



Technical specification for
FURNITURE
For
4X270 MW BHADRADRI TPS

SPEC NO.: PE-TS-411-145-I

VOLUME

SECTION

REV. NO.

00

DATE : 19.03.2015

SHEET

OF

SPECIFICATION FOR FURNITURE

- a) 4 Nos. cushioned revolving, independently adjustable seat and back chairs.
- b) Glass top Teak wood / MDF table for mounting Operator Station monitors.
- c) Printer tables.
- d) Glass top Teak wood / MDT table for System Engineering Room / Engineering stations with drawer at end.
- e) Glass top teak wood / MDF table with vertical file mounting arrangement (two layer to house approx. 40 Nos of files and lockable drawers at both end) for System Engineering Room / Engineers.



Technical specification for
CONTROL & INSTRUMENTATION
4 X 270 MW BHADRADRI TPS

SPEC NO.: PE-TS-411-145-I

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OF

CABLE BOQ

CABLE SIZES FOR 4 X 270 MW BHADRADRI TPS PROJECT JOB NO. 411 (PER UNIT)	
Sl no.	Cable Type
	G-TYPE
1	2P X 0.5 sqmm
2	4P X 0.5 sqmm
3	8P X 0.5 sqmm
4	12P X 0.5 sqmm
	F-TYPE
1	4P X 0.5 sqmm
2	8P X 0.5 sqmm
3	12P X 0.5 sqmm
4	24P X 0.5 sqmm
	CONTROL CABLE
1	3C X 2.5 sqmm
2	5C X 2.5 sqmm
3	12C X 1.5 sqmm



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KKS PHILOSOPHY

	DOCUMENT TITLE
	KKS NUMBERING PHILOSOPHY 4X 270 MW BHADRADRI TPS

KKS NUMBERING PHILOSOPHY

For identifying (tagging) an instrument / equipment in Power plant KKS numbering scheme is used. The purpose is to assign a unique number to every equipment in the power plant. For C&I equipment unique number are to be provided up to the signal level so that a unique number Input / Output exist in DCS for every signal.

Normally KKS number is a 10 digit alpha-numeric code and is typically split into the following:

X	X	X	A A Y			Y B B	B		
---	---	---	-------	--	--	-------	---	--	--

First three digits indicate the Sub-System. The Code for the major system are given as per **Annexure-1**.

Fourth and Fifth digits are the **Numerical Keys at System Code Level** and used to distinguish between main systems having same Alpha Codes.

Sixth and Seventh digits are the **Equipment / Apparatus / Measuring Circuit Code**. The code of various Equipment / Apparatus / Measuring Circuit is shown in **Annexure-2**

Eight, Nine and tenth digits are the **Numerical Keys at Equipment / Apparatus / Measuring Circuit Code** and used to distinguish between various instruments in the same sub-group. Numerical keys at System / Equipment / Apparatus / Measuring Circuit is shown in **Annexure-3**.

	DOCUMENT TITLE KKS NUMBERING PHILOSOPHY
	4X 270 MW BHADRADRI TPS

ANNEXURE-1**List of System / Sub-System Codes used in Power Plant:**

- 1) Compressed air system : QEA, QEC
- 2) Ventilation System : SAA TO SAZ
- 3) Fire Detection & Protection System + Fire Water pumps : SGM, SGN, SGO, SGP
- 4) Sewage Treatment : SJA TO SJZ
- 5) Pre-treatment Plant : GBI, GBM, GBV
- 6) RO DM Plant : GCI, GCM, GBV
- 7) AC SYSTEM : QKA,QKB,...QKZ

ANNEXURE-2**Standard Equipment Codes:**

AA	Valves including drives, also hand operated
AB	Seclusions, Lock, Gates, Doors
AC	Heat Exchanger
AE	Turning, Driving, Lifting equipment
AF	Continuous conveyors, Feeders
AG	Generator Units
AH	Heating and Cooling Units
AK	Pressing and Packaging equipment
AM	Mixer, Stirrer
AN	Blower, Air Pumps / Fans, Compressor Units
AP	Pump Units
AT	Purification, Drying, Filter
AV	Combustion Equipment e.g. grates

Standard Apparatus Codes:

BB	Vessels and Tank
BF	Foundation
BG	Boiler Heating Surfaces
BN	Injector, Ejector
BP	Flow and throughput limitation equipment (Orifice)
BQ	Holders, Carrying Equipment, Support
BR	Piping, Ducts, Chutes, Compensator
BS	Sound Absorber
BU	Insulations, Sheatings



DOCUMENT TITLE

KKS NUMBERING PHILOSOPHY

4X 270 MW BHADRADRI TPS

Standard Measuring Circuits Codes:

CD	Density
CE	Electrical Quantities
CF	Flow, throughput
CG	Distance, Length, Position
CK	Time
CL	Level
CM	Humidity
CQ	Analysis (SWAS)
CS	Speed, Velocity, Frequency
CT	Temperature
CY	Vibration, Expansion

ANNEXURE-3**Numerical Keys****A) Numerical Keys at System Code Level**

- i) Use 10, 20, 30, To distinguish between main systems having same Alpha Codes. Examples:
 - a) Main Steam (Left) and Main Steam (Right)
 - b) BFP – A/B/C
 - c) ID Fan – A/B, FD Fan A/B, AH – A/B
- ii) For branch off from main system path having code say 10, keep the same alpha code and use 11, 12, 13 etc. Similarly for other branch off from main system path having code say 20, keep the same alpha code and use 21, 22, 23 etc and shall carry on further in the same way.
- iii) If the branch off from main system / sub system path is used for some other system, where different alpha codes can be applied, then in that case the said branch line will be designated by the alpha codes of the system to which it is providing the input.

B) Numerical keys at Equipment Code level:

There are three numerical keys available for each type of equipment code. Following has been agreed upon considering present practice, better flexibility and ease in sorting.

- i) **Valves and Dampers --- Equipment Code – AA**

N1N2 N3

DOCUMENT TITLE			
			
KKS NUMBERING PHILOSOPHY			
4X 270 MW BHADRADRI TPS			
Motorised (<i>on/off duty</i>)	-	0	01 to 50
Motorised (<i>inching duty</i>)	-	0	51 to 99
Pneumatic (Control)	-	1	01 to 50
Motorised (<i>thyrestor Control</i>)	-	1	51 to 99
Sol. Operated	-	2	01 to 99
(Open / Close duty (Valves, NRVs, Gate)			
Hydraulic	-	3	01 to 99
NRV (Without actuation)	-	4	01 to 99
Manual	-	5	01 to 99
Manual	-	6	01 to 99
Relief & Safety Valves	-	7	01 to 99
Reserve	-	8	01 to 99
Reserve	-	9	01 to 99
ii) Field Instruments			
Field Transmitters & Analog Signals	-	0	01 to 99
Field Switches & Binary Signals	-	1	00 to 99
PG Test Point	-	4	00 to 99
Gauges	-	5	00 to 99
Automatic Turbine Tester (ATT)-HWR	-	2	00 to 99
(Reserved for protection Signals used by Hardwar)			
Example of Numerical Key Usage:			
In line with the philosophy adopted for Valves / Dampers /instruments etc. pumps and fans in the main systems (having different system code) can be numbered as AP/N100 and as AP/N101, 102, Where system code is same.			



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OF

LIST OF DELIVERABLES

LIST OF DELIVERABLES OF PEM - C&I DEPARTMENT FOR MAUX PACKAGES						
4 X 270MW BHADRADRI TPS						
DOCUMENT NUMBER PE-GL-411-145-1100						
Sl.No.	DRAWING NO.	DRAWING/DOCUMENT TITLE	CATEGORY	CUSTOMER	FROM	USER
INSTRUMENTATION						
1	PE-V9-411-XXX-1901	INSTRUMENT DATA SHEETS	A	-	VENDOR	C&I
2	PE-V9-411-XXX-1902	INSTRUMENT SCHEDULE	I	-	VENDOR	C&I
3	PE-V9-411-XXX-1903	INSTRUMENT INSTALLATION/ HOOK UP DIAGRAMS	A	-	VENDOR	C&I
4	PE-V9-411-XXX-1904	FIELD JB TERMINATIONS /GROUPING DOCUMENT	I	-	VENDOR	C&I
5	PE-V9-411-XXX-1905	QUALITY PLANS (CV,FE, Tx and Analyser)	A	-	VENDOR	C&I
PLC PANEL						
1	PE-V9-411-XXX-1906	PLC CONFIGURATION DRAWING	A	A	VENDOR	C&I
2	PE-V9-411-XXX-1907	PLC PANEL GA (INTERNAL & EXTERNAL) DRAWING	A	-	VENDOR	C&I
3	PE-V9-411-XXX-1908	CONTROL SCHEMES (BLOCK LOGIC)	A	-	VENDOR	C&I
4	PE-V9-411-XXX-1909	PLC INPUT / OUTPUT SIGNAL LIST	I	-	VENDOR	C&I
5	PE-V9-411-XXX-1910	UPS BATTERY CHARGER/ BATTERY DATASHEET & SLD	I	\$\$	VENDOR	C&I
6	PE-V9-411-XXX-1911	UPS SIZING CALCULATIONS	I	-	VENDOR	C&I
7	PE-V9-411-XXX-1912	BATTERY SIZING CALCULATIONS	I	-	VENDOR	C&I
8	PE-V9-411-XXX-1913	CONTROL DESK LAYOUT / GA DRAWING	A	-	VENDOR	C&I
9	PE-V9-411-XXX-1914	PLC-OWS/PRINTER FURNITURE BOM	A	-	VENDOR	C&I
10	PE-V9-411-XXX-1915	PLC CONTROL ROOM LAYOUT DRAWING	A	-	VENDOR	C&I
11	PE-V9-411-XXX-1916	PLC CATALOGUE	I	-	VENDOR	C&I
12	PE-V9-411-XXX-1917	PLC QUALITY PLAN & FAT PROCEDURE	A	-	VENDOR	C&I
13	PE-V9-411-XXX-1918	LIST OF SIGNAL EXCHANGE WITH DDCMIS (BOTH HARDWIRED & SERIAL INTERFACE IN BHEL FORMAT)	A	-	VENDOR	C&I
14	PE-V9-411-XXX-1919	PROCESS GRAPHIC MANUSCRIPTS PLC	I	-	VENDOR	C&I
15	PE-V9-411-XXX-1920	PROCESS GRAPHIC MANUSCRIPTS FOR DDCMIS	I	-	VENDOR	C&I
16	PE-V9-411-XXX-1921	CABLE SCHEDULE (IN BHEL EXCEL FORMAT) & CABLE INTERCONNECTION DETAILS	I	-	VENDOR	C&I
17	PE-V9-411-XXX-1923	PANEL & ELECTRONIC EARTHING REQUIREMENT	I	-	VENDOR	C&I
18	PE-V9-411-XXX-1924	PANEL HEAT DISSIPATION DATA	I	-	VENDOR	C&I
19	PE-V9-411-XXX-1925	MANDATORY SPARES BILL OF MATERIAL	A	A	VENDOR	C&I
20	PE-V9-411-XXX-1926	PLC O & M MANUAL	I	-	VENDOR	C&I
21	PE-V9-411-XXX-1927	PLC EARTHING SCHEME	I	-	VENDOR	C&I
Notes:		411 - Project No				
		XXX -SI No of MAX Package				
		\$\$ -Approval by BHEL if Vendor BBU Item Approval by Customer if Customer BBU Item				



SPECIFIC TECHNICAL REQUIREMENT ANNEXURE

SPEC NO.:

VOLUME II - B

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SPECIFIC TECHNICAL REQUIREMENTS

SENSOR REDUNDANCY

Following redundancy criteria shall be met:

1. Two out of three measurements philosophy shall be adopted for all CLCS (Closed Loop Control System) and Protection for reliability of operation. The control system shall select the median value for the normal control purpose. In case of deviation of one transmitter output from the other two, the same shall be automatically isolated and average output of the remaining transmitters shall be fed to the control and measurement system and the control loop in this case shall be maintained on auto, with an alarm on the operator's work station as well as on the engineer's station. In case of failure of the two remaining transmitters in circuit, deviation of one transmitter output is more than the pre-set limit compared to the other transmitter, there shall be automatic bump less transfer to manual and Changeovers shall have suitable alarms in the operator's work station as well as engineer's station.
2. For signal compensations, separate signals from separate transmitters other than used for measurement & control shall be used.
3. For OLCS (Open Loop Control System) all sensors used for the protection shall be triple redundant All sensors for permissive and interlock shall be dual redundant.

GENERAL POINTS:

1. The Instrumentation furnished in the PID is a minimum requirement however any instrument required for completeness of the system shall be provided by bidder without any cost implication. The requirement shall be decided during detailed engineering.
2. Solenoid Valves shall be mounted in Pneumatic Junction Boxes only and Pneumatic Junction box shall be in the scope of bidder. (Typical photo of Pneumatic Junction Box is attached for ready reference)
3. LIE/LIR shall be provided for mounting of the instrument and LIE/LIR shall be in the scope of bidder.



SOV JB



**4x270 MW BHADRADRI TPS
AIRCONDITIONING SYSTEM
TECHNICAL SPECIFICATION
(ELECTRICAL PORTION)**

SPECIFICATION No: PE-TS-411-553-A001

SECTION : I

SUB-SECTION : C-5

REV. 01

DATE: MARCH 2017

SECTION: I

SUB-SECTION: C-5

TECHNICAL SPECIFICATION (HANDLING ARRANGEMENT PORTION)



TECHNICAL SPECIFICATION FOR
ELECTRIC HOIST AND MANUAL HOIST
4X270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-553-A001

SECTION-I

SUB SECTION -C5

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SUB-SECTION: C-5
Material Handling Equipments Specification



**TECHNICAL SPECIFICATION FOR
ELECTRIC HOIST AND MANUAL HOIST
4X270 MW BHADRADRI TPS**

SPECIFICATION NO. PE-TS-411-553-A001

SECTION-I

SUB SECTION -C5

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1.0 ELECTRIC HOIST AND MANUAL HOIST (CHAIN PULLEY BLOCK)

Required number of electric hoist / manual hoist of adequate capacity, to meet the erection and maintenance requirements are to be provided for the various areas where handling weight is more than 500 kg.

Manual hoists (hand operated) shall be designed to duty class 2 as per IS 3832 and electric wire rope hoist shall be designed as per IS: 3938 (latest).

The stipulations of all statutory codes like Indian Electricity Act, Indian Electricity Rules, Factory Acts, Local Municipality act etc. shall however prevail over the specification requirements, in case any conflict arises between this specification and the statutory codes.

Maintenance tools and tackles shall be as per data sheet attached.

DESIGN CRITERIA

For the hoists with more than 2.0 tonne lifting capacity and/ or more than 10.0 M lift i.e. either capacity or lift is more than 2T or 10 m, Electrical hoist shall be provided. Less than or equal to 2T and lift $\leq$ 10m hoist blocks shall be of hand operated type for both travel and lift.

However, all monorails coming out of the building shall be provided with electric hoist block, irrespective of load and lift.

Capacity of electric and manual (Chain pulley block) hoists shall be decided keeping 25% margin over heaviest equipment to be handled.

For hand operated hoists, the hoists shall be suitable for operation from floor level. Hand chain shall be provided for long travel of trolley and the Hoisting mechanism. For electric hoist, operator shall be able to control the movement of the electrical hoist with the help of floor operated pendant

MINIMUM LIFTING REQUIREMENT

Sl.N.	Area / Equipment description	Qty (nos)	Capacity (T)	Lift (m)	Travel (m)
1					

Note;

1. Area, type, capacity mentioned are minimum requirement and shall be finalized during detail engineering without any commercial implication
2. Travel and Lift are layout dependent and shall be finalized during detail engineering without any commercial implication
3. Additional electric/manual hoist required during detail engineering shall be provided as per design criteria given above without any commercial implication.



**TECHNICAL SPECIFICATION FOR
ELECTRIC HOIST AND MANUAL HOIST
4X270 MW BHADRADRI TPS**

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2.0 SCOPE OF SUPPLIES

Equipment and services to be furnished by the bidder for the ELECTRIC HOIST/ MANUAL HOIST with accessories as per the details given in the technical specification and data sheet A. Any equipment / accessories not specified in the specification but required to make the ELECTRIC HOIST/ MANUAL HOIST complete and efficient operation shall also be under the bidder's scope of work.

Compliance with this specification shall not relieve the bidder of the responsibility of furnishing material and workmanship to meet the specified working/duty conditions.

2.1.0 ELECTRIC HOIST

Electric hoist shall include but not be limited to the following: -

- a. Hoisting and CT drive arrangement
- b. All electrical equipment including cables (as per electrical scope matrix) and panels.
- c. PVC insulated shrouded bus bar DSL
- d. Earthing arrangement.
- e. Fill of lubricant till commissioning / handling over to customer.
- f. Painting of electric hoist and accessories.
- g. Maintenance tools & Tackles
- h. Erection & Commissioning spares
- i. Isolating switch in enclosure at operating floor for disconnecting supply to DSL while maintaining the electric hoist.
- j. Mandatory spares

2.2.0 MANUAL HOIST (CHAIN PULLEY BLOCK)

Manual hoist shall include but not be limited to the following:

- a. Chain pulley blocks with/without traveling trolleys
- b. Maintenance Tools and Tackles
- c. Mandatory spares

2.3.0 Erection and Commissioning spares (ELECTRIC HOIST)

The Bidder shall also supply erection & commissioning spares along with his main equipment as per his experience, for replacement of damaged or unserviceable parts during the execution of the project at site, to avoid delay in the project schedule. This shall form part of the main equipment supply. The Purchaser shall retain the unutilized commissioning spares. The initial fill of lubricants, oil etc. shall also be supplied by the bidder.

2.4.0 Services to be provided by the bidder

Packing, forwarding and transportation to site, storage and handling at site.

2.5.0 Erection and Commissioning

2.6.0 Functional test (Overload testing, load testing at rated speed, travel and hoisting motion checks as per relevant Indian standards)

2.7.0 Obtaining clearance and acceptance certificate from the concerned competent authority after site test as applicable. Necessary fees/expenditure as required shall be borne by the supplier.

3.0 Inspection and Testing

Inspection and testing shall be carried out as per enclosed standard quality plan approved QAP and as per IS 3938 (latest revision). Prime inspection agency shall be NBPPL/End Customer. Equipment supplied shall be strictly in accordance with nomenclature & technical specification. Any additional testing requirement/ CHP(Customer Hold Point) at any stage of inspection deemed necessary by Customer/NBPPL during detailed engineering shall be carried out without any commercial or technical implication.

4.0 Works Excluded

Supply of ISMB monorail.



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5.0 PAINTING SPECIFICATION

As per painting details specified elsewhere in specification.

ELECTRIC HOIST COLOR SHADE:

Color shade: Structure: Golden Yellow, RAL 1004

Panel: **Opaline green for exterior and semi glossy white for interior.**

However, same shall be finalized during detail engineering)

MANUAL HOIST COLOR SHADE:

Trolley: Lemmon yellow (Shade 355 as per IS 5)

Hook: Light grey (Shade 631 as per IS 5)

6.0 PACKING

As per packing details specified elsewhere in specification.

7.0 DEMONSTRATION TEST

Hoist along with its drives, controls and other accessories shall be demonstrated for the rated capacity against the rated speed of motions and for the service conditions specified as specified in QAP and as per IS 3938 for electric hoist and IS 3832 for manual hoist.

The bidder shall have the full responsibility for the safe and efficient operation of the hoist with associated accessories as a single unit.

If the shop/site performance tests indicate the failure of any of the components to achieve the guaranteed performance, the deficiency shall be made good at bidder's cost.

Demonstration tests shall be carried out each time after the rectification /modification is carried out.

8.0 MAKE OF SUB - VENDOR ITEMS

Makes of bought out items will be as per list specified in the specification. No other make will be acceptable, until and unless specifically got it approved by the purchaser/ end client.

9.0 TESTING AT SITE

A) ELECTRIC HOIST:

As required for statutory clearance for operating at site i.e., overload test, load test and other tests as per IS 3938.

Test for Operation -After the supply has been connected, tests shall be carried out to prove the following:

- The satisfactory operation of each controller, switch, contactor, relay and other control devices and in particular the correct operation of all limit switches under the most unfavorable conditions;
- The correctness of all circuits and interlocks and sequence of operation; and
- The satisfactory operation of all protective devices.

Overload Test -After test but before the hoist is put into service, it shall be tested with overload relays appropriately set, to lift and sustain a test load of 125 percent of the working load. During the overload test, the hoist shall sustain the load under full control. The specified speeds need not be attained but the hoist shall show itself capable of dealing with the overload without difficulty.

B) MANUAL HOIST:

As required for statutory clearance for operating at site with following minimum test i.e., overload and load test.



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10.0 TECHNICAL DATA SHEET:

A) ELECTRIC HOIST:

Sl.no	DESCRIPTION	TECHNICAL PARTICULARS
1.0	Type	Steel wire electric hoist with electrically operated trolley
2.0	Scope (Qty., Capacity, Lift, Travel Length)	As per specification and layout requirement
3.0	Type of service	Indoor
4.0	Overload test	125% of SWL
5.0	Design Ambient temperature	50° C
6.0	General Design	As per IS: 3938 / 1983 or latest, Class-II duty
7.0	Operating speed	
7.1	Hoisting speed	3 MPM.
7.2	Trolley speed	15 MPM
8.0	Type of transmission	Through Electric motor and gear box.
9.0	Wire Rope	
9.1	Construction / core	6 x36/ 6X37 (Steel core)
9.2	Code	IS:2266
9.3	Number of falls	Min. 4
9.4	Factor of safety	Not less than 5
10.0	Load Hook and block	NORMALISED HOOK ONLY
10.1	Type of load hook	Plain shank trapezoidal section with safety latch.
10.2	Load hook Code	IS: 15560
10.3	Load hook Material	As per IS:15560
10.4	Hook suspension	Thrust bearing
10.5	Material of block suspension	Fabricated from steel plate, Material: IS: 2062
11.0	Gearing	
11.1	Type	Spur / Helical
11.2	Gear/ pinion material	as per IS 3938
11.3	Lubrication	Oil splash/ grease lubricated
11.4	Bearing type	Antifriction Ball / Roller
12.0	Trolley drive	
12.1	Wheel	Single flange taper thread



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12.2	Wheel conform to (Std. / code)	IS: 3938	
12.3	Wheel material	IS: 3938	
12.4	Bearing type	Antifriction Ball / Roller	
12.5	Trolley type	Rolled structural steel with side plates extended beyond wheel flanges to protect wheels.	
12.6	Hardness	Max hardness 200 BHN	
13.0	SHEAVE		
13.1	Material	Fabricated from steel plate. IS: 2062 Gr. A or Gr. B / as per IS: 3938	
13.2	Bearing type	Antifriction Ball / Roller.	
14.0	BRAKE (HOIST and TROLLEY)		
14.1	Type	DC EM brakes disc type (fail to safe).	
14.2	Capacity	As per IS 3938.	
14.3	Number	One number for each motor.	
15.0	ROPE DRUM		
15.1	Material	Cast iron, cast steel or mild steel.	
15.2	Flange / Flangeless	Flanged	
15.3	Type of groove	As per manufacturers standard to suit the layout requirement.(Shall be decided during detail engineering)	
17.0	TYPE OF DSL		
17.1	CT travel	PVC Shrouded bus bar conductor type DSL	
18.0	MOTORS		
18.1	Type	Sq. Cage induction, TEFC, S4 duty, 40% CDF.	
18.2	Number of start	150 starts / hr	
18.3	Voltage , Phase and Frequency	415V ±10%, 3 phase, 4 wire, 50 Hz	
18.4	Class of insulation	Class “F” and temperature rise limited to class B.	
18.5	Type of enclosure	TEFC	
18.6	Degree of protection provided for enclosure	IP-54/IP-55 depending upon Indoor / Outdoor application	
18.7	Margin	Motor rating will be calculated keeping margin of at least 15% over the maximum power requirement in the duty condition specified.	
19.0	LIMIT SWITCHES	Hoisting	Trolley
19.1	Type	Snap action, self actuating type	Lever type



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20.0	Control panel	* Fabricated from Cold rolled sheet steel not less than 2.5mm for front & rear & 2mm for side, top & bottom portion with gland plate of 3mm thick. * Degree of protection shall be IP 54. * Power on indicating lamps shall be provided * Panel illumination lamps operated by door switch. * 2 nos earthing terminals on panel. * 20 % spares terminals (clip on type) shall be provided. * Power and control terminals (clip on type) shall be on separate channels. * Gland plate shall be double brass compression type.
20.1	Qty	1 No.
21.0	Pendent Push buttons	Up /down / forward / Reverse push buttons. Indicative marking for easy operation shall be provided.
22.0	Power cables	FRLS / EPR flexible Cu cable / Aluminum cable
23.0	Control cable	FRLS / EPR flexible Cu cable
24.0	Control Voltage	110 V
25.0	Painting	A) Structural Surface preparation: De greasing and Mechanical cleaning with wire brush or hand tool. (SA 1/ ST 2 / ST 3 as applicable) Primer: Red oxide Zinc phosphate (Alkyd medium) - 2 coat, DFT 35 μ per coat. Finish Coat: Synthetic enamel (Alkyd medium) as per IS: 2932- 2 coats, DFT 35 μ per coat. Total DFT: 140μ B) Electrical /Control Panel Surface preparation: Seven tank process Primer: Red Oxide Zinc phosphate (Alkyd medium) - 2 coat, Minimum DFT 35 μ per coat. Finish Coat: Synthetic enamel (Alkyd medium) as per IS: 2932- 2 coats, Minimum DFT 35 μ per coat. Total DFT: 140 μ Note: Final coat of paint on all the equipment's / item covered under the package shall be done at the time of handing over of package.

B) MANUAL HOIST (CHAIN PULLEY BLOCK):

DATA SHEET-A

1	Type	Chain pulley block with/without travelling trolley
2	General Design	IS: 3832
3	Duty Class as per IS:3832	Class –II
4	Hoisting Mechanism	
a)	Type	Hand operated gear transmission
b)	Type of gear	Spur / Helical



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c)	Load Chain	
i)	Type	Link type
ii)	Material	T (8) as per IS: 6216
iii)	Conforms to (Std./Code)	IS: 6216
d)	Hand Chain	
i)	Type	Link type
ii)	Material	Mild steel Grade 30
iii)	Conform to Std.	IS:2429 (Part I)
e)	Load Hook & Hook Block	
i)	Type of load hook	Plain shank- Trapezoidal section
ii)	Load hooks conforms to	IS: 15560
iii)	Type of hook suspension	Swivelling type with lock
iv)	Type of make of bearing	Thrust ball bearing of hook suspension
v)	Type & Material of hook	Carbon steel/forged steel As per IS 15560
f)	Gears/ Pinion	
i)	Type	Spur
ii)	Material	Alloy steel / carbon steel
iii)	Type of Bearing	Antifriction ball bearing / Roller
h)	Sprockets:	
	Type of bearings used	Antifriction ball bearing / Roller
i)	Method of lubrication	
	Bearings	Grease
	Gearing & Pinions	Grease
	Sprockets	Grease
j)	Brakes	
	Type	Screw and friction disc type
5	Trolley and Bridge drive	
a)	Trolley	
i)	Type	Geared (Manually operated)
ii)	Material of frame	Mild steel (IS:2062 Grade A or B)
b)	Drive Chain	
i)	Type	Link type
ii)	Material	Steel Gr.30 as per IS 2429 (part 1)
c)	Wheel	
i)	Number of pairs of wheel	Two in each trolley/bridge
ii)	Flange	Single flanged
iii)	Wheel material	Cast Iron Gr. FG 200 as per IS:210
iv)	Type of bearings need	Antifriction
d)	Gears	
i)	Type	Spur / helical
ii)	Material	EN8
iii)	Type of bearings used	Antifriction
e)	Method of lubrication for	
i)	Bearings	Grease



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ii)	General	Grease
iii)	Sprockets	Grease
6	Painting	As per manufacturer standard

11.0 Maintenance Tools and Tackles

One (1) complete unused new set of special purpose tools, tackles and accessories along with detailed instructions and maintenance manual shall be supplied for each EH/CPB. Tools shall be of suitable sizes for maintenance of electric hoist of each type and capacity. Each tool shall be stamped so as to be identified easy for its use. The tools shall be supplied in steel toolbox. The items supplied shall be of the best quality, specially protected against rusting. The following shall be provided as minimum requirement:

S-No.	Description	Qty.
1	Complete set of ring spanners (Indicate the sizes offered)	1 Set
2	Complete set of screwdrivers (Indicate the sizes)	1 Set
3.	Adjustable Spanner	1 No.
4.	Insulated plier	1 No.
5.	Grease gun	1 No.
6.	Oil gun	1 No.
7.	Line tester	1 No.

Note:- Bidder shall ensure that the tools & tackles mentioned in above list are sufficient to handle all sizes/capacities of hoists & in case any other /additional tool is required for handling/maintenance any size/capacity of hoist the same shall be included in this list.

12.0 DRAWING/DOCUMENT SUBMISSION

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

A) ELECTRIC HOIST

Sl. No.	BHEL DRG.NO	DRAWING TITLE
1	PE-V0-XXX-563-A100	Manufacturing Quality Plan with Sub vendor list
2	PE-V0-XXX-563-A101	GA Drawing for Electric Hoist, DSL arrangement and painting details
3	PE-V0-XXX-563-A102	Schematic Circuit Diagram
4	PE-V0-XXX-563-A103	Mechanism Sizing Calculation
5	PE-V0-XXX-563-A104	Detailed BOM/BOQ for EH
6	PE-V0-XXX-563-A105	O & M Manual including Erection procedure
7	PE-V0-XXX-563-A106	Mandatory spare parts list

C) MANUAL HOIST (CHAIN PULLEY BLOCK):

Sl. No.	BHEL DRG.NO	DRAWING TITLE
1	PE-V0-XXX-563-A200	Manufacturing Quality Plan
2	PE-V0-XXX-563-A201	GA Drawing for Chain Pulley Block with detail BOM with painting details
3	PE-V0-XXX-563-A202	O & M Manual including Erection procedure

Notes;

- The above drawing list is tentative and shall be finalized with the successful bidder after placement of order.



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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. 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 labeled 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 names.
 - 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, 3etc.

13.0 MANDATORY SPARES:

As per list below.

1.11	HOISTS (for each type and rating, hoists)	
1.11.1	Bearings for long travel wheels	2 sets
1.11.2	Bearings for gear boxes for each type of hoist	2 sets
1.11.3	Break liners for all the brakes	100% of total population of each type & size
1.11.4	Oil seals	100% of total population of each type, size rating
1.11.5	Brake springs for all brakes	-do-
1.11.6	Wire ropes for hooks	100% installed on each crane and hoist
1.11.7	Solenoid coils for brakes	2 sets
1.11.8	Overload relay for motors	2 Nos.
1.11.9	Limit switches for hoists and travel mechanisms	2 sets
1.11.10	Spare motors for hoists	2 Nos.
1.11.11	Long travel machinery	
	i. Gear wheel	1 set
	ii. Internal clip	2 Nos.
	iii. Pinion	1 No.
1.11.12	Chain pulley block	
	i. Load chain wheel	1 No.
	ii. Load chain stripping fork	5 Nos.
	iii. Hand chain wheel	2 Nos.
	iv. Ratchet pawl	1 No.
	v. Locking ratchet wheel	2 Nos.
	vi. Guide roller	2 Nos.
	vii. Brake disc	2 Nos.
2	Electrical Items	



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2.1	Trailing Cable	One set of full length of each size/type of cables as used for each type of Electrical Hoist
2.2	415 Volt Motor (Up to 30KW Rating)	
a	Driving End & Non-Driving End Bearing	3Set for each type and rating of Motor
b	Cooling Fan	2No. for each type and rating of Motor
c	Motor Terminal Block	5Nos. for each type and rating of Motor
d	Complete Set of Coupling	1Set for each Application
2.3	Control Panel	
a	Back-up panel mounted devices (Selector switches/ Push buttons/ Indicators etc.	5% of installed capacity
b	Lamps/ LEDs	100% of the total quantity
c	Blank Tiles	10% of installed capacity
d	MCBs	10% of each type & rating
e	Fuses/ Fuse holder	100% of each type & rating

14.0 MAKES:**MAKES OF ELECTRIC HOIST AND CHAIN PULLEY BLOCK AS PER LIST BELOW:**

Package Name	Vendor Name
ELECTRIC HOIST	Alpha Services
	CONSOLIDATED HOISTS PVT LTD
	CENTURY CRANE ENGINEERS PVT. LTD.
	EDDY CRANES PVT. LTD.
	Grip Engineers Pvt. Ltd.,
	GLOBAL TECHNOLOGIES
	HERCULES HOISTS LTD.
	LIFTING EQUIPMENTS and ACCESSORIES
	Mangla Hoists Pvt Ltd
	REVA INDUSTRIES LTD.
	ROCKWELL HOISTO CRANES PVT. LTD.
	SAFEX ENERGY PVT. LTD.
	TUOBRO FURGUSON (INDIA) PVT LTD
CHAIN PULLEY BLOCK	ARMSEL MHE PVT. LTD
	HERCULES HOISTS LTD.
	LIFTING EQUIPMENTS and ACCESSORIES
	TUOBRO FURGUSON (INDIA) PVT LTD
	TRACTEL TIRFOR INDIA PVT. LTD.

Note: No other make will be acceptable, until and unless specifically got approved by BHEL/Customer / Customer's consultant during detail engineering only. Acceptance/non acceptance of same shall not have any impact on manufacturing, delivery schedule and on cost of the Electric hoists

MAKES OF SUB VENDORS ITEMS AS APPLICABLE TO ELECTRIC HOIST:

S.NO.	ITEM	STANDARD MAKES	REMARKS
1	STEEL	SAIL /TISCO / JINDAL/ ESSAR	
2	HOOKS	Steel Forging & Engg. Co., Kolkata/ SIMRITI FORGING/ Karachiwala (up to 25T)	



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3	GEAR COUPLINGS	ALLIANCE / FLEX-TRANS (formerly known as HICLIFF) / OEM / NUTECH/ SAHARA	
4	WIRE ROPE	USHA MARTIN / FORT WILLIAMS/ Bharat Wire Ropes.	
5	BEARINGS	SKF/ FAG/ TATA / NBC	
6	MOTORS	SIEMENS / NGEF (up to 15KW) / CROMPTON / KIRLOSKAR / BHARAT BIJLI / MARATHON/ ABB/LHP	
7	BRAKES	ELECTROMAG /SPEED-O- CONTROL / BCH (for DCEM Brakes only) / Kakku	
8	CONTACTOR	SIEMENS / L&T /SCHNEIDER (Earlier TELE MECHANIQUE) / BCH	
9	OVER LOAD RELAYS	SIEMENS / L&T / ABB / SCHNEIDER (Earlier TELE MACHANIQUE)	
10	HRC FUSES	SIEMENS / L&T/ ENGLISH ELECTRIC / GE Power / Eaton (Bussmann)/ABB	
11	ISOLATING SWITCH	SIEMENS/ L&T/ CONTROL & SWITCH GEAR/ABB	
12	SWITCH FUSE UNITS	SIEMENS/ L&T/ CONTROL & SWITCH GEAR/ ABB	
13	TIME DELAY RELAYS	SIEMENS/ L&T/ ABB/ BCH/ SCHNEIDER (Earlier TELE MACHANIQUE)	
14	TRANSFORMERS	INDCOIL / LOGICSTAT/ KAPPA / AUTOMATIC ELECTRIC / PRECISE ELECTRICALS / SILKAAN ELECTRIC MFG. CO. LTD. / SOUTHERN ELECTRIC/NEC	
15	CABLE LUGS (HEAVY DUTY)	DOWELLS / UML ENGINEERS, KOLKATA / JAINSON	
16	CABLES		
a)	PVC Power Cables	APAR INDUSTRIES LTD., CORDS CABLE INDUSTRIES LTD., Diamond Power Infrastructure Ltd, GOYOLENE FIBRES (INDIA) PVT.LTD, GOVIND CABLE INDUSTRIES, GUPTA POWER INFRASTRUCTURE LIMITED,, Havells India Limited, KEI INDUSTRIES LTD., KRISHNA ELECTRICAL INDUSTRIES LTD., KEC INTERNATIONAL LIMITED, MANSFIELD CABLES COMPANY LTD., NICCO CORPORATION LTD., PARAMOUNT COMMUNICATIONS LTD., POLYCAB WIRES PVT. LTD., RADIANT CORPORATION PRIVATE LIMITED, RAVIN CABLES LIMITED, SUYOG ELECTRICALS LTD., SRIRAM CABLES PVT. LTD., Scot Innovation Wires and Cables Pvt. Ltd., Sam Cables & Conductors (P) Ltd., THERMO CABLES LTD.,	



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b)	PVC Control cables	Advance Cable Technologies (P) Ltd., APAR INDUSTRIES LTD., CMI LTD., CORDS CABLE INDUSTRIES LTD., CRYSTAL CABLE INDUSTRIES LTD, DELTON CABLES LTD, Diamond Power Infrastructure Ltd, ELKAY TELELINKS LTD, GEMSCAB INDUSTRIES LTD., GOVIND CABLE INDUSTRIES, GUPTA POWER INFRASTRUCTURE LIMITED,, Havells India Limited, Incom Cables (P) Ltd.,KEI INDUSTRIES LTD., KRISHNA ELECTRICAL INDUSTRIES LTD., KEC INTERNATIONAL LIMITED, MANSFIELD CABLES COMPANY LTD., NICCO CORPORATION LTD., PARAMOUNT COMMUNICATIONS LTD., POLYCAB WIRES PVT. LTD., RAVIN CABLES LIMITED, SUYOG ELECTRICALS LTD., SPECIAL CABLES PVT. LTD, Scot Innovation Wires and Cables Pvt. Ltd., Sam Cables & Conductors (P) Ltd., SPM POWER & TELECOM PVT. LTD,TORRENT CABLES LTD., THERMO CABLES LTD., TIRUPATI PLASTOMATICS PVT. LTD., UNIVERSAL CABLES LTD.	
c)	Trailing Cables	Nicco / Universal / Incab / ICL / KEI/ APAR INDUSTRIES LTD/ CMI LTD/ KEI INDUSTRIES LTD./ SUYOG ELECTRICALS LTD.	
d)	XLPE Power Cables	APAR INDUSTRIES LTD., CORDS CABLE INDUSTRIES LTD., CRYSTAL CABLE INDUSTRIES LTD, Diamond Power Infrastructure Ltd, GEMSCAB INDUSTRIES LTD., GOVIND CABLE INDUSTRIES, GUPTA POWER INFRASTRUCTURE LIMITED,, Havells India Limited, KEI INDUSTRIES LTD., KRISHNA ELECTRICAL INDUSTRIES LTD., KEC INTERNATIONAL LIMITED, MANSFIELD CABLES COMPANY LTD., PARAMOUNT COMMUNICATIONS LTD., POLYCAB WIRES PVT. LTD., RAVIN CABLES LIMITED, SUYOG ELECTRICALS LTD., SPECIAL CABLES PVT. LTD, Scot Innovation Wires and Cables Pvt. Ltd., SRIRAM CABLES PVT. LTD.,TORRENT CABLES LTD., THERMO CABLES LTD., TIRUPATI PLASTOMATICS PVT. LTD.,	
e)	XLPE Control cables	APAR INDUSTRIES LTD., CABLE CORPORATION OF INDIA LTD., CRYSTAL CABLE INDUSTRIES LTD., Diamond Power Infrastructure Ltd, GEMSCAB INDUSTRIES LTD., Havells India Limited, KEI INDUSTRIES LTD., KRISHNA ELECTRICAL INDUSTRIES LTD., KEC INTERNATIONAL LIMITED, PARAMOUNT COMMUNICATIONS LTD., POLYCAB WIRES PVT. LTD., RADIANT CORPORATION PRIVATE LIMITED, RAVIN CABLES LIMITED, SUYOG ELECTRICALS LTD., SRIRAM CABLES PVT. LTD., TORRENT CABLES LTD., UNIVERSAL CABLES LTD.	
17	Cable gland	COMMET / SUNIL&CO./ ARUP ENGINEERING / JAINSON / DOWELL	
18	PUSH BUTTONS	SIEMENS / L&T / BCH / Schneider	
19	Limit Switches	Speed-o-control / Electromag	
20	Pendent Push button station	OEM	
21	Indicating Lamps	Tecknic / BCH / Siemens / Standard	



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22	MCB	MDS / Indo Copp / Standard / Siemens / L&T/ ABB/ Schneider	
23	Panels	OEM / RITTAL / PYROTECH	
24	Resistance boxes	Enapros / OEM	
25	VVVF	YASKAWA/ ABB / SIEMENS/ SCHNIEDER/ FUJI ELECTRIC/ MITSUBISHI ELECTRIC	
26	Shrouded DSL	Susheel/ Stromag	
27	LOAD CELL	IPA, Sartorius	
28	GEAR BOX	OEM/ ELECON ENGINEERS/ SHANTI GEARS/ PBL*/ NAW*/ NORD*/ SEW*/ BONGFILIOLI*	* = Applicable for Geared Motors only
29	RAIL	JSPL / SAIL	
NOTE: Above sub-vendors are subjected to Customer approval during detailed engineering without any cost and time implication.			

Note : 1 All the trailing cables shall be sourced from only one sub-vendor from the list
2 No other make will be acceptable, until and unless specifically got approved by BHEL/Customer / Customer's consultant during detail engineering only. Acceptance/non acceptance of same shall not have any impact on manufacturing, delivery schedule and on cost of the Electric hoists/ CPB

REV: 00 DATE:

STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (FOR EPC PROJECTS)

PACKAGE: ELECTRIC HOIST FOR AC PLANT

PROJECT : 4 X 270 MW BHADRADRI TPS

SCOPE OF VENDOR: SUPPLY , ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT

S. NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	Isolating Switch	Vendor	Vendor	BHEL will provide one number 415 V(3ph, 4W) supply feeder only up to isolating switches for cranes. Any other voltage level (AC/DC) required will be derived by the vendor. Motor starter shall be part of crane control panel.
2	Power cables, control cables, screened control cables and any special cables (if required) between equipment supplied by vendor.	Vendor	Vendor	Cable from supply feeder to isolating switch shall be in BHEL scope.
3	Cabling material (cable trays, accessories, cable tray supporting system, conduits etc).	Vendor	Vendor	
4	Equipment Earthing	Vendor	Vendor	All equipment metallic enclosures / frames, metal structure etc. shall be grounded at two points each to the nearest grounding points / risers provided by BHEL.
5	Motors	Vendor	Vendor	
6	Cable glands and lugs for equipment supplied by vendor	Vendor	Vendor	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power & control cables.
7	a) Input cable schedules (C & I) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for Control and Instrumentation Cable in enclosed excel format shall be submitted by vendor during detailed engineering stage.
8	Equipment layout drawings	Vendor	-	
9	Electrical Equipment GA drawing	Vendor	-	For necessary interface review.

		MANUFACTURERS NAME & ADDRESS				STANDARD QUALITY PLAN				PROJECT				WIRE ROPE ELECTRIC HOIST			
		AS PER APPROVED VENDOR LIST				ITEM:		ELECTRIC WIRE ROPE		QP NO		PACKAGE		CONTRACT No			
										REV		CONTRACTOR		BHEL			
										DATE							
CHARACTERISTICS		CATEGORY		TYPE OF CHECK		EXTENT OF CHECK		REFERENCE DOCUMENT		ACCEPTANCE NORMS		FORMAT OF RECORD		AGENCY		REMARKS	
1.	2	3	4	5	6	7	8	9	10	11							
1.0 RAW MATERIALS																	
1.1	a) STRUCTURAL MATERIAL b) RAW MATERIAL FOR HOIST AND GEAR BOX HOUSING, TROLLEY PLATE (AS APPLICABLE)	MECH. , CHEM. PROPS	MA	CHEMICAL COMPOSITION AND TENSILE STRENGTH	1 / lot	APPD. DRG. / DATA SHEET	APPD. DRG. / DATA SHEET	Mill.s TC	✓	V	V	V	V	V	V	Test shall be carried out in absence of mill TC	
1.2	GEARS, SHAFT/AXLES, WHEELS	MECH. , CHEM. PROPS	MA	CHEMICAL COMPOSITION, HARDNESS (DURING IN- PROCESS)	1 / LOT	APPD. DRG. / DATA SHEET	APPD. DRG. / DATA SHEET / IS:3938	LAB. REPORT / MANUFACTURER'S TEST CERTIFICATE	✓	P	V	V	V	V	V	In case the items are not manufactured in-house, the manufacturer's test certificate shall be submitted for chemical	
	U.T FOR DIA/THK > 50mm	CR	NDT	100%	100%	ASTM A 388	NOTE 4	INSPN. REPORT	✓	P	V	V	V	V	V		
1.3	WIRE ROPE	Dimensional CHECK	MI	Dia.	100%	APPD. DRG. / DATA SHEET	APPD. DRG. / DATA SHEET	MFRS' TEST CERT.	✓	P	V	V	V	V	V		
	BREAKING LOAD CAPACITY	CR		BREAKING LOAD	100%	APPROVED DRG/DATA SHEET / IS:3938 / IS: 2266	APPROVED DRG/DATA SHEET AND / IS:3938 / IS:2266	MFRS' TEST CERT.	✓	P	V	V	V	V	V		
1.4	HOOKS	PHYS. / MECH. , CHEM. PROPS.	MA	CHEMICAL COMPOSITION, HARDNESS	1 / LOT	APPROVED DRG/DATA SHEET / IS:3938 / IS:15560	APPROVED DRG/DATA SHEET / IS:3938 / IS:15560	MFRS' TEST CERT.	✓	P	V	V	V	V	V		
	U.T IF SHANK DIA > 50mm	CR	NDT	100%	100%	ASTM A 388	NOTE 1	INSPN. REPORT	✓	P	W	V	V	V	V	SHANK PORTION ONLY	
	PROOF LOAD CAPACITY	CR		PROOF LOAD TEST	100%	APPROVED DRG/DATA SHEET / IS:3938 / IS:15560	APPROVED DRG/DATA SHEET / IS:3938 / IS:15560	INSPN. REPORT	✓	P	W	V	V	V	V		
	DP AFTER PROOF LOAD	CR		NDT	100%	ASTM E-165	NO CRACKS	INSPN. REPORT	✓	P	V/W	V	V	V	V		
2.0	IN-PROCESS																
2.1*	WELDING PROCEDURE SPECIFICATION	CORRECTNESS	MA	SCRUTINY	100%	IS:7307 / ASME SEC IX	IS:7307 / ASME SEC IX	FORMAT OF IS / ASME SEC IX		P	V	V	V	V	V		
2.2*	PROCEDURE & WELDER QUALIFICATION	WELDING PARAMETRES	MA	PHYS. TESTS/RT	100%	IS:7310 / ASME SEC IX	IS:7310 / ASME SEC IX	AS PER ASME SEC IX	✓	P	W	W	W	W	W	IN CASE OF LLOYDS / EIL / TPL QUALIFIED WELDERS AVAILABLE, REQUALIFICATION OF WELDER IS NOT REQUIRED.	
LEGENDS																	
* RECORDS IDENTIFIED WITH TICK(✓) SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION																	
** M: MANUFACTURER/SUBCONTRACTOR																	
C: CONTRACTOR NOMINATED INSPECTION AGENCY(BHEL) N: CUSTOMER																	
INDICATE 'P' PERFORM 'W' WITNESS AND 'V' VERIFICATION AS APPROPRIATE 'CHP' CUSTOMER SHALL IDENTIFY IN COLUMN 'N'																	
MANUFACTURER/ SUB CONTRACTOR																	
SIGNATURE																	
REVIEWED BY																	
NAME & SIGN OF APPROVING AUTHORITY & SEAL																	

MANUFACTURER'S NAME & ADDRESS:		MANUFACTURING QUALITY PLAN		PROJECT : PACKAGE : CHAIN PULLEY BLOCKS VOL IIB, SEC C	
		ITEM : Chain Pulley Block QP No.: PE-TS-XXX-XXX-A001 REV.:0, Date.: , PAGE: 2 OF 4			

Sr. No.	COMPONENT / OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9.	M C N 10.	11.

						APPROVED DRAWING	APPROVED DRAWING			shall be given.
		INTERNAL DEFECTS	MA	UT	10%	ASTM A-388 (REFER NOTE 1)		✓	P	
1.4.	LOAD CHAIN WHEELS	- CHEMICAL COMPOSITION MECHANICAL PROPERTIES	MA	CHEMICAL MECHANICAL PROPERTIES	ONE SAMPLE PER LOT	APPD. DRG.	APPD. DRG.	✓	P	V
1.5	BEARINGS	MAKE, TYPE, CATALOGUE NO.	MA	VISUAL	RANDOM	APP DRG / MFR'S CATALOGUE		✓	P	V
1.6	HAND CHAIN WHEEL	CHEMICAL MECHANICAL PROPERTIES	MA	CHEMICAL MECHANICAL PROPERTIES	ONE SAMPLE PER LOT	AS PER DRAWING	AS PER DRAWING	✓	P	V
1.7	HAND CHAIN	GRADE/ DIMENSION	MA	GRADE DIMENSION	100 %	AS PER DRAWING	AS PER DRAWING	✓	P	V
1.8	TROLLEY GEARS, PINION, WHEELS, AXLE	CHEMICAL & MECHANICAL	MA	LAB ANALYSIS,	100%	APPVD DRGS	APPVD DRGS	✓	P	V
2	IN PROCESS									
2.1	RATCHET PAWL / RATCHET WHEEL	-HARDNESS	MA	HARDNESS	100%	IS:3832 / APPD DRG.	IS:3832/ APPD. DRG.	✓	P	V

LEGEND:		FOR CUSTOMER USE	
** M : MANUFACTURER / SUB-CONTRACTOR C : BHEL / NOMINATED INSPECTION AGENCY. N : CUSTOMER INDICATE "P" PERFORM "W" WITNESS AND "V" VERIFICATION			
MANUFACTURER / CONTRACTOR			
SUB-CONTRACTOR			
SIGNATURE		REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY & SEAL





MANUFACTURER'S NAME & ADDRESS:		MANUFACTURING QUALITY PLAN		PROJECT :	
ITEM : Chain Pulley Block		QP No.: PE-TS-XXX-XXX-A001		PACKAGE : CHAIN PULLEY BLOCKS	
REV.:0, Date.: PAGE: 3 OF 4				VOL IIB, SEC C	

Sr. No.	COMPONENT / OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY		REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9.	M	C N	11.
									10.		

		-SURFACE CRACK	MA	DPT	100 %	ASTM E165	NO DEFECT	IR	✓	P	V	V
2.2	GEARS AND PINIONS AFTER MACHINING	SURFACE HARDNESS HEAT TREATMENT, SURFACE CRACK, CASE DEPTH	MA	HARDNESS HT CHART, DPT FOR SURFACE CRACK	RANDOM ASTM E 165 FOR DPT	MFG STANDARD NO DEFECT	MFG STANDARD	IR	✓	P	V	V
3.0	FINAL INSPECTION							IR	✓	P	V	V
3.1	COMPLETE ASSEMBLY	OVERALL DIMENSION	MA	MEASUREMENT	100 %	IS:3832 /APPD DRG	IS:3832 /APPD DRG	IR	✓	P	W	V
		PROOF LOAD TEST	CR	LOAD TEST	100%	-DO-	No cracks, flaws & other defects	IR	✓	P	W	V
		LIGHT LOAD TEST	MA	LOAD TEST	100%	IS 3832	IS 3832	IR	✓	P	W	V
		HEIGHT OF LIFT	MA	MEASUREMENT	100%	-DO-	-DO -	IR	✓	P	W	V
		SWIVELING OF HOOK	MA	VISUAL	100 %	-DO-	-DO-	IR	✓	P	W	V
		EFFORT	MA	PULL ON CHAIN	100%	-DO-	-DO-	IR	✓	P	W	V
3.2	PAINTING	-CLEANING	MA	VISUAL	AT RANDOM	APPROVED	APPROVED	IR		P	--	--
		- SHADE & DFT OF PAINT (Blue / Black)	MI	VISUAL	AT RANDOM	DRAWING/ SPECIFICATION	DRAWING/ SPECIFICATION	IR		P	W	-

		LEGEND: ** M : MANUFACTURER / SUB-CONTRACTOR C : BHEL / NOMINATED INSPECTION AGENCY. N : CUSTOMER INDICATE "P" PERFORM "W" WITNESS AND "V" VERIFICATION	FOR CUSTOMER USE	
MANUFACTURER / CONTRACTOR				
SUB-CONTRACTOR				
SIGNATURE			REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY & SEAL

MANUFACTURER'S NAME & ADDRESS :		MANUFACTURING QUALITY PLAN				PROJECT : PACKAGE : CHAIN PULLEY BLOCKS VOL IIB, SEC C			
		ITEM : Chain Pulley Block QP No.: PE-TS-XXX-XXX-A001 REV.:0, Date.: PAGE: 4 OF 4							

Sr. No.	COMPONENT / OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									M	C	N	
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.			11.

3.3	NAME PLATE	VERIFICATION	MA	VISUAL	100%			IR		P	V	--
3.4	PACKING	-VERIFICATION	MI	VISUAL	100%	SPECS.	SPECS.	IR		P	--	-
3.5	REVIEW OF QA DOCUMENTATION	VERIFICATION	MA	VISUAL	100%	APPD. QP	APPD. QP		✓	V	V	V

CR – CRITICAL, MA – MAJOR , MI – MINOR
NOTE 1: BACK WALL ECHO SHALL BE ADJUSTED TO 100% OF FULL SCREEN HEIGHT IN SOUND (DEFECT FREE) AREA. DEFECT ECHO HEIGHT MORE THAN 20% OF SCREEN HEIGHT SHALL BE TREATED AS UNACCEPTABLE. BACK WALL ECHO SHALL NOT BE LESS THAN 80% OF SCREEN HEIGHT IN ANY CASE.
NOTE 2: RECORDS IDENTIFIED WITH TICK SHALL BE ESSENTIALLY INCLUDED IN QA DOCUMENTATION.

LEGEND:		FOR CUSTOMER USE	
MANUFACTURER / CONTRACTOR	** M : MANUFACTURER / SUB-CONTRACTOR C : BHEL / NOMINATED INSPECTION AGENCY. N : CUSTOMER INDICATE "P" PERFORM "W" WITNESS AND "V" VERIFICATION		
SUB-CONTRACTOR SIGNATURE		REVIEWED BY NAME & SIGN OF APPROVING AUTHORITY & SEAL	



**4x270 MW BHADRADRI TPS
AIRCONDITIONING SYSTEM
TECHNICAL SPECIFICATION
(ELECTRICAL PORTION)**

SPECIFICATION No: PE-TS-411-553-A001

SECTION : I

SUB-SECTION : C-6

REV. 01

DATE: MARCH 2017

SECTION: I

SUB-SECTION: C-6

LIST OF ANNEXURES- I, II, III, IV, V, VI, VII & VIII

	4x270 MW BHADRADRI TPS AIR CONDITIONING SYSTEM LIST OF MAKES OF SUB-VENDOR ITEMS	SPECIFICATION NO. PE-TS-411-553-A001	
		SECTION : I	
		SUB SECTION : C 6	
		REV 01	DATE: MARCH 2017

SECTION-I

SUB SECTION C6

ANNEXURE-I

LIST OF MAKES OF SUB-VENDOR ITEMS



**4x270 MW BHADRADRI TPS
AIR CONDITIONING SYSTEM**

LIST OF MAKES OF SUB-VENDOR ITEMS

SPECIFICATION NO. PE-TS-411-553-A001

SECTION : I

SUB SECTION : C 6

REV 01

DATE: MARCH 2017

SLNo	ITEM	VENDOR
1	SCREW CHILLER	YORK
		TRANE
		CARRIER
		KIRLOSKAR
		DUNHAM BUSH
		MCQUAY (DAIKIN)
		BLUE STAR
		VOLTAS
2	VAPOUR ABSORBTION MACHINE	VOLTAS
		THERMAX
		KIRLOSKER
3	PRECISION PACKAGE UNITS	STULZ
		UNIFLAIR
		Emerson process management (Rosemount)
		BLUEBOX
		CLIMADENTA
4	PACKAGE UNIT	VOLTAS
		BLUE STAR
		CARRIER
5	SPLIT AIR CONDITIONER	VOLTAS
		BLUE STAR
		CARRIER
		HITACHI-HIREL
		LG
6	AIR HANDLING UNITS	VOLTAS
		BLUE STAR
		ZECO
		CARRYAIRE (flakt)
		EDGETECH
		ETHOS
		SYSTEM AIR
		WAVES AIRCON
7	AHU FAN (CENTRIFUGAL FAN)	CB DOCTOR
		FLAKT
		KRUGER
		NICOTRA
		COMEFRI
		MARATHON
		PATEL AIR

	4x270 MW BHADRADRI TPS AIR CONDITIONING SYSTEM		SPECIFICATION NO. PE-TS-411-553-A001	
			SECTION : I	
	LIST OF MAKES OF SUB-VENDOR ITEMS		SUB SECTION : C 6	
			REV 01	DATE: MARCH 2017
			ADVANCE	
			DRAFT AIR	
			HYDERABAD POLLUTION	
			SK SYSTEM	
8	PUMPS		SARLA	
			BEST & CROMPTON	
			JYOTI	
			SAM TURBO	
			KBL	
			KSB	
			M&P	
			VOLTAS	
			BEACON-WEIR	
			WORTHINGTON	
			Flowmore	
			SULZER PUMPS INDIA LTD.	
			BHARAT PUMPS & COMPRESSORS LTD	
			FLOWSERVE INDIA CONTROL PVT LTD	
			V-FLOW PUMPS & SYSTEMS CO	
			Kishore Pumps	
9	COOLING TOWER		PAHARPUR	
			MIHIR	
			PCT	
			FLOWTECH	
			BELL	
10	LV MOTORS (NON FLAME PROOF)		SIEMENS	
			ABB	
			CGL	
			MARATHON	
			KEC	
			BHARAT BIJLEE	
			NGEF	
			JYOTI	
			LHP	
			BHARAT ELECTRIC	
11	AIR FILTER		PUROLATOR	
			FMI	
			ANFILCO	
			TENACITY	
			JOHN FOWLER	
			SPECTRUM	
			AIR TECH	

	4x270 MW BHADRADRI TPS AIR CONDITIONING SYSTEM LIST OF MAKES OF SUB-VENDOR ITEMS		SPECIFICATION NO. PE-TS-411-553-A001	
			SECTION : I	
			SUB SECTION : C 6	
			REV 01	DATE: MARCH 2017

		PUROMATIC
12	FRESH AIR/ SUPPLY/ EXHAUST/ RE UNIT FANS	FLAKT
		KHAITAN
		PATEL AIR
		NICOTRA
		SARLA (SITAL)
		KRUGER
		MARATHON
		C B DOCTOR
		HYDERABAD POLLUTION
		SK SYSTEM
		ADVANCE
13	INSULTATION MATERIAL	BEARDSHEL
		K-FLEX
		PARAMONT
		ARMAFLEX
		SUPREME
		LLOYDS
		UP TWIGA
		AEROCELL
14	BALANCING VALVE	ADVANCE
15	BUTTERFLY VALVES	ADVANCE
		Audco
		Fouress Engg
		INTER VALVE
		BDK
		WEIR BDK
		TYCO
		CRANE PROCESS
		KEYSTONE
		Fluidline
		INSTRUMENTATION LTD
		R and D MULTIPLES (METAL CAST) PVT LTD
		SURYA VALVES AND INSTRUMENTS MFG CO
PENTAIR VALVES AND CONTROLS INDIA PRIVATE LIMITED		
UPADHAYA VALVES MANUFACTURERS PRIVATE LIMITED		
VENUS PUMPS AND ENGG. WORKS		
16	NON RETURN VALVE	Leader Valves

	4x270 MW BHADRADRI TPS AIR CONDITIONING SYSTEM		SPECIFICATION NO. PE-TS-411-553-A001	
			SECTION : I	
	LIST OF MAKES OF SUB-VENDOR ITEMS		SUB SECTION : C 6	
			REV 01	DATE: MARCH 2017
			H SARKAR	
			Fluidline	
			HI-TECH	
			CRESCENT VALVES	
			A V VALVES	
			Bankim	
			SHIVADURGA	
			SURYA VALVES AND INSTRUMENT MANUFACTURING	
			ATAM VALVES	
			GM DAULI & SONS	
			KBL	
			VENUS PUMPS AND ENGINEERING WORKS	
17	STEEL GATE/GLOBE/NR VALVES(WATER SYSTEM)		CRESCENT VALVES	
			BDK	
			Audco	
			Fouress Engg	
			KIRLOSKAR BROTHERS LTD.	
			SANT VALVES	
			BOMBAY METAL & ALLOYS	
			Bankim	
			Leader Valves	
			H SARKAR	
			AV Valves	
			VENUS PUMPS	
			Fluidline	
			HI –TECH	
			SHIVADURGA	
			SURYA VALVES AND INSTRUMENT MANUFACTURING	
18	4 WAY MIXING VALVE WITH ACTUATING MOTOR		SIEMENS BUILDING TECHNOLOGY	
			JOHNSON	
			BELIMO	
			HONEYWELL AUTOMATION	
			RAPID CONTROL	
			ALC	
19	BUTTERFLY VALVE (MOTORIZED)		ANERGY	
			ADVANCE	

4x270 MW BHADRADRI TPS AIR CONDITIONING SYSTEM

	4x270 MW BHADRADRI TPS AIR CONDITIONING SYSTEM		SPECIFICATION NO. PE-TS-411-553-A001	
			SECTION : I	
	LIST OF MAKES OF SUB-VENDOR ITEMS		SUB SECTION : C 6	
			REV 01	DATE: MARCH 2017
			BST	
			JINDAL	
			SAIL	
			PSL	
			LALIT PROFILE	
			SAMSHI PIPE INDUSTRIES	
			S MUKUT PIPES	
			MANN INDUSTRIES	
			SURENDRA ENGINEERING	
			PRATIBHA PIPES AND STRUCTURES PVT LTD	
			JCO GAS PIPES	
			NUKAT TANK AND VESSELS	
			GOODLUCK TUBES	
			ADVANCE STEEL TUBES	
			BIHAR TUBES	
			HITECH PIPES	
			RATNAMANI	
			MAHARASHTRA SEAMLESS	
24	PIPING - CS SEAMLESS (ASTM A 106)		ISMT	
			Maharastra Seamless	
25	GI SHEETS FOR DUCTING		TISCO	
			INDIAN IRON & STEEL CO	
			RASHTRIYA ISPAT NIGAM LIMITED	
			ESSAR	
			ISPAT INDUSTRIES	
			JSW	
			LLOYDS	
			Bhushan steels	
			TATA	
			SAIL	
26	FIRE DAMPER		JINDAL	
			TSC	
			CARRYAIRE	
27	GRILL/DIFFUSER/VOLUME CONTROL DAMPER		RAVISTAR (SYSTEM AIR)	
			AIR FLOW	
			TSC	
			AIR MASTER	
			CARRYAIRE	
28	STRIP HEATER		RAVISTAR (SYSTEM AIR)	
			ESCORTS	
			RACOLDS	

	4x270 MW BHADRADRI TPS AIR CONDITIONING SYSTEM	SPECIFICATION NO. PE-TS-411-553-A001	
		SECTION : I	
		SUB SECTION : C 6	
		REV 01	DATE: MARCH 2017
LIST OF MAKES OF SUB-VENDOR ITEMS			
		DASPASS	
		ALCO	
		HEATCO	
		HOTSET	
29	PAN HUMIDIFIER	RAPID COOL	
		HOTSET	
		ALCO	
30	RELIEF / PURGE VALVE	BRASSOMATIC	
31	THERMOSTATS	HONEYWELL AUTOMATION	
		RANCO	
		PENN	
		DANFOSS	
		INDFOSS	
		JHONSON CONTROL	
		RANUTROL	
32	HUMID STAT	JHONSON CONTROL	
		HONEYWELL AUTOMATION	
		PENN	
33	ANTI FREEZE THERMOSTAT	RANCO	
		HONEYWELL AUTOMATION	
		PENN	
		DANFOSS	
		INDFOSS	
34	PRESSURE GAUGE/ DIFF.PRESSURE GAUGE	General Instrument Consortium	
		Bells Controls Ltd	
		H. GURU IND	
		WAAREE INSTRUMENTS	
		H. GURU INST	
		Forbes Marshall	
		Manometer India	
		A. N Instrument	
		Gauges Bourdon	
		GLUCK INDIA	
		WIKA.	
		ASHCROFT INDIA PVT LTD.	
		Baumer Technologies India Pvt. Ltd.	
		PRECISION MASS PRODUCTS	
		BOSE PANDA INSTRUMENTS PVT.LTD.	
35	TEMPERATURE GAUGE	H. GURU IND	
		H. GURU INST	
		Forbes Marshall	
		DETRIVE INST & ELECTRONICS	

	4x270 MW BHADRADRI TPS AIR CONDITIONING SYSTEM		SPECIFICATION NO. PE-TS-411-553-A001	
			SECTION : I	
	LIST OF MAKES OF SUB-VENDOR ITEMS		SUB SECTION : C 6	
			REV 01	DATE: MARCH 2017
38	TEMPERATURE SWITCH		INDFOSS	
			SIEMENS	
			DANFOSS	
			DK INSTRUMENTS	
			SOR INC	
			VASU	
			DRESSER	
			TOSHNIWAL	
			Switzer Instrument Ltd.	
39	FLOW SWITCH		Switzer Instrument Ltd.	
			LEVCON	
			DK INSTRUMENTS	
			SBEM	
			V AUTOMAT	
			SIEMENS	
40	LEVEL SWITCH-FLOAT TYPE		SBEM	
			BLISS ANAND	
			HI-TECH	
			RAMAN INST	
			SIGMA	
			SOR INC	
			WAREE INST	
			LEVCON	
			DK INSTRUMENTS	
			V AUTOMAT	
			CHEMTROL	
			SIEMENS	
			FLOW STAR	
			TRAC	
			FLOW TECH	
			NIVO CONTROLS	
			PUNE TECHTROL	
			SAPCON INSTRUMENT	
			Baumer Technologies India Pvt. Ltd.	
			GIC	
41	LEVEL SWITCH-CAPACITANCE TYPE		SBEM	
			BLISS ANAND	
			HI-TECH	
			RAMAN INST	
			SIGMA	
			SOR INC	
			WAREE INST	

	4x270 MW BHADRADRI TPS AIR CONDITIONING SYSTEM		SPECIFICATION NO. PE-TS-411-553-A001	
	LIST OF MAKES OF SUB-VENDOR ITEMS		SECTION : I	
			SUB SECTION : C 6	
			REV 01	DATE: MARCH 2017
			LEVCON DK INSTRUMENTS V AUTOMAT CHEMTROL SIEMENS FLOW STAR TRAC FLOW TECH NIVO CONTROLS PUNE TECHTROL SAPCON INSTRUMENT Baumer Technologies India Pvt. Ltd. GIC	
42	FLOW TRANSMITTERS		SBEM TAYLOR ABB BRISTOL BABCOCK BIRLA KENT TAYLOR BLISS ANAND SMART INST V AUTOMAT FISHER-ROSEMOUNT SIEMENS TATA HONEYWELL PUNE TECHTROL NIVO CONTROLS PANAM ENGINEERS Emerson process management (Rosemount) MOORE TOSHNIWAL YOKOGAWA E&H ABB	
43	PRESSURE/ DIFF. PRESSURE TRANSMITTER		SBEM TAYLOR ABB BRISTOL BABCOCK BIRLA KENT TAYLOR BLISS ANAND SMART INST V AUTOMAT	

	4x270 MW BHADRADRI TPS AIR CONDITIONING SYSTEM LIST OF MAKES OF SUB-VENDOR ITEMS		SPECIFICATION NO. PE-TS-411-553-A001	
			SECTION : I	
			SUB SECTION : C 6	
			REV 01	DATE: MARCH 2017
		FISHER-ROSEMOUNT		
		SIEMENS		
		TATA HONEYWELL		
		PUNE TECHTROL		
		NIVO CONTROLS		
		PANAM ENGINEERS		
		Emerson process management (Rosemount)		
		MOORE		
		TOSHNIWAL		
		YOKOGAWA		
		E&H		
		ABB		
44	SIGHT FLOW INDICATORS	SIGMA		
		LEVCON		
		V AUTOMAT		
		TELLACE		
		EUREKA INDUSTRIAL EQUIPMENTS PVT.LTD.		
		TATA HONEYWELL		
		BLISS ANAND		
		SCIENTIFIC DEVICES		
		BK EQUIPMENTS		
		INSTRUMENTATION ENGINEERS		
45	FLOW ELEMENT - ORIFICE	BRISTOL BABCOCK		
		BALIGA LIGHTING EQPT PVT LTD		
		LIGHTING EQUIP		
		ENGINEERING SPECIALITIES		
		IL		
		MINCO		
		MICRO PRECISION		
		STAR-MECH CONTROLS (I) PVT.LTD.		
46	TEMPERATURE ELEMENT	General Instrument Consortium		
		PYRO ELECTRIC		
		WAAREE INSTRUMENTS		
		DETRIVE INST & ELECTRONICS		
		TOSHNIWAL		
		GOA INSTRUMENTS		
		Gauges Bourdon		
		TECHNO INSTRUMENTS		
		TEMPSENS INSTRUMENTS		
		THERMAL INSTRUMENTS		

	4x270 MW BHADRADRI TPS AIR CONDITIONING SYSTEM		SPECIFICATION NO. PE-TS-411-553-A001	
	LIST OF MAKES OF SUB-VENDOR ITEMS		SECTION : I	
			SUB SECTION : C 6	
			REV 01	DATE: MARCH 2017
47	FLOW METER	TM TECNOMATIC SPA		
		Baumer Technologies India Pvt. Ltd.		
		EUREKA INDUSTRIAL EQUIPMENTS PVT.LTD.		
		INSTRUMENTATION ENGINEERS		
		PLACKA		
		TRAC		
		FLOW STAR		
		SCIENTIFIC DEVICES		
48	RH SENSOR/TEMP SENSOR	HONEYWELL AUTOMATION		
		JOHNSON		
		SIEMENS		
		General Instrument Consortium		
49	PLC BASED PANEL	SIEMENS		
		SCHNEIDER		
		Rockwell Automation		
		GE INTELLIGENT		
		HONEYWELL AUTOMATION		
		ABB		
50	OWS/PC	MITSUBISHI ELECTRIC		
		HP		
		COMPAQ		
		DELL		
		HCL		
		IBM		
51	PRINTER	LENOVO		
		HP		
		CANNON		
		EPSON		
		XEROX		
		IBM		
52	UPS	LEXMARK		
		HITACHI-HIREL		
		APC		
		DELTA		
		Emerson process management (Rosemount)		
		DB POWER		
53	FIBRE OPTIC CABLE	APLAB		
		Birla Ericsson		
		Finolex		
		AKSH FIBRE		

	4x270 MW BHADRADRI TPS AIR CONDITIONING SYSTEM		SPECIFICATION NO. PE-TS-411-553-A001	
			SECTION : I	
			SUB SECTION : C 6	
			REV 01	DATE: MARCH 2017
LIST OF MAKES OF SUB-VENDOR ITEMS				

54	ANNUNCIATOR	ICC
		PECON
		PROCON
55	LT ADAPTER BOX FOR AL TO CU CABLE CONVERTOR	CONTROL DEVICE
		SYSTEM POWER CONTROL
		JACKSON ENGINEERS
		UNILEC
		ELECTRIC ALLIED PRODUCT
56	METERING PUMPS	SHAPO TOOLS
		VK PUMPS
57	WATER SOFTENING PLANT	THERMAX
		ION EXCHANGE
		DOSI ION
58	PRESSURE/ DIFF. PRESSURE TRANSMITTER	ABB
		ENDRESS+HAUSER (INDIA)
		MOORE
		SIEMENS
		SMART INST
		SBEM
		TOSHNIWAL
		V AUTOMAT
		Emerson process management (Rosemount)
		YOKOGAWA
		HONEYWELL AUTOMATION
59	TEMPERATURE TRANSMITTERS	FUJI
		ABB
		ENDRESS+HAUSER (INDIA)
		MOORE
		SIEMENS
		SMART INST
		SBEM
		TOSHNIWAL
		V AUTOMAT
		Emerson process management (Rosemount)
		YOKOGAWA
60	ROTAMETER	HONEYWELL AUTOMATION
		CHEMTROLS SAMIL (INDIA) PVT LTD.
		EUREKA INDUSTRIAL EQUIPMENTS PVT.LTD.
		IL

	4x270 MW BHADRADRI TPS AIR CONDITIONING SYSTEM LIST OF MAKES OF SUB-VENDOR ITEMS	SPECIFICATION NO. PE-TS-411-553-A001	
		SECTION : I	
		SUB SECTION : C 6	
		REV 01	DATE: MARCH 2017

		TRANSDUCERS AND CONTROL
61	BATTERY CHARGER	AMARA RAJA POWER SYSTEMS LIMITED
		CHHABI ELECTRICALS PVT.LTD.
		DUBAS ENGG
		HBL POWER SYSTEM
		STATCON POWER CONTROLS LTD
		CALDYNE
62	DC LEAD ACID/NI-CD BATTERY	HBL POWER SYSTEM
		AMCO SAFT INDIA LTD
		SAFT

NOTES:

1. THE SUB VENDOR LIST ABOVE IS INDICATIVE ONLY AND IS SUBJECT TO BHEL AND CUSTOMER APPROVAL DURING DETAILED ENGINEERING STAGE WITHOUT ANY COMMERCIAL & DELIVERY IMPLICATION TO BHEL. BIDDER TO PROPOSE SUB VENDOR WITHIN 4 WEEKS OF PLACEMENT OF LOI. THEREAFTER NO REQUEST FOR ADDITIONAL SUB-VENDOR SHALL BE ENTERTAINED.
2. THE INSPECTION CATEGORY WILL BE INTIMATED AFTER AWARD OF CONTRACT BY BHEL/CUSTOMER. HOWEVER THE SAME WILL BE ADHERED BY THE BIDDER WITHOUT ANY COMMERCIAL AND DELIVERY IMPLICATION TO BHEL/ CUSTOMER.
3. PLEASE ALSO REFER RESPECTIVE SUB-SECTION C-3, C-4 & C-5 FOR ELECTRICAL, C&I AND HANDLING RELATED EQUIPMENT LIST OF MAKE.



**4X270 MW BHADRADRI TPS
AIR CONDITIONING SYSTEM
MANDATORY SPARE LIST**

SPECIFICATION NO. PE-TS-411-553-A001

SECTION : I

SUB-SECTION : C6

REV 01

DATE: MARCH 2017

SHEET 1 OF 1

**SECTION-I
SUB SECTION –C6**

**ANNEXURE-II
MANDATORY SPARE LIST**

	4X270 MW BHADRADRI TPS AIR CONDITIONING SYSTEM MANDATORY SPARE LIST	SPECIFICATION NO. PE-TS-411-553-A001	
		SECTION-I	
		SUB SECTION C6	
		REV 01	DATE: MARCH 2017
		SHEET 1 OF 4	

LIST OF MANDATORY SPARES FOR AC SYSTEM

S.No.	Items	Quantity	Remarks
2.1	Screw Chiller		
2.1.1	Bearing for the compressor	1 Set for each rating of compressor	
2.1.2	Gaskets as applicable for Condenser & Chiller Heads	1 Set for each rating of chiller	
2.2	Centrifugal Pump		
2.2.1	Bearings for each pump and motor	1 Sets for each rating of pump & motor	
2.2.2	Mechanical seal / gland packing as applicable, wearing rings and lantern rings for shaft and impeller	1 Set for each type and rating of pump	
2.2.3	Complete Impeller Assembly	1Set for each application and ratings of Pumps	
2.2.4	Key for impeller	1No. for each application and ratings of Pumps	
2.2.5	Pump shaft	1No. for each application and ratings of Pumps	
2.2.6	Coupling	1No. for each application and ratings of Pumps	
2.3	Cooling Tower		
2.3.1	Spray nozzles	10% of each rating of cooling tower	
2.3.2	Set of fills	10% of each rating of cooling tower	
2.3.3	Bearings for each fan and motor	1 Sets for each rating of fan & motor	
2.4	Refrigerant & Oil		
2.4.1	Refrigerant gas in a non-returnable cylinder	15% of installed charge	
2.4.2	Filter oil in sealed tins for the full set for 6 operations of cleaning	As required	
2.5	Air Handling Units		
2.5.1	Bearings for each AHU fan & motor	1 Set for each rating of fan	
2.5.2	V-Belts	1 Set for each type of AHU	
2.5.3	Filters of each type	1 Set for each type of AHU	
2.6	Centrifugal fans		
2.6.1	Bearings for fan & motor	1 Sets for each rating of fan & motor	
2.6.2	V-belts	1 Set for each rating of fan	
2.6.3	Vibration Isolators	1 set for each rating of fan	
2.7	Precision Air Conditioners / Package Air Conditioners		
2.7.1	Filters	1 set for each PAC unit	
2.7.2	Bearings	1 set for each rating of PAC unit (both for condenser & Indoor Unit)	
2.7.3	Expansion valve	1 set for each rating of PAC unit	

	4X270 MW BHADRADRI TPS AIR CONDITIONING SYSTEM MANDATORY SPARE LIST	SPECIFICATION NO. PE-TS-411-553-A001	
		SECTION-I	
		SUB SECTION C6	
		REV 01	DATE: MARCH 2017
		SHEET 2 OF 4	
2.8	Mandatory Spares for Programmable Logical Control (PLC) and other Electronic System / Subsystem / PLC		
2.8.1	Function controller and control modules (10% of number for each type or minimum of 4 number for each type whichever is high.)	2 Lot	
2.8.2	Process I/O cards and drive modules (10% of the number of cards offered for the project from each category.)	2 Lot	
2.8.3	All other type of electronic modules like CPU of workstation, Power supply modules, communication modules, modules for Data highway / modules for LAN, controllers not covered above (10% of each type or minimum of 2 nos. of each type whichever is more).	2 Lot	
2.8.4	All cards, controllers, lamp and other components used in LVS.	2 Lot (10%)	
2.8.5	control logic power supply fuses at each current rating (Three times the one hundred percent spare replacement).	2 Lot	
2.8.6	Electric to pneumatic converters (10% of each type utilized with automatic control system using pneumatic drives or a minimum of one of each type, whichever is more.)	2 Lot	
2.8.7	Plug-in type keyboard	2 No. of each type	
2.8.8	Dot matrix Printer	2 No.	
2.8.9	CRT	2 No.	
2.8.10	DVDs	40 Nos.	
2.8.11	Printer ribbons /inking mechanism for colour printer.	20 Nos.	
2.8.12	Ribbons for dot matrix printer.	60 Nos.	
2.8.13	Data highway cable with adequate connectors.	500 Meters	
2.8.14	Hard disc drive unit as offered for system complete with accessories.	2 No.	
2.8.15	Interface cables for each type	4 Sets	
2.8.16	Power supply modules of each type and rating	2 Lot (10%)	
2.8.17	Interposing / coupling relays of each type.	2 Lot (5% of total quantity)	
2.9	Mandatory Spares for Control Panels / Desks		
2.9.1	Crimping Pins	2 Roll	
2.9.2	Bulbs for indicating lights (Three times the one hundred percent	2 Lot	

	4X270 MW BHADRADRI TPS AIR CONDITIONING SYSTEM MANDATORY SPARE LIST	SPECIFICATION NO. PE-TS-411-553-A001	
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	spare replacement)		
2.9.3	control circuit fuses of each current rating (Three times, the one hundred percent spare replacement)	2 Lot	
2.9.4	Push buttons, electrical control switches and Illuminated push buttons etc	2 Lot (20%)	
2.10	Mandatory Spares for Un-Interruptible Power Supply System :		
2.10.1	Fuses (3 times, the one hundred percent spare replacement fuses shall be furnished with each panel board.)	2 Lot	
2.10.2	Electronic modules for UPS , Charger, static switch & stabilizer and DC power supply system with each set consisting of atleast one number of each type of electronic module for inverters, chargers, static switch, stabiliser etc.	2 Set	
2.10.3	Battery cells	2 Lot (10%)	
2.10.4	Thyrister without heat sink	2 Lot (10%)	
2.10.5	Semiconductor fuse	2 Lot (10%)	
2.11	LP VALVES		
2.11.1	LP Piping valves & traps - Complete assembly	5% or min. 1 no. (whichever is more) for each size, type & rating for total population	
2.11.2	Steam traps - Complete assembly	5% or min. 1 no. (whichever is more) for each size, type & rating for total population	
2.12	Mandatory Spares for Temperature Elements and Thermowells		
2.12.1	Thermocouple / RTD elements (10% of each type and length of elements , or a minimum of one number, whichever is more.)	2 Lot	
2.12.2	Thermowells for each type of temperature sensors (10% or a minimum of one for each type, whichever is more.)	2 Lot	
2.13	Mandatory Spares for Electronic Transmitters (for pressure, DP, Flow, level, Temperature) and Electrical Transducers.		
2.13.1	Transmitters and Electrical Transducers (10% of total number of offered for each model and type for the project or a minimum of one number, whichever is more)	2 Lot	
2.14	Mandatory spares for local		

	4X270 MW BHADRADRI TPS AIR CONDITIONING SYSTEM MANDATORY SPARE LIST		SPECIFICATION NO. PE-TS-411-553-A001	
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	gauges/switch (for Pressure, DP, Temperature, Flow, level , etc.)			
2.14.1	Local gauges/ Switch (for Pressure, DP, Temperature, Flow, level , etc.) (10% of total number of instruments offered for each model and type for the project or a minimum of one number, whichever is more.)	2 Lot		
2.15	CONTROL VALVES	FOR 1 UNIT		
2.15.1	DIAPHRAGM	2 NOS. OF EACH TYPE OF ACTUATOR		
2.15.2	GLAND PACKING	1 SET FOR EACH TYPE OF VALVE		
2.15.3	TRIM	1 SET FOR EACH TYPE OF VALVE		
2.15.4	GASKET	2 SET FOR EACH TYPE OF VALVE		
2.15.5	POSITION TRANSMITTER COMPLETE SET	10 % of total quantity used in the system for each type & model		
2.15.6	complete set of solenoid valve for on/off valve	5 nos. for each type & ratings		
2.15.7	Position limit switch	5 nos. for each type & ratings		
2.16	Electrical Spares for Motors			
2.16.1	Motor bearing set for AHU fan motor	1 set for each type and rating of fan motor		
2.16.2	Motor bearing set for fresh air fan motor	1 set for each type and rating of fan motor		
2.17	Material handling equipment spares as applicable	As specified under SUB Section C5 of SECTION-I "Material handling equipment specification".		
NOTE				
1.	Unless stated otherwise, a "set" or "Lot" means items required for complete replacement in one equipment of each type / size/ range.			
2.	Wherever quantity has been specified as percentage (%), it shall mean percentage (%) of the population of the item required for one unit of 270 MW in the station (project), unless specified otherwise.			
3.	In case of Bought Out items, itemised spares list may be vendor specific and may differ from the list of spares mentioned above. In such cases, The quoted price shall be considered for applicable items only without any change in the contract price.			
4.	Above mandatory spares shall be supplied as applicable as per system requirement during detail engineering.			



**4X270 MW BHADRADRI TPS
AIR CONDITIONING SYSTEM
PAINTING & COLOUR SCHEME**

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SECTION-I
SUB SECTION C6
ANNEXURE-III
PAINTING & COLOUR SCHEME
(AS PER SECTION C2C)



**4X270 MW BHADRADRI TPS
AIR CONDITIONING SYSTEM
LIST OF TOOLS & TACKLES
AND
LIST OF COMMISSIONING SPARES**

SPECIFICATION No: PE-TS-411-553-A001

SECTION: I

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SECTION-I

SUB-SECTION-C6

ANNEXURE-IV

**LIST OF TOOLS & TACKLES
AND
LIST OF COMMISSIONING SPARES**



**4X270 MW BHADRADRI TPS
AIR CONDITIONING SYSTEM
LIST OF TOOLS & TACKLES
AND
LIST OF COMMISSIONING SPARES**

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LIST OF TOOLS & TACKLES

SL NO	ITEM DESCRIPTION	UNIT	QTY
1	FLAT D WRENCH - 6 MM TO 32 MM (12 Pcs)	SET	1
2	BOX WRENCHES - 6 MM TO 22 MM (14 Pcs)	SET	1
3	RING SPANNER - 6 MM TO 32 MM (12 Pcs)	SET	1
4	ALLEN KEYS - 2 MM TO 10 MM	SET	1
5	CRESCENT SCREW SPANNER	NO.	1
6	SCREW DRIVER	NO.	1
7	OFFSET SCREW DRIVER	NO.	1
8	INSULATED PLIER	NO.	1
9	TORCH LIGHT FOR 2 CELL	NO.	1
10	HAMMER 1 LB	NO.	1
11	OIL CAN	NO.	1
12	POCKET THERMOMETER - 0 TO 50 DEG. C)	NO.	1
13	INSULATION TAPE ROLL	NO.	1
14	STEEL FOOT RULE - 12"	NO.	1
15	FEELER GAUGE 9 BLADES	NO.	1
16	PIPE WRENCH	NO.	1
17	FLARE NUT (1/4")	NOS.	6
18	FLARING TOOL	NO.	1
19	TUBE CUTTER	NO.	1
20	GAS CHARGING PIPE	NO.	1
21	NITROGEN CHARGING ADAPTER	NO.	1
22	FREON PRESSURE GAUGE (2 1/2" DIA DIAL)) 0 - 300 MM PSI	NO.	1
23	FREON PRESSURE GAUGE (2 1/2" DIA DIAL)) 30 - 150 MM PSI	NO.	1
24	PSYCHRO METER	NO.	1
25	LOCK WITH KEY FOR TOOL BOX	NO.	1
26	RATCHET 1/4"	NO.	1
27	MS TOOL BOX	NO.	1

NOTE:-

Above is the minimum list. Any other Tools and tackles required for the system shall also be provided by the vendor as per system / customer requirement.

LIST OF COMMISSIONING SPARES

SL NO	ITEM DESCRIPTION	UNIT	QTY
1	AHU FAN BELTS	SET	1
2	PRESSURE GAUGE	NO.	1
3	TEMPERATURE GAUGE	NO.	1
4	FILTER	SET	1
5	COMPRESSOR OIL	Ltr.	1 Lot
6	REFRIGERANT	Kg	1 Lot

NOTE:-

Above is the minimum list. Any other commissioning spare required for the system shall also be provided by the vendor as per system / customer requirement.



4X270 MW BHADRADRI TPS

**AIRCONDITIONING SYSTEM
DRAWINGS / DOCUMENTS SUBMISSION
PROCEDURE**

SPECIFICATION No: PE-TS-411-553-A001

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ANNEXURE-V

DRAWINGS / DOCUMENTS SUBMISSION PROCEDURE

DISTRIBUTION SCHEDULE

S. No	Description	TSGENCO										CONSULTANT			Equipment Vendor	Remarks
		Director Projects	Director Technical	CE/Civil Thermal Projects Hyd.	CE/ TPC-I, Hyd	CE/ O&M/ KTPS	SE/ Civil KTPS	SE/E&M / KTPS	DE Constr. KTPS	Kolkata	HYD	KTPS				
A	Letter Of Intent or Contract Documents	1	1	1	S	1	2	2	1	1	1	1	2			
B	Vendor Drawings															
1.	Preliminary	1	1	1	2	1	1	2	2	12	1	-	S			
2.	Return preliminary with comments	-	-	1	2	1	1	1	1	S	1	-	1			
3.	Final and any revision thereof															
	a. Civil	1	1	6+1T	1	1	6+1T	1	-	2+1T	1	1	S			
	b. E&M	1	1	1	6+1T	1	1	6+1T	1	2+1T	1	1	S			
C.	Design Drawings															
1.	Preliminary															
	a. Civil	1	1	2	1	1	2	1	1	4	1	1	S			
	b. E&M	1	1	1	2	1	1	2	1	4	1	1	S			
2.	Released for construction															
	a. Civil	1	1	2	1	1	6	1	1	1	1	2	S			
	b. E&M	1	1	1	1	2	1	6	1	1	1	2	S			
3.	Return marked 'As built'															
	a. Civil	-	-	1	-	-	1	-	-	1	1	S	1			
	b. E&M	-	-	-	1	-	-	1	1	1	1	S	1			
4.	As built drawings															
	a. Civil	-	-	1+1T	-	2+1T	5+1T	-	1	1+1T	-	1	S			
	b. E&M	-	-	1	2+1T	2+1T	-	5+1T	1+1T	1+1T	-	1	S			

S. No	Description	TSGENCO										CONSULTANT				Equipment Vendor	Remarks
		Director Projects	Director Technical	CE/Civil Thermal Projects Hyd.	CE/ TPC-I, Hyd	CE/ O&M/ KTPS	SE/ Civil KTPS	SE/E&M / KTPS	DE Constr. KTPS	Kolkata	HYD	KTPS					
D	Progress Report Monthly																
1.	Equipment vendor	1	1	1	2	1	1	2	1	1	1	1			S		
2.	M/s DCPL, Kolkata	1	1	2	2	1	1	2	1	S	1	1			Nil		
E	Test & Inspection Reports																
1.	Equipment manufacturer																
	a. Civil	1	1	1	2	1	1	1	1	11	1	1			S		
s	b. E&M	1	1	-	2	1	-	1	1	11	1	1			S		
2.	M/s DCPL, Kolkata	1	1	-	2	1	-	1	1	S	-	1			-		
F	Instruction Manuals/Data Books																
1.	Equipment manufacturer																
	a. Civil	1	1	1+1T	1	1	6+1T	1	1	2+1T	1	1			S		
	b. E&M	1	1	-	3+1T	1	-	6+1T	2	3+1T	1	1			S		
2.	M/s DCPL, Kolkata	1	1	-	10+1T	1	-	15+1T	-	S	1	1			Nil		
G	M/s DCPL, Kolkata Criteria	1	1	1	8+1T	1	1	2	1	1	1	1			S		
H	Design Calculations	1	1	1	8+1T	1	1	2	1	1	1	1			S		
I	Final consulting Engineering Report	1	1	1	10	1	1	2	1	S	1	1			Nil		

S – Source, T – Transparency & Soft Copy on CD,

Telangana State Power Generation Corporation Ltd.

EPC Bid Document
e-PCT/TS/K/02/2014-15

Director, Technical, Hyd	:	Director/ Technical, TSGENCO, Vidyut Soudha, Hyderabad – 500 082
CE/ Civil, Hyd	:	Chief Engineer/Civil, Thermal Projects, TSGENCO, Vidyut Soudha, Hyderabad – 500 082
CE/ TPC-I, Hyd	:	Chief Engineer/TPC, TSGENCO, Vidyut Soudha, Hyderabad – 500 082
CE/ O&M/ KTPS	:	Chief Engineer(O&M), KTPS, Kothagudem, Telangana
SE/Civil, KTPS	:	Superintending Engineer (Civil), KTPS, Kothagudem, Telangana
SE/E&M, KTPS	:	Superintending Engineer (E&M), KTPS, Kothagudem, Telangana
DE/Constr./ KTPS	:	Divisional Engineer/Construction, KTPS, Kothagudem, Telangana
M/s DCPL, Kolkata	:	M/s DCPL, Kolkata.
M/s DCPL, Hyd	:	M/s DCPL, Hyderabad.
M/s DCPL, KTPS	:	M/s DCPL, KTPS, Kothagudem, Telangana

DEVELOPMENT CONSULTANTS
(e-PCT-TS-K-02-2014-15-Vol. IIA-6 Annx.docx)

V.IIA/S-6 Anx-1: 3



2X800MW NTPC TELANGANA STPP PHASE-I
(SG PACKAGE)
AIRCONDITIONING SYSTEM
MASTER DRAWING LIST WITH SCHEDULE OF
SUBMISSION

SPECIFICATION No: PE-TS-424-553-A001

SECTION : I

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ANNEXURE-VI

**MASTER DRAWING LIST WITH SCHEDULE OF
SUBMISSION**



**2X800MW NTPC TELANGANA STPP PHASE-I
(SG PACKAGE)
AIRCONDITIONING SYSTEM
MASTER DRAWING LIST WITH SCHEDULE OF
SUBMISSION**

SPECIFICATION No: PE-TS-424-553-A001

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Sr. No.	BHEL Drawing No	Drawing Title	SCH. WEEK (FROM DATE OF LOI)	MDL categorization
1	PE-V0-391-553-A001	ITEM CATEGORISATION LIST & SUBVENDOR LIST	2	B
2	PE-V0-391-553-A002	QUALITY PLAN OF SCREW CHILLERS	6	MC
3	PE-V0-391-553-A003	QUALITY PLAN OF PRECISION PU	7	MC
4	PE-V0-391-553-A004	QUALITY PLAN OF CENTRIFUGAL PUMPS	7	MC
5	PE-V0-391-553-A005	QUALITY PLAN OF COOLING TOWER	8	MC
6	PE-V0-391-553-A006	QUALITY PLAN OF AHU	8	MC
7	PE-V0-391-553-A007	QUALITY PLAN OF MOTOR	9	MC
8	PE-V0-391-553-A008	QUALITY PLAN OF PLC	7	MC
9	PE-V0-391-553-A101	HEAT LOAD CALC FOR MAIN CONTROL ROOM AREAS IN TG BLDG, ESP CONTROL ROOM BUILDING AND SERVICE BUILDING.	3	B
10	PE-V0-391-553-A102	PRESSURE DROP CALC FOR CHILLED WATER PIPING & CONDENSER WATER PIPING	4	B
11	PE-V0-391-553-A103	CONTROL & OPERATION PHILOSOPHY OF AC SYSTEM	10	D
12	PE-V0-391-553-A202	DATA SHEET AND GA FOR SCREW CHILLER	9	MC
13	PE-V0-391-553-A203	DATA SHEET AND GA FOR AIR COOLED PRECISION PU	8	MC
14	PE-V0-391-553-A204	DATA SHEET AND GA FOR AHUs AND FCUs	8	MC
15	PE-V0-391-553-A205	TECHNICAL DATA SHEET & GA DRAWING FOR CHILLED WATER PUMPS AND CONDENSER WATER PUMPS	7	MC
16	PE-V0-391-553-A206	DATA SHEET AND GA FOR COOLING TOWER	7	MC
17	PE-V0-391-553-A207	DATA SHEET AND GA FOR ONLINE NON CHEMICAL WATER TREATMENT EQUIPMENT	5	MC
18	PE-V0-391-553-A208	DATA SHEET AND G.A. FOR PRE AND FINE FILTER ALONGWITH FIXING DETAILS.	6	MC

	2X800MW NTPC TELANGANA STPP PHASE-I (SG PACKAGE) AIRCONDITIONING SYSTEM MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION		SPECIFICATION No: PE-TS-424-553-A001	
			SECTION : I	
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Sr. No.	BHEL Drawing No	Drawing Title	SCH. WEEK (FROM DATE OF LOI)	MDL categorization
19	PE-V0-391-553-A209	DATA SHEET AND GA FOR FIRE DAMPER ALONGWITH FIXING DETAILS.	6	MC
20	PE-V0-391-553-A210	DATA SHEET AND GA FOR FRESH AIR FANS	7	MC
21	PE-V0-391-553-A211	DATA SHEET AND GA DRAWINGS FOR VLAVES AND STRAINER (BALANCING, GATE, NRV, B/F , MOTORISED B/F, Y-STRAINER AND OTHER VALVES AS APPLICABLE)	9	MC
22	PE-V0-391-553-A212	DATA SHEET AND GA FOR 3 WAY MOTORISED VALVE	8	MC
23	PE-V0-391-553-A213	DATA SHEET AND GA FOR HEATER PACKAGE	7	MC
24	PE-V0-391-553-A214	DATA SHEET AND GA FOR PAN HUMIDIFIER	7	MC
25	PE-V0-391-553-A215	DATA SHEET FOR INSTRUMENTS (TEMPERATURE GAUGE, PRESSURE GAUGE, PRESSURE SWITCH, SENSORS - TEMPERATURE & HUMIDITY, LEVEL GAUGE, LEVEL SWITCH & DIFFERENTIAL PRESSURE SWITCH AND OTHER APPLICABLE INSTRUMENTS).	9	MC
26	PE-V0-391-553-A216	DATA SHEET OF INSULATION FOR DUCT, PIPE AND ACCOUSTIC LINING ALONG WITH TYPICAL DETAIL FOR DUCT, PIPE AND ACCOUSTIC INSULATION	5	MC
27	PE-V0-391-553-A217	DATA SHEET FOR SPLIT AC AND AIR COOLED PAC.	4	MC
28	PE-V0-391-553-A218	DATA SHEET FOR PIPES	2	MC
29	PE-V0-391-553-A219	DATA SHEET FOR GI SHEET	2	MC
30	PE-V0-391-553-A220	DATA SHEET AND GA DRAWING FOR GRILLS / DIFFUSERS / DAMPERS ETC	3	MC
31	PE-V0-391-553-A221	GA OF EXPANSION TANK, MAKEUP WATER AND SOFT WATER TANK	3	MC
32	PE-V0-391-553-A222	TDS AND GA OF MOTOR (PUMP, COOLING TOWER, AHU)	6	MC
33	PE-V0-391-553-A501	P&I DIAGRAM FOR AC SYSTEM	5	D

	2X800MW NTPC TELANGANA STPP PHASE-I (SG PACKAGE) AIRCONDITIONING SYSTEM MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION		SPECIFICATION No: PE-TS-424-553-A001	
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Sr. No.	BHEL Drawing No	Drawing Title	SCH. WEEK (FROM DATE OF LOI)	MDL categorization
34	PE-V0-391-553-A502	AC PLANT ROOM LAYOUT, COOLING TOWER AREA LAYOUT WITH EQPT FOUNDATION DETAILS FOR TG BUILDING	8	D
35	PE-V0-391-553-A503	AC DUCT LAYOUT DRAWING FOR CONTROL ROOM AREAS AT 15.5M, ALONG WITH AHU ROOM LAYOUT WITH FOUNDATION DETAILS AT 21.0M FOR TG BUILDING	7	D
36	PE-V0-391-553-A504	FCU LAYOUT WITH FIXING DETAIL FOR AC AREA AT 9.0M FOR TG BUILDING	6	D
37	PE-V0-391-553-A505	CHILLED & CONDENSER WATER PIPING LAYOUT INSIDE AC PLANT, COOLING TOWER, AHU ROOMS IN ALL BUILDING AND INTERCONNECTING CHILLED WATER PIPE FROM PLANT ROOM TO ALL AHU ROOM.	9	D
38	PE-V0-391-553-A506	AC DUCTING & DIFFUSER LAYOUT FOR ESP CONTROL ROOM ALONG WITH AHU ROOM LAYOUT WITH FOUNDATION DETAIL.	7	D
39	PE-V0-391-553-A507	AC DUCTING & DIFFUSER LAYOUT FOR SERVICE BUILDING ALONG WITH PU ROOM LAYOUT WITH FOUNDATION DETAIL.	8	D
40	PE-V0-391-553-A508	AC DUCTING & DIFFUSER LAYOUT FOR ADMIN BUILDING ALONG WITH PU ROOM LAYOUT WITH FOUNDATION DETAIL.	6	D
41	PE-V0-391-553-A509	TYPICAL Details DUCT: FABRICATION, SUPPORT AND ERECTION. INSULATION: DUCTING, PIPING, EQUIPMENTS AND ACOUSTIC LINING. PIPING: FABRICATION, SUPPORT AND ERECTION	3	D
42	PE-V0-411-553-A510	SPLIT AC SCHEDULE ALONGWITH HEAT LOAD CALCULATION FOR AUXILIARY BUILDING	4	D
43	PE-V0-411-553-A701	TDS OF PLC WITH CONF DIAG, BOM, GA & INTRL WIRG DIAG, LOGIC FLOW DIAG, IO WIRG DIAG, UPS LAYOUT,	8	MC

	2X800MW NTPC TELANGANA STPP PHASE-I (SG PACKAGE) AIRCONDITIONING SYSTEM MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION	SPECIFICATION No: PE-TS-424-553-A001	
		SECTION : I	
		SUB-SECTION : C6	
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Sr. No.	BHEL Drawing No	Drawing Title	SCH. WEEK (FROM DATE OF LOI)	MDL categorization
		UPS CALCULATION, BATTERY LAYOUT ETC., PLC ROOM LAYOUT FOR AIR CONDITIONING SYSTEM		
44	PE-V0-411-553-A702	I/O LIST FOR AC SYSTEM FOR AIR CONDITIONING SYSTEM	9	D
45	PE-V0-411-553-A703	ELECTRICAL FEEDER LIST FOR AIR CONDITIONING SYSTEM	6	D
46	PE-V0-411-553-A704	CABLE SCHEDULE FOR AIR CONDITIONING SYSTEM	8	D
47	PE-V0-391-553-A901	DEMONSTRATION TEST	5	D
48	PE-V0-391-553-A902	O & M MANUAL	11	D

MDL categorisation: Basic (B), Detailed (D) & Manufacturing clearance (MC) categories

Notes:

- 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.
- 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.
- 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.
- 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.:
 - All drawings and documents shall indicate the list of all reference drawings including general arrangement.
 - 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.
 - Painting schedule shall also be made as a part of general arrangement drawing of each equipment / items indicating at least 3 trade names.
 - 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.
 - 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, 3etc.
 - 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.
 - 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,

	2X800MW NTPC TELANGANA STPP PHASE-I (SG PACKAGE) AIRCONDITIONING SYSTEM MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION	SPECIFICATION No: PE-TS-424-553-A001	
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		REV 00	DATE: 28 Feb 2017
		SHEET 6 OF 6	
requirement of radiography and hydraulic tests, painting details, elevation, side view, plan, skin section and blow-up view for clarity. h) All drawings shall be prepared as per BHEL'S title block and shall bear BHEL'S drawing no. i) 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. j) Bidder to follow the following the drawing submission schedule: k) 1st submission of drawings from date of LOI as per the submission schedule (week). l) Every revised submission incorporating comments – within 7 days. m) 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.			

	4x270MW BHADRADRI TPS AIR CONDITIONING SYSTEM CLARIFIED WATER ANALYSIS	SPECIFICATION No: PE-TS-411-553-A001	
		SECTION : I	
		SUB-SECTION : C6	
		REV 01	DATE: MARCH 2017

SECTION-I

SUB-SECTION-C6

ANNEXURE-VII

CLARIFIED WATER ANALYSIS



**4X270 MW BHADRADRI TPS
AIR CONDITIONING SYSTEM**

SPECIFICATION NO. PE-TS-411-554-A001

REV 01

DATE: MARCH 2017

SHEET 1 OF 1

DESIGN CLARIFIED WATER ANALYSIS

SL. NO.	Constituent	Unit	Value
1.	pH	-	7.73
2.	Color and Odor	-	-
3.	Oil and grease	mg/l	-
4.	BOD	-	-
5.	COD	-	-
6.	Suspended solids	mg/l	≤10
7.	Turbidity	NTU	16
8.	Calcium as Ca	mg/l	60
9.	Magnesium as Mg	mg/l	34
10.	Sodium as Na	mg/l	-
11.	Potassium	mg/l	-
12.	Total Hardness as CaCO ₃	mg/l	94
12.	Chloride as Cl	mg/l	30
13.	Sulphate as SO ₄	mg/l	58
14.	Sulphide	mg/l	-
15.	Total Alkalinity as CaCO ₃	mg/l	140
16.	P-Alkalinity as CaCO ₃	mg/l	-
17.	Nitrates as NO ₃	mg/l	-
18.	Nitrite	mg/l	-
19.	Silica as SiO ₂	mg/l	5.2
21.	Iron as Fe	mg/l	0.007
23.	Total dissolved solids	mg/l	218
24.	Conductivity at 25 degree C	Micro Siemens /cm	328
25.	Dissolved Oxygen as O ₂	mg/l	-
26.	Carbon dioxide free	mg/l	-

1. TEST REPORT BY ENVIRONMENT SUB-DIVISION (TSPGCL)

2. SAMPLE NAME:- GODAVARI RIVER WATER

2. LOCATION :- AT MANUGURU

3. SAMPLING DATE:- 09.10.2014

4. REPORTING DATE:- 10.10.2014



4X270 MW BHADRADRI TPS

AIR CONDITIONING SYSTEM

SPECIFICATION No: PE-TS-411-553-A001

SECTION : I

SUB-SECTION : C6

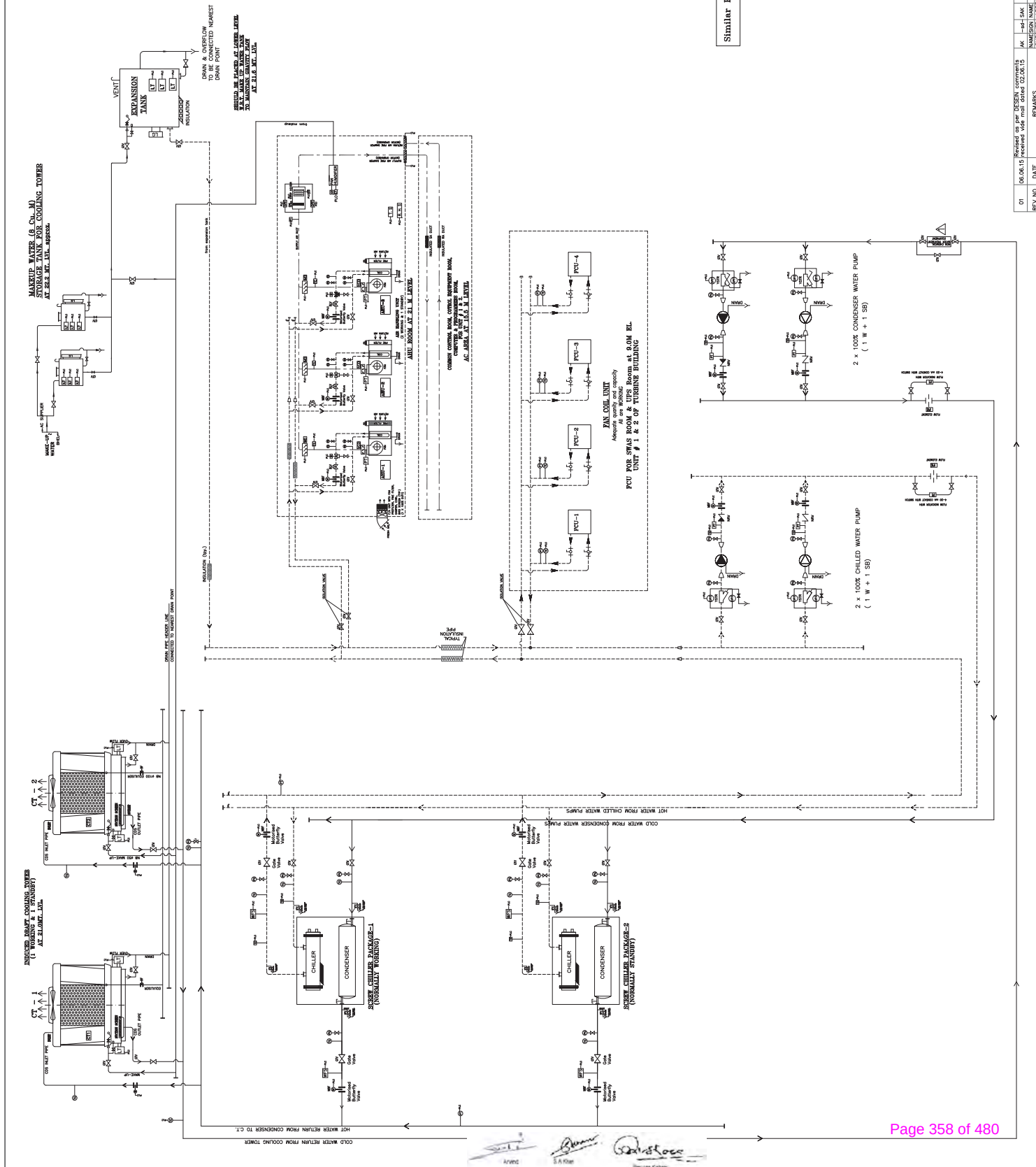
REV 01

DATE: MARCH 2017

SECTION-I
SUB-SECTION-C6

ANNEXURE-VIII

**PID
AND
DRAWINGS**



NOTE:—

THESE SAMPLES ARE BEING IN COLLECTION WITH TEST SPEC. NO. 47-117-411-500-400-100-01

Similar PID shall follow for Main AC Plant-2 for Unit 3 & 4.

FOR TENDER

CUSTOMER : **TSGENCO**

PROJECT:



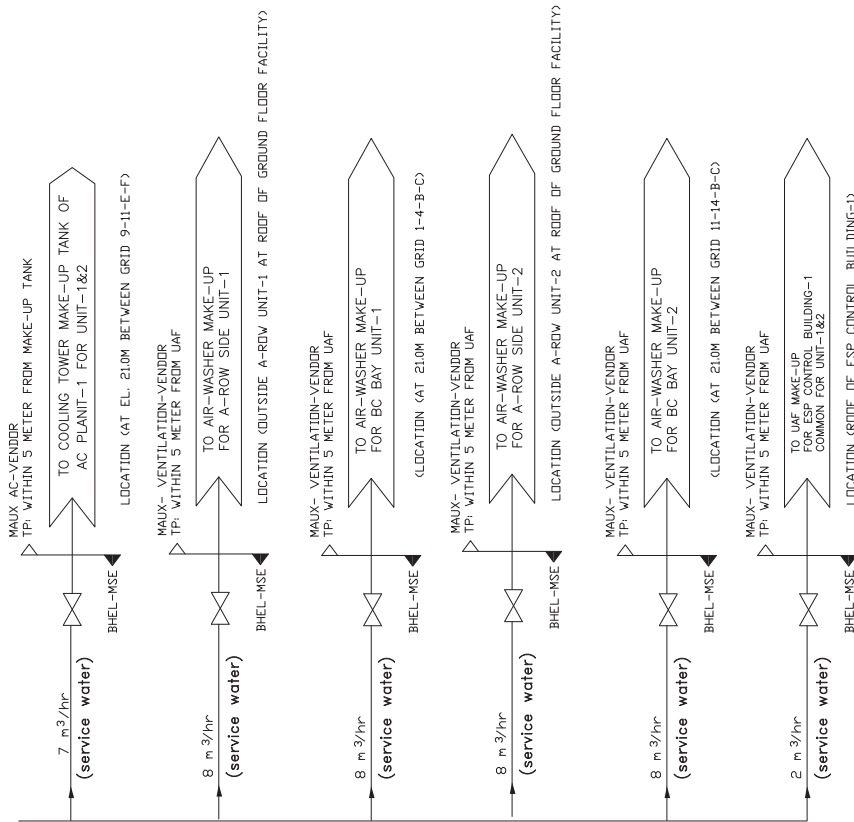
BHARAT HEAVY ELECTRICALS LTD.
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, (UP)

	NAME	SIGN.	DATE
DRAWN	AK		31.03.17
DESIGN	AK		31.03.17
CHECKED	VK		31.03.17
APPROVED	SAK		31.03.17

TITLE :	P&I DIAGRAM FOR CONDENSER & CHILLED WATER SYSTEM FOR MAIN PLANT-1 FOR UNIT 1&2		SCALE = NTS	SHEET OF 1	APPROVED	SAR
			Dwg No. PE-DG-411-553-A001			

REV. NO	DATE	REMARKS	NAME/SGN	AK	ad-SAK	ad-SGN
01	06.06.15	Revised as per DESEN comments received vide mail dated 02.06.15				

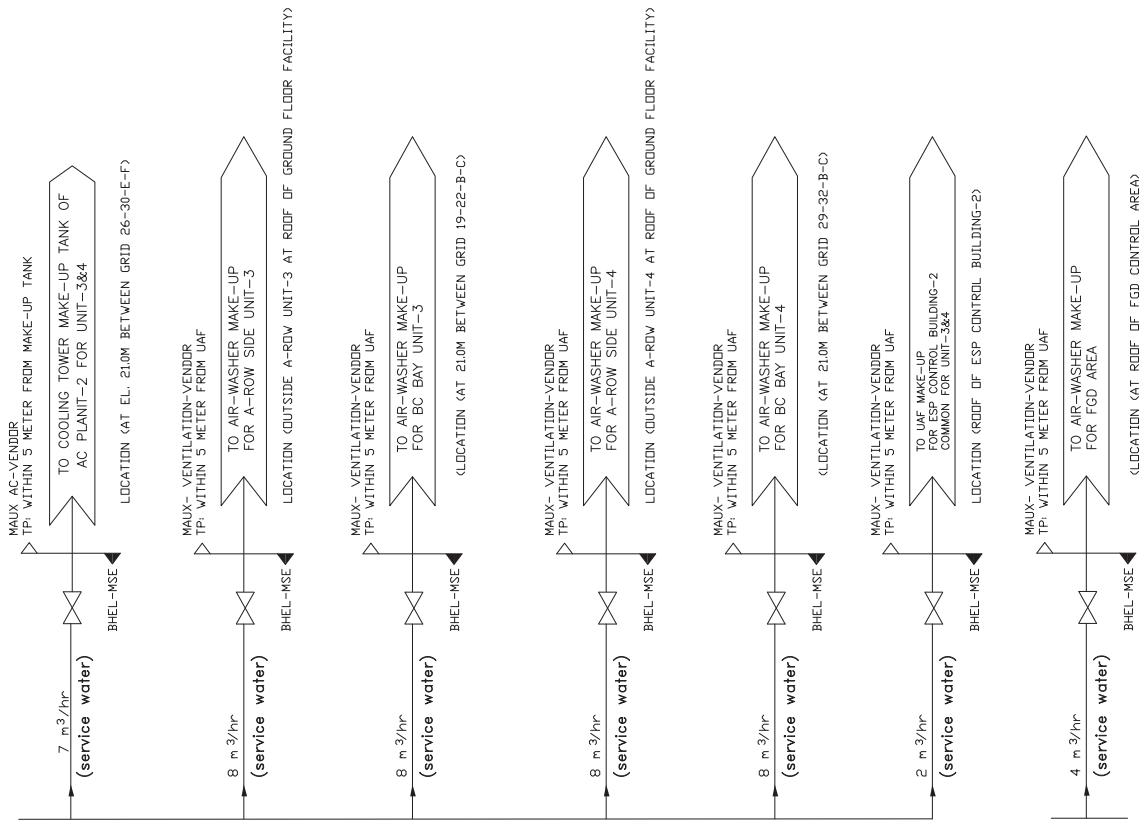
4X270 MW BHADRADRI TPS FOR UNIT-1&2



NOTE:-

1. HVAC MAKE-UP WATER PIPING INCLUDING FITTINGS SHALL BE TERMINATED WITHIN THE RANGE OF 5 METER DISTANCE FROM MAKE-UP WATER TANK / AIR-WASHER BY BHEL FURTHER PIPING SHALL BE DONE BY VENDOR AS MARKED IN THIS DRG.

4X270 MW BHADRADRI TPS FOR UNIT-3&4

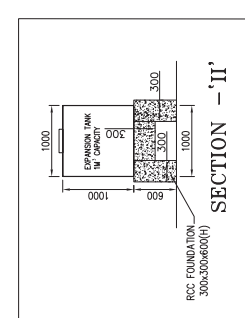
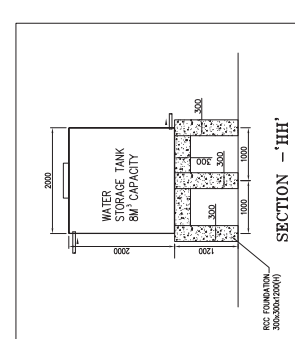
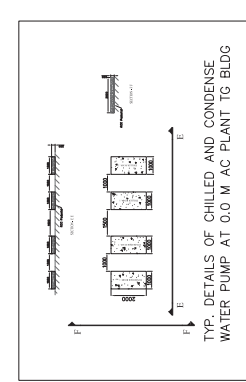
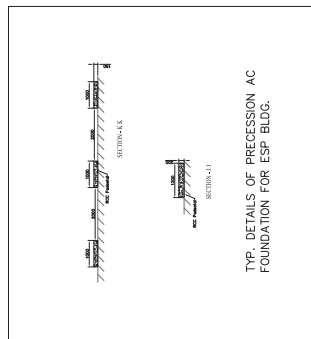
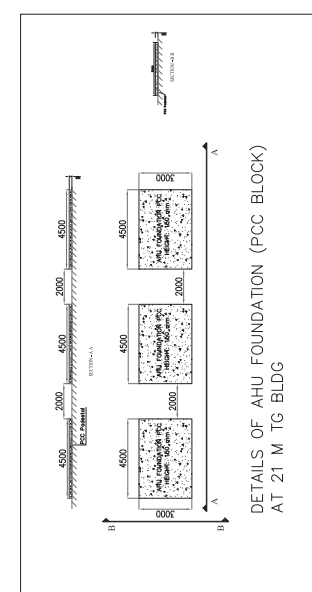
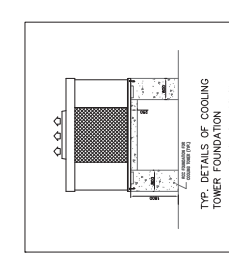
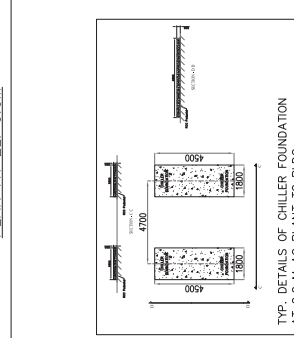
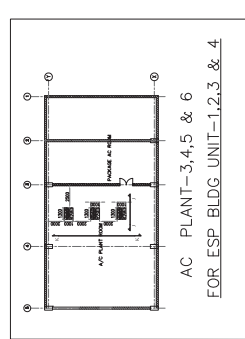
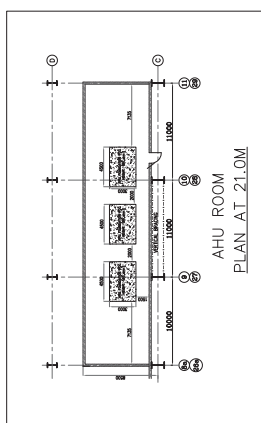
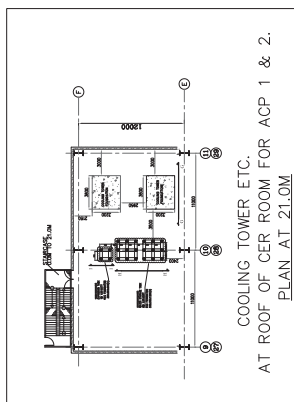
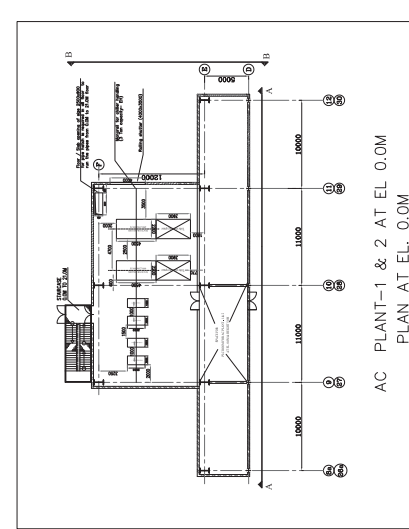
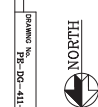


PROJECT TITLE 4X270 MW BHADRADRI TPS

TITLE MAKE UP WATER SCHEME FOR HVAC SYSTEM

DRG. NO. PF-DG-411-554-A003 REV. 01

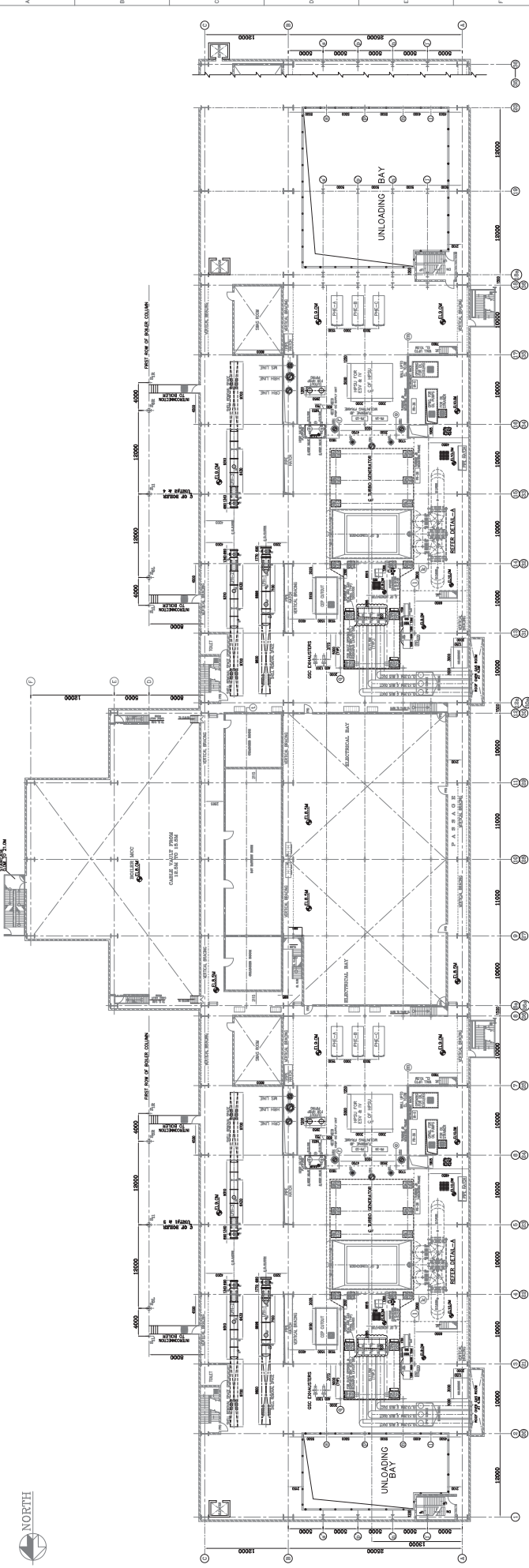
SCALE	NTS	DATE	CHECKED	APPROVED



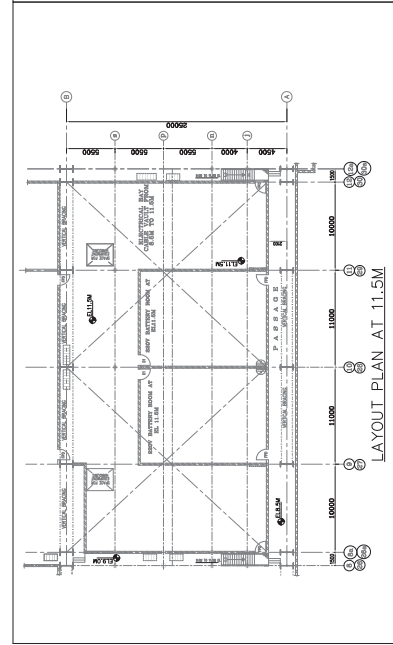
NOTE:-
1.) Flat, platform type RCC / PCC foundation shall be provided for installing CHILLER / PRECESSION AND PACKAGE AC UNIT / AHU / pumps ETC
2.) Bidder shall fix the equipment using proper anchor fastener to secure the equipment and obtain parameter related to vibration and noise.

FOR TENDER ONLY

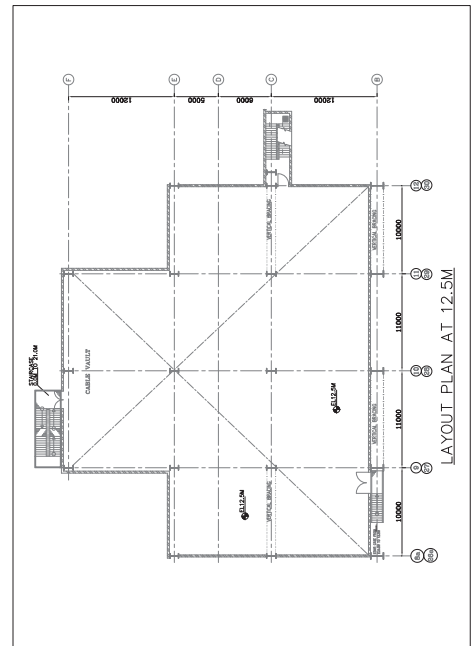
4000-001-119-DC-PP-01 DRAWING



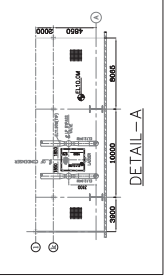
PLAN AT EL. 9.0M



LAYOUT PLAN AT 11.5M



LAYOUT PLAN AT 12.5M



DETAIL-A

- LEGENDS:-**
- CHECKERED PLATE FLOORING
 - REMOVABLE CHECKERED PLATE
 - GRADED FLOORING
 - REMOVABLE GRATING
 - CONCRETE BLOCK
 - OUT OUTS
 - HAND RAILING
 - PARQUET WALL
 - GLASS PARTITION
 - BRICK WALL
- NOTES:-**
- ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
 - ALL ELEVATIONS ARE REFERRED TO FINISH HOUSE FINISHED FLOOR ELEVATION CLM.
 - FOR TO COIL & FLOOR FINISHING REFER CHAL. DRWG. SEPARATELY.
 - ALL DIMENSIONS ARE TO FACE UNLESS SPECIFIED OTHERWISE.
 - ALL DIMENSIONS ARE TO FACE UNLESS SPECIFIED OTHERWISE.
- REFERENCE DRGS:-**
- PE-00-411-100-4003
 - PE-00-411-100-4004
 - PE-00-411-100-4005
 - PE-00-411-100-4007

PROGRESSIVE COPY
25.02.2015

CUSTOMER		TELANGANA STATE POWER GENERATION CO. LTD.	
CUSTOMER'S CONSULTANT		4X270 MW BHADRADRI TPP	
DESIGNER		BHADRADRI TPP	
STATUS		PROJECT ENGINEER	
CONTRACT		T.G. HALL EQUIPMENT LAYOUT PLAN AT MEZZANINE (9.0M) FLOOR	
DATE		25.02.2015	
SCALE		1:50000	
SHEET NO.		PP-DC-411-100-M004	
SHEET 1 OF 1		REV. 01	

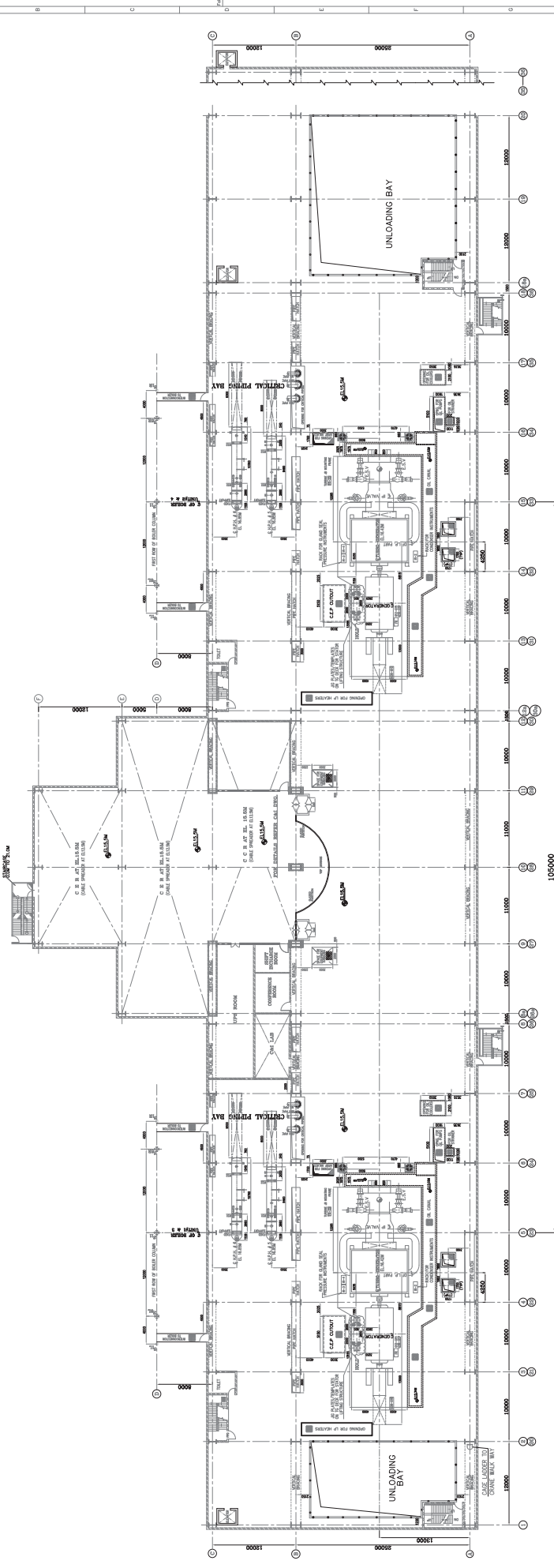


5000-10000-15000-20000-25000-30000-35000-40000-45000-50000-55000-60000-65000-70000-75000-80000-85000-90000-95000-100000

ALL DIMENSIONS ARE IN MM

FIRST FLOOR PROJECTION

NET DIMENSIONS (EXCLUDING)



PLAN AT 15.5M

LEGENDS:-

- CHECKERED PLATE FLOORING
- REMOVABLE CHECKERED PLATE
- GRADED FLOORING
- REMOVABLE GRATING
- CONCRETE BLOCK
- CUT OUTS
- HAND RAILING
- PARQUET WALL
- GLASS PARTITION
- BRICK WALL

NOTES:-

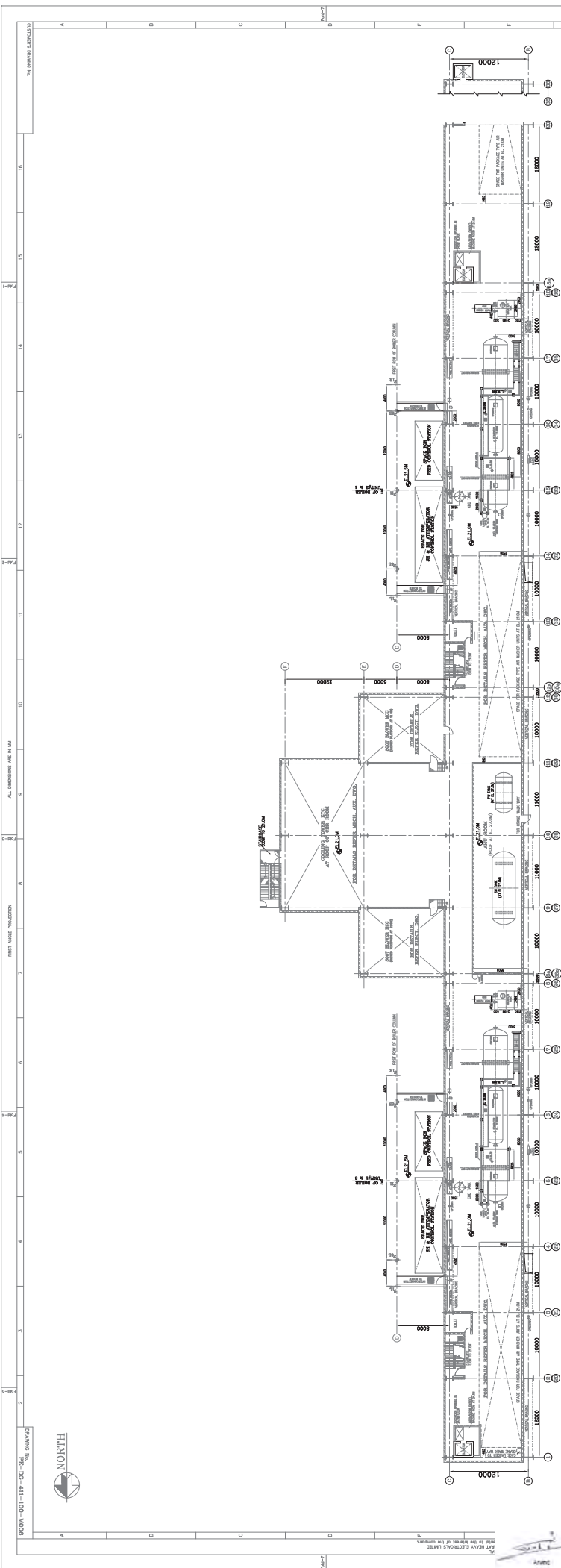
- ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
- ALL ELEVATIONS ARE REFERRED TO FINISH HOUSE FINISHED FLOOR ELEVATION 0.0M.
- FOR TOILETS & BATHS, THE FINISH FLOOR ELEVATION SHOULD BE NOTED.
- FOR TO COIL & FLOOR FINISHING REFER CIVIL DRWG. SEPARATELY.
- ALL CIVIL DETAILS SUCH AS DOORS/WALLS/COLUMNS/ROOFINGS/TOILETS/STAIRCASES ETC. ARE INDICATIVE ONLY & FOR EXACT DETAILS REFER CIVIL/ARCHITECTURE DRAWINGS.

REFERENCE DRGS:-

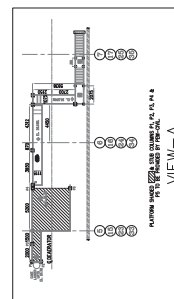
- T.G. HALL EQUIPMENT LAYOUT PLAN AT GROUND FLOOR
- T.G. HALL EQUIPMENT LAYOUT PLAN AT 15.5M FLOOR
- T.G. HALL EQUIPMENT LAYOUT PLAN AT 15.5M FLOOR
- ABOVE OPERATING FLOOR IN BC BAY
- CROSS - SECTION OF T.G. BUILDING

PROGRESSIVE COPY
25.02.2015

CUSTOMER		TELANGANA STATE POWER GENERATION CO. LTD.	
CUSTOMER'S CONSULTANT		4X270 MW BHADRADRI TPP	
DESIGN NO.		BHADRAT TRACT	
STATUS		CONTRACT	
DESCRIPTION		BHADRAT TRACT	
REV	DATE	BY	CHK
1	25.02.2015	SAI	SAI
2	25.02.2015	SAI	SAI
3	25.02.2015	SAI	SAI
4	25.02.2015	SAI	SAI
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7	25.02.2015	SAI	SAI
8	25.02.2015	SAI	SAI
9	25.02.2015	SAI	SAI
10	25.02.2015	SAI	SAI
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23	25.02.2015	SAI	SAI
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44	25.02.2015	SAI	SAI
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66	25.02.2015	SAI	SAI
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90	25.02.2015	SAI	SAI
91	25.02.2015	SAI	SAI
92	25.02.2015	SAI	SAI
93	25.02.2015	SAI	SAI
94	25.02.2015	SAI	SAI
95	25.02.2015	SAI	SAI
96	25.02.2015	SAI	SAI
97	25.02.2015	SAI	SAI
98	25.02.2015	SAI	SAI
99	25.02.2015	SAI	SAI
100	25.02.2015	SAI	SAI



PLAN AT 21.0M



LEGENDS:—

NOTES.—

- REMOVABLE CHEQUERED PLATE FLOORING

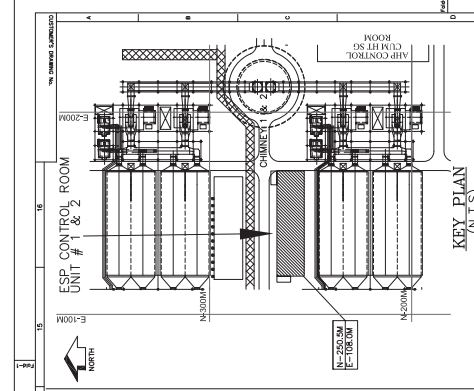
1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATIONS ARE REFERRED TO POWER HOUSE FINISHED GROUND FLOOR ELEVATION UNLESS STATED OTHERWISE.
3. FOR LOADING OF EQUIPMENTS, RESPECTIVE EQUIPMENT DWS. SHOULD BE REFERRED. FOR TO COLA & CUM FRAMING REFER CIVIL Dwg. SEPARATELY.
4. ALL CIVIL DETAILS SUCH AS DOORS/WALLS/CLANDINGS/OPENINGS/TOILETS/STAIRCASES.
5. ALL INNOVATIVE, ONLY & FOR EXACT OFFER, REFER CIVIL ARCHITECTURE DRAWINGS.

REFERENCE DRGS:—

- REFERENCE, DRGS. —**
- | | | |
|----|--|--------------------|
| 1. | T.G. HALL EQUIPMENT LAYOUT PLAN AT GROUND FLOOR | PE-DG-411-100-M003 |
| 2. | T.G. HALL EQUIPMENT LAYOUT PLAN AT MEZZANINE FLOOR | PE-DG-411-100-M004 |
| 3. | T.G. HALL EQUIPMENT LAYOUT PLAN AT OPERATING FLOOR | PE-DG-411-100-M005 |
| 4. | CROSS - SECTION OF T.G. BUILDING | PE-DG-411-100-M007 |

PROGRESSIVE COPY
25.02.2015

CUSTOMER		CUSTOMER'S CONSULTANT		JOB No.		411	
STATUS		CONTRACT		DESIGNATION			
REV	DATE	4/12	QSD	APPD	DATE	4/12	QSD
BY				TO			
							
							
TELANGANA STATE POWER GENERATION CO. LTD. 4X270 MW BHADRADRI TPP BHADRA POWER CORPORATION LTD PROJECT POWER SUPPLY NEW BURL THE T.G. BURL POWER PLANT PROJECT WATER OPERATING PLANT (LOI) IN BG BURL							
W.C.	DATE	1 MAY	1991	SCALE	1:500	DRAWING No.	PP-202-411-00-0008
						SHEET 1 OF 1	
						1:500	



KEY PLAN (N.T.S)

- LEGEND:-**
- CABLE RISERS/CABLE TRAYS
 - CABLE SECTION NUMBER (TYP.)
 - WALL
 - PANEL FRONT
 - LADDER TYPE TRAY
 - PERF. TYPE TRAY
 - NORMAL
 - EMERGENCY
 - VENTILATION DUCT

ESP. DRESS:

1. FLOOR PLAN
2. FLOOR PLAN
3. FLOOR PLAN
4. FLOOR PLAN
5. FLOOR PLAN
6. FLOOR PLAN
7. FLOOR PLAN
8. FLOOR PLAN
9. FLOOR PLAN
10. FLOOR PLAN
11. FLOOR PLAN

NOTES:-

1. ALL ELEVATIONS ARE IN METERS AND DECIMALS IN METERS.
2. THIS DRAWING SHALL BE USED FOR THE INSTALLATION OF ELECTRICAL EQUIPMENT AND CABLE LAYOUT ONLY.
3. CABLE TRAYS & TRAY SUPPORTS INSTALLATION SHALL BE DONE AS PER IEC 60364-5-53 & 5-54.
4. CABLE TRAYS ARE TO BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.
5. ALL CABLES SHALL BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.
6. ALL CABLES SHALL BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.
7. ALL CABLES SHALL BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.
8. ALL CABLES SHALL BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.
9. ALL CABLES SHALL BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.
10. ALL CABLES SHALL BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.
11. ALL CABLES SHALL BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.

ESP. DRESS:

1. FLOOR PLAN
2. FLOOR PLAN
3. FLOOR PLAN
4. FLOOR PLAN
5. FLOOR PLAN
6. FLOOR PLAN
7. FLOOR PLAN
8. FLOOR PLAN
9. FLOOR PLAN
10. FLOOR PLAN
11. FLOOR PLAN

NOTES:-

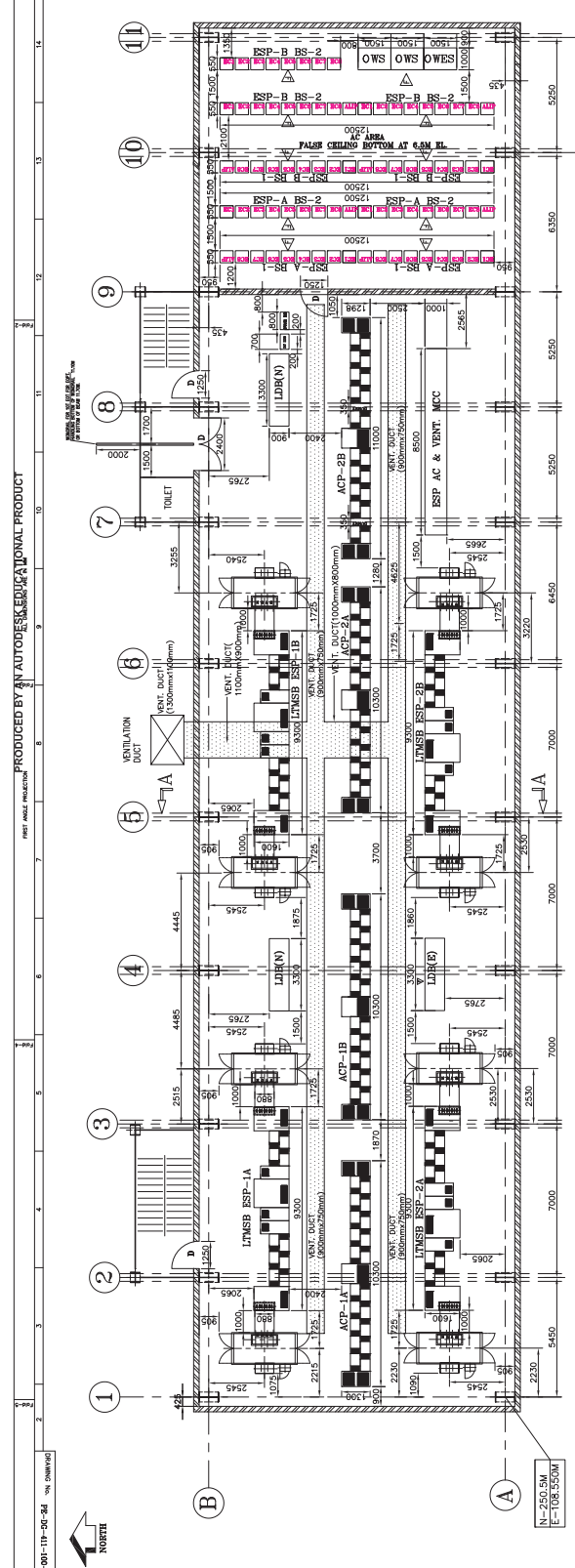
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2. THIS DRAWING SHALL BE USED FOR THE INSTALLATION OF ELECTRICAL EQUIPMENT AND CABLE LAYOUT ONLY.
3. CABLE TRAYS & TRAY SUPPORTS INSTALLATION SHALL BE DONE AS PER IEC 60364-5-53 & 5-54.
4. CABLE TRAYS ARE TO BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.
5. ALL CABLES SHALL BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.
6. ALL CABLES SHALL BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.
7. ALL CABLES SHALL BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.
8. ALL CABLES SHALL BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.
9. ALL CABLES SHALL BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.
10. ALL CABLES SHALL BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.
11. ALL CABLES SHALL BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.

ESP. DRESS:

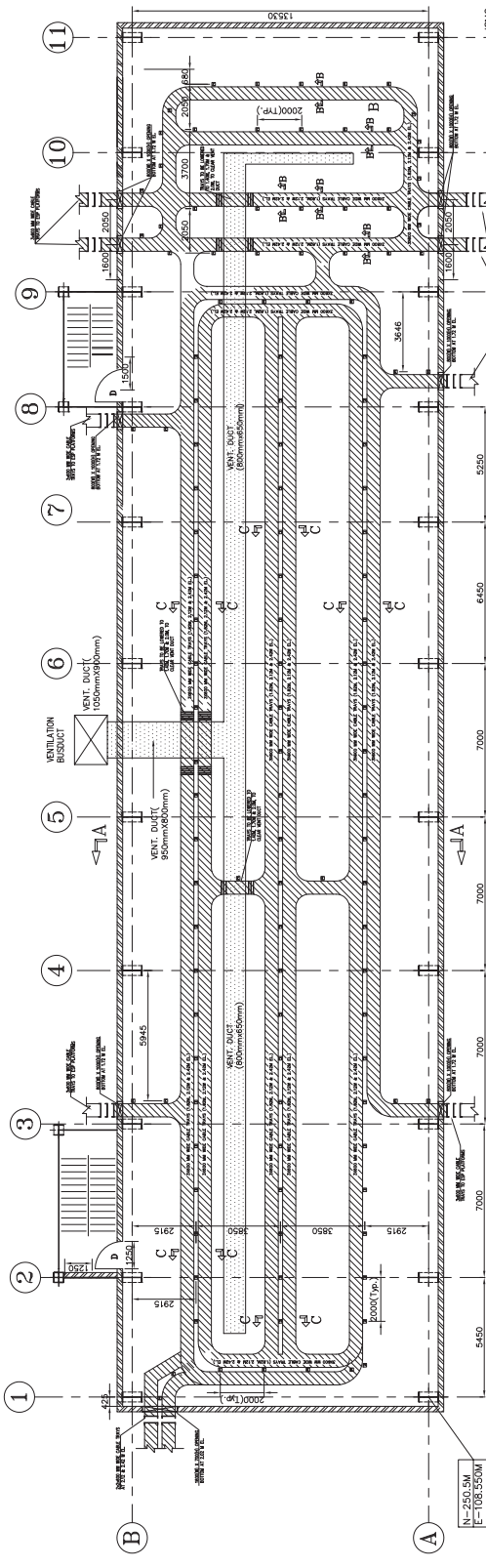
1. FLOOR PLAN
2. FLOOR PLAN
3. FLOOR PLAN
4. FLOOR PLAN
5. FLOOR PLAN
6. FLOOR PLAN
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8. FLOOR PLAN
9. FLOOR PLAN
10. FLOOR PLAN
11. FLOOR PLAN

NOTES:-

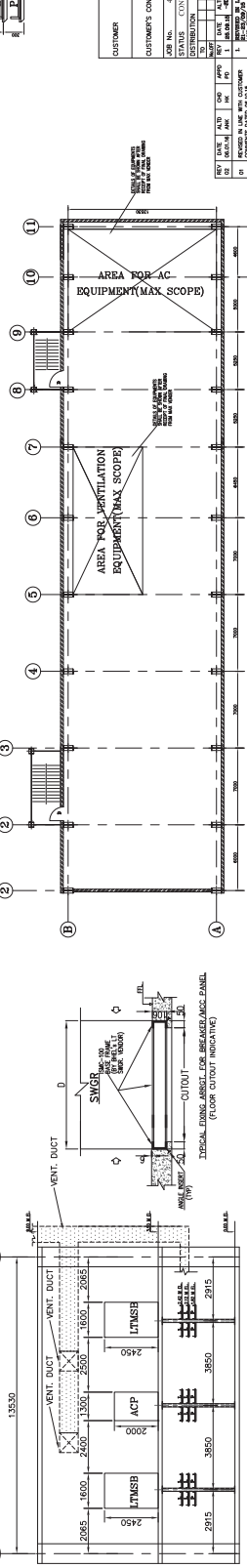
1. ALL ELEVATIONS ARE IN METERS AND DECIMALS IN METERS.
2. THIS DRAWING SHALL BE USED FOR THE INSTALLATION OF ELECTRICAL EQUIPMENT AND CABLE LAYOUT ONLY.
3. CABLE TRAYS & TRAY SUPPORTS INSTALLATION SHALL BE DONE AS PER IEC 60364-5-53 & 5-54.
4. CABLE TRAYS ARE TO BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.
5. ALL CABLES SHALL BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.
6. ALL CABLES SHALL BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.
7. ALL CABLES SHALL BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.
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10. ALL CABLES SHALL BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.
11. ALL CABLES SHALL BE CARRIED OUT AT SITE AS PER SITE REQUIREMENTS.



ESP CONTROL ROOM UNIT # 1 & 2 (PLAN AT 3.50M EL.)



ESP CONTROL ROOM UNIT # 1 & 2 (PLAN AT 0.0M EL.)



SECTION-AA

ESP CONTROL ROOM UNIT # 1 & 2 (PLAN AT 0.0M EL.)



**4X270 MW BHADRADRI TPS
AIRCONDITIONING SYSTEM
STANDARD TECHNICAL SPECIFICATIONS**

SPECIFICATION No: PE-TS-411-553-A001

SECTION : II

REV. 01

DATE: MARCH 2017

SECTION: II
STANDARD TECHNICAL SPECIFICATIONS



**4X270 MW BHADRADRI TPS
AIRCONDITIONING SYSTEM
STANDARD TECHNICAL SPECIFICATIONS**

SPECIFICATION No: PE-TS-411-553-A001

SECTION : II

Sub Section D

REV. 01

DATE: MARCH 2017

SECTION: II
SUB SECTION D
STANDARD TECHNICAL SPECIFICATIONS



**STANDARD TECHNICAL
SPECIFICATION
FOR
CENTRAL AIR-CONDITIONING**

SPECIFICATION NO.PES-553-01

VOLUME II B

SECTION D

REV. 02

DATE: 17.09.2012

SHEET 1 OF 6

**STANDARD TECHNICAL SPECIFICATION
FOR
CENTRAL AIR-CONDITIONING PLANT**

	STANDARD TECHNICAL SPECIFICATION FOR CENTRAL AIR-CONDITIONING	SPECIFICATION NO.PES-553-01	
		VOLUME II B	
		SECTION D	
		REV. 02	DATE: 17.09.2012
		SHEET 2 OF 6	

1.	<u>GENERAL</u>
1.1	This specification covers the design, manufacture, testing at Manufacturer’s works, delivery to site, handling at site, installation, commissioning and carrying out acceptance tests and final painting at site of various equipment of the central air conditioning plant, as specified hereinafter.
2.	<u>CODES & STANDARDS</u>
2.1	The design, manufacture and performance of air conditioning equipment shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment are to be installed. The equipment shall also conform to the latest applicable Indian/British/American standards. Nothing in this specification shall be construed to relieve the tenderer of this responsibility. In particular the equipment shall conform to the latest editions of the following standards.
2.1.1	IS-660 : Safety code for Mechanical Refrigeration.
2.1.2	ARI 520-90 : Standard for Positive Displacement Refrigerant compressors and condensing units.
2.1.3	IS-5111 : Code of Practice of Measurement for Testing Refrigeration compressors.
2.1.4	ASHRAE/23-93 : Method of Testing for Rating Positive Displacement Refrigerant compressors and condensing units.
2.1.5	ARI-450: Standard for water-cooled Refrigerant condensers, Remote Type.
2.1.6	ASME : Unfired pressure Vessels Code. (Section VIII)
2.1.7	IS-2825 : -do-
2.1.8	IS-4503 : Shell and tube type heat exchangers.
2.1.9	ASHRAE/22-92 : Method of Testing for rating of Water Cooled refrigerant condensers.
2.1.10	IS-659 : Safety code for Air conditioning.
2.1.11	IS-2379 : Color Code for Identification of pipe lines.
2.1.12	TEMA : Standards of Tubular Exchanger manufacturers Association.
2.1.13	IS-1239 (Part-I) : Seamless steel tubes (Up to & including 168.2 mm OD.).
2.1.14	IS-3589 : For piping above 168.2mm to 2032mm Outside Diameter.
2.1.15	IS-778 : Valves up to 50 MM.
2.1.16	IS-780 : Valves 50 MM to 300 MM.
2.1.17	ASHRAE 24 : Method of Testing for Rating liquid coolers.

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2.1.18	ARI-480:	Standard for refrigerant cooled liquid coolers-Remote type.
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3.	<u>DESIGN & CONSTRUCTION REQUIREMENTS</u>	
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3.1	The components of Central air conditioning plant comprising compressor, chiller refrigerant piping, valves and fittings etc. Shall be as given in Data sheet A. The type of all accessories, controls and instrumentation shall also be as indicated in data sheet A.	
3.2	The various equipments supplied under this specification shall be fully compatible with each other & capable of operating as fully balanced integrated system to deliver the specified output under design conditions.	

4.	<u>TESTING AND INSPECTION</u>	
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	(Refer standard quality plan)	
4.1	Hydrostatic, Volumetric and refrigerant leak tests etc. shall be carried out at manufacturers works before dispatch of equipment in accordance with the applicable codes and standards.	
	Following minimum tests amongst others shall be conducted.	
4.1.1	Material analysis, testing and identification (Data sheet/ Drg. Shall clearly indicate the specification, grade, class and Heat treatment condition of material for which TC will be furnished)	
4.1.2	Hydrostatic pressure test of all pressure parts.(Testing pressure shall be clearly indicated for each component/ subassembly/ assembly)	
4.1.3	Static and Dynamic balancing test of rotating parts at rated and over speed and to determine vibration & noise level.(Grade of balancing, type- whether dynamic or single plane balancing for components/ subassembly/ assembly shall be clearly indicated in data sheet/ approved drg.. Permissible vibration (velocity and displacement –peak to peak and noise level in dB(A) to be indicated in Data Sheet/Approved Drg.)	
4.1.4	Radiography & magna-flux examination of materials & welds.(Components to be subjected to NDT with applicable, procedures and acceptance norms to be clearly indicated in Data sheet/ approved drg. If in a component only certain areas are to be subjected to NDT same shall be clearly brought out else it will be understood that the entire component is subject to NDT)	
4.1.5	Ultrasonic test of castings & forgings.(Procedure and acceptance norms with areas subject to NDT to be clearly indicated in Quality Plan).	
4.1.6	Performance test including determination of capacity, efficiency & characteristics etc.(Applicable standard, Acceptance norms, Procedure for test (if not covered in applicable standard),performance characteristics with applicable tolerances and drive to be used during shop test to be clearly indicated in Quality Plan). Performance data to be indicated in Approved Drg./ Data Sheet)	

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4.1.7	Functional checks and adjustments of controls & instrumentation. (Functional checks required to be clearly indicated with extent of check and applicable standard in approved check list / Quality plan. Class of instruments / tolerances and performance data to be incorporated in Approved Data Sheet / Drg.)		
4.1.8	Checking of working clearances.(desired working clearances to be indicated in approved Drg.)		
4.1.9	Examination after selective opening up after testing.(basis/ reasons for selective opening up, areas to be examined and parameters to be checked to be brought out in Quality Plan)		
4.2	TESTS AT SITE Tests to prove guaranteed performance of the air conditioning plant, shall also be carried out at site after proper installation. The site test shall include performance testing (as per FQP) of equipment for 72 continuous hours each in all three seasons i.e. Summer, Winter and Monsoon. Unless specified elsewhere. All instruments, tools etc. as may be required to carry out site tests shall be arranged by the tenderer.		
5.	<u>PERFORMANCE GUARANTEE</u>		
5.1	Each equipment of air conditioning system shall be guaranteed for its rated capacity under the specified site conditions.		
5.2	If the shop/site performance tests indicate failure of equipment to meet specified requirement, it would be tenderer's responsibility to carry out required alterations at no extra cost to purchaser. Tests shall be repeated after carrying out the modifications to demonstrate the performance.		
5.3	The air conditioning plant before being taken over by purchaser shall be subjected to running test for a minimum period of one week during which all readings shall be recorded. Any deficiencies noted during this period, shall be rectified by the tenderer /at no extra cost to purchaser. These running tests shall be in addition to the seasonal performance test specified under clause 4.2. The inside design conditions shall be guaranteed throughout the year.		

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6.	<u>DRAWINGS/DOCUMENT/DATA REQUIRED AFTER AWARD OF CONTRACT</u>
6.1	Final version of all drawings & data submitted with the along with technical schedules enclosed in Volume III.
6.2	Drawings including equipment layout, foundation & loading details etc. for civil works for the entire plant. These drawings must cover sufficient details so that design of civil works can be completed.
6.3	Inspection, operation & Maintenance Manuals.
6.4	Manuals for method of testing & calibration of all instruments.
6.5	Equipment description giving complete design calculations, basis of design, selection criteria etc.
6.6	Schematic piping diagrams.
6.7	Layout of piping.
6.8	Electrical drawings.
6.9	Test Certificates.
6.10	Final as built documentation i.e. final-version of all drawings, data & information as per the requirement specified elsewhere.

	STANDARD TECHNICAL SPECIFICATION FOR CENTRAL AIR-CONDITIONING	SPECIFICATION NO.PES-553-01	
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CENTRAL AIR-CONDITIONING PLANT
DATA SHEET - A

VOLUME II-B

SECTION D

REV 00

DATE 17.09.2012

SHEET 1 OF 4

DESCRIPTION

DATA

1. GENERAL

- | | |
|---|---|
| 1.1 Type of AC plant | : Chilled Water Type. |
| 1.2 Plant configuration/capacity. | : Refer to Section-C of Specific Technical Requirements. |
| 1.3 Location of AC plant rooms | : As per Tender drawings. |
| 1.4 Type of lifting facility provided. | : Chain Pulley block with monorail (by BHEL) |
| 1.5 Electrical work scope: - | |
| i) MCC for AC plant | : By Others |
| ii) Power cables / Control cables. | : By Others |
| iii) Drives | : By Bidder. |
| iv) Whether separate alarm/annunciation Panel/control panels required | : Yes (By bidder), Refer to Section-C of Specific Technical Requirements. |
| v) Termination of cabling & earthing at Equipment end. | : By Bidder for bidder supplied equipment. |

2. REFRIGERATION COMPRESSOR

- | | |
|-------------------------------|--|
| 2.1. Type | : SCREW CHILLE |
| 2.2. Nos. (working + standby) | : Refer to Section-C of Specific Technical Requirements. |
| 2.3. Type of capacity control | : Automatic. |
| 2.4. Type of drive | : Direct driven. |
| 2.5. Restart after tripping | : Manual. |
| 2.6. Type of start | : As per manufacturing standard. |
| 2.7. Shaft Seal | : Mechanical shaft seal. |
| 2.8. Purge Recovery unit | : As per manufacturing standard. |
| 2.9. Type of lubrication | : As per manufacturing standard. |
| 2.10. Refrigerant used | : Environment friendly HCFC, (CFC is not acceptable) |



CENTRAL AIR-CONDITIONING PLANT
DATA SHEET - A

VOLUME II-B

SECTION D

REV 00

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SHEET 2 OF 4

3. DESIGN REQUIREMENTS

- 3.1. Minimum capacity at Design conditions : Refer to Section-C of Specific Technical Requirements.
- 3.2. Capacity control : Microprocessor based Control Panel sheet metal panel, located on each Compressor/chiller unit including protection devices
- 3.3. Vibration isolator : Neoprene rubber pads/Equivalent approved to suit chiller package.
- 3.4. Type of foundation : Floating / As per manufacturing standard

4.0 CONDENSER

- 4.1 Type : Horizontal shell & tube type water-cooled
- 4.2 Number required : One no. for each machine.
- 4.3 Design requirements
- 4.3.1 Fluid : Refrigerant (Shell side) Water (tube side)
- 4.3.2 Cooling Water Quantity : To suit requirement.
- 4.3.3 Capacity of condensers : To match compressor & to provide at least 2°C sub cooling.
- 4.3.4 Cooling water inlet temp. : Refer to Section-C of Specific Technical Requirements.
- 4.3.5 Leaving Water Differential. : Refer to Section-C of Specific Technical Requirements.
- 4.3.6 Max. flow velocity through tubes. : 2.5 m/sec.
- 4.3.7 Design fouling factor : 0.0002 (MKS Unit)
- 4.3.8 Maximum pressure drop. : 0.6 Kg/cm² (g)
- 4.3.9 Tube wall Thickness : Not less than 18 SWG
- 4.4 Materials of construction
- i/ Shell : M.S. Plate fusion welded.
- ii/ Tube : Integrally bonded Seamless copper



CENTRAL AIR-CONDITIONING PLANT
DATA SHEET - A

VOLUME II-B

SECTION D

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SHEET 3 OF 4

- iii/ Head ends : Cast Iron.
- iv/ Tube sheet material : Steel
- v/ Baffle plate : Steel.
- 4.5 Accessories required
- i/ Purge & drain connections with valves. : Yes
- ii/ Relief valves : Yes
- iii/ Liquid line shut off valve. : Yes
- iv/ Isolating valves on water side. : Yes
- v/ Flow switch : Yes (interlocked with control of individual refrigeration system)
- vi/ Pressure/temperature gauges at inlet/outlet : Yes
- vii/ Descaling tee : Yes
- viii/Charging valve : Yes
- ix/ MS supporting frame work : Yes
- viii/Cooling thermostat : Yes
- ix/ MS supporting frame work. : Yes
- 5.0 **CHILLER** (Applicable for chilled water type plant only.)
- 5.1 Type : Horizontal shell & tube flooded type
- 5.2 Number required/standby : One no. for each chiller package.
- 5.3 **Design requirements**
- 5.3.1 Fluid to be cooled : Water
- 5.3.2 Water flow rate (Inside tube) : To suit requirement.
- 5.3.3 Water inlet temperature : 12 °C approx.
- 5.3.4 Water outlet temperature : 7 °C approx.
- 5.3.5 Super heating of refrigerant material : By at least 3 deg. C.
- 5.3.6 Insulation /thickness/finish : As per the manufacture standard.
- 5.3.7 Design fouling factor : 0.00010(MKS Unit)



CENTRAL AIR-CONDITIONING PLANT
DATA SHEET - A

VOLUME II-B

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SHEET 4 OF 4

- 5.3.8 Maximum pressure drop. : 0.6 Kg/cm² (g)
- 5.3.9 Tube wall Thickness : Not less than 22 SWG.
- 5.4 Materials of construction
- i/ Shell : M.S. Plate fusion welded.
- ii/ Tube : Integrally Seamless copper (internally Corrugated)
- iii/ Head ends : Cast Iron.
- iv/ Tube sheet material : Steel.
- v/ Baffle plate : Steel.
- 5.5 Accessories required
- i/ Purge & drain : Yes
- ii/ Gate valves at water inlet/outlet. : Yes
- iii/ Flow switch : Yes
- iv/ Pressure/temperature gauges at inlet/outlet : Yes
- v/ Anti-freeze thermostat : Yes
- vi/ Thermostatic expansion valves : Yes
- vii/ Pilot solenoid valve : Yes
- viii/ Cooling thermostat : Yes
- ix/ MS supporting frame work. : Yes

Note :-

The system shall also incorporate:

- 1) Auto operation of chilling plant for operation of the whole AC system.
- 2) A Central Control Panel with fault annunciators with provision for remote extension besides local control kiosks.
- 3) Water Chiller package shall be skid-mounted unit with microprocessor based control panel complete with all accessories and controls are assembled at manufacturing works on single unit.
- 4) Screw chiller shall be suitable for 415V $\pm$ 10 %/50 Hz $\pm$ 3%/3 phase operation with voltage & frequency variation as specified with built in starter etc.
- 5) Only supply feeders shall be provided for chillers.

	TECHNICAL SPECIFICATION AIR HANDLING UNITS		SPECIFICATION NO.PES-553-02	
			VOLUME II B	
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STANDARD TECHNICAL SPECIFICATION
FOR
AIR HANDLING UNITS

	TECHNICAL SPECIFICATION AIR HANDLING UNITS	SPECIFICATION NO.PES-553-02	
		VOLUME II B	
		SECTION D	
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1.

GENERAL

1.1

This specification covers the design, manufacture, Construction features, installation, commissioning, inspection and performance testing at site of AHUs.

2.

CODES AND STANDARDS

2.1

The design manufacture and performance of AHU shall comply with all currently applicable statutes, regulations and safety codes in the locality where the AHU is to be installed. The equipments shall also conform to the requirements of the latest editions of applicable Indian/British/US standards. Nothing in this spec. shall be construed to relieve vendor of this responsibility. In particular the equipment shall conform to the latest editions of the following standards:

2.1.1

IS-659 : Safety code for air conditioning

2.1.2

IS-660 : Safety code for mechanical refrigeration

2.1.3

ASHRAE: Method of testing forced circulation air-cooling and air heating coils.
standard 33

2.1.4

ARI 41 : Standard for forced circulation air cooling and air heating coils.

2.1.5

ARI 430/435 : Air-cooling and air heating coils Central Station AHU / Application
of Central Station AHU.

2.1.6

AMCA : 211 and 311

In case of any conflict in the standards and this specification the decision of PEM,BHEL shall be final and binding.

3.

CONSTRUCTION FEATURES

3.1

The casing of AHU shall be made of insulated double wall construction of min. 24 gauge galvanized sheet steel - IS 277 Gr. 120 (parent sheet: D/DD-IS-513) ribbed and reinforced for structural strength and rigidity with 25 mm thick polyurethane insulation of minimum 40 kg/m³ density in between. The external wall will be pre-plasticised over GI coating on the outside. Angle irons or channel sections made of 16 gauge galvanized sheet steel shall be used for reinforcing. The casing shall be of sectionalized construction with proper sealing at the joints to make them air tight. Fan section and panels with bearing support shall be reinforced with heavy gauge channels (min. 5 mm thick). Suitable number of forged hot dip galvanized (610 gm/sq.m) U brackets shall be provided for AHU suspended from ceiling/roof.

Necessary arrangement shall be provided on the casing for measuring temperature and pressure in cooling/heating coil. Class of instruments shall be min. 2.

3.2

Fan impeller shall be forwardly/backwardly inclined curved blade centrifugal type. Impeller shall be double width double inlet type. Fans shall be preferably low rpm (<=1500) to minimize vibration and noise. Noise shall be within 85 dB(A) at 1 metre distance from AHU casing. Max. Vibration level shall be acceptance and norms to be specified. Two to three wheels (impellers) shall be provided for each AHU. Impeller blades shall be fabricated from (min. 1.0 mm) galvanized/ epoxy powder coated sheet steel. Fan shall be of epoxy powder coated / galvanized sheet steel (min. 1.6