OF ROAD 11B+49.5
CL OF ROAD 13B+38
CONV.36A/B
ASH WPH
ASH WATER M/UP TO AWPH SUMP
PEDESTALS FOR ASH SLURRY PIPES STAGE-IV
SW.GR. FOR CT STAGE-III
IDCT-6A
SPACE FOR FGD
11A+87.766
12B+21.5
CL OF ROAD 11A+61.766
11A+43.482
11B+49.5
11A+45.27
12B+21.5
11A+48.158
13B+38.5
11A+34.5
13B+58.21
TP30
EXISTING RAIL TRACK
PROPOSED CULVERT FOR SOLAR TRANSMISSION LINE
11A+77
15B+18.6
DRY ASH PIPE ROUTING
441

FGUTPP (1x500 MW)

BLOCK LAYOUT OF COMPRESSOR HOUSE



TP FOR IA/SA TO COMPRESSOR HOUSE (13B+25.5, 15A+10)

TP FOR ECW TO COMPRESSOR HOUSE (13B+25.5, 15A+0.5)

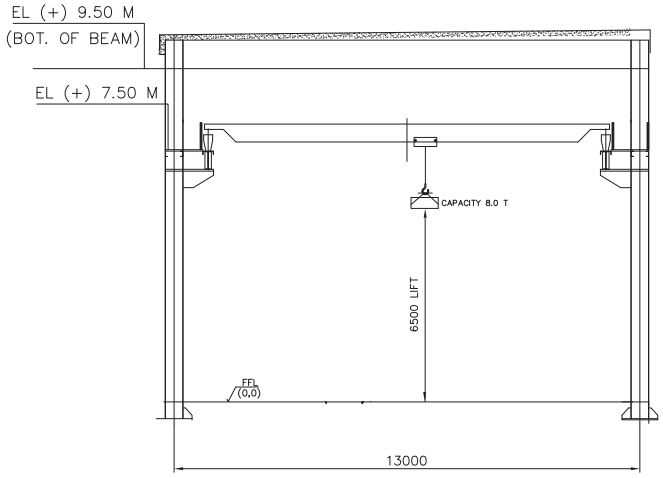
COOLING WATER REQUIREMENT=105 M3/HR

ECW INLET PRESSURE AT TP= 5 KG/CM2 (maximum)

ECW INLET WATER TEMPERATURE= 36 DEG C

RISE IN TEMPERATURE= 10 DEG C

PRESSURE DROP ACROSS SYSTEM=10MWC



SECTION XX

NOTE

1. ALL THE INTERNAL DIMENSIONS ARE IN MM AND ARE TENTATIVE.
2. THIS BLOCK LAYOUT IS FOR PLANNING THE SPACE REQUIREMENT OF COMPRESSOR HOUSE ONLY.

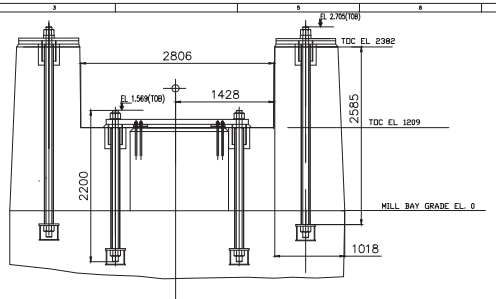
STATUS: PRELIMINARY INPUT FOR COMPRESSOR HOUSE

SKETCH No. PE-401-555-ASK1 Rev 00

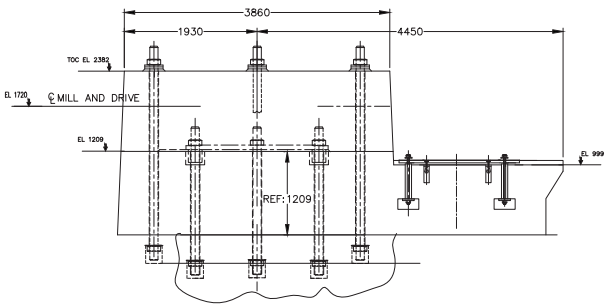
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

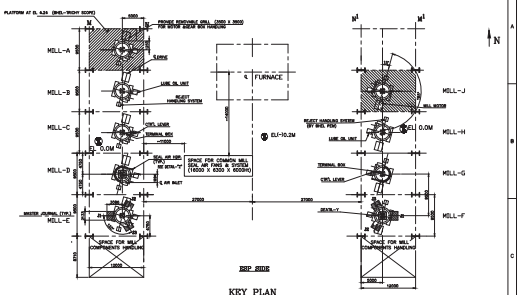
DRG. NO 0-00-610-86090



VIEW Q-Q

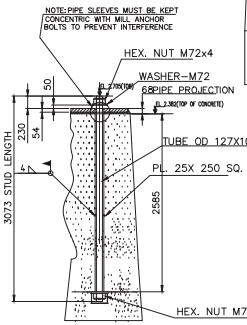


VIEW-D



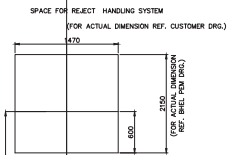
KEY PLAN

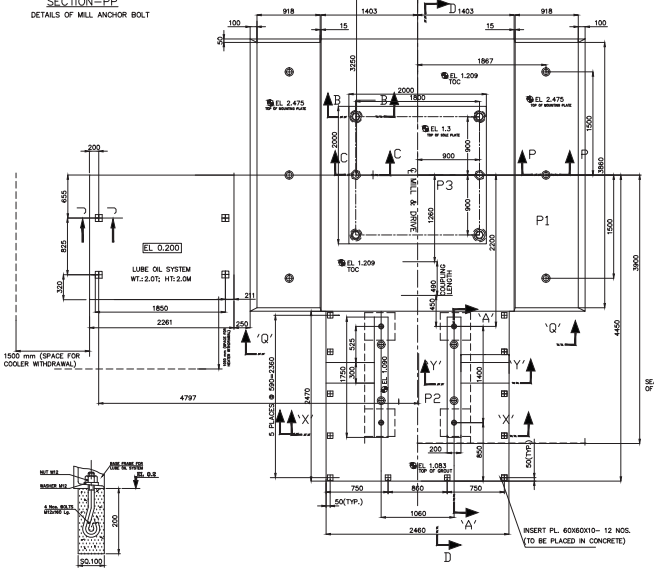
NOTE:PIPE SLEEVES MUST BE KEPT CONCENTRIC WITH MILL ANCHOR BOLTS TO PREVENT INTERFERENCE



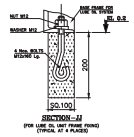
SECTION-PP

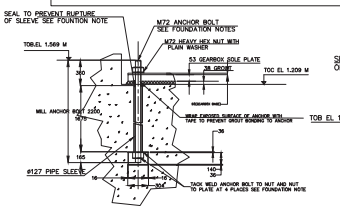
DETAILS OF MILL ANCHOR BOLT



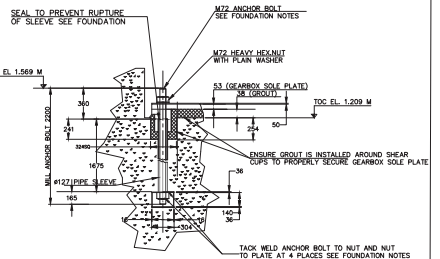


FOUNDATION PLAN

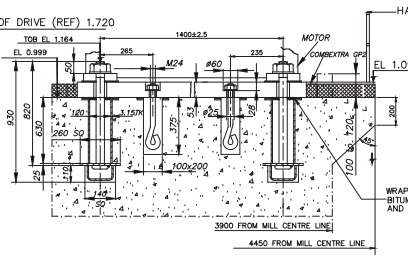




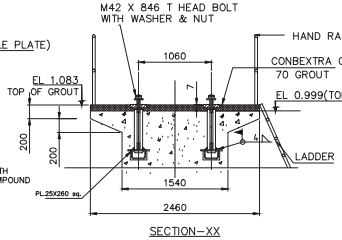
SECTION C-C (2 PLACES)



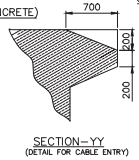
SECTION B-B (4 PLACES)



SECTION-AA



SECTION-XX

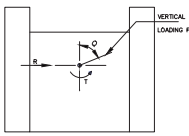


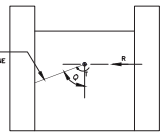
SECTION-YY

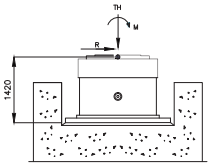
(DETAIL FOR CABLE ENTRY)

FOUNDATION LOADS(STATIC)		
P1	50 T	Wt. ON GROUT
P2	6 T	Wt. ON GROUT
P3	35.5 T	Wt. ON GROUT

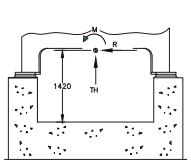
MAXIMUM DYNAMIC FOUNDATION LOADING	
MOMENT (M) - KN-M	1100
THRUST(TH)-KN	2060
RADIAL(R)-KN	100
TORQUE(T)-KN-M	360
ANGLE(Q)	0° THRU 360° RANDOM DIRECTION







GEAR BOX LOADING DIAGRAM

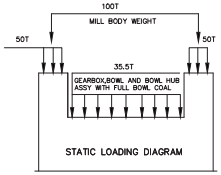


MILL BODY LOADING DIAGRAM

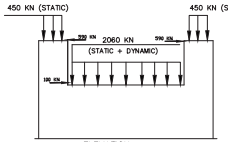
LEGEND

KN - KILO NEWTON

KN-M - KILO NEWTON METER



STATIC LOADING DIAGRAM



ELEVATION

TOTAL LOADS ON INDIVIDUAL PEDASTAL FORCES DUE TO STATIC AS WELL AS DUE TO ABNORMAL OPERATION (DYNAMIC FORCES)

NOTES:-

01. FOUNDATION TO BE MADE OF WELL REINFORCED CONCRETE AND SHALL REST ON SOUND SOIL.
02. ALL ANCHOR BOLTS ARE TO BE SET IN PIPE SLEEVES AS PER SECTION"P-P","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 BOLTS TO ELONGATE WHEN TENSIONED. ANCHOR BOLTS ARE TO BE WELDED AS SHOWN TO PREVENT ROTATION.
03. BOWL MILL FOUNDATION BOLT PIPE SLEEVES ASSY. SHOULD BE POSITIONED, PREFERABLY, USING TEMPLATE; SO AS TO MAINTAIN FOUNDATION BOLTS CENTRE LINE DISTANCE WITHIN ±2mm AND TO BE IN LINE WITH MILL BASE BOLT HOLES.
04. THIS DRAWING REPRESENTS A SUGGESTED FOUNDATION ARRANGEMENT ONLY.
05. FOR OTHER DETAILS OF BOWL MILLS, REFER BOWL MILL GENERAL ARRANGEMENT DRG.
06. TUBE AND MILL ANCHOR BOLTS ARE IN THE SCOPE OF BHEL (HYD)
07. MOTOR MOUNTING PLATE, FOUNDATION BOLTS WITH SLEEVES,PACKERS, ETC., ARE IN THE MOTOR SUPPLIERS SCOPE.
08. REFER DRG No. 0-00-620-86089 FOR GENERAL ARRANGEMENT OF XRP 1003 BOWL MILL.
09. WEIGHT OF CONCRETE, MAKING FOUNDATION SHOULD BE ATLEAST 2 1/2 TIMES THE WEIGHT OF PULVERISER.
10. ELEVATION (+/-) 0.00M CORRESPONDS TO RL XXX M
11. GROUTING BY BHEL.
12. SCOPE OF SUPPLY OF EMBEDMENT FOR HANDRAIL AND HANDRAIL IS WITH BHEL.
13. THE BOWL MILL FOUNDATION MUST BE DESIGNED AS PER THE LOADING VALUE (STATIC AND DYNAMIC) MENTIONED IN THE DRAWING 0006108G022
14. THE MILL & MOTOR FOUNDATION SHALL BE PREFERABLY CONSTRUCTED IN SINGLE POURING OF CONCRETE.

MOTOR DATA:-

SUPPLIER : B H E L - BHOPAL

RATING : 525 KW

SPEED : 984 RPM

FULL LOAD AMP STATOR : 129 AMP

VOLTAGE 3 PHASE 50 Hz : 3300 VOLTS

APPROX. WEIGHT OF MOTOR : 5750 Kgs

APPROX. WEIGHT OF ROTOR : 1200 Kgs

GD^2 OF ROTOR : 156 Kgm^2

MAX. FOUNDATION LOADING : 65 kN UPWARDS (ALTERNATING)PER MOTOR

LONGITUDINAL SIDE : 121 kN DOWNWARDS

DIRECTION OF ROTATION VIEWED FROM DRIVE END : BI-DIRECTIONAL

MILL DATA

1. MOTOR SPEED : 984 RPM
2. SPEED OF PULVERIZER : 42 RPM
3. TOTAL WT. OF MILL (INCLUDING MOTOR) : 130 TONNES.
4. TYPE OF LOAD : MODERATE SHOCK LOAD.
5. ROTATING WEIGHT OF MILL. : 22.88 TONNES

DRAFT DRAWING FOR COMMENTS ONLY

REV.	DATE	ALTERED	CHECKED	APPROVED

NAME OF CUSTOMER : NTPC LIMITED

NAME OF PROJECT- : 1 x 500 MW FEROZE GANDHI UNCHAHAR TPP STG-IV

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE
DRN.	PALLAVI		21.12.12
CHD.	RAJESH		21.12.12
APPD.	M.M. MURTHY		21.12.13

DEPT: P.E. | UNTOL.DIMLOR. | SCALE: NTS | WEIGHT (KG): N.A. | REF. TO ASSY DRG.: N.A. | ITEM NO.: N.A. | NO.OF ITEM: N.A.

CODE: 446 | Q/M/P | CARD CODE: N.A.

FOUNDATION PLAN OF BOWL MILL (XRP 1003) (WITH PLANETARY GEAR BOX)

DRAWING NO. NTPC DWG NO:

SHEET NO. 01 | NO OF SHEETS 01

REV.

0-00-610-86090

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

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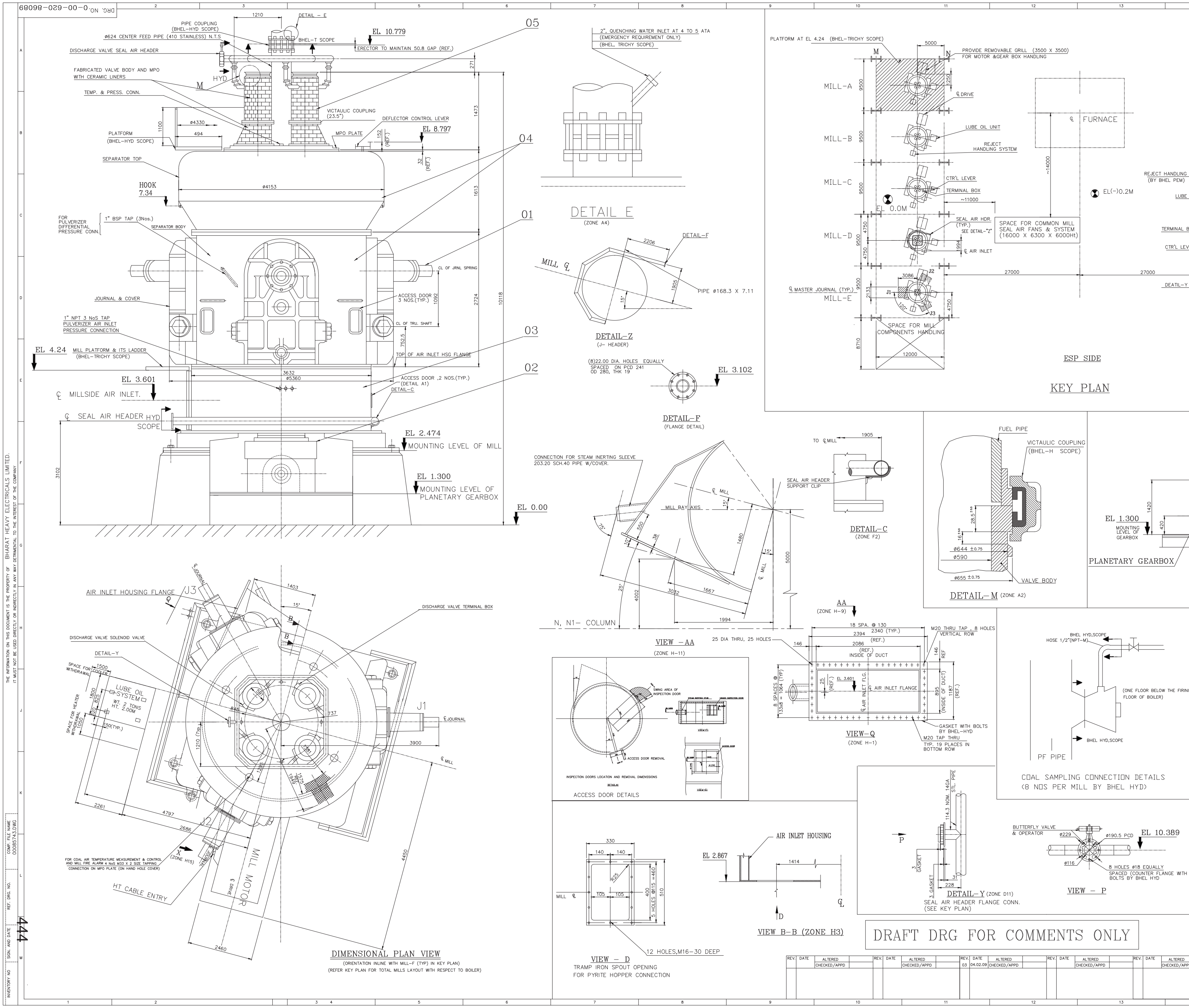
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)



NOTES: -

01. REFER DRG No.0-00-610-86090 FOR FOUNDATION ARRANGEMENT OF MILL AND MOTOR
02. REF BOILER GA-PLAN DRG.0-00-022-XXXXX FOR ORIENTATION OF MILLS WITH REFERENCE TO BOILER
03. PROVISION FOR FUTURE INSTALLATION OF ROTARY CLASSIFIER TO BE MADE CONSIDERING THE FOLLOWING
   a) ADDITIONAL HEIGHT DIFFERENCE 619 MM
   b) ELECTRICAL CONNECTION TO ROTARY CLASSIFIER DRIVE
   c) SEPARATOR TOP WILL BE REPLACED BY ROTARY CLASSIFIER DURING RETROFITTING
04. STAIR CASE, LADDERS,PLATFORMS,HAND RAILS & EMBEDED PLATES ARE IN OTHERS SCOPE OF SUPPLY
05. REJECTS HANDLING SYSTEM IS IN THE SCOPE OF SUPPLY OF BHEL-PEM.
06. FOR SEAL AIR SYSTEM REFER BHEL (TRICHY) "MILL PLANT ARRANGEMENT DRG." No.0-47-686-XXXXX.
07. FOR ROTARY PROBE COAL SAMPLING, ACCESS PLATEFORM SHALL BE PROVIDED NEAR THE BOILER ON THE FLOOR, BELOW THE FIRING FLOOR BY B.H.E.L TRICHY.
08. VIBRATION PICK-UP ARE PROVIDED ON MOTOR, REFER MOTOR GA DRG. OF BHEL BHOPAL.
09. FOR LUBRICATION SYSTEM REFER DRG.No.1-61-190-XXXXX.
10. FOR MILL HANDLING ARRANGEMENT REFERENCE DRG.No.1-61-800-XXXXX.
09. GEARBOX WITHDRAWAL FIXTURE WITH RAIL ARRANGEMENT SHALL BE PROVIDED BY HYDERABAD. REF. "GEARBOX WITHDRAWAL FIXTURE ASSEMBLY DRG. NO.1-61-800-01392
10. EL.0.00 M CORRESPONDS TO RL XXX M.
11. MATERIAL OF CONSTRUCTION:
   i) CLASSIFIER CONE: CERAMIC LINED ON BOTH SIDES OF THE CONE - Min.15MM THICKNESS CERAMIC TILES.
   ii) CLASSIFIER VENTURI VANES: CERAMIC LINED ON BOTH SIDES OF THE VANE.
   iii) GRINDING ROLLS: CARBIDE INSERT ROLLS WITH HIGH HARDNESS AND WEAR LIFE. .
   iv) BULL RING SEGMENTS: HI-CHROME BULL RING SEGMENTS WITH HIGH HARDNESS AND WEAR LIFE. Min.550BHN HARDNESS.
   v) CLASSIFIER VANES: NIHARD MATERIAL.

ITEM No.	DESCRIPTION	NET WEIGHT / QUANTITY	GROSS WEIGHT
08	MOTOR FOR MILL(BHEL BHOPAL)	5400.00 / 1	
07	FOUNDATION FASTENRES ASSEMBLY (NOT SHOWN IN THIS DRG)	722.00 / 1	
06	MILL MOTOR COUPLING ASSEMBLY	120.00 / 1	
05	MILL DISCHARGE VALVE ASSEMBLY	5943.00 / 1	
04	SEPARATOR & CLASSIFIER ASSEMBLY	46296.00 / 1	
03	MILL SIDE & LINER ASSEMBLY	12000 / 1	
02	PLANETARY GEAR BOX & BOWL, BOWL HUB ASSY	29500 / 1	
01	JOURNAL ASSEMBLY	7703.00 / 3	

DRAFT DRG FOR COMMENTS ONLY

NAME OF CUSTOMER: NTPC LTD.

NAME OF PROJECT: 1 x 500 MW FEROZE GANDHI UNCHAHAR TPP STG -IV

BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

	NAME	SIGN.	DATE	NO.OF VAR.
DRN.	PALLAVI		21.12.13	N.A.
CHD.	RAJESH R.		21.12.13	
APPD.	MVR MURTHY		21.12.13	

DEPT.	UNTOL.DIMS.GR.	SCALE	WEIGHT (KG)	REF. TO ASSY DRG.	ITEM NO.	NO.OF ITEM
P.E / CODE 446	C/M/F	N.A	N.A.	N.A.	N.A.	N.A.

REV.	DATE	ALTERED / CHECKED/APPD
03	04.02.09	

GENERAL ARRANGEMENT OF BOWL MILL XRP1003 (WITH PLANETARY GEAR BOX)

CARD CODE N.A. — DRAWING NO. NTPC DWG NO: — REV. 00-DRAFT

SHEET NO. 01 — NO OF SHEETS 01

0-00-620-86089