	TITLE AXIAL FLOW FANS <u>DATA SHEET - A</u> (FRESH AIR FANS)	REV	SPECIFICATION NO. PE-TS-372-553-A001.	
			VOLUME II-B	
			SECTION D	
			00	DATE 07.10.2011
			SHEET 1 OF 2	
S.NO.	DESCRIPTION	UNIT	DATA/PARTICULARS	
1.0	GENERAL INFORMATION			
1.1	Designation/service	--	Fresh Air fans	
1.2	Nos. reqd.	--	In each AHU room. (capacity may differ, as per room size)	
1.3	Location	--	Wall mounted	
1.4	Area	-	As per section – 'C' of spec.	
2.0	DESIGN DATA			
2.1	Type of fan	-	Axial fan supply fans	
2.2	Capacity at site	M ³ /hr	As per system requirements	
2.3	Fluid handled	-	Atmospheric air	
2.4	Temp.	Deg.C	As per Project information.	
2.5	Static press reqd.	mm wg.	As per system requirements	
3.0	MATERIALS OF CONSTRUCTION			
3.1	Casing	-	Mild steel to IS: 2062 latest	
3.2	Impeller	-	Cast aluminum alloy A-6M/IS: 617	
3.3	Inlet cone or bell	-	MS to IS: 2062 latest	
3.4	Outlet cone	-	-Do- (As applicable)	
3.5	Guide vane	-	Yes	
3.6	Support frame and structure	-	MS (IS-2062)	
4.0	ACCESSORIES			
4.1	Neoprene rubber pads	-	Yes (as applicable)	
4.2	Wooden block for mounting	-	Yes (as applicable)	
4.3	Supporting frame for mounting	-	Yes	
4.4	Louvered shutter	-	No	
4.5	Wall cowl with bird screen	-	Yes (at inlet to fan)	



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AXIAL FLOW FANS

DATA SHEET - A

(FRESH AIR FANS)

REV

4.6	Inlet cone	-	Yes
4.7	Wire guard	-	No
5.0	MOTOR		
5.1	Motor by	-	Bidder
5.2	Starter by	-	Purchaser
5.3	Any other information	-	Dry panel pre-filters, high efficiency filters, volume control dampers, supports, supporting structures etc. shall be provided (for each fan)



TITLE

**STANDARD TECHNICAL SPECIFICATION
VENTILATION FANS**

SPECIFICATION NO. PES-553-04

VOLUME II-B

SECTION D

REV 01

DATE 04-12-1996

SHEET 1 OF 1

DATA SHEET - C

Data to be furnished by vendor after the award of contract as applicable.

A. AXIAL FANS

1. GA drawing, wall opening, fixing arrangement etc.
2. Operation and maintenance manual.
3. Motor data as per data sheet C of motor specification.
4. Performance curve for approval.
5. Instruction for bearing lubrication.



TECHNICAL SPECIFICATION

AIR FILTER

SPECIFICATION NO.PES-553-04

VOLUME II B

SECTION D


REV. 02

DATE: 19.06.2007

SHEET 1 OF 3

SECTION-D

AIR FILTER

	TECHNICAL SPECIFICATION AIR FILTER	SPECIFICATION NO.PES-553-04	
		VOLUME II B	
		SECTION D	
		REV. 02	DATE: 19.06.2007
		SHEET 2 OF 3	

1.

GENERAL

This specification covers the design, manufacture, inspection and testing at manufacturer's work or his sub-contractor's works of Air filters to be used for air-conditioning and ventilation system:

2.

CODES AND STANDARDS

This design, manufacture and performance of AIR FILTERS shall comply with all currently applicable statutes, regulation and safety codes in the locality where the equipment will be installed. The equipment shall also conform to latest applicable Indian/British/USA standards. Nothing in this specification shall be construed to relieve the vendor of this responsibility. The following standards, in particular, shall be applicable for certified ratings of filters and for conducting performance test, if required.

a) BS EN - 779 -Methods of test for air filters used in air conditioning and general ventilation.

3.

GENERAL

The enclosed Data sheet A gives the type and other particulars of filters required.

3.1

POLY FIBRE AIR FILTERS

Filtering media shall consist of a suitable fibrous material (e.g. polyethylene extruded sections coir etc.) packed into a 20 gauges GSS framework, complete with handles etc. The filter element shall be supported by galvanised steel wire mesh of 10mm. sq. on either side, Velocity across the filters shall not exceed 2.5 M/sec. Average efficiency Em (%) shall be ≥ 80 as per BS EN - 779..

3.2

DRY FABRIC AIR FILTERS

Filter element shall be pressed felt filter fabric or suitable material recommended by the manufacturer, stitched on to galvanised wire gauge support and crimped to form deep folds. Suitable aluminium spacers shall be provided to ensure uniform distribution of air flow through filters. Filter casing shall be provided with neoprene sponge rubber sealing, The filter shall have Average efficiency Em (%) of ≥ 95 as per BS EN - 779.

3.3

PANEL TYPE METALLIC FILTERS (DRY/VISCOUS)


Filter shall consist of V-fold galvanised wire mesh interspaced with flat layers of galvanised wire mesh. The density of media shall increase in the direction of air flow. Edges of wire mesh shall be suitably hemmed to prevent abrasion during handling. The media shall be supported on either side by galvanised expanded metal casing. The framework shall be at least 18 gauge GSS. Filter shall be either dry or wetted type as per data sheet=A. The oil shall be mineral oil of approved quality and make. As a the filter frame made of Aluminium alloy conforming to IS:737 can be considered unless use of aluminium is prohibited otherwise due to site conditions being saline/corrosive.

All filters shall be capable of being cleaned of their accumulated dust by tap water flushing. The dry metallic filter shall have Average arrestance Am (%) shall be ≥ 90 . However oil wetted air filters shall have Average Efficiency Em (%) ≥ 90 as per BS EN - 779..

3.4

AUTOMATIC CLEANING FILTERS

~~This shall consist of a filter mat and drop eliminator, driven by a suitably rated geared~~

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<p>motor unit being supported on a steel framework. The filter mat shall consist of an endless steel wire mat insets of steel mesh held between an upper & a lower shall drop eliminator shall consist of an endless steel wire without insets of steel mesh. The unit shall include a suitable oil pump, gludge raking mechanism and sludge container and tensioning device. Pressure drop shall be limited to 0.5 / mm WG when clean & 40 mm when dirty. Air velocity across filter shall not exceed 3M/sec.</p>			
3.5	ABSOLUTE FILTERS (HEPA)		
<p>Filters shall be constructed by pleating a continuous sheet of filter medium into closely spaced pleats separated by heavy corrugated aluminium spacers. They shall be individually tested and certified to have an efficiency of not less than 99.97% when tested with 0.3 micron dioctyphalate smoke as per IS:2831. The clean filter initial static pressure drop shall not be greater than 25mm WC at rated capacity. A neoprene sponge rubber sealing shall be provided on either face of filter frame.</p>			
3.6	WATER REPELLANT NYLON FILTERS		
<p>This shall be constructed of water repellent nylon fabric with continuous water spraying on it from a header for keeping it clean. Efficiency of this filter shall be 85% down to 10 microns. This filter shall be used for unitary air filtration system only.</p>			
4.	INSPECTION & TESTING		
<p>The scope of inspection for air filters shall be as below:</p>			
<p>List of TCs arranged as per Approved Quality Plan shall be furnished along with copy of TCs at the time of inspection by BHEL.</p>			
4.1.1	Dimensional inspection of frame & filter media – TC from Manufacturer- review by BHEL/Customer.		
4.1.2	Witnessing by BHEL/Customer of type tests on one per type per size air filters for the following properties.		
	a) Gravimetric efficiency.		
	b) Pressure drop in clean & dirty (choked - %age to be specified) condition.		
	c) Efficiency as per BS EN - 779.		
4.1.3	Verification of type test certificates for similar type & size of filters for sodium flame test as per BS-3928 (if applicable- refer data sheet) - by BHEL/Customer		



TITLE

AIR FILTER
DATA SHEET - A

SPECIFICATION NO. PE-TS-372-553-A001

VOLUME II-B

SECTION D

REV 00

DATE 31.07.2012

SHEET 1 OF 1

Description**Data****1) General**

1.1 Service

Air Conditioning.

1.2 Location

DX condensing unit, package AC plant, fresh air fan system. Also for split AC.

1.3 Nos.

Refer Section 'C' of Specification.

1.4 Total air flow/type

Refer Section 'C' of Specification.

1.5 Temperature

As per project information.

1.6 Relative Humidity

100%

1.7 Gas Composition

Atmospheric Air (Dusty) as prevalent in power Station.

1.8 Filter Media

Synthetic non-woven

1.9 Efficiency

Average arrestance efficiency of 65-80 % for Dry Panel filter (pre-filters) and average arrestance Efficiency of 80-90 % for fine filters.

1.10 Allowable pressure drop

2.5 mm & 6.5 mm in clean and dirty condition respectively for dry panel filters(prefilters).
12 mm in clean condition for fine filters.

1.11 Frame Work

18 G, GSS.

1.12 Mounting

Ladder Type M.S Angles (galvanised)

1.13 Size

600 x 600 mm

Note:-

1) Face velocity of air across the filters shall not exceed 2.5 m/sec.



TITLE STANDARD TECHNICAL SPECIFICATION AIR FILTERS	SPECIFICATION NO. PES-553-04	
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DATA SHEET - C

Data to be furnished by vendor after award of contract

1. GA Drawing
2. Drawing showing material/construction detail
3. Installation and\service manual
4. Rating curves/charts
5. Test certificates
6. Elect. diagrams (when automatic cleaning type)



TECHNICAL SPECIFICATION
THERMAL INSULATION FOR COLD
SURFACES

SPECIFICATION NO.PES-553-08

VOLUME II B


SECTION D

REV. 01

DATE: 04.12.1996

SHEET 1 OF 4

SECTION-D
THERMAL INSULATION FOR COLD SURFACES

	TECHNICAL SPECIFICATION THERMAL INSULATION FOR COLD SURFACES	SPECIFICATION NO.PES-553-08	
		VOLUME II B	
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1.

SCOPE

This specification covers design, manufacture, testing at manufacturers works, supply, application & finishing of insulation for cold piping, air conditioning ducting & equipment for low temperature service.

2.

CODES & STANDARDS

The design, manufacture and performance of materials covered under this specification shall comply with all currently applicable statues, regulations & safety codes in the locality where the equipment/material are to be installed. The material shall also conform to the latest applicable Indian/British/American codes & standards. Nothing in this specification shall be construed to relieve the vendor of his responsibility. In particular, the material shall conform to the latest editions of the following standards :-

2.1.1

IS:3069:

Glossary of terms & symbols & units relating to thermal insulation materials.

2.1.2

IS:4671:

Expanded polystyrene for thermal insulation purposes.

2.1.3

IS:3677:

Mineral wool for thermal insulation

2.1.4

IS:8183:

Resin bonded mineral wool

2.1.5

IS:702

3.

DESIGN REQUIREMENTS

3.1.1

The insulating material as well as protective covering shall be new & unused, non-corrosive, vermin/rodent proof and shall be guaranteed to withstand continuously & without deterioration the maximum/minimum temperatures to which they may be subjected to, under specified site conditions.

3.1.2

The insulation material must be light weight, strong, free from shots & coarse fibre & shall provide high insulation efficiency at low weight & coat. It should be non-hygroscopic & should not rot. It shall not settle or shake down even when subjected to prolonged vibrations.

3.1.3

The insulation material, density and thickness etc. Shall be as specified in DATA SHEET A.

4.

APPLICATION DETAILS

4.1.1

The surface to be insulated shall be thoroughly cleaned and allowed to dry. Pressure/hydrostatic tests, if any, shall be carried out before application of insulation.

4.1.2

A layer of solvent free, anticorrosive paint shall be applied & allowed to dry.

4.1.3


Hot industrial bitumen of grade 85/40 or 85/25 conforming to latest IS:702 shall be uniformly applied @ 1.5 kg/sq.m on the surface to be insulated. A similar layer shall also be applied on the inside surface & edges of the insulation. A suitable cold adhesive compound may also be used in place of bitumen.

4.1.4

Insulation in the form of pipe sections/rolls slabs of specified density & thickness shall be stuck to the coated surface with joints staggered & well butted & secured. The adjoining sections shall be tightly pressed together. All the joints shall be sealed with bitumen/equivalent adhesive. Voids if any shall be packed with suitably cut pieces of insulation material.

4.1.5

In case of double layer application both circumferential & longitudinal joints shall be suitably staggered.

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5.

VAPOR SEALING & INSULATION FINISH

The insulation shall be treated for vapor sealing & weather proofing & finished as specified in DATA SHEET A The acceptable types of finishes are outlined below:-

5.1

FINISHING SYSTEM I: EXTERNAL INSULATION WITH PLASTER FINISH

5.1.1

A thick vapor seal of hot bitumen @ 2.5 kg/Sqm shall be applied on the outer surface of insulation & allowed to dry.

5.1.2

The surface shall then be wrapped with 20mm (3/4"_ hexagonal mesh of 24 SWG GI wire, butting all the joints & laced down with 22 SWG GI lacing wire.

5.1.3

12.5mm (1/2 inch) thick sand cement plaster in the ratio of (1:1) shall be applied in two layers, the second layer being brought to a smooth finish. A water proofing compound shall be added to the cement before its application.

5.2

FINISH SYSTEM II: EXTERNAL INSULATION WITH PLASTER FINISH OVER POLYTHENE.

5.2.1

The insulation shall be covered with 500 g polythene/polythene bonded Hessians (PBH) with 50mm overlap on longitudinal & circumferential joints. Overlaps shall be sealed with synthetic adhesive in case o-f polythene & liberal coat of bitumen in case of PBH:

5.2.2

The surface shall then be wrapped with 20mm (3/4") mesh of 24 SWG GI wire butting all the joints & laced down with 22 SWG GI lacing wire.

5.2.3

12.5mm thick (1/2 inch) sand cement plaster in ratio of(4:1) shall be applied in two layers, the second layer being brought to a smooth & even finish similarly as described above.

5.3

FINISH III:EXTERNAL INSULATION WITH SHEET METAL FINISH

5.3.1

The insulation shall be covered with 500g polythene with 50mm overlaps at joints which shall be sealed with synthetic adhesive or equivalent compound.

5.3.2

The polythene shall be covered with 24 gauge GI/aluminum sheet

5.3.3

25mm wide x 22 SWG GI/aluminum peripheral straps shall be fixed over the GI/aluminum sheet at 300mm centres to secure.

5.4

FINISH IV: EXTERNAL INSULATION WITH PLASTER & WATER PROOFING COMPOUND

For ducts & piping exposed to atmosphere, the finish shall be as follows:

5.4.1

A thick vapor seal of hot bitumen at 2.05 kg/sq.m shall be applied on the outer surface of insulation & allowed to dry.

5.4.2


The surface shall then be wrapped with 20mm (32/4") hexagonal mesh of 24 SWG GI Wire butting all the joints & laced down with 223 SWG GI lacing wire.

5.4.3

12.5mm thick (1/*2 inch) sand cement plaster in ratio of (4:1) shall be applied in two layers, the second layer being brought to a smooth finish with water proofing compound added to the cement.

5.4.4

3mm (1/8") thick coat of water proofing compound shall be applied & wrapped with fibre glass RP tissue. A final coat of 3mm thick water proofing compound shall then be applied over the fiberglass RP tissue & allowed to dry. Alternatively, in place of water proofing as desired above, tar felt type 3 grade 1 of IS 1322 with joints overlapped by 75mm shall be fixed & sealed with bitumen & over this 24 SWG. 25mm hexagonal GI mesh shall be fixed with 22 swig. GI lacing wire & finally bitumen paint shall be applied over wire netting.

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6.

INSULATION OF PUMPS & VALVES

For all inspection covers & hatches on equipment, pump casing & valve bodies, flanges etc. the insulation shall be applied such as to facilitate removal with minimum damage to the insulation. This shall be achieved by encasing the insulation in 22 gauge aluminum sheet metal boxes, which shall be bolted together around the equipment to permit easy removal & replacement. Proper care shall be taken to maintain continuity of vapor seal between the static & removable partitions of the insulation.

The tenderer may offer thickness of insulation & finishes other than that specified in DATA SHEET A. However, calculations/reasons in support of alternative proposal shall be furnished for purchaser's approval.

7.

INSPECTION & TESTING (REFER SPEC. NO - PES-553.00)

All necessary tests, as required to ensure that the material supplied conform to the requirements of applicable codes & standards, shall be carried out at manufacturer's works & test certificates including these for material/accessories shall be furnished for purchasers approval.

8.

PAINTING

8.1.1

Pipe work having insulation & cladding shall be provided with color identification for the fluids handled and for indicating direction of flow.

8.1.2

Equipment surfaces having insulation and cladding shall also have identification numbers and any other relevant data provided on the insulated surface.

8.1.3

All painting for insulated surfaces shall conform to the requirement specified elsewhere.



TITLE

INSULATION
DATA SHEET - A

SPECIFICATION NO. PE-TS-372-553-A001

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Insulation Material

Insulation	Code	Thermal Conductivity MW/cm ⁰ C	Density Kg/m ³
Resin bonded mineral wool / glass wool	IS:8183	0.49 at 50 °C	At least 24 for duct insulation and 48 for acoustic lining.
Mineral Wool Pipe Section (min. Gr.2)	IS:9842	0.43 at 50 °C	At least 81
Expanded Polystyrene	IS:4671	0.37 at 10 °C	At least 15

Type of Insulation

S.No.	Surface	Insulation Material	Insulation Form	Thickness (mm)
i)	Supply & Return air duct for air-conditioning system	Resin bonded roll Mineral Wool (IS:8183)		25
ii)	Refrigerant Piping	a) Expanded Polystyrene or b) Mineral Wool	Pipe Section Pipe Section	75 75
iii)	AHU drain pipe	a) Expanded Polystyrene or b) Mineral Wool	Pipe Section Pipe Section	25 25
iv)	AHU drain pan coil section and fan section	a) Expanded Polystyrene or b) Mineral Wool	Slabs Slabs	25 25
v)	Chilled water piping, valves & specialties	a) Expanded Polystyrene or b) Mineral Wool	Pipe Section Pipe Section	75 75
vi)	Chiller	a) Expanded Polystyrene or b) Mineral Wool	Slabs Slabs	100 100
vii)	Chilled Water Pumps	a) Expanded Polystyrene or b) Mineral Wool	Slabs Slabs	50 50
viii)	Expansion tank with pipe	a) Expanded Polystyrene or b) Mineral Wool	Slabs/Pipe Section Slabs/Pipe Section	50 50



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DATA SHEET - C

Data to be furnished after award of contract

- 1.0 Final version of data sheet 'B' incorporating changes if any along with design data.
- 2.0 Test certificates/reports giving result of insulation to ensure conformance to applicable codes & standards & in particular the following:-
 - i Thermal conductivity test
 - ii Sound absorption coefficient test
 - iii Corrosion test
 - iv Sulphur content, moisture content, shot content, moisture absorption etc.
 - v Compressive strength & cross breaking strength test
- 3.0. Sketches/technical literature/sectional drgs. indicating insulation materials finish and method of application etc.
- 4.0 Manual dealing with safety aspects & instructions for combating fire arising out of insulation work
- 5.0 Instructions on maintenance of insulation work.



TECHNICAL SPECIFICATION
SPLIT AIR-CONDITIONING UNIT

1.1.1 SPECIFICATION NO.PES-553-13

VOLUME II B

SECTION D

REV. 02

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SHEET 1 OF 5

SECTION-D
SPLIT AIR-CONDITIONING UNIT



TECHNICAL SPECIFICATION
SPLIT AIR-CONDITIONING UNIT

SPECIFICATION NO.PES-553-13

VOLUME II B

SECTION D

REV. 02

DATE:19.06.2007

SHEET 2 OF 5

1 GENERAL

This specification covers the design, manufacture, inspection and testing at the manufacturer's works and suitable packing delivery and testing of the packaged air conditioning unit.

2 CODES AND STANDARDS

The design, manufacture, inspection, testing and performance of the packaged type airconditioning unit shall comply with all statutes, regulations and safety codes currently applicable in the locality where the equipment will be installed. The equipment shall also conform to the latest editions of the codes and standards specified herein under. Nothing in this specification shall be construed to relieve the vendor of this responsibility.

In particular, the packaged airconditioning Unit (max 7.5 TR capacity, ductable or non ductable type) or cassette type (up to 5 TR) shall conform to the latest editions of the following standards:

- I.S.660 - Safety code for Mechanical Refrigeration.
- I.S.5111 - Code of practice for measurement, and testing of refrigerant compressor.
- I.S.659 - Safety code for air conditioning.
- I.S.2494 - V Belt for industrial purpose.
- I.S.3142 - V grooved pullies for V Belts.
- I.S.4503 - Shell and tube type heat exchanger.
- ARI 210 - Standard for/unitary airconditioning equipment
- ARI 270 - Standard for application installation and servicing of unitary equipment.
- ASHRAE-37 - Standard methods of testing for rating unitary airconditioning and heat pump / equipment.
- ANSI-B9-1 - Safety code for mechanical refrigeration.

3 DESIGN AND CONSTRUCTIONAL REQUIREMENTS

3.1 COMPRESSOR

The compressor shall be hermetic or semi-hermetic or screw rotary type or scroll type. The same shall be suitable for Freon-22 refrigerant. The compressor shall be mounted on anti-vibration spring/rubber pads and shall be positioned in such a way that it is freely accessible with sufficient space all around for easy maintenance. Safety controls like High and Low pressure cut-out overload and single phasing protection for the motors shall be provided. A crankcase heater shall also be provided, if considered necessary by the vendor.

3.2 CONDENSING UNIT :

Shell and tube type water cooled condenser or air cooled condenser with adequate area shall be provided as specified in Data Sheet-A. The condensing unit shall be complete with multipass heads and shall be fitted with the following:

- Hot gas inlet and liquid outlet connection with shut off valve for liquid.
- Drain plug, air vent and test valve.
- Water inlet and outlet connection with thermowell and suitable cocks respectively.



TECHNICAL SPECIFICATION
SPLIT AIR-CONDITIONING UNIT

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- Relief valve and air purge valve (Fusible plug in place of relief valve not acceptable).
- Any other accessory as recommended by the manufacturer for proper functioning of the equipment.

3.3 AIR HANDLING UNIT/FAN COIL UNIT

3.4 AIR HANDLING FAN

The air handling fan shall be of the centrifugal type and with forward curved blades. This shall be driven by means of a three phase induction motor through V belt drive. The fan static pressure shall be selected for passing air through high efficiency absolute filters, if specified in Data Sheet-A.

3.5 FILTERS

Filters shall be of dry panel type and shall be cleanable. The velocity of air across the filters shall not exceed 1.75m/sec (350FPM).

3.6 COOLING COIL

The cooling coil shall be of direct expansion type and shall be made of heavy gauge copper with aluminium fins. The fins shall be bonded to the copper tubes under hydraulic pressure. A distributor shall be provided for feeding the refrigerant to different sections of the coil. Rows shall be staggered in the directions of airflow. The velocity of air across coil shall not exceed 2.5M/Sec. (500 FPM).

3.7 CONTROLS

All necessary controls and accessories like thermostatic expansion valve, refrigerant solenoid valve, distributor, filter drier in the liquid lines, shut off valves, HP/LP cut out for compressor, thermostat with adjustable settings, overload and single phasing preventer for motor etc. are to be provided. The microprocessor based control ~~relays, contactors, starters etc. shall be mounted on a panel~~ shall be provided kept outside the packaged unit on one side. The control panel shall generally be in line with the specification for control panels given elsewhere.

The control shall be so interlocked ~~arranged~~ that the fan shall be started independently first, and then only the compressor. Tripping of the compressor by the thermostat or compressor cut outs shall not trip the fan. The thermostat setting shall be adjustable and the HP/LP cut out shall be hand-resetting type.


3.8 REFRIGERANT PIPING

The refrigerant piping shall be either heavy gauge copper ~~or heavy class seamless mild steel pipe~~ as furnished in Data Sheet-A. The piping shall be completely factory assembled, pressure tested, dehydrated and initially charged with freon gas and compressor oil. The line accessories shall include liquid line shutoff valve dehydrator, strainer, flow indicator and distributor etc.

3.9 CABINET

All the equipments, except control panel, mentioned above shall be provided within a heavy gauge sheet metal cabinet, of floor/ wall mounted type. This shall be given two coats of anti-corrosive and rust proof paint, finished with two coats of final paint . Painting shall be as per manufacturers std unless specified otherwise in data sheet 'A'. The interior of the cabinet shall be provided with thermal and acoustic insulation of minimum 25mm thick. The insulating material shall be fire proof.

The front and back side of the cabinets shall be easily removable providing

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maintenance to all the interior parts.

All the electric wires within the cabinet shall run in flexible conduits and carry identification tags. The bottom side of the panel shall be specially ribbed to take care of the transportation.

3.10 OTHER ACCESSORIES

Each packaged air conditioner shall be provided with required number of neoprene rubber isolating pads.

4 CONTROL AND INTERLOCK REQUIREMENTS

The compressor shall have all protective devices like HP/LP cutouts, overload protection for the motor, single phasing preventor for motor etc.

The interlocking requirement shall be as indicated below:

The compressor shall not start, unless condenser water flow is achieved for water cooled condenser. The condenser flow shall be sensed by means of a flow switch.

The compressor shall not start unless the evaporator fan is started.

The tripping of compressor on HP/LP, overload or on thermostat shall not trip the fan.

Strip heater (if provided in the ducting system) shall not be switched on, unless the evaporator fan is started and airflow is established. For this purpose, an air stat on flow switch shall be used. The heater shall be separately controlled by humidistat/thermostat

A humidifying package, if specified in data sheet A, shall be controlled by humidistat.

5 TEST AND INPSECTION

5.1 INSPECTION AND TESTING AT MANUFACTURER’S WORKS

FOR STANDARD SPLIT AIR CONDITIONER UPTO 3 TON CAPACITY AVAILABLE OFF THE SHELF, POINT 5.1.1 TO 5.1.6 IS NOT APPLICABLE. ONLY ORIGINAL MAKE AND GUARANTEE/ WARRANTEE CERTIFICATE SHALL BE FURNISHED

5.1.1 ~~Witnessing~~ static and dynamic test for fans.- Report review by BHEL

5.1.2 Hydrostatic static test on condenser and cooling coil.-TC review by BHEL

5.1.3 ~~Witnessing~~ vacuum/pressure test for the complete refrigeration circuit.-TC review by BHEL

5.1.4 Visual and Free running test of the packaged unit on test bed- WITNESS BY BHEL.

5.1.5 Free running test on compressor-.witness by BHEL

5.1.6 AIR CAPACITY WITH ANEMOMETER- WITNESS BY BHEL

5.1.7 NOISE LEVEL- <=85 dB(A)- witness by BHEL/ as per IS for split AC below 3 tons

5.1.8 Other tests as per approved qualities plan/scope of inspection.

5.2 INSPECTION AND TESTING AT SITE

Performance testing of the packaged unit for 72 hours in summer / monsoon & 24 ~~hours in winter.~~ Up-to 3 TR (individual M/c capacity) inside room temperature (Dry & wet bulb) will be checked with all machines in the room operating.

The actual days of testing shall be mutually agreed. During the above testing, the following readings shall be taken to compare the same with guaranteed performance data.



TECHNICAL SPECIFICATION
SPLIT AIR-CONDITIONING UNIT

SPECIFICATION NO.PES-553-13

VOLUME II B

SECTION D

REV. 02

DATE:19.06.2007

SHEET 5 OF 5

Condenser inlet and outlet pressure and temperature

Entering and leaving air temperature of the cooling coil air filters.

Motor current for the compressor and blower.

Air quantity delivered by the fan. This shall be computed by adding air quantity leaving all the grilles entering the air filters.

Room temperature (Dry & wet bulb)

Test to ensure all controls and safety instruments are working properly.

During the above testing, noise level also will be checked to ensure that the same are within acceptable limits. Any undue vibration detected physically will be corrected.

All tools and instruments required for the above testing will be provided by the vendor.

6 PAINTING:

The packaged unit shall be given two coats of primer paint finished with two coats of finish paint as per Manufacturers std. unless specified otherwise elsewhere/ Data sheet 'A'. The colour of finish paint will be as specified in Data Sheet-A.

7 GUARANTEES

The package unit shall be guaranteed for performance measured in terms of the inside temperature maintained.

The packaged unit shall also be free from any manufacturing defects and shall be guaranteed as per contract after the first test as per 5.0 is successfully carried out, and the plant taken over by the purchaser.

8 NAME PLATES

Suitable Name plate as per Data Sheet 'A', depicting the equipment number as designated in Data Sheet A shall be provided for each packaged unit and screwed to a prominent position on the packaged unit.

9. Packing: Packing shall be as per manufacturers standard unless specified otherwise elsewhere as per project requirements (domestic / export)



TITLE

SPLIT AIR-CONDITIONING UNIT**DATA SHEET - A**

SPECIFICATION NO. PE-TS-372-553-A001.

VOLUME II-B

SECTION D

REV 00

DATE 31.07.2012

SHEET 1 OF 1

Description**Data**

- | | |
|--|--|
| 1) Capacity of the unit at operating conditions. | As per spec. |
| 2) Numbers required | Later during detailed engineering stage but variable items / unit rates to be indicated. |
| 3) Designation of the unit | Split AC Unit |
| 4) Whether air cooled | Yes |
| 5) The plant shall be suitable for maximum-ambient temp. | Refer outdoor design condition as specified. |
| 6) Whether a plenum Chamber required | Units shall be connected to fresh air ducts. |
| OR | |
| Whether to be connected duct system. | Yes. |
| 7) Whether Humidifier required for humidity-control. | Yes. |
| 8) Whether strip heaters required for winter heating. | Yes |
| 9) Whether strip heater required for Humidity control. | Yes |
| 10) Final painting colour shade | Subject to approval / during detail engineering stage. |
| 11) Whether fan static pressure is to be designed for filters arrangement shown. | Yes. |
| 12) Installation supporting structure/drain piping, insulation. | Required. Drain piping up to the nearest drain point. |
| 13) Controls & Instruments | Yes (Lot) |
| 14) Isolation Switch | Yes |



TITLE

**STANDARD TECHNICAL SPECIFICATION
SPLIT AIR CONDITIONING UNIT**

SPECIFICATION NO. PES-553-13

VOLUME II-B

SECTION D

REV 01


DATE 04-12-1996


SHEET 1 OF 1

DATA SHEET - C

Data to be furnished after award of contract

- 1.0 Final technical data as per Data Sheet-B
- 2.0 G.A. and interior view of packaged unit
- 3.0 Electrical wiring diagram
- 4.0 Catalogues for all controls
- 5.0 O & M Manual
- 6.0 Erection Manual

	TITLE	SPECIFICATION NO. PE-TS-372-553-A001		
		VOLUME		
		SECTION - E		
		REV	00	DATE
		SHEET	1	OF 2
AIR-CONDITIONING SYSTEM INSPECTION AND TESTING				
1.00.00	INSPECTION AND TESTING			
1.01.00	Inspection and Tests during Manufacture.			
1.01.01	The method and techniques to be used by the Bidder for the control of quality during manufacture of all plant and equipment shall be agreed with the Owner prior to the Award of Contract.			
1.01.02	The Owner's general requirements with respect to quality control and the required shop tests are set out elsewhere in this specification.			
1.01.03	Before any item of plant or equipment leaves its place of manufacture the Owner shall be given the option of witnessing inspections and tests for compliance with the specification and related standards.			
1.01.04	Advance notice shall be given to the Owner as agreed in the Contract, prior to the stage of manufacture being reached, and the piece of plant must be held at this stage until the Owner has inspected the piece, or has advised in writing that inspection is waived. If having consulted the Owner and given reasonable notice in writing of the date on which the piece of plant will be available for inspection, the Owner does not attend the Bidder may proceed with manufacture having forwarded to the Owner duly certified copies of his own inspection and test results.			
	The owner's representative shall have at all reasonable times access to bidder's or his sub-vendor's premises and shall have power to inspect/ examine materials and workmanship or equipment under manufacture.			
	The Bidder shall forthwith forward to the engineer duly certified copies of the Test Certificates in six copies (one to the Purchaser and five to the Consulting Engineer) for approval. Further nine (9) copies of Shop Test Certificates shall be bound with Instruction Manuals referred to elsewhere.			
	For electrical equipment, routine tests as per relevant IS spec are to be carried out on all equipment. Type tests are also to be carried out on selected equipment as detailed in the specs of concerned electrical equipment.			
1.01.05	Under no circumstances any repair or welding of castings be carried out without the consent of the Engineer. Proof of the effectiveness of each repair by radiographic and/or other non-destructive testing technique, shall be provided to the Engineer.			
1.01.06	All the individual and assembled rotating parts shall be statically and dynamically balanced in the works. Where accurate alignment is necessary for component parts of machinery normally assembled on site, the Bidder shall allow for trial assembly prior to despatch from place of manufacture.			
1.01.07	All materials used for the manufacture of equipment covered under this specification shall be of tested quality. Relevant test certificates shall be made available to the Purchaser. The certificates shall include tests for mechanical properties and chemical analysis of representative material. Equipment or parts coming under any statutory Regulations shall be certified by a Competent Authority under the regulations in the specified format.			

	TITLE	SPECIFICATION NO. PE-TS-372-553-A001	
		VOLUME	
		SECTION - E	
		REV 00	DATE
		SHEET 2	OF 2
1.01.08	All pressure parts connected to pumping main shall be subjected to hydraulic testing at a pressure of 150% of shut-off head for a period not less than one hour. Other parts shall be tested for one and half times the maximum operating pressure, for a period not less than one hour.		
1.01.09	All necessary non-destructive examinations shall be performed to meet the applicable code requirements.		
1.01.10	<p>All welding procedures adopted for performing welding work shall be qualified in accordance with the requirements of Section-IX of ASME code or IBR as applicable. All welded joints for pressure parts shall be tested by liquid penetrant examination according to the method outlined in ASME Boiler and Pressure Vessel code. Radiography, magnetic particle examination magnuflux and ultrasonic testing shall be employed wherever necessary/ recommended by the applicable code. At least 10% of all major but welding joints shall be radiographed unless otherwise stipulated.</p> <p>Statutory payments in respect of IBR approvals including inspection shall be made by the bidder. Bidder's scope shall include to preparation of all necessary documents, co-ordination and follow-up for above approval. Owner shall only forward assistance/endorsement of documents /design /drawings /reports/records to be submitted for approval as stipulated/ required by Statutory Authorities till registration of the unit and clearance for commercial operation.</p>		
1.02.00	Performance Tests at Site		
1.02.01	The full requirements for testing the system shall be agreed between the Owner and the Bidder prior to Award of Contract. The completely erected System shall be tested by the Bidder on site under normal operating conditions. The Bidder shall also ensure the correct performance of the System under abnormal conditions, i.e. the correct working of the various emergency and safety devices, interlocks, etc.		
1.02.02	The Bidder shall provide complete details of his normal procedures for testing, for the quality of erection and for the performance of the erected plant. These tests shall include site pressure test on all erected pipe work to demonstrate the quality of the piping and the adequacy of joints made at site.		
1.02.03	The Bidder shall furnish the quality procedures to be adopted for assuring quality from the receipt of material at site, during storage, erection, pre-commissioning to tests on completion and commissioning of the complete system/equipment.		
1.03.00	<p>For details of specific tests required on individual equipment refer to respective section of this specification.</p> <p>All Statutory testing / clearance is in Bidder's scope including payment of all fees, etc. as required</p>		

CORPORATE QUALITY ASSURANCE


SYSTEM :

ITEM :

[illegible]


3. Sub-Vendor

Page No.	1. QP No.	2. Vendor	3. QP No.	4. Vendor	5. QP No.	6. Vendor
QP No	CQS/SQP/31	Signature	Date			
	Rev		Name			
Page No	1 of 1		Party	Customer/Consultant	Bhel	Vendor

	Title : 400 MW MARIB GTPS PHASE-II	Spec. No.: PE-TS-372-553-A000		
	AIR HANDLING UNIT	Volume III	Part	
	DATA SHEET 'B'	Sheet 1	of	3


S.NO	ITEM	UNIT	PARTICULARS
1.0	General		
	i) Model no. of AHU		
	ii) Manufacturer of AHU		
	iii) Overall weight of unit		
	iv) No. of AHU's offered		
	v) Weight of Coil (cooling) Section	Kg	
	vi) Belt guard provided	Yes/No	
	vii) Motor data sheet as per No.PES-506-02	Furnished/Not furnished	
	viii) Insulation as per spec. No.PES-553-08	Yes/No	
	ix) Selection criterion, performance curves etc.	Furnished/Not furnished	
	x) Capacity	CFM	
	xi) Static Pressure	mm WC	
2.0	Cooling Coil		
	i) Type		
	ii) Sensible heat removing capacity	Kcal/hr.	
	iii) Latent heat removing capacity	Kcal/hr.	
	iv) Chilled water flow quantity	CUM per Hr.	
	v) Chilled water in temperature	Deg. C	
	vi) Temperature rise	Deg. C	
	vii) Pressure drop of chilled water side	MW C	
	viii) Tube thickness and diameter	mm/mm	
	ix) Design pressure of tubes	Kg/Cm ² (g)	
	x) Test pressure of tubes & duration	Kg/Cm ² (g) minutes	
	xi) No. of rows		
	xii) Air side pressure drop	mm WC	
	xiii) Entering dry bulb temp.	Deg. C	
	xiv) Entering wet bulb temp.	Deg. C	
	xv) Leaving dry bulb temp.	Deg. C	
	xvi) Leaving wet bulb temp.	Deg. C	
	xvii) Overall heat transfer Coefficient	Kcal/hr/m ² /°C	
	xviii) Fouling factor	M ² hr °C/Kcal	
3.0	Damper Section		
	i) Max. press drop	mm WC	
	ii) Min. press drop	mm WC	
	iii) a) Modutrol motor included	Yes/No.	
	b) Model No.		
	c) Rating	KW	
	d) Voltage/phase/freq.	V / / Hz	
	iv) Max. torque required by damper	Kgm	
	v) Max. torque developed by motor	Kgm	
4.0	Filter Section		
	i) Type of filter	-	
	ii) Manufacturer	-	
	iii) No. of filters / AHU	-	
	iv) Size of each type	mmxmm	

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	Title : 400 MW MARIB GTPS PHASE-II	Spec. No.: PE-TS-372-553-A000		
	AIR HANDLING UNIT	Volume III	Part	
	DATA SHEET 'B'	Sheet 2	of 3	


	v) Filter media vi) Capacity vii) Face area of each type viii) Face velocity across each type ix) Pressure drop across each type a) Clean condition b) Clogged condition x) Manometer to monitor Filter condition xi) Filter efficiency/test code	M ³ /Hr. Sq.m/sq.ft. M/Sec. mm Wg mm Wg Yes/No %	
5.0	Humidifier Section		
	i) Type ii) Flow quantity iii) Inlet pressure iv) Inlet temp. v) Inlet connection size vi) No. of nozzles vii) Drain pump viii) Drain piping ix) Spray pump and piping	Steam/Water Spray CUM per Hr Kg/Cm ² (g) Deg. C mm Yes/No Yes/No Yes/No	
6.0	Vibration isolators		
	i) Type / Model ii) No. iii) Size iv) Manufacturer		
7.0	PERFORMANCE		
	i) Capacity ii) Total pressure iii) Outlet velocity iv) Discharge v) No. of impellers vi) Impeller dia vii) Impeller speed viii) Shaft power ix) Motor rating x) Motor speed	CUM/Hr. mm WC M/Sec - - mm RPM KW KW RPM	

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	Title : 400 MW MARIB GTPS PHASE-II	Spec. No.: PE-TS-372-553-A000
	AIR HANDLING UNIT	Volume III Part
	DATA SHEET 'B'	Sheet 3 of 3

8.0	Materials of Construction, Thickness & Code Conformance i) Casting ii) Impeller iii) Shaft iv) Coil Pipe v) Fans vi) Face/Bypass damper vii) Filter media viii) Filter frame work		
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	Title : 400 MW MARIB GTPS PHASE-II LOW PRESSURE AIR DISTRIBUTION SYSTEM	Spec. No.: PE-TS-372-553-A001.
		Volume - III Part
	DATA SHEET 'B'	Sheet 1 of 1

S.NO	ITEM	UNIT	PARTICULARS
1.0	Material & code conformance of duct sheets	--	
2.0	Zinc coating/class as per IS-277	gms/m ²	
3.0	Any deviation from specification requirements for construction & fabrication		Yes/No
4.0	Following accessories included		Yes/No
4.1	Branch dampers		Yes/No
4.2	Fire dampers		Yes/No
4.3	Guide vanes		Yes/No
4.4	Duct supports		Yes/No
5.0	Qty. of duct sheets included		
	18G sheet	M ²	
	20G sheet	M ²	
	Any other size	M ²	
6.0	Qty. of supply air grilles & diffusers included	M ²	
7.0	Qty. of return air duct work, if any	M ²	
8.0	Thermal insulation		
8.1	Type/make/thickness	mm	
8.2	Qty.included		
9.0	Acoustics insulation	M ²	
9.1	Type/make/thickness	MM	
9.2	Qty.included	M ²	
10.0	Any deviation from inspection & testing requirements		Yes/No
11.0	Pressure drop across		
	i. Supply air diffusers	Mm WG	
	ii. Supply air grilles	Mm WG	
12.0	Velocity at outlet		
	i. Grilles	M / sec	
	ii. Diffusers	M / sec	
13.0	Throw of		
	i. Grilles	M	
	ii. Diffusers	M	


	Title: 400 MW MARIB GTPS PHASE-II	Spec. No.: PE-TS-372-553-A001			
	AIR FILTER	Volume III	Part		
	DATA SHEET 'B'	Sheet 1	of	1	

S.NO	ITEM	UNIT	PARTICULARS
1.	Manufacture	--	
2.	Model No.	--	
3.	Type	--	
4.	Size	mm xmmxmm	
5.	Rating	M ³ /hr	
6.	Nos.	--	
7.	Efficiency	Microns	
8.	Test method	--	
9.	Press drop at clean conditions	Mm wg	
10.	Press drop at dirty conditions	Mm wg	
11.	Filter media	--	
12.	Whether cleanable	--	
13.	Material of frame	--	
14.	Weight of filter	Kg	
15.	Mounting frame work	--	


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


	Title : 400 MW MARIB GTPS PHASE-II	Spec. No.: PE-TS-372-553-A001.	
	VENTILATION FRESH AIR FANS (axial flow)	Volume III	Part
	DATA SHEET 'B'	Sheet 1	of 2


SL.NO.	ITEM	UNIT	PARTICULARS
1.	Manufacturer	--	
2.	Model No.	--	
3.	Nos. offered	--	
4.	Area	--	
5.	Specific weight of air at temp.	Kg/M ³	
6.	Static pressure at rated speed	MMWG	
7.	Total pressure at rated speed	MMWG	
8.	Outlet velocity of air	M/sec	
9.	Rated speed	RPM	
10.	Critical speed of fan shaft & impeller assembly	RPM	
11.	Tip speed	M/sec	
12.	Impeller dia	MM	
13.	No. of blades	--	
14.	Pitch angle	Degree	
15.	Efficiency at rated speed	%	
16.	Fan power at rated speed	KW	
17.	Recommended/selected motor	KW	
18.	Material of impeller & thickness and code conference	MM	
19.	Material of casing & thickness and code conference	MM	
20.	Material of casing & shaft and diameter code conference	MM	
21.	Type of bearing & material		
22.	Type of drive & manufacturer		
23.	Percentage reduction in capacity of fan when any of the following are added		
	a) Inlet cone or bell	%	
	b) Outlet cone	%	
	c) Louver shutter	%	
	d) Wall cowl	%	
	e) Wire mesh guard	%	


	Title : 400 MW MARIB GTPS PHASE-II	Spec. No.: PE-TS-372-553-A001.	
	VENTILATION FRESH AIR FANS (axial flow)	Volume III	Part
	DATA SHEET 'B'	Sheet 2	of 2

24.	Motor data a) Voltage, phase, frequency b) Rated KW c) Type of enclosure d) Type of insulation e) Motor design ambient of temp.	V/ph/HZ KW -- -- °C	
25.	Motor data sheet B as per spec. PES-5-6-02 furnished		Yes / No
26.	Fan statically & dynamically balanced		Yes / No
27.	Weight of fan/motor/base drive	Kg	
28.	Fan sound pressure level at 3 impeller dia from center of fan inlet/outlet (with ref. To 10^5N/M^2)	Db (A)	
29.	Performance curves enclosed		Yes / No

	Title: 400 MW MARIB GTPS PHASE-II		SPECIFICATION NO. PE-TS-372-553-A001.	
	AIRCOOLED PACKAGE AC <u>DATA SHEET - B</u>		VOLUME - III	
			SECTION	
			REV 00	DATE
		SHEET 1 OF 3		
S.No.	ITEM			
1.01	Make :			
1.02	Model No. :			
1.03	Type :			
1.04	Capacity :			
1.05	No. of Units :			
1.06	Refrigerant :			
1.07	Compressor Make/Model No./Type :			
1.08	Compressor Motor/type/HP/Voltage :			
1.09	Suction Temperature (°C) :			
1.10	Condensing Temperature (°C) :			
1.11	Ambient Temperature DB (°C) :			
2.00	Compressor Materials			
2.01	Cylinder :			
2.02	Piston :			
2.03	Connecting rod :			
2.04	Crankshaft :			
2.05	Crank pin :			
2.06	Crankpin bearing :			
2.07	Crank shaft bearing :			
3.00	Auxiliaries Supplied			
3.01	High pressure gauge :			
3.02	Crank case heater :			
3.03	Low pressure gauge :			
3.04	Base plate :			
3.05	HP cutout :			
3.06	LP cutout :			
3.07	Automatic unloading device :			
3.08	Oil failure switch :			
3.09	Pressure relief valve :			
3.10	Unloaded starting device :			
4.00	Remarks on Following Items			
4.01	Lubrication system :			
4.02	Vibration isolation arrangement :			

	Title: 400 MW MARIB GTPS PHASE-II	SPECIFICATION NO. PE-TS-372-553-A001.	
	AIRCOOLED PACKAGE AC <u>DATA SHEET - B</u>	VOLUME - III	
		SECTION	
		REV 00	DATE
		SHEET 2 OF 3	
4.03	Compressor motor cooling arrangement	:	
5.00	Condenser (Water/Air cooled)		
5.01	Tube material	:	
5.02	Tube dia	:	
5.03	Fin material	:	
5.04	Fin spacing	:	
5.05	No. of rows	:	
5.06	Coil face area (m ²)	:	
6.00	For Air cooled unit		
6.01	Total air quantity (m Cu. / hr.)	:	
6.02	No. of fans / types of fan	:	
6.03	Fan diameter	:	
6.04	Blade material	:	
6.05	No. of blades	:	
6.06	Fan speed (RPM)	:	
6.07	Fan shaft material	:	
6.08	Direct drive / belt drive	:	
6.09	Fan motor details. Please furnish as per motor technical particulars in specification (Section – E1)	:	
6.10	Fan Motor HP / Voltage	:	
6.11	Design pressure kg / cm ²	:	
6.12	Test pressure kg/cm ²	:	
7.00	For Water Cooled Unit		
7.01	Total water quantity (m Cu. / hr.)	:	
7.02	Pressure drop (mm WG)	:	
7.03	Water temperature in / °C	:	
7.04	Water temperature out / °C	:	
7.05	Design pressure kg / cm ²	:	
7.06	Test pressure kg / cm ²	:	
8.00	Evaporator		
8.01	Tube material	:	
8.02	Tube dia.	:	
8.03	Fin spacing	:	
8.04	No. of rows	:	
8.05	Coil face area (m ²)	:	
8.06	Total air quantity (m Cu. / hr.)	:	
8.07	Cooling capacity	:	
8.08	On coil air temperature DB / WS (°C)	:	
8.09	Coil leaving air temperature DB / WB (°C)	:	
8.10	Refrigerant temperature (°C)	:	
8.11	Filter material	:	
8.12	Filter efficiency as per AFI	:	

	Title: 400 MW MARIB GTPS PHASE-II	SPECIFICATION NO. PE-TS-372-553-A001.	
	AIRCOOLED PACKAGE AC <u>DATA SHEET - B</u>	VOLUME - III	
		SECTION	
		REV 00	DATE
		SHEET 3 OF 3	
8.13	Filter pressure drop (mm WG)	:	
8.14	Blower capacity (m Cu. / hr.)	:	
8.15	Blower speed	:	
8.16	Type of blower / blades	:	
8.17	Blower motor details to be furnished as per motor technical particulars	:	
9.00	Other Queries		
	Are starters for compressor, fan / blowers provided within the units?	:	
	Noise level of packaged unit (low side) dBA at a distance 1M.	:	
	Noise level of condenser unit (outdoor) dBA at a distance 1M.	:	
	Is Plenum Box with supply air grille included?	:	
	Is Return air grille on packaged unit included?	:	
	Material of refrigerant piping: Factory Installed / Field Installed	:	
	Is condenser assembly including motor suitable for outdoor installation?	:	
	Are fusible plug and pressure relief valve for condenser provided within the units?	:	

	TITLE: 400 MW MARIB GTPS PHASE-II		SPECIFICATION NO. PE-TS-372-553-A001	
	SPLIT TYPE AIR-CONDITIONER		VOLUME III	
	<u>DATA SHEET - B</u>		SECTION	
	REV	00	DATE	
	SHEET	1	OF 1	

S.No.	ITEM	:
1.00	Model No.	:
2.00	Make	:
3.00	Overall dimensions	:
4.00	Condenser : Type	:
	Make	:
	Capacity	:
5.00	Nominal Capacity	:
6.00	Operating capacity	:
7.00	Quantity	:
8.00	Operating weight	:
9.00	Rated speed	: ST : CT :
10.00	No. of cylinder	: Motor rating :
11.00	Consumed power	:
12.00	Condenser	
12.01	Heat rejection (K Cal / hr.)	:
12.02	Inlet air temp.	:
12.03	Temp. rise	:
12.04	Fan power	:
12.05	Fan motor rating	:
12.06	Condenser air quantity	:
13.00	Fan	
13.01	Air quantity	:
13.02	Static pressure	:
13.03	Rated speed	:
13.04	Consumed power	:
14.00	Accessories provided	
14.01	Unloaded starting device	: Yes/No.
14.02	Capacity control arrangement	: Yes/No.
14.03	HP cutout switch	: Yes/No.
14.04	LP cut out switch	: Yes/No.

**DEVIATION SHEET : PART-B
(TECHNICAL)**

If the proposal has got any deviation from the stipulations of "General Specification and Technical Specification", (Volume-II) the Bidder shall tabulate the same with full particulars quoting the relevant clause/clauses. Vague reference such as "See Covering letter", etc. are not acceptable. Compliance with the specification will be taken for granted in absence of any departure from any of the clauses of the "General Specification and Technical Specification" if it is not mentioned in this Schedule. The price implications for the deviations shall be indicated in Deviation sheet part C. Add more sheets, if necessary.

Clause No.	Deviation, if any
------------	-------------------

SEAL OF COMPANY

Signature :

Name :

Designation

DEVIATION SHEET PART - C

Against each and every deviation from the Technical Specification as enumerated in the Deviation Sheet (Part-B), the amount by which the bid price will thereby be increased or decreased be intimated clause by clause in this Schedule. In case the amount is not mentioned in the Schedule against any of the deviations mentioned in Deviation Sheet (Part-B), it will be taken for granted that the same does not involve any change in the Bid Price.

Clause No.	Deviation, if any	Amount by which the Bid Price will change	
		Increase (Rs.)	Decrease (Rs.)

SEAL OF COMPANY

Signature :

Name :

Designation :

400 MW MARIB GTPS PH - II
AIRCONDITIONING SYSTEM
SUGGESTIVE PRICE FORMAT

Clause No.	DESCRIPTION	Qty.	Unit	SUPPLY	
				Unit Price (Rs)	TOTAL Price (Rs)
1.0	<p>Total price for Equipment & Services as Specified, Comprising design & engineering, manufacture, inspection, testing at manufacturers or their subvendo's works, Painting at manufactures works, duly seaworthy packed for transportation, delivery upto Mumbai port, supervision of erection & commissioning, preparation and submission of as built drawing for the total scope of complete Air conditioning system as per Specification PE-TS-372-553-A001 including maintenance tools & tackles, commissioning spares etc.</p> <p>All necessary fittings and accessories required for complete erection of various equipments at site like bolts, nuts, washers, gaskets, vibration isolation pads, duct supports, pipe supports and supports for equipment like split unit indoor and outdoor unit of split AC, AHU, Condensing unit, fresh air fans, hanging arrangements for ducts, pipes and other equipments etc as per approved engineering drawing required for complete installation shall be provided with respective equipment in adequate quantities.</p> <p>If any accessory item is not covered in the list above, the same shall not relieve the bidder to include that particular item required to make the installation complete in all respect.</p>				
2.0	Breakup prices for items covered in clause 1.0 above.				
2.1	AC Plant -1 (Main control room areas and 400 KV control area at EL 5.2 m)				
2.1.1	DX type, air cooled condensing unit of 100 TR (ACTUAL) capacity. The refrigerant compressor shall be Reciprocating / Scroll, Open / Semi-hermetic type suitable for Refrigerant R-134a / R-407c / R-410a environment friendly HFC refrigerants with drive package (for open type compressor only), Suction and discharge valves, capacity control system, expansion valve, crank case heater etc. A control panel shall be provided to house all gauges and controls. The panel shall contain all necessary terminal strips to facilitate external wiring. The unit shall be complete with expansion valve, all necessary fittings, accessories, insulated refrigerent piping to and from AHUs, cadmium plated foundation bolts, nuts, washers etc complete in all respect.	2	No		

400 MW MARIB GTPS PH - II
AIRCONDITIONING SYSTEM
SUGGESTIVE PRICE FORMAT

Clause No.	DESCRIPTION	Qty.	Unit	SUPPLY	
				Unit Price (Rs)	TOTAL Price (Rs)
2.1.2	Sheet metal cabinet type air handling units (double skin as per specification) The draw through horizontal AHUs shall comprise of Mixing box, Dampers, Filters (pre filter and fine filters with DP gauge across filters), DX- cooling coil, Electric heating coil, Electric steam humidifier and Fan section with fan & TEFC sq cage induction motor, drive set, face and bypass damper with modulating motor, condensate drain pan, thermostatic controls and other accessories to meet the AC load of control room areas at El 5.2m	1	Lot		
2.1.3	GI medium class drain piping insulated and cladded upto the nearest drain point.	1	Lot		
2.1.4	Winter heating kit comprising of strip heaters, safety controls, air-stat, contactors, frame work, thermostat & humidistat/ sensors etc.(Heaters shall be provided in the AHU chamber)	1	Lot		
2.1.5	Electric steam humidifier for each AHU complete with humidistat, fittings and installation accessories (Humidifiers shall be provided in the AHU chamber).	1	Lot		
2.1.6*	Fire dampers for ACP 1 & 2.				
2.1.6.1*	Fire damper having 90minutes fire rating as per UL-555 with auto resetting, limit switches, indication lamps, UL etc.	5	SQM*		
2.1.6.2*	Motorized actuator with single phase power supply for the above fire damper.	6	Nos*		
2.1.7*	Ducting, diffuse/ grill, thermal insulation for duct for (These items are common for ACP 1 & 2)				
2.1.7.1*	Finished GSS Ducting with supporting structure etc. complete with hangers, supports, splitters, volume control damper and all other accessories as required for complete installation.				
2.1.7.1.1*	18 G	250	SQM*		
2.1.7.1.2*	20 G	500	SQM*		
2.1.7.1.3*	22 G	600	SQM*		
2.1.7.1.4*	24 G	800	SQM*		
2.1.7.2*	Extruded aluminium powder coated adjustable double louvered Grilles with front adjustable opposed blades sheet metal (black painted) volume control damper. Grills shall be complete with fixing screws and other accessories as required for complete installation as per specifications.	10	SQM*		
2.1.7.3*	Extruded Aluminium powder coated adjustable eyelash deflection blade type diffusers with front adjustable opposed blades sheet metal (black painted) volume control damper. Diffusers shall be complete with fixing screws and other accessories as required for complete installation as per specifications.	10	SQM*		

400 MW MARIB GTPS PH - II
AIRCONDITIONING SYSTEM
SUGGESTIVE PRICE FORMAT

Clause No.	DESCRIPTION	Qty.	Unit	SUPPLY	
				Unit Price (Rs)	TOTAL Price (Rs)
2.1.7.4*	Acoustic insulation of the first 6 of ducting from AHU outlets.	1	Lot		
2.1.7.5*	Thermal insulation of supply air duct & return air duct with finish as specified.	2350	SQM*		
2.1.8	Fresh air fan (axial flow type), complete with motor, inlet cone, air filters (pre and fine), dampers etc.	2	Nos		
2.1.9	Relay based control panel for ACP 1 & 2 with all controls, interlocks, including the local control panels as required for individual AHU rooms for control of AHU, Heater, Fire Dampers etc as required and specified.	1	Lot		
2.1.10	Field instruments as specified for ACP 1 & 2	1	Lot		
2.2	AC Plant -2 (Switchgear hall at EL 0 m)				
2.2.1	DX type, air cooled condensing unit of 50 TR (ACTUAL) capacity. The refrigerant compressor shall be Reciprocating / Scroll, Open / Semi-hermetic type suitable for Refrigerant R-134a / R-407c / R-410a environment friendly HFC refrigerants with drive package (for open type compressor only), Suction and discharge valves, capacity control system, expansion valve, crank case heater etc. A control panel shall be provided to house all gauges and controls. The panel shall contain all necessary terminal strips to facilitate external wiring. The unit shall be complete with expansion valve, all necessary fittings, accessories, insulated refrigerent piping to and from AHUs, cadmium plated foundation bolts, nuts, washers etc complete in all respect.	2	No		
2.2.2	Sheet metal cabinet type air handling units (double skin as per specification) The draw through horizontal AHUs shall comprise of Mixing box, Dampers, Filters (pre filter and fine filters with DP gauge across filters), DX- cooling coil, Electric heating coil, Electric steam humidifier and Fan section with fan & TEFC sq cage induction motor, drive set, face and bypass damper with modulating motor, condensate drain pan, thermostatic controls and other accessories to meet the AC load of control room areas at El 5.2m	1	Lot		
2.2.3	GI medium class drain piping insulated and cladded upto the nearest drain point.	1	Lot		
2.2.4	Winter heating kit comprising of strip heaters, safety controls, air-stat, contactors, frame work, thermostat & humidistat/ sensors etc.(Heaters shall be provided in the AHU chamber)	1	Lot		
2.2.5	Electric steam humidifier for each AHU complete with humidistat, fittings and installation accessories (Humidifiers shall be provided in the AHU chamber).	1	Lot		
2.3	Air conditioning system for Auxiliary control rooms etc as specified.				

400 MW MARIB GTPS PH - II
AIRCONDITIONING SYSTEM
SUGGESTIVE PRICE FORMAT

Clause No.	DESCRIPTION	Qty.	Unit	SUPPLY	
				Unit Price (Rs)	TOTAL Price (Rs)
2.3.1*	Air-cooled package type AC units consisting of condensing unit & evaporating unit including refrigerant pipes & fittings with insulation etc.				
2.3.1.1*	15.0 TR capacity.	2	Nos*		
2.3.1.2*	10.0 TR capacity.	2	Nos*		
2.3.1.3*	Inlet Louvres with pre & fine filter for fresh air arrangement of Package AC Room	2	SQM*		
2.3.2*	Air-cooled split type AC units consisting of condensing unit & evaporating unit including refrigerant pipes & fittings with insulation, isolation switch (MCB), cabling from MCB to indoor and outdoor units with minimum 4 star rating as per BEE.				
2.3.2.1*	5.0 TR capacity (ductable type, 415 V, 3 phase with isolation switch, i.e., MCB of required rating along with socket box, plug and cabling as required).	4	Nos*		
2.3.2.2*	2.0 TR capacity (non-ductable type, 240 V, 1 phase isolation switch, i.e., MCB of required rating along with socket box, plug and cabling as required).	30	Nos*		
2.3.2.3*	1.5 TR capacity (non-ductable type, 240 V, 1 phase isolation switch, i.e., MCB of required rating along with socket box, plug and cabling as required).	35	Nos*		
2.4	Any other item not indicated above, but required to complete Airconditioning package as per system requirements including commissioning spares.	1	Lot		
2.5	Total lump sum prices for commissioning spares (bidder to furnish lists of spares with item wise prices separately along with the price bid).	1	Lot		
2.6	Total lump sum prices for special tools for erection and maintenance (bidder to furnish lists of spares with item wise prices separately along with the price bid).	1	Lot		
3.0	SUPERVISION OF ERECTION AND COMMISSIONING				
3.1*	No of mandays	60	Nos*		
NOTES					
1	The bidder shall furnish unit rates for variable items (marked *) like finished ducting, thermal insulation, diffusers / grilles, fire dampers, split A/cs, for necessary adjustment (plus or minus) variation during detailed engg.				
2	The above BOQ is indicative for Price Purpose only and not exhaustive. The equipment / items as required for system requirements shall be provided with no commercial implication.				
3	Bidder must submit prices in the Pro Forma duly filled in signed and stamped on every page without any ambiguity. The price shall be written against each item. Term such as "refer covering letter" etc. are not acceptable. Extra sheet may be attached if the space provided is not sufficient.				
4	Price format shall not be changed by the bidder.				

400 MW MARIB GTPS PH II
AIR CPONDITIONING SYSTEM
GUARANTEED POWER CONSUMPTION FIGURES

S.NO.	DESCRIPTION OF EQUIPMENT	NO OF EQUIPMENT		TOTAL GUARANTEED POWER CONSUMPTION FOR EACH EQUIPMENT AT MOTOR INPUT TERMINAL AND CONTROL PANEL	DUTY FACTOR	TOTAL KW
		WORKING	STANDBY			
1	2	3A	3B	4	5	6=3Ax4x5
1	DX Condensing unit for control areas (100 TR)	1	1		1	
2	Air handling units for control areas	1	1		1	
4	DX Condensing unit for Switchgear areas (50 TR)	1	1		1	
5	Air handling units for switchgear areas	1	1		1	
				TOTAL (KW)		255

Note:	<p>Estimated power consumption (EPC) figure for the system (for working drives only) has been considered as 255 KW. So long bidder's quoted guaranteed power consumption (GPC) above remains within this EPC, there will be no technical loading of bid on power consumption for evaluation. However, if bidder's quoted GPC exceeds EPC, there shall be technical loading of bid for evaluation @ US\$ 620 per KW of additional power over EPC.</p> <p>Bidder's guaranteed power consumption at motor input terminals (not shaft power) as furnished in relevant schedule shall be demonstrated by the successful bidder during performance testing at works/ site. In case power consumption is noted higher than EPC / bidder's quoted GPC whichever is higher, during inspection/ PG test, penalty @ US\$ 620 per additional KW shall be levied on vendor.</p>
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FORMAT FOR NO DEVIATION CERTIFICATE
(To be submitted in the bidder's letter head)

BHARAT HEAVY ELECTRICALS LIMITED,
Power Sector - Northern Region,
Plot no 25, Sector – 16A,
NOIDA – 201301

Sub	No Deviation Certificate.	
Job	Design, engineering, manufacturing, supply, supervision of E&C etc of AIR CONDITIONING System for 400MW MARIB GTPS PH II, YEMEN.	
Ref	01	Tender no
	02	BHEL's NIT, vide reference no
	03	Our offer, vide reference no _____, dated _____.
	04	Other references (if any).

Dear Sirs,

With reference to above, this is to confirm that as per tender conditions, we have visited site before submission of our offer and noted the job content & site conditions etc. We also confirm that we have not changed/ modified the tender documents as appeared in the website/ issued by you and in case of such observance at any stage, it shall be treated as null and void.

We hereby confirm that we have not taken any deviation from tender clauses together with other references as enumerated in the above referred NIT. We hereby confirm our unqualified acceptance to all terms & conditions and unqualified compliance to technical specification.

In the event of observance of any deviation in any part of our offer at a later date whether implicit or explicit, the deviations shall stand null & void.

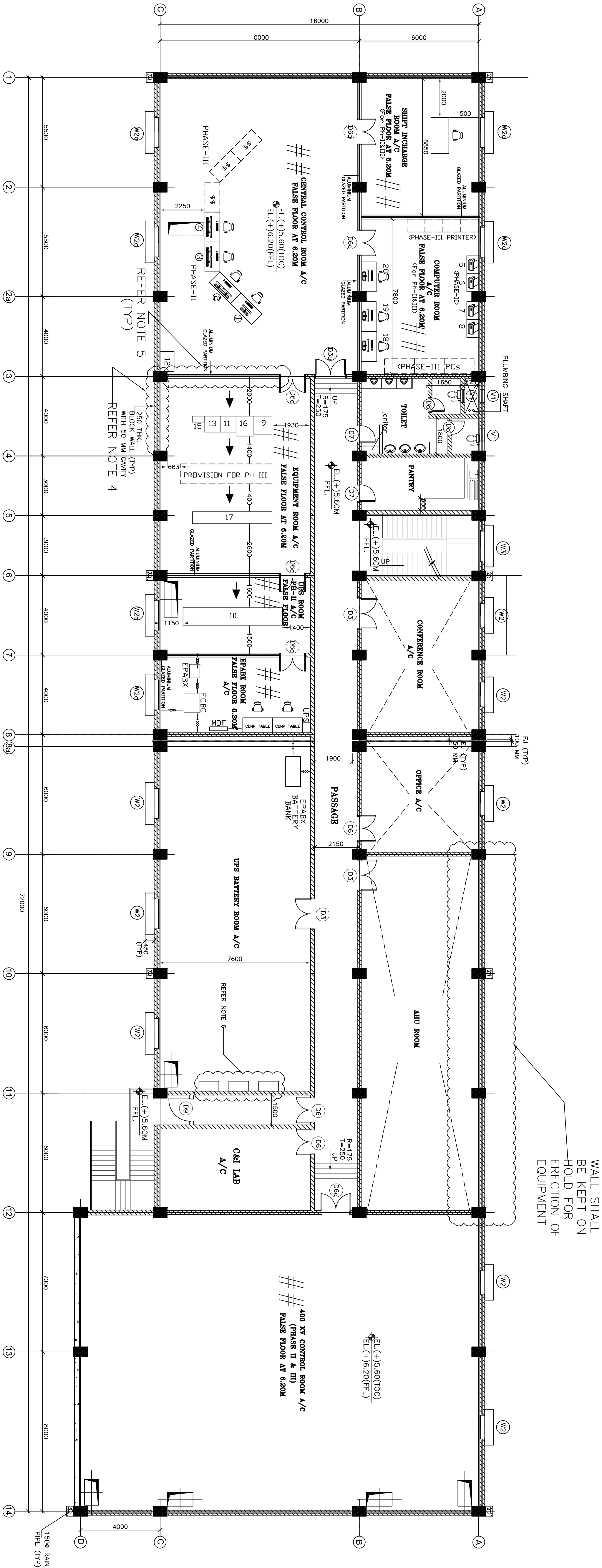
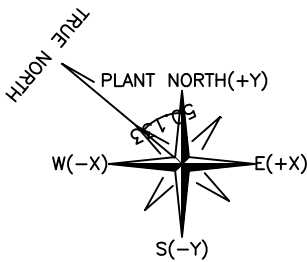
We confirm to have submitted offer in accordance with tender instructions and as per aforesaid references.

Thanking you,

Yours faithfully,

(Signature, date & seal of authorized
representative of the bidder)

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.



FLOOR PLAN AT EL.(+5.600M (FFL)

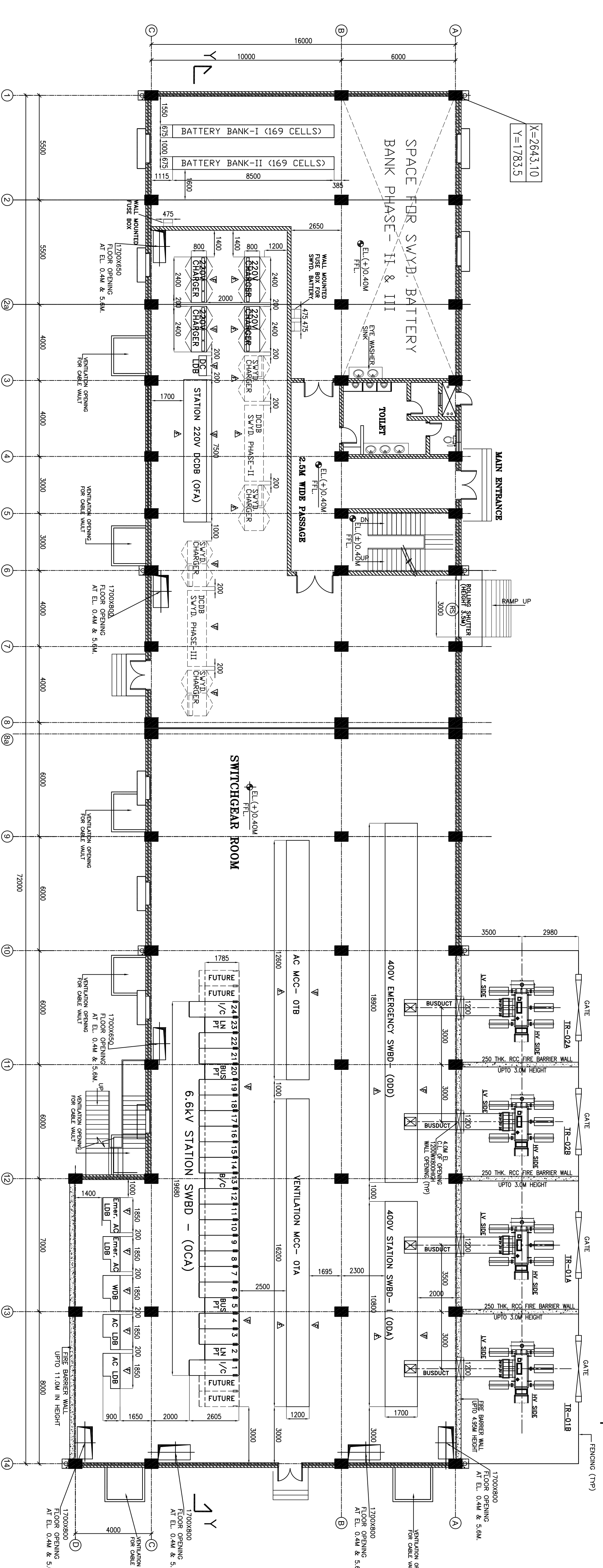
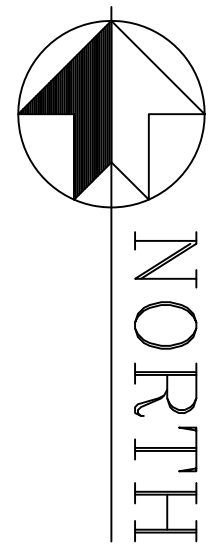
LIST OF EQUIPMENT WITH TABLE DIMENSIONS:

S/L NO.	DESCRIPTION	WIDTH (IN MM)	DEPTH (IN MM)	HEIGHT (IN MM)	HEAT DISS	SCOPE
1	OT FOR GT-1 : (MONITOR,KB,MOUSE) & PC	1500	750	740	500W	SEMIENS
2	OT FOR GT-2 : (MONITOR,KB,MOUSE) & PC	1500	750	740	500W	SEMIENS
3	OT FOR GT-3 : (MONITOR,KB,MOUSE) & PC	1500	750	740	500W	SEMIENS
4	OT FOR GT-4 : (MONITOR,KB,MOUSE) & PC	1500	750	740	500W	SEMIENS
5	ALARM PRINTER (A4 COLOR LASER)	900	600	740	450W	SEMIENS
6	ALARM PRINTER (A4 COLOR LASER)	900	600	740	450W	SEMIENS
7	ENGINEERING PRINTER (A4 B/W LASER)	900	600	740	450W	SEMIENS
8	WIN-TS PRINTER (A3 COLOR LASER)	900	600	740	450W	SEMIENS
9	GAS DETECTION PANEL	825	82.3	2155	3500W	SEMIENS
10	UPS PANELS	5000	800	2200	13KW	BHEL-EDN
11	MASTER SLAVE CLOCK	800	800	2400	400W	BHEL-EDN
12	FAP & PC	1000	700	2345	10000W	BHEL-PEM
13	PA SYSTEM	800	800	2415	400W	BHEL-PEM
14	EPABOX ROOM(2 PC, 1 MDF, 1 EPABX, 1 FCBG)	600	300	1000	20000W	BHEL-EDN
15	LAN NETWORK SWITCH RACK	600	300	1000	600W	SEMIENS
16	LAN SERVER CABINET (CROV1)	900	1000	2200	3500W	SEMIENS
17	ACDB	4000	600	2000	400W	BHEL-EDN
18	WIN-TS	1500	750	735	450W	SEMIENS
19	WIN-TS	1500	750	735	450W	SEMIENS
20	SWAP-OUT SERVER	1500	750	735	800W	SEMIENS
21	SPACE PROVISION FOR PH-III OPERATOR TERMINAL			13KW		

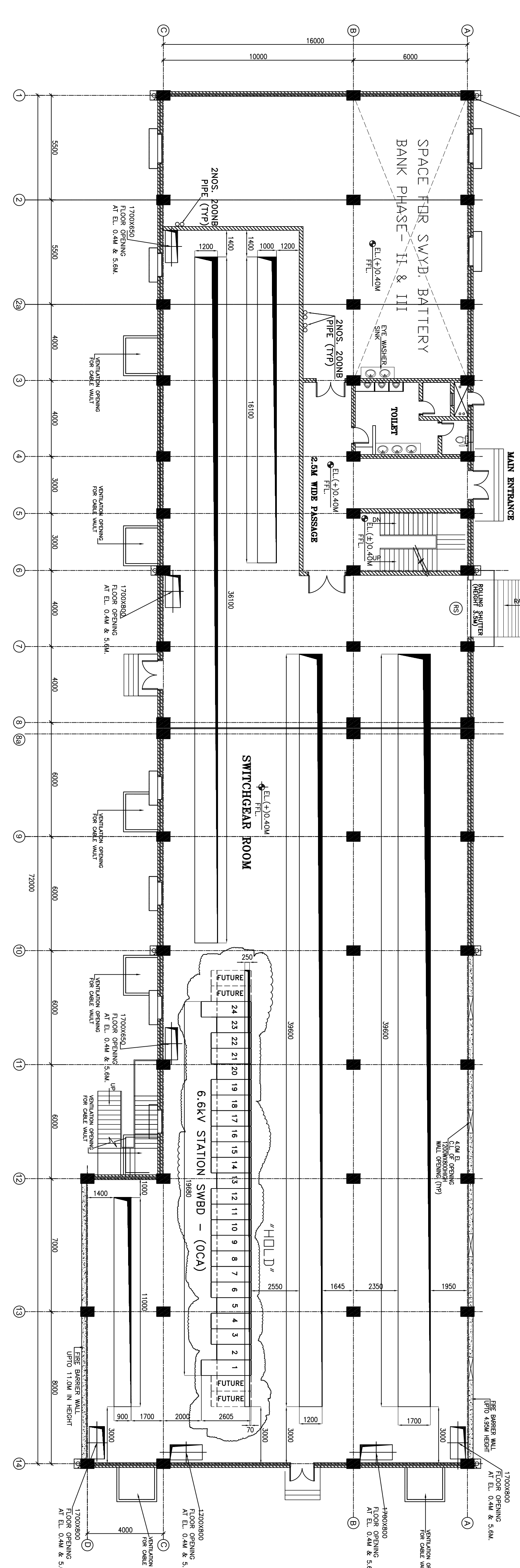
LEGENDS:

- | | |
|-------|--|
| ===== | BRICK WALL UPTO 3 FEET, REST GLASS WALL. |
| ===== | BRICK WALL. |
| ===== | GLASS PARTITION |
| ===== | MAIN DISTRIBUTION FRAME |
| MDF | FLOAT CUM BOOSTER CHARGER |
| FCBC | |

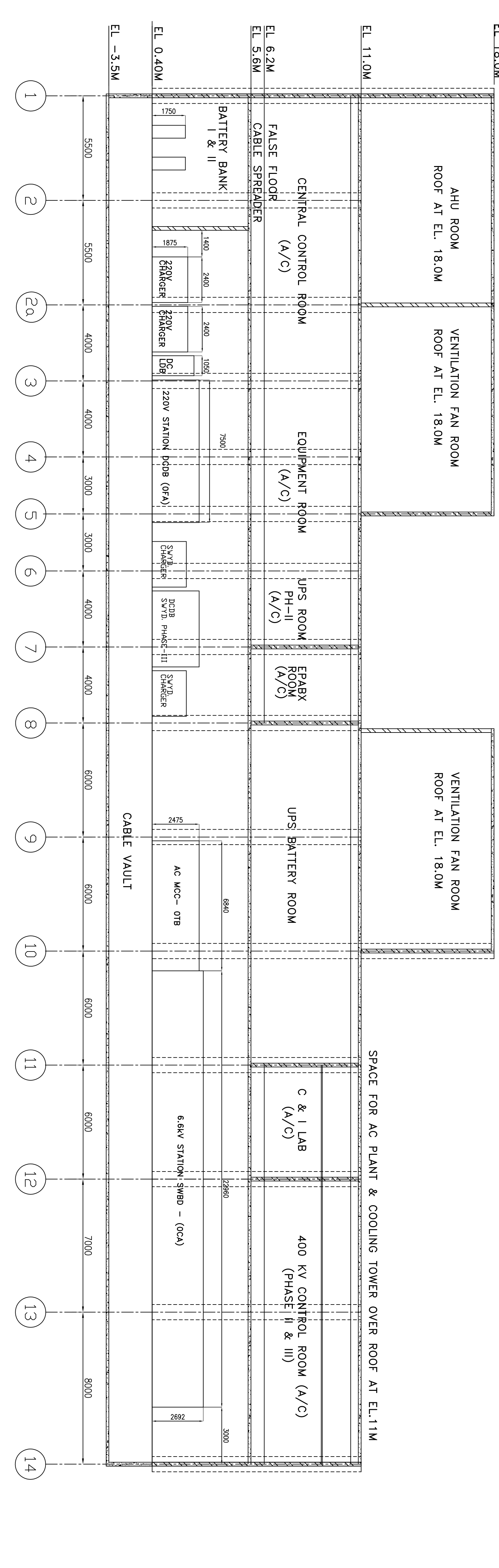
[illegible]



SWITCHGEAR ROOM AT EL. (+)0.40M



FLOOR CUTOOT DETAILS AT EL. (+)0.40M



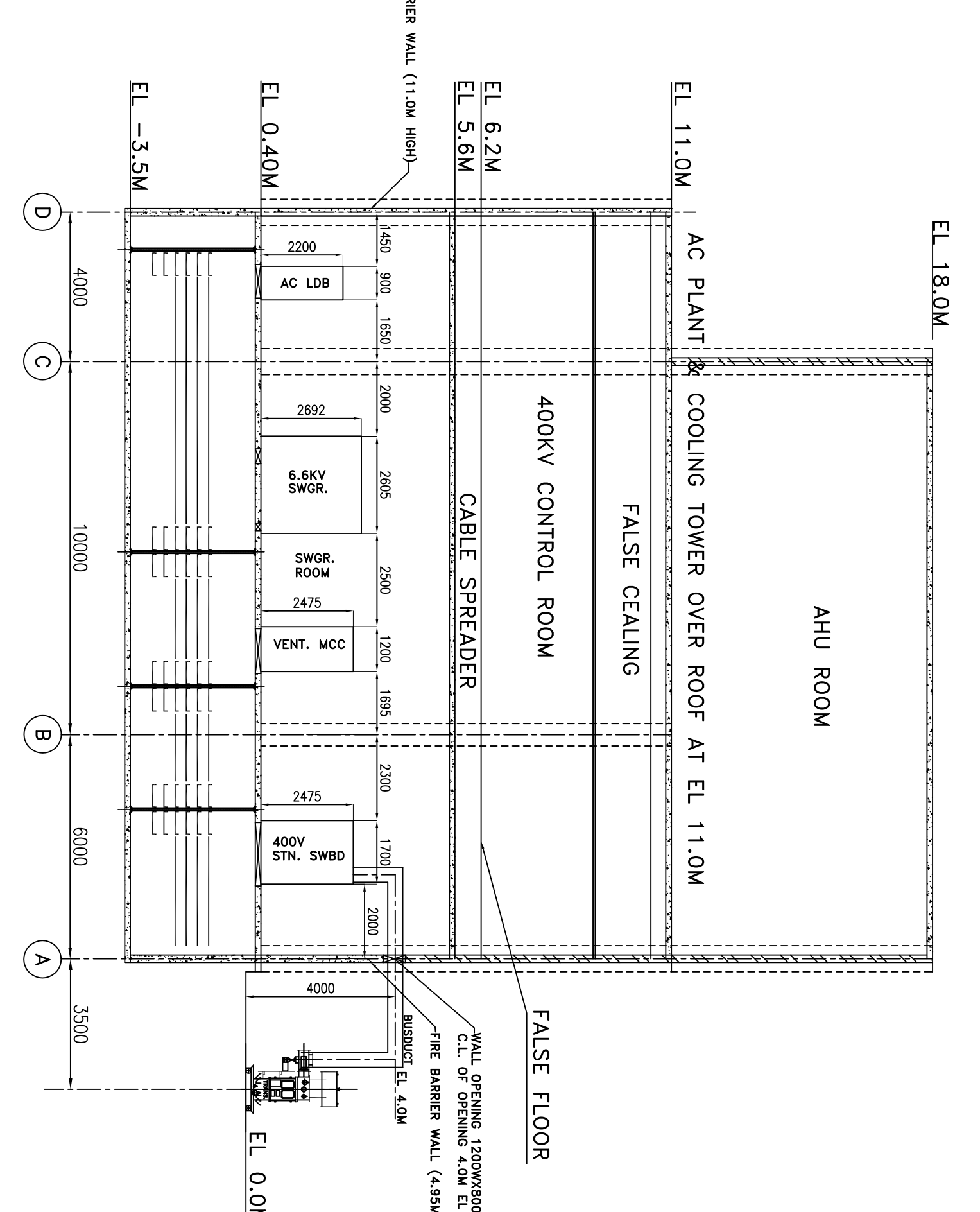
SECTION-XX

LEGEND:-

- PANEL FRONT
- BRICK WALL
- FIRE BARRIER WALL
- FLOOR CUTOOT
- ROLLING SHUTTER

NOTES:-

- ALL DIMENSIONS ARE IN MM & ELEVATION IN METRE.
- CABLE TRENCHES & CABLING ARRANGEMENT FOR THIS BUILDING REFER DRG. NO. PE-DG-372-100-E011.
- THIS DRG. SHALL ONLY BE REFERRED FOR EL. 0.4M FLOOR ELECTRICAL DETAILS.
- FOR EL.-6.60M FLOOR DETAIL, REFER C&I DRAWING (PE-DG-372-145-1401).
- FOR EL.-11.0M FLOOR DETAIL, REFER MAXX VENDOR DRAWINGS.
- CUTOOT DETAILS FOR SWGR'S SHALL BE REVISED/INFORMED AS A PART OF MANUFACTURER DRG.
- EQUIPMENTS DIMENSIONS SHOWN ARE INDICATIVE & TENTATIVE, & SAME SHALL BE REVISED AFTER RELEASE OF MANUFACTURER DRGS.
- ALL WALL OPENINGS FOR BUSDUCT SHALL BE SEALED WITH SUITABLE FIRE RESISTANT MATERIALS.
- EQUIPMENTS OTHER THAN IN BHEL SCOPE ARE SHOWN TENTATIVE/INDICATIVE & SAME SHALL BE DECIDED BY CUSTOMER (SWITCHYARD DCDB, CHARGERS ETC).
- FOR DETAILS OF CABLE TRAY LAYOUT UNDER SWGR ROOM/CABLE VAULT, SEPARATE DRG. NO. PE-DG-372-100-E011 SHALL BE REFERRED.
- 6.6KV SWGR DETAILS SHALL BE REVISED AFTER RECEIPT OF CA DRGS FROM BHEL-BHOPAL & FLOOR CUTOOT DETAILS FOR POWER CABLE ENTRY SHALL BE PROVIDED.



SECTION-XX

DETAILS OF PANEL FIXING & CABLE CUTOOT FOR 6.6KV SWGR

1. PANEL FRONT

2. BRICK WALL

3. FIRE BARRIER WALL

4. FLOOR CUTOOT

5. ROLLING SHUTTER

6. PANEL WITH EXTENSION CHAMBER

7. PANEL SUPPORTING ARRANGEMENT (TYPE) ON FLOOR WITH EXTENSION CHAMBER

8. NTS

CUSTOMER DRG. NO.: MARB-II-12/2008-E-42021

PUBLIC ELECTRICITY CORPORATION(PEE)
MINISTRY OF ELECTRICITY AND ENERGY
SMAA, REPUBLIC OF THERN

THE MULLAN CORPORATION
ENGINEERS ARCHITECTS CONSULTANTS
PULWANA, N. INDIA

400MW MAHB GAS TURBINE POWER STATION (PHASE-II)

STATUS: CONTRACT

ADJ. NO.: 372

DISTRIBUTION:

NO.	REV.	DATE	BY	CHK.	APP.
1	1	12/08/2008	AK	AK	AK
2	1	12/08/2008	AK	AK	AK
3	1	12/08/2008	AK	AK	AK
4	1	12/08/2008	AK	AK	AK
5	1	12/08/2008	AK	AK	AK
6	1	12/08/2008	AK	AK	AK
7	1	12/08/2008	AK	AK	AK
8	1	12/08/2008	AK	AK	AK
9	1	12/08/2008	AK	AK	AK
10	1	12/08/2008	AK	AK	AK
11	1	12/08/2008	AK	AK	AK
12	1	12/08/2008	AK	AK	AK
13	1	12/08/2008	AK	AK	AK
14	1	12/08/2008	AK	AK	AK
15	1	12/08/2008	AK	AK	AK
16	1	12/08/2008	AK	AK	AK

TITLE: LAYOUT OF SWITCHGEAR ROOM (EL. 0.0M)

SCALE: 1:142

PROJECT: PE-DG-372-100-E002

DATE: 12/08/2008

REV: 03

MASTER DRAWING / DOCUMENT LIST - AIR CONDITIONING SYSTEM

S. NO.	DRAWING NO	DRG./ DOC. TITLE	SCH. WEEK	PURPOSE	SOURCE
1	PE-V0-372-553-A001	INSPECTION CATEGORISATION PLAN	4	A-CUST	VENDOR
2	PE-V0-372-553-A002	QAP OF CONDENSING UNITS	14	A-CUST	VENDOR
3	PE-V0-372-553-A003	QAP OF AIR HANDLING UNIT	14	A-CUST	VENDOR
4	PE-V0-372-553-A004	QAP OF MOTORS	15	A-CUST	VENDOR
5	PE-V0-372-553-A005	QAP OF RELAY BASED PANEL	20	A-CUST	VENDOR
6	PE-V0-372-553-A101	HEAT LOAD CALCULATION FOR CONTROL CUM SWITCHGEAR BUILDING ETC	4	A-CUST	VENDOR
7	PE-V0-372-553-A102	OPERATION & CONTROL PHILOSOPHY FOR AIR CONDITIONING SYSTEM	12	A-CUST	VENDOR
8	PE-V0-372-553-A201	TDS AND GA OF CONDENSING UNITS ALONG WITH FOUNDATION DETAILS	16	A-CUST	VENDOR
9	PE-V0-372-553-A202	TDS AND GA OF AIR HANDLING UNITS ALONG WITH FOUNDATION DETAILS	14	A-CUST	VENDOR
10	PE-V0-372-553-A203	TDS AND GA OF PAC / SPLIT AIR CONDITIONER	12	A-CUST	VENDOR
11	PE-V0-372-553-A204	TDS AND GA OF MOTOR (AHU)	15	A-CUST	VENDOR
12	PE-V0-372-553-A205	TDS OF INSULATION MATERIAL (DUCT INSULATION, DUCT LINING, PIPE INSULATION)	12	I-CUST	VENDOR
13	PE-V0-372-553-A206	TDS AND GA OF FRESH AIR FANS	12	I-CUST	VENDOR
14	PE-V0-372-553-A207	TDS AND GA OF HEATERS AND HUMIDIFIER	7	I-CUST	VENDOR
15	PE-V0-372-553-A208	TDS AND GA OF FIRE DAMPER WITH ACTUATOR	10	A-CUST	VENDOR
16	PE-V0-372-553-A209	TDS AND GA OF SUPPLY / RETURN AIR DIFFUSER/GRILL	8	I-CUST	VENDOR
17	PE-V0-372-553-A210	TDS OF GI SHEET	5	I-CUST	VENDOR
18	PE-V0-372-553-A211	TDS OF PIPES	5	I-CUST	VENDOR
19	PE-V0-372-553-A212	TDS AND GA OF FILTERS	10	I-CUST	VENDOR
20	PE-V0-372-553-A213	TDS FOR INSTRUMENTS (PRESSURE GAUGE, TEMPERATURE GAUGE, LEVEL GAUGE, PRESSURE SWITCH, TEMPERATURE SWITCH, LEVEL SWITCH, DP SWITCH, TEMPERATURE AND HUMIDITY SENSORS ETC)	12	I-CUST	VENDOR
21	PE-V0-372-553-A501	PID FOR MAIN PLANT	8	A-CUST	VENDOR
22	PE-V0-372-553-A502	TYPICAL DETAILS DUCT FABRICATION DRAWING / SUPPORT / ERECTION. INSULATION OF DUCTING / PIPING & EQUIPMENTS REFRIGERENT PIPING ERECTION	7	I-CUST	VENDOR
23	PE-V0-372-553-A503	AC DUCT LAYOUT DRAWING FOR CONTROL ROOM AREAS AT 5.2 M ALONG WITH AHU ROOM LAYOUT WITH FOUNDATION DETAILS	16	A-CUST	VENDOR
24	PE-V0-372-553-A504	AC DUCT LAYOUT DRAWING FOR SWITCHGEAR HALL AT 0.4 M ALONG WITH AHU ROOM LAYOUT WITH FOUNDATION DETAILS	17	A-CUST	VENDOR
25	PE-V0-372-553-A505	AC LAYOUT DRAWING FOR BATTERY AND BATTERY CHARGER ROOM, UPS BATTERY ROOM ALONGWITH SPLIT UNIT DETAILS	18	A-CUST	VENDOR
26	PE-V0-372-553-A506	REFRIGERENT PIPING LAYOUT BETWEEN CONDENSING UNITS AND AHUs	20	A-CUST	VENDOR
27	PE-V0-372-553-A507	SPLIT AC SCHEDULE ALONGWITH HEAT LOAD CALCULATION FOR AUXILIARY BUILDING	22	A-CUST	VENDOR

MASTER DRAWING / DOCUMENT LIST - AIR CONDITIONING SYSTEM

S. NO.	DRAWING NO	DRG./ DOC. TITLE	SCH. WEEK	PURPOSE	SOURCE
28	PE-V0-372-553-A701	TDS OF RELAY BASED PANEL WITH CONFIGURATION DIAGRAM, BILL OF MATERIAL, GA & INTERNAL WIRING DIAGRAM, LOGIC FLOW DIAGRAM, IO WIRING DIAGRAM , PLC ROOM LAYOUT	20	A-CUST	VENDOR
29	PE-V0-372-553-A751	ELECTRICAL FEEDER LIST	18	I-G-P	VENDOR
30	PE-V0-372-553-A752	CABLE SCHEDULE	22	I-G-P	VENDOR
31	PE-V0-372-553-A901	PG TEST PROCEDURE	12	A-CUST	VENDOR
32	PE-V0-372-553-A902	O&M MANUAL	25	I-CUST	VENDOR

Notes

- | | |
|---|---|
| 1 | Schedule for PEM generated documents - From date of CIO |
| 2 | Schedule for VENDOR generated documents - From date of PO |
| 4 | I-CUST : Shall be sent to customer for Information |
| 5 | I-G-P : For Interdepartment coordination |