



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

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

ADDENDUM No. 01

DATE: 07.07.2015

SHEET 1 OF 2

4X270 MW BHADRADRI TPS

ADDENDUM No. 01

(TECH SPEC No. PE-TS-411-553-A001 Rev 01)

AIR CONDITIONING SYSTEM



**4X270 MW BHADRADRI TPS
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SPECIFICATION NO. PE-TS-411-553-A001

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SHEET 2 OF 2

ADDENDUM No. 01 TO THE TECHNICAL SPECIFICATION PE-TS-411-553-A001 Rev 01

AMENDMENT TO EXISTING CLAUSES OF THE TECHNICAL SPECIFICATION

S.No	VOLUME	SECTION	CLAUSE	Existing Description	To Be Read As (Amendment)
1.	IIB	C-1-E		Painting specification, stamp running page no. from 128 to 140.	Revised painting specification rev 01 shall be considered as per attached enclosure.
2.	IIB	C	Annexure	Annexure-I "LIST OF MAKES" (stamp running page no. 323 to 326)	Revised Annexure-I "LIST OF MAKES" Rev 01 shall be considered as attached enclosure.
3.	IIB	C-4	14.0	Makes for Electric hoist & Makes of sub-vendor items as applicable for electric hoist (stamp running page no. 313 to 314)	Refer revised Annexure-I "LIST OF MAKES" Rev 01 for make of Electric hoist & revised Makes of sub-vendor items Rev 01 as applicable for electric hoist shall be considered as attached enclosure.
4.	IIB	C-3		PLC specification (stamp running page no. 180 of 446)	Additional technical specification of PLC (in addition to the existing technical specification of PLC system) like Remote I/O, Ethernet Specification, UPS signal IO List etc. shall be considered as per attached enclosure.
5.	IIB	C-3		PLC configuration diagram (stamp running page no. 196 of 446)	Revised PLC configuration diagram rev 01 along with DESCRIPTION OF CONTROL SYSTEMS FOR MECHANICAL AUXILIARY PACKAGE (AC & Ventilation PACKAGE) shall be considered as per attached enclosure.
6.	III	7(I).		PID for main chilled water plant (PE-DG-411-553-A001 R-00), stamp running page no. 437.	Revised PID for main chilled water plant (PE-DG-411-553-A001 R-01) shall be considered as per attached enclosure.

Revised Painting specification (Rev 01) – Section C-1-E of Technical specification no. PE-TS-411-553-A001-Rev 01

Paint Reference Scheme	Surface Preparation Grade / Surface Profile	Primer Coat			Intermediate Coat			Finish Coat			Total DFT in microns
		Premier Paint	No. of Coats	DFT in Microns	Intermediate Paint	No. of Coats	DFT in Microns	Finish Paint (See Note)	No. of Coats	DFT in Microns	
Various type of equipment/ valve, etc. (Temp. up to 90°C)	Degreasing and Mech. Cleaning with wire brushing/hand tool (Sa1/St2/St3 as applicable)	Red Oxide Zinc Phosphate (alkyd Medium)	2	35 per coat				Synthetic enamel (alkyd med.) as per IS:2932	2	35 per coat	140
LP Piping/ structural/ Vessels, etc. (Temp. upto 90°)	- do -	Red Oxide Zinc Phosphate (alkyd Medium)	2	35 per coat				Synthetic enamel (alkyd med.) as per IS:2932	2	35 per coat	140
Equipment with (Temp. upto 250°)	- do -	Heat resistant Al – paint	2	20 per coat	- NA	-	-	Heat resistant Al – paint	2	20 per coat	80
Elect. / Control Panels, etc.	Seven tank process	Red Oxide Zinc Phosphate (alkyd Medium)	2	35 per coat				Synthetic enamel (alkyd med.) as per IS:2932	2	35 per coat	140

Notes

1. Surface preparation shown above is as per Swedish Standards SIS 05-5900. Degreasing will be as per Standard SSPC-SP1.
2. In case of insulated surfaces, only primer coats shall be applied.
3. Gun metal/SS items with piping and G.I. pipes will not be painted. Further SS/GI piping shall be given necessary colour banding for identification as per colour scheme.

4. All instruments shall be painted as per manufacturer standard practice.
5. All structural steel items shall be painted at site. Piping shall go with primer coating & finish paint shall be applied at site. Equipment shall be finish painted at shop.
6. Method of painting application shall be as per paint manufacturer's recommendation.
7. Paint makes - Asian Paints/Berger Paints/Shalimar Paints / Goodlass Nerolac / Addison Paints / Grand Paints / Bombay Paints / Jenson & Nicholson / CDC Carboline / Jotun / Hemple / Akzonoble.



**4X270 MW BHADRADRI TPS
AIR CONDITIONING SYSTEM
LIST OF MAKES OF SUB-VENDOR ITEMS**

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

VOLUME : II B

SECTION- C

REV 01

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**“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	
		VOLUME : II B	
		SECTION- C	
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SI. NO.	ITEM / EQUIPMENT	SUB SUPPLIER	
1	SCREW CHILLER	YORK / TRANE / CARRIER / KIRLOSKAR / DUNHAM BUSH / MCQUAY (DAIKIN) / BLUE STAR / VOLTAS	
2	VAPOUR ABSORBTION MACHINE	VOLTAS / THERMAX	
3	PRECISION PACKAGE UNITS	STULZ / UNIFLAIR / EMERSON / BLUEBOX / CLIMADENTA	
4	PACKAGE UNIT	VOLTAS / BLUE STAR / CARRIER	
5	SPLIT AIR CONDITIONER	VOLTAS / BLUE STAR / CARRIER / HITACHI / 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	
8	CHILLED & CONDENSER WATER PUMP	BEST & CROMPTON / JYOTI / SAM TURBO / KBL / KSB / M&P / VOLTAS / BEACON-WEIR / WORTHINGTON / FLOWMORE / SULZER / BHARAT PUMPS & COMPRESSORS LTD / FLOWSERVE INDIA CONTROL PVT LTD / V-FLOW PUMPS & SYSTEMS CO/ KISHORE PUMP	
9	COOLING TOWER (FRP)	PAHARPUR / MIHIR / PCT / FLOWTECH / BELL	
10	INDUCTION MOTORS (LT)	SIEMENS / ABB / CGL / MARATHON / KEC / BHARAT BIJLEE / NGEF / JYOTI / LHP / BHARAT ELECTRIC	
11	AIR FILTER	PUROLATOR / FMI / ANFILCO / TENACITY / JOHN FOWLER / SPECTRUM / AIR TECH / PUROMATIC	
12	AXIAL FANS / F.A. FANS	FLAKT / KHAITAN / PATEL / NICOTRA / SARLA / KRUGER / MARATHON / C DOCTOR	
13	INSULATION MATERIAL (Fibreglass / EPS/ PUF / Nitrile /EPDM)	BEARDSHELL / K-FLEX / PARAMONT / ARMAFLEX / SUPREME / LLOYDS / UP TWIGA	
14	BALANCING VALVE	ADVANCE	
15	BUTTERFLY VALVE	ADVANCE / AUDCO / FOURESS / 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 (CI)	LEADER / H.SARKAR / FLUID LINE / HI -TECH / CRESENT / A V VALVES / BANKIM & COMPANY / SHIVADURGA / SURYA VALVES AND INSTRUMENT MANUFACTURING / ATAM VALVES / GM DAULI & SONS / KBL / VENUS PUMPS AND ENGINEERING WORKS	
17	GATE / GLOBE VALVES (CI)	CRESENT / BDK / AUDCO / FOURESS / KIRLOSKAR / SANT / BOMBAY METAL & ALLOYS / LEADER / H.SARKAR / FLUID LINE / HI –TECH / A V VALVES / BANKIM & COMPANY / SHIVADURGA / SURYA VALVES AND INSTRUMENT MANUFACTURING / ATAM VALVES / GM DAULI &	

 4X270 MW BHADRADRI TPS AIR CONDITIONING SYSTEM LIST OF MAKES OF SUB-VENDOR ITEMS		SPECIFICATION NO. PE-TS-411-553-A001	
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SI. NO.	ITEM / EQUIPMENT	SUB SUPPLIER	
		SONS / KBL / VENUS PUMPS AND ENGINEERING WORKS	
18	GUN METAL VALVES	LEADER / A V VALVES / ATAM VALVES / VALTECH INDUSTRY / SANT VALVES	
19	FLOAT VALVE	H.SARKAR / LEADER / GM DAULI & SONS	
20	3 WAY MIXING VALVE WITH ACTUATING MOTOR	SIEMENS BUILDING TECHNOLOGY /JOHNSON / BELIMO / HONEYWELL / RAPID CONTROL / ALC	
21	MOTORIZED BUTTERFLY VALVE	ANERGY / ADVANCE / BELIMO / JOHNSON / HONEYWELL / SIEMENS/ LEADER / H.SARKAR / FLUID LINE / A V VALVES / BANKIM & COMPANY / SURYA VALVES AND INSTRUMENT MANUFACTURING / ATAM VALVES / GM DAULI & SONS / KBL / VENUS PUMPS AND ENGINEERING WORKS	
22	ACTUATOR FOR MOTORIZED BUTTERFLY VALVE	SIEMENS BUILDING TECHNOLOGY /JOHNSON / BELIMO / HONEYWELL / RAPID CONTROL / ALC / AUMA / LIMITORQUE	
23	Y / POT STRAINER	MULTITEX / GREAVES COTTON / JAYPEE / SANT / OTOKLIN / GRAND PRIX / GUJARAT OTOLIFT / DS ENGG / SAROJINI ENTERPRISE / BHATIA ENGINEERING / FILTERATION ENGINEERS INDIA PVT LTD / SUNGOV ENGINEERING/ OTOKLIN GLOBAL BUSINESS LTD	
24	PIPING - ERW	SURYA ROSHNI / TISCO / DADU PIPES / INDUS TUBE / WELSPUN / TATA TUBES / BST / JINDAL / SAIL / PSL / LALIT PROFILE / SAMSHI PIPE INDUSTRIES / 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	
25	PIPING – CS SEAMLESS (ASTM A 106)	ISMT / MAHARASHTRA SEAMLESS	
26	SS PIPES (FOR SMALL QUANTITY 500M)	REMI / RATNAMANI / APEX TUBES / CHOKSI	
27	GI SHEETS FOR DUCTING	TISCO / INDIAN IRON & STEEL CO LTD. / RASHITRYA ISPAT NIGAM LTD. / ESSAR/ ISPAT INDUSTRIES / JSW STEEL / LLOYDS STEEL / BHUSHAN / TATA / SAIL / JINDAL	
28	FIRE DAMPER	TSC / CARRYAIRE / RAVISTAR (SYSTEM AIR)	
29	GRILL/DIFFUSER/VOLUME CONTROL DAMPER	AIR FLOW/ TSC /AIR MASTER/ CARYAIRE/RAVI STAR (SYSTEM AIR)	
30	STRIP HEATER	ESCORTS / RACOLD / DASPASS/ ALCO/ HEATCO / HOTSET	
31	PAN HUMIDIFIER	RAPID COOL/ HOTSET /ALCO	
32	RELIEF / PURGE VALVE	BRASSOMATIC	
33	THERMOSTATS	HONEYWELL / RANCO / PENN / DANFOSS / INDFOSS / JHONSON CONTROL/RANUTROL	
34	HUMID STAT	JHONSON CONTROL / HONEYWELL / PENN	
35	ANTI FREEZE THERMOSTAT	RANCO / HONEYWELL / PENN / DANFOSS / INDFOSS	
36	PRESSURE GAUGE / DP GAUGE	GENERAL INST CONSORTIUM / BELL / H.GURU INST/ H GURU / WAAREE INSTRUMENTS / FORBES MARSHALL / MANOMETER / A.N. INST / GAUGES BOURDON / GLUCK / WIKA / ASHCROFT / BAUMER TECHNOLOGIES	

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SI. NO.	ITEM / EQUIPMENT	SUB SUPPLIER	
37	TEMPERATURE GAUGE	H.GURU IND/ H.GURU INST/ FORBES MARSHALL/DETRIVE INST & ELECTRONICS / PYRO ELECTRIC /TOSHNIWAL BROSS / WAREE INSTRUMENTS / A.N.INST / GOA INSTRUMENTS / WIKA / ASHCROFT / H GURU (SI) / BUDENBERG GUAGE CO.LTD./ GOA THERMOSTATIC INSTRUMENTS PVT.LTD./ GAUGE BOURDON INDIA PVT. LTD/ Baumer Technologies India Pvt. Ltd.	
38	LEVEL GAUGE	GENERAL INSTRUMENTS / CHEMTROLS / SBEM, PUNE/ AUTOMAT MUMBAI /SIGMA / TOSHNIWAL / TECHNOMATIC / TELACO /LEVCON / D K INSTRUMENTS / PUNE TECHTROL / FLOW STAR	
39	PRESSURE SWITCH / DP SWITCHES	BELLS / DANFOSS / DK INSTRUMENTS/ DRESSER / SOR INC / VASU / SWITZER / INDFOSS / TRAFAG / GIC / ASHCROFT / DELTA CONTROL	
40	TEMPERATURE SWITCH	INDFOSS/ SEIMENS / DANFOSS/ DK INSTRUMENTS/ SOR INC / VASU / DRESSER / TOSHNIWAL / SWITZER	
41	FLOW SWITCH	SWITZER / LEVCON / DK INSTRUMENT / SBEM / V. AUTOMATE/ SIEMENS	
42	LEVEL SWITCH	SBEM / BLISS ANAND / HI TECH / RAMAN INST / SIGMA / SOR INC / WAREE INST / LEVCON / DK INSTURMENT / V ATUOMATE /CHEMTROLS / SIMENS / FLOW STAR / TRAC	
43	LEVEL INDICATOR	SBEM / SIGMA / LEVCON / DK INSTURMENT / V ATUOMATE / FLOW STAR / SCIENTIFIC DEVICES / GAUGES BOURDON / PNE TECHTROL	
44	TRANSMITTERS	EMERSON / LAXONS AUTOMATION / YIL / TAYLOR / ABB / BRISTOL BABCOCK / BIRLA KENT TAYLOR / BLISS ANAND / SBEM / SMART INST / V AUTOMATION & INST / FISHER-ROSEMOUNT / SIEMENS/ HONEYWELL / YOKOGAWA / FUJI / Endress + Hauser (India) Pvt. Ltd. / Moore Industries International Inc. / NIVO CONTROLS PVT. LTD. / Pune Techtrol Pvt. Ltd./ SIEMENS LIMITED / TOSHNIWAL /	
45	SIGHT FLOW INDICATORS	SIGMA / LEVCON /V AUTOMAT / TELLACE /EUREKA / TATA HONEYWELL/BLISS	
46	FLOW ELEMENT	BRISTOL BABCOCK / BALIGA /LIGHTING EQUIP /ENGINEERING SPECIALITIES /IL / MINCO/ MICRO PRECISION / STAR MECH	
47	TEMPERATURE ELEMENT	GENERAL INST CONSORTIUM/ PYRO ELECTRIC /WAAREE INSTRUMENTS/ DETRIVE INST & ELECTRONICS / TOSHNIWAL	
48	FLOW METER	EUREKA / INSTRUMENTATION ENGINEERS PVT LTD / PLACKA /TRAC / FLOW STAR/ SCIENTIFIC DEVICE	
49	RH SENSOR/TEMP SENSOR	HONEY WELL /JOHNSON /SIEMENS / GENERAL INSTRUMENTS	
50	PLC BASED PANEL	SIEMENS / SCHENIEDER / ROCKWELL / GE INTELLIGENT / HONEYWELL AUTOMATION / ABB	
51	OWS / PC	HP / COMPAQ / DELL / HCL / IBM / LENOVO	
52	PRINTER	HP / CANON / EPSON / XEROX / IBM / LEXMARK	
53	UPS	HITACHI-HIREL / APC / DELTA / EMERSON / DB POWER / APLAB	
54	FIBRE OPTIC CABLE	BIRLA ERICSON / FINOLEX / AKSH FIBRE	
55	ANNUNCIATOR FOR PANEL	ICC / PECON/ PROCON	
56	LT ADAPTER BOX FOR AL TO CU CABLE CONVERTOR	CONTROL DEVICE / SYSTEM POWER CONTROL / JACKSON / UNILEC / ELECTRIC ALLIED PRODUCT	
57	METERING PUMP	SHAPO TOOLS / VK PUMPS	

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SI. NO.	ITEM / EQUIPMENT	SUB SUPPLIER	
58	WATER SOFTENING PLANT	THERMAX / ION EXCHANGE / DOSI ION	
59	PRESSURE TRANSMITTER	ABB / ENDRESS + HAUSER (INDIA) / MOORE / SIEMENS / SMART INSTRUMENT BRAZIL / SBEM / TOSHNIWAL / V. AUTOMAT / EMERSON / YOKOGAWA / HONEYWELL / FUJI	
60	TEMPERATURE TRANSMITTER	ABB / ENDRESS + HAUSER (INDIA) / MOORE / SIEMENS / SMART INSTRUMENT BRAZIL / SBEM / TOSHNIWAL / V. AUTOMAT / EMERSON / YOKOGAWA / HONEYWELL	
61	ROTAMETER	CHEMTROLS SAMIL / EUREKA IND / TRANSDUCERS AND CONTROL / Flow Star Engineering Pvt. Ltd. / FLOWTECH INSTRUMENTS SERVICRS / INSTRUMENTATION ENGINEERS PVT LTD / SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	
62	BATTERY CHARGER	AMARARAJA/ CHHABI ELECTRICAL / DUBAS ENGG. / HBL POWER SYSTEM / STATCON / CALDYNE	
63	BATTERY (NI -Cd)	HBL POWER / AMCO SAFT / SAFT	
64	BATTERY (Maintenance free for PLC)	EXIDE / HBL POWER / AMARAJA /	
65	JUNCTION BOX	AJMERA INDUSTRIAL & ENGINEERING WORKS / FLEXPOR ELECTRICALS PVT. LTD. / K.S.INSTRUMENTS PVT.LTD./ SUCHITRA INDUSTRIES / Shrenik & Company,	
66	STEAM TRAP	LEADER VALVES LTD./ PENNANT ENGINEERING PVT. LTD. / FORBES MARSHALL STEAM SYSTEM PVT. LTD.	
67	INSTRUMENT FITTINGS	AURA INCORPORATED / Astec Valves & Fittings Pvt. Ltd., / Arya Crafts & Engineering Pvt. Ltd./ Comfit & Valve Pvt. Ltd./ FLUIDFIT ENGINEERS PVT. LTD / Fluid Controls Pvt. Ltd./ HP VALVES & FITTINGS INDIA PVT. LTD. / PRECISION ENGINEERING INDUSTRIES / Panam Engineers, / Perfect Instrumentation Control (India) Pvt. Ltd. / VIKAS INDUSTRIAL PRODUCTS	
68	PAINT	Asian Paints (I) Ltd./ Berger Paints India Ltd /Goodlass Nerolac/Jenson & Nicholson (I) Ltd /CDC carboline (I) Ltd. /Shalimar Paints Ltd. /Addison Paints Ltd/Grand Polycoat/Bombay Paints/Hemple Paints (Singapore)/ Jotun Paints	
69	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./ ARMSEL MHE Pvt. Ltd/ TUOBRO FURGUSON (INDIA) PVT LTD/ MEEKA MACHINERY PVT. LTD./ TECHNO INDUSTRIES.	
NOTE: ABOVE SUB-VENDORS ARE SUBJECTED TO CUSTOMER APPROVAL DURING DETAILED ENGINEERING WITHOUT ANY COST AND TIME IMPLICATION.			

Revised Make of sub-vendor items as applicable to electric hoist (Rev 01) – Section C-4 of Technical specification no. PE-TS-411-553-A001-Rev 01

MAKES OF SUB-VENDOR ITEMS AS APPLICABLE FOR ELECTRIC HOISTS

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)	
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.,	
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	
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.			

Additional technical specification of PLC (in addition to the existing technical specification of PLC system) like Remote I/O, Ethernet Specification, UPS signal IO List etc.

Remote I/O

Remote I/O panels shall be provided with pushbuttons, indicating lamps and hardwired annunciation system for local control/ operations.

Ethernet Specification

Networking (LAN) components:

Networking (LAN) components including switches, Firewall, fibre optics cable, other cable as required, jack panel with wire manager, patch cord, coupler, rack with all accessories, connectors, port, etc. shall be supplied.

A) The Industrial graded, IEC 61850-3 Std compliant, Managed Ethernet Switches shall meet following minimum requirements:

- i) 48 X Gigabit Ethernet Port
- ii) 24 or 48 x 10/100/1000 Base TX ports (STP)
- iii) SNMP, RMON, VOIP, VLAN, Multi link Trunk support
- iv) Broadcast/multicast storm control
- v) Supervisor Engine redundancy capability
- vi) Redundant Power Supply
- vii) Extra expansion slots for future up gradation.
- viii) Integrated Security features (IPS, ACL, Firewall)
- ix) 10 GB module support for future upgradeability

Expandability/stackability through a dedicated high speed expansion port.

Routable, remotely manageable, configurable.

One intelligent SNMP manageable mini-UPS for 30 minutes backup shall be provided with all accessories and software.

B) Secondary switches shall have the following features:

- i) 24 or 48 X 10/100/1000 Base TX ports (STP)
- ii) 2 or 4 X Gigabit Ethernet Port
- iii) SNMP, RMON, VOIP, VLAN, Multi link Trunk support.
- iv) Support for stacking with high throughput
- v) Broadcast/multicast storm control

C) The Firewall shall meet following minimum requirements:

Firewall appliance shall facilitate multi-vendor, multi-application environment and shall support third-party products on open alliance. It shall support Active-Active configuration.

i) The firewall shall contain following features:

- a) Stateful inspection of packets.
- b) NAT functionality, including dynamic and static NAT translations
- c) Latest version of SNMP

ii) The firewall must send log information to a separate log server via an encrypted connection. Firewall logging must not impact firewall performance.

iii) Remote network access to the firewall shall only be possible through the administration interface.

iv) The firewall administration station must be capable of pushing firewall security policies and configurations to individual or multiple firewalls through a secure, encrypted connection to the firewall administration interfaces.

v) Graphical User Interface (GUI) and a Command Line Interface (CLI) for making changes to the firewall rules set shall be provided. (Access to the firewalls via the GUI or the CLI must be through an secure encrypted channel).

vi) Any changes or commands issued by an authenticated user shall be logged to a database configured on any of the machines in the LAN. The administration station must allow for a hierarchical architecture for rules set administration and viewing of firewall configurations Management.

vii) The firewall must not support any unencrypted means of access to the firewall.

viii) It shall Monitor ALL network traffic-traffic at Firewalls (Internet and external networks), in the DMZ and detect known threat through deep packet inspection.

ix) Detects unknown threats via anomaly scanning.

x) Detect unknown threats via behavior pattern to protect from zero day attacks.

xi) Keeps up-to-date on new threats and vulnerabilities.

D) Intrusion Detection System (IDS) and Intrusion Prevention System (IPS)
Features:

In order to inspect all inbound and outbound network activity and identify suspicious patterns that may indicate a network or system attack from someone attempting to break into or compromise a system on the Station LAN Network, the recommended IDS/IPS shall contain the following combined features. Any feature can be selected depending on whether it is to be configured as IPS or IDS.

i) Able to analyze, detect and report on security related events.

ii) Able to inspect traffic and to drop malicious traffic based on the configuration of security policy.

iii) Able to inspect the content of network packets for unique sequences/signatures.

iv) Able to detect and prevent known types of attacks such as worm or Trojan infections and hacks.

- v) Able to prevent denial of service (DOS) and Distributed Denial of Service attacks.
- vi) Able to prevent abnormal behaviors by monitoring and learning normal network behaviors.
- vii) Keeps up-to-date on new threats and vulnerabilities.
- viii) Shall provide user friendly interface to queries and reports on threats and event data so that security administrators can gain a better understanding of their ability to protect their network.
- ix) Shall provide detailed activity logs for auditing.
- x) Able to detect known threats via deep-packet inspection.
- xi) Able to detect unknown threats via anomaly scanning.
- xii) Able to detect unknown threats via behavior pattern to protect from zero day attacks.

UPS signal IO List

The following minimum hardwire/software signal shall be provided between UPS and PLC. These analog & digital signals shall be updated in HMI MIMICS.

- a. Main I/P 1, 2 alternate I/P voltage, currents.
- b. After line transformer -1&2 voltages
- c. DC O/P VOLTAGE, current and battery charging , discharging currents,
- d. Inverter o/p voltage, current.
- e. Static switch main I/P, alternate i/p voltage.
- f. SCVS O/P VOLTAGE, CURRENT, HZ
- g. UPS-1 & 2 –KVA, KW o/ps
- h. ACDB -1&2 VOLTAGE, CURRENT
- i. UPS-1,2 –POWER FACTOR

Revised PLC configuration diagram rev 01 along with DESCRIPTION OF CONTROL SYSTEMS FOR
MECHANICAL AUXILIARY PACKAGE (AC & Ventilation PACKAGE)

TELANGANA STATE POWER GENERATION CORPORATION LTD
4x270 MW BHADRADRI THERMAL POWER STATION

CONTROL SYSTEM FOR MECHANICAL AUXILIARY PACKAGES

PROJECT:		BHADRADRI TPS, UNITS # 1 TO 4 (4X270 MW), MANUGURU, KHAMMAM DISTRICT					
CUSTOMER:		 TELANGANA STATE POWER GENERATION CORPORATION LTD					
OWNER'S CONSULTANT:		 DESEIN PRIVATE LIMITED					
 BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA							
COPY RIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED it must not be used directly or indirectly in any way detrimental to the interest of the company.		DEPT CODE	NAME	SIGN	DATE		
		DRN	RINKY	~sd~	23.04.15		
		DESN	SS	~sd~	23.04.15		
		CHD	SSB	~sd~	23.04.15		
		APPD	MAM	~sd~	23.04.15		
REV. 01	DATED. 05.06.15	DRWN RINKY	DESN SS	CHD SSB	APPD MAM	TITLE CONTROL SYSTEM FOR MECHANICAL AUXILIARY PACKAGES	
THE DOCUMENT IS REVISED IN LINE WITH THE i) CONSULTANT LETTER NO. 16, DTD 28/04/15. ii) CUSTOMER COMMENTS DTD 18/05/15.						DEPT.	SCALE
						SIGN	
		DRAWING NO. PE--DM-411-145-1900		SHEET 1 OF 11		REV. 01	

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4 X 270 MW BHADRADRI TPS

**DRG.
No.**

PE-DM-411-145-I900

TITLE:-

INDEX

**REV.
No.**

01

DATE

05.06.2015

SHEET

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OF

11



DOCUMENT TITLE

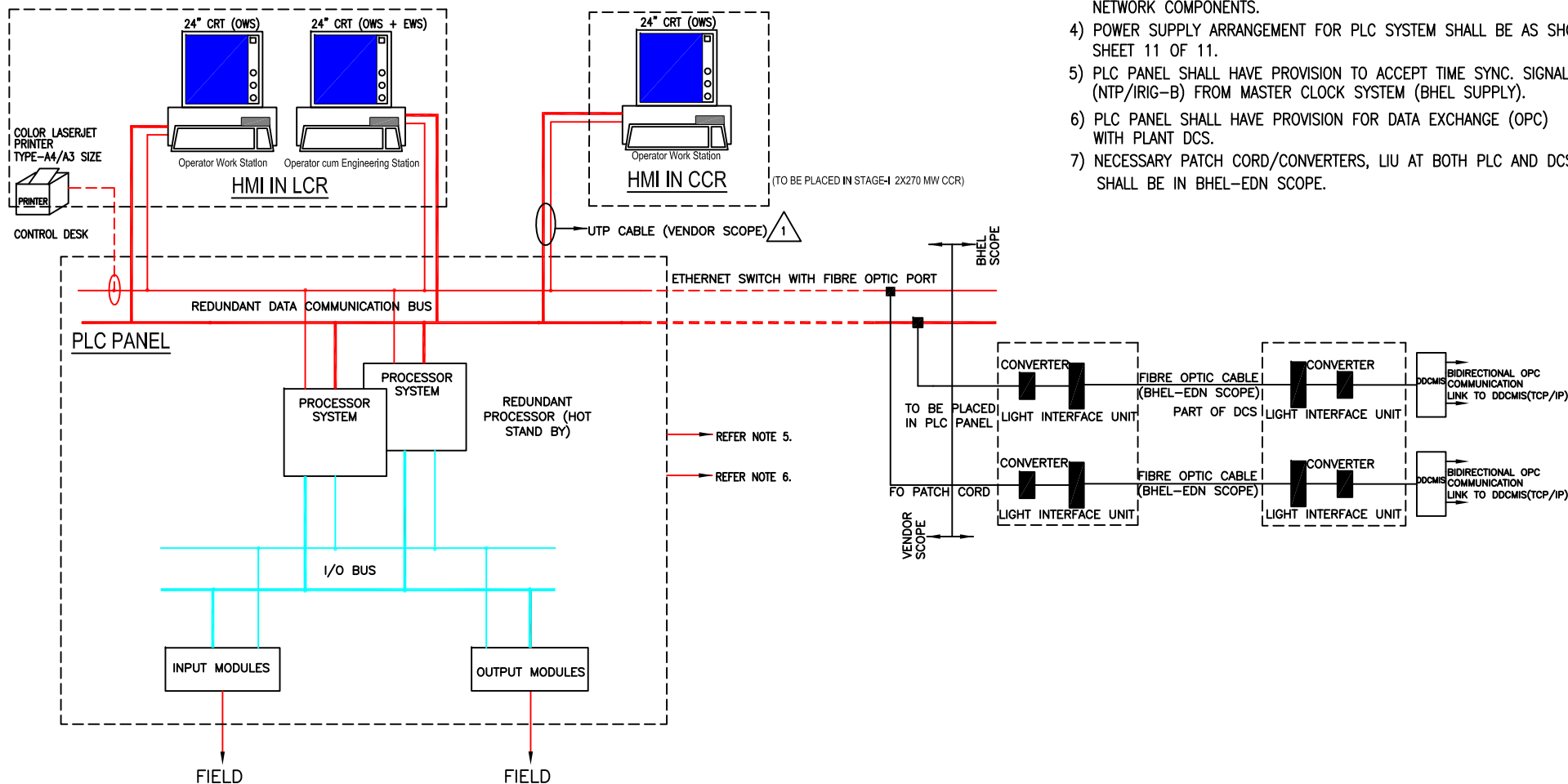
DOCUMENT **PE-DM-411-145-I900**
NUMBER**CONTROL SYSTEMS FOR MECHANICAL
AUXILIARY SYSTEM**REVISION 01 DATE : 05.06.15
NUMBER**4 X 270 MW BHADRADRI TPS,**

SHEET 3 OF 11

DESCRIPTION OF CONTROL SYSTEMS FOR MECHANICAL AUXILIARY PACKAGE

1. This document covers control system matrix of different Mechanical Auxiliary packages (Supplied / Engineered by BHEL PEM), PLC System Configuration diagram and power supply arrangement for PLC based control system.
2. The Mechanical Auxiliary packages in terms of control location, type of control system (PLC/DCS/Relay/Microprocessor), communication with main plant DCS, time sync etc., shall be as per page 4 of 11.
3. Package specific PLC system configuration diagram are shown on page nos. 5 -10.
4. Soft link shall be provided for communication between plant DCS and PLC system. Soft link shall be redundant and OPC compliant over fibre optic link.
5. All PLC based system shall be time synchronized with plant Master clock system using IRIG-B signals.
6. PLC based control system shall be powered through dedicated UPS except for PLC/RIO/RPU placed in the TG building. The UPS configuration shall be as per page 11 of 11.
7. The operating philosophy, interlock & protection for each package shall be provided separately in design memoranda / detailed write-up of the respective package.
8. Wherever DCS is mentioned, it shall be read as DCS/DDCMIS.

CONTROL PHILOSOPHY FOR MECHANICAL AUXILIARY PACKAGES FOR 4 X 270 MW BHADRADRI PROJECT															
Sl. No.	System / Package	PER UNIT /COMMON	Control System Scope	Control System		Operation from		Type of interface with main plant DCS		Communication			Time Sync Format	HMI REQUIREMENT	Remarks
				Type	Location	Local	Remote (CCR)	Link	Purpose	Cable Type	Redundant (Y/N)	Protocol			
1	AC SYSTEM & VENTILLATION	COMMON	VENDOR	PLC (COMMON FOR AC & Ventilation System)	NEAR AC PLANT ROOM	Y	N	SOFT	MONITORING	FO	Y	OPC	IRIG-B	1OWS+ 1EOWS in local control room, 1 OWS in main CCR i.e. in Stage-I(2 X270 MW) CCR	REFER SHEET 5 OF 11
2	EFFLUENT TREATMENT PLANT	COMMON	VENDOR	PLC (WITH RIO)	INSIDE ETP AREA	Y	N	SOFT	MONITORING	FO	Y	OPC	IRIG-B	Mimic based LCP in local control room, 1 OWS+EOWS in local control room	REFER SHEET 6 OF 11
3	SEWAGE TREATMENT PLANT	COMMON	VENDOR	PLC (WITH RIO)	STP AREA	Y	N	SOFT	MONITORING	FO	Y	OPC	IRIG-B	1 OWS+EOWS in local control room	REFER SHEET 7 OF 11
4	PRE TREATMENT PLANT	COMMON	VENDOR	PLC	PT PLANT AREA	Y	N	SOFT	MONITORING	FO	Y	OPC	IRIG-B	1 OWS+EOWS in local control room	REFER SHEET 8 OF 11
5	CW CHLORINATION PLANT	COMMON (FOR 2 UNITS)	VENDOR	PLC	NEAR PLANT AREA	Y	N	SOFT	MONITORING	FO	Y	OPC	IRIG-B	Mimic based LCP, 1 OWS+1 EOWS in local control room	REFER SHEET 9 OF 11
6	DM PLANT	COMMON	VENDOR	PLC based	DM PLANT BUILDING	Y	N	SOFT	MONITORING	FO	Y	OPC	IRIG-B	Mimic based LCP, 2 OWS+1 EOWS in local control room, 2 LVS+ 1 DISPLAY CONTROLLER	REFER SHEET 10 OF 11
7	CW TREATMENT PLANT	COMMON (FOR 2 UNITS)	EDN	DDCMIS	CWPH	Y	Y	-	-	-	-	-	-	2 OWS	
8	SELF CLEANING STRAINER	UNIT	EDN	DDCMIS	CCR	N	Y	-	-	-	-	-	-		
9	COLTCS	UNIT	EDN	DDCMIS	CCR	N	Y	-	-	-	-	-	-		
10	CW & ACW SYSTEM	COMMON (FOR 2 UNITS)	EDN	DDCMIS	CCR	N	Y	-	-	-	-	-	-	RIO panel in local control room+OWS in LCR	
11	DMCW SYSTEM	UNIT	EDN	DDCMIS	CCR	N	Y	-	-	-	-	-	-		
12	CT %, HOT WELL MAKE UP PUMPS 3X50%, BOILER FILL PUMPS 2X100%	COMMON	EDN	DDCMIS	CCR	N	Y	-	-	-	-	-	-		
13	CW MAKE UP PUMPS	COMMON	EDN	DDCMIS	CCR	N	Y	-	-	-	-	-	-		
14	COMPRESSED AIR SYSTEM	COMMON	VENDOR	MICROPROCESSOR BASED + DCS	SKID MOUNTED + CCR	Y	Y	HARD	MONITORING	-	-	-	-	Start /Stop, loading unloading shall be implemented in DCS.	Loose Microcontroller shall be provided.
15	HP/LP CHEMICAL DOSING SYSTEM	UNIT	EDN	DDCMIS	CCR	LCP	Y	-	-	-	-	-	-	Local start/Stop facility to be provided.Hardwired to DDCMIS	
16	Misc Pumps (SWP 2X100%, APHWP 2X100%,CHP 2X100%, AHP 3X50%, HVAC 3X50%, AHP Seal 2X100%, Pot WTR Plant 2X100%, Pot Wtr Colony 2X100%)	COMMON	EDN	DDCMIS	CCR	N	Y	-	-	-	-	-	-		
17	FUEL OIL HANDLING & STORAGE SYSTEM	COMMON	EDN	DDCMIS	FOPH	Y	Y	-	-	-	-	-	-	Local Control Panel is provided near HFO unloading area with controls in DCS. OWS & EWS shall be provided along with FOCP panel located in FO pressurizing pump house.	
18	MILL REJECT HANDLING SYSTEM	UNIT	EDN	DDCMIS	CCR + LCP	Y	Y	-	-	-	-	-	-	1 OWS	LCP located near each mill for Local Operation with Controls at DDCMIS.
19	Sump Pump			Relay baesd Local Starter Box		YES	NO								
20	RAW WATER PUMPS	STAND ALONE DCS													
21	CHP	REFER BHEL ISG (BANGALORE) DOCUMENT													
22	AHP	REFER BHEL ISG (BANGALORE) DOCUMENT													
23	FIRE DETECTION SYSTEM & FIRE WATER PUMPS	REFER BHEL HYDERABAD DOCUMENT													



NOTES:

- 1) TABLE TOP OWS/EWS SHALL BE 24" OR AVAILABLE INDUSTRY STANDARD.
- 2) PLC SYSTEM SHALL HAVE REDUNDANCY IN PROCESSOR, POWER SUPPLY AND COMMUNICATION SYSTEM.
- 3) UPS POWER SUPPLY SHALL BE USED FOR PLC PANEL(S), OWS/EWS AND NETWORK COMPONENTS.
- 4) POWER SUPPLY ARRANGEMENT FOR PLC SYSTEM SHALL BE AS SHOWN ON SHEET 11 OF 11.
- 5) PLC PANEL SHALL HAVE PROVISION TO ACCEPT TIME SYNC. SIGNAL (NTP/IRIG-B) FROM MASTER CLOCK SYSTEM (BHEL SUPPLY).
- 6) PLC PANEL SHALL HAVE PROVISION FOR DATA EXCHANGE (OPC) WITH PLANT DCS.
- 7) NECESSARY PATCH CORD/CONVERTERS, LIU AT BOTH PLC AND DCS END SHALL BE IN BHEL-EDN SCOPE.

LEGEND: -

PLC	- PROGRAMMABLE LOGIC CONTROLLER
DCS	- DISTRIBUTED CONTROL SYSTEM
UPS	- UNINTERRUPTED POWER SUPPLY
OWS/EWS	- OPERATOR WORK STATION/ ENGINEERING WORK STATION
HMI	- HUMAN MACHINE INTERFACE
NTP	- NETWORK TIME PROTOCOL
OPC	- OLE PROCESS CONTROL
MCCB	- MOULDED CASE CIRCUIT BREAKER
MCB	- MINIATURE CIRCUIT BREAKER
LCR	- LOCAL CONTROL ROOM
CCR	- COMMON CONTROL ROOM



PROJECT:

4X270 MW BHADRADRI TPS

TITLE:

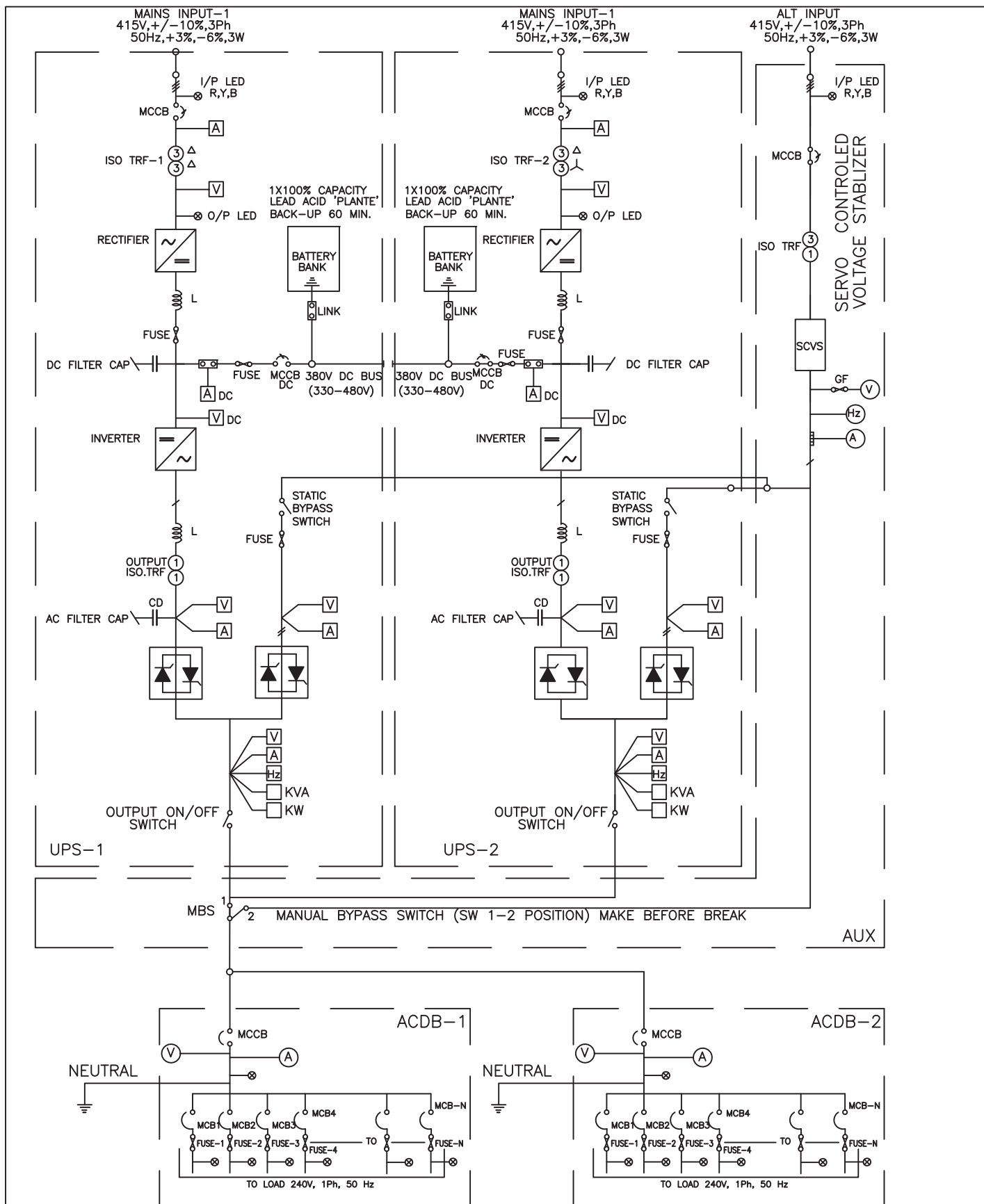
PLC CONFIGURATION
AC/VENTILATION

DRG.NO. PE-DM-411-145-I900

DATE 05.06.2015

REV.NO. 01

SHT 5 OF 11



4 x 270 MW BHADRADRI TPS

TITLE:—

UPS SINGLE LINE DIAGRAM

DRG.
No.

PE-DM-411-145-I900

REV.
No.

00

DATE

23.04.15

SHEET

11

OF

11



DOCUMENT TITLE

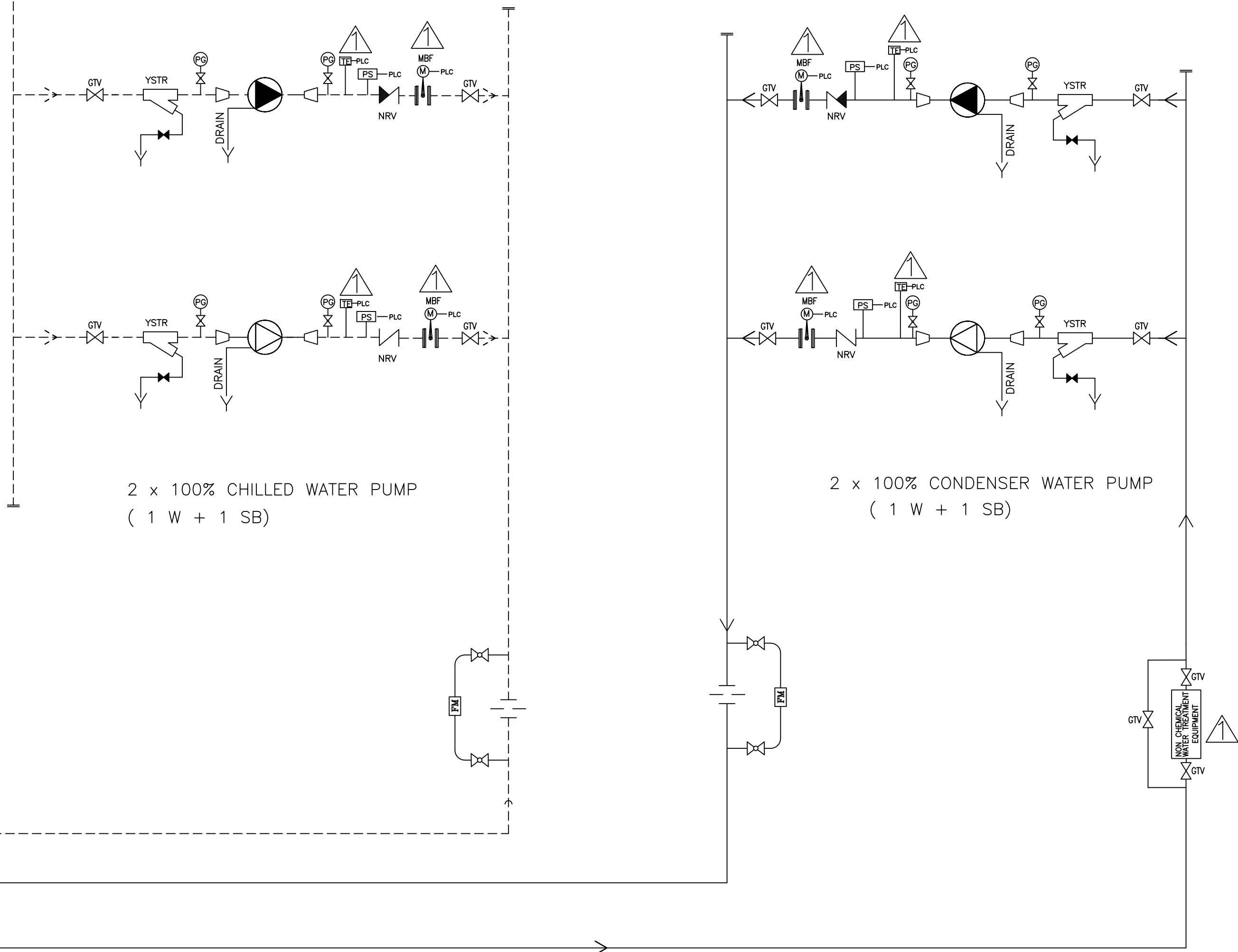
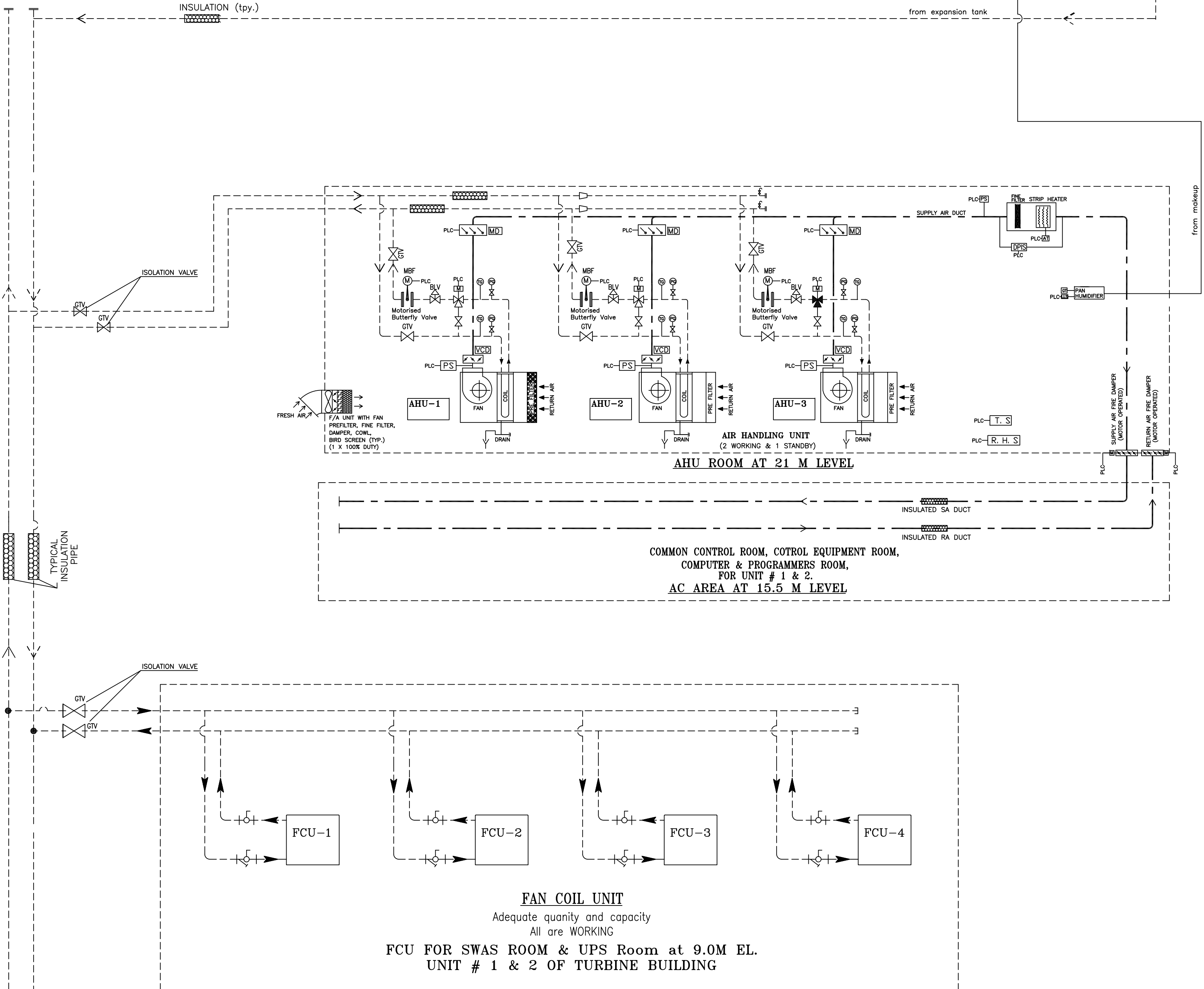
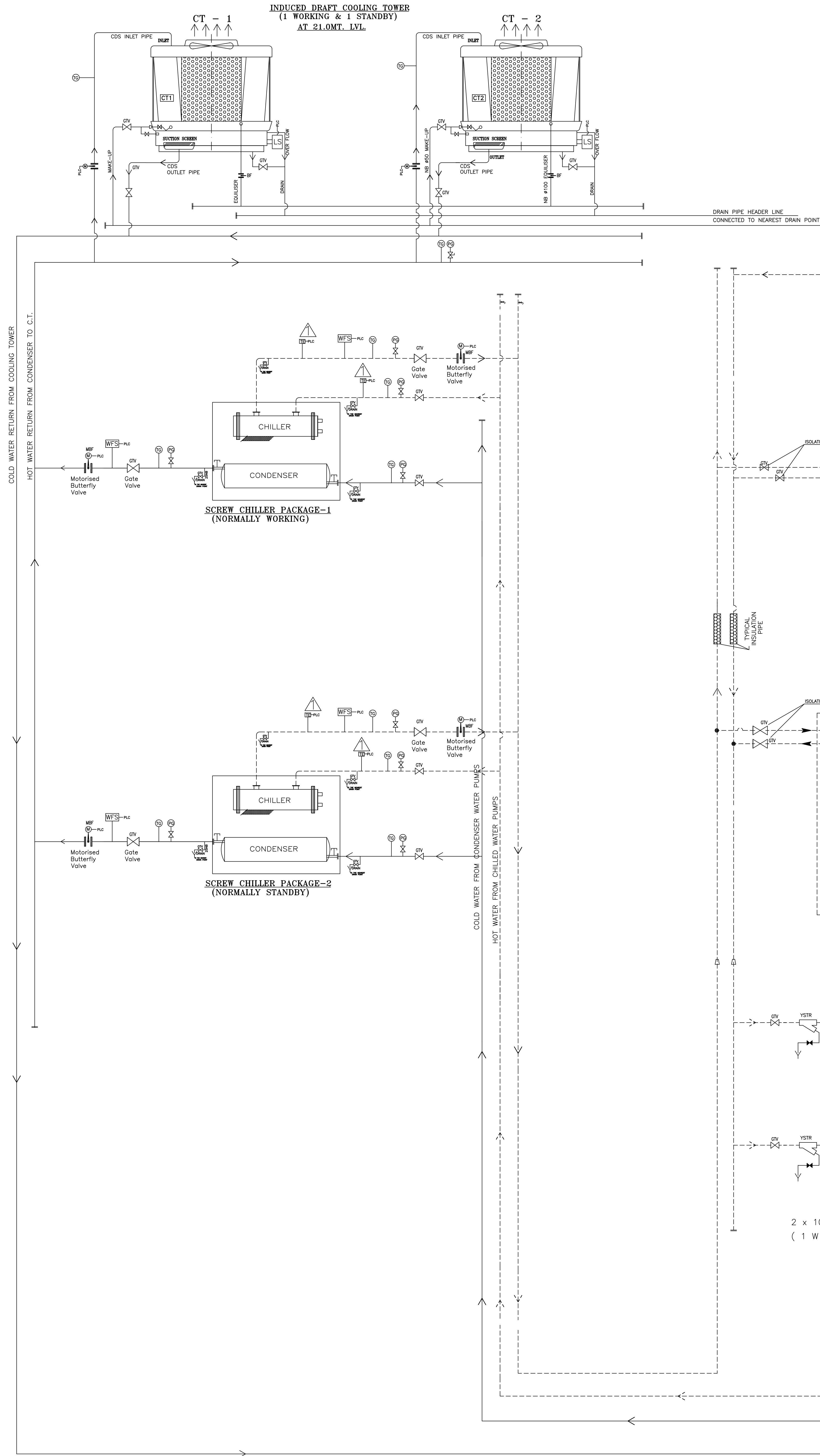
DOCUMENT **PE-DM-410-145-I900**
NUMBER**CONTROL SYSTEMS FOR MECHANICAL
AUXILIARY SYSTEM**REVISION 02 DATE 05.06.15
NUMBER**4 X 270 MW BHADRADRI TPS**

SHEET 11A OF 11

DESCRIPTION OF UPS SIGNAL I/O LIST**UPS signal IO List**

The following minimums hardwire/software signal shall be provided between UPS and PLC. These analog & digital signals shall be updated in HMI MIMICS.

- a. Main I/P 1, 2 alternate I/P voltage, currents.
- b. After line transformer -1&2 voltages
- c. DC O/P VOLTAGE, current and battery charging , discharging currents,
- d. Inverter o/p voltage, current.
- e. Static switch main I/P, alternate i/p voltage.
- f. SCVS O/P VOLTAGE, CURRENT, HZ
- g. UPS-1 & 2 –KVA, KW o/ps
- h. ACDB -1&2 VOLTAGE, CURRENT
- i. UPS-1,2 –POWER FACTOR



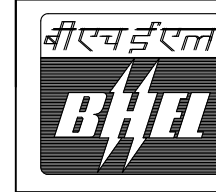
Similar PID shall follow for Main AC Plant-2 for Unit 3 & 4.

FOR TENDER

LEGEND :-		
WF-S	WATER FLOW SWITCH	CONDENSER/CHILLER OUTLET
PS	PRESSURE SWITCH	CONDWTR/CHWTR PUMP OUT/AHU FAN DISH.
STRIP	STRIP HEATER	SUPPLY AIR DUCT LINE
DUCT	DUCT	SUPPLY AIR DUCT
FINE FILTER	AS SHOWN	AS SHOWN
FIRE FILTER	AS SHOWN	AS SHOWN
VOLUME CONTROL DAMPER	AS SHOWN	AS SHOWN
LEVEL GAUGE	EXPANSION TANK, SOFTWATER TANK, STORAGE TANK	EXPANSION TANK, SOFTWATER TANK, STORAGE TANK
LEVEL SWITCH	COOLING TOWER & EXPANSION TANK, SOFT WATER TANK, STORAGE TANK	COOLING TOWER & EXPANSION TANK, SOFT WATER TANK, STORAGE TANK
MOTORIZED DAMPER	AFTER AHU MOUTH (EACH)	AFTER AHU MOUTH (EACH)
PUMP	CONDWTR ,CHILLED WTR & MAKE-UP WATER	CONDWTR ,CHILLED WTR & MAKE-UP WATER
PIPE	CONDENSER WATER PIPE	CONDENSER WATER PIPE
PIPE	CHILLED WATER PIPE SUPPLY	CHILLED WATER PIPE SUPPLY
PIPE	CHILLED WATER PIPE RETURN	CHILLED WATER PIPE RETURN
TEMP GAUGE	COND-IN/OUT, CHILLER IN/OUT, AHU - IN/OUT	COND-IN/OUT, CHILLER IN/OUT, AHU - IN/OUT
PS	PRESSURE GAUGE	COND-IN/OUT, CHILLER IN/OUT, PUMP-IN/OUT, AHU - IN/OUT
TEMP	TEMP.SENSOR	AS SHOWN
R.H.SENSOR	R.H.SENSOR	AS SHOWN
PAN HUMIDIFIER	PAN HUMIDIFIER	IN SIDE AHU ROOM
SA FIRE DAMPER MOTOR OPERATED	SUPPLY AIR AS SHOWN (AT WALL)	SUPPLY AIR AS SHOWN (AT WALL)
RA FIRE DAMPER MOTOR OPERATED	RETURN AIR AS SHOWN (AT WALL)	RETURN AIR AS SHOWN (AT WALL)
Y-STRAINER	ALL PUMP INLET	ALL PUMP INLET
FLOAT VALVE	ALL COOLING TOWER/ EXPANSION TANK PAN HUMIDIFIER	ALL COOLING TOWER/ EXPANSION TANK PAN HUMIDIFIER
NON RETURN VALVE	ALL PUMP OUT LET	ALL PUMP OUT LET
3-WAY-MIXING VALVE	ALL AHU CHWTR. RETURN LINE	ALL AHU CHWTR. RETURN LINE
GATE VALVE	CONDWTR PUMP INLET/OUTLET/CHWTR PUMP IN/OUT COOLING TOWER OUT/CONDCHILLER IN/AHU IN ALL MAKE-UP/QUICK FILL/DRAIN	CONDWTR PUMP INLET/OUTLET/CHWTR PUMP IN/OUT COOLING TOWER OUT/CONDCHILLER IN/AHU IN ALL MAKE-UP/QUICK FILL/DRAIN
MOTORIZED BUTTER FLY VALVE	CONDENSER OUTLET / CHILLER OUTLET COOLING TOWER INLET/AHU OUTLET	CONDENSER OUTLET / CHILLER OUTLET COOLING TOWER INLET/AHU OUTLET
FLOW METER	CONDENSER WATER OUTLET/CHILLED WATER OUT LINE	CONDENSER WATER OUTLET/CHILLED WATER OUT LINE
ORIFICE PLATE	CONDENSER WATER OUTLET/ CHILLED WATER OUT LINE	CONDENSER WATER OUTLET/ CHILLED WATER OUT LINE
GLOBE VALVE	CONDENSER OUTLET / CHILLER OUTLET	CONDENSER OUTLET / CHILLER OUTLET
VENT VALVE	ALL FCU CHWTR. RETURN LINE	ALL FCU CHWTR. RETURN LINE
AIR STAT	AS SHOWN	AS SHOWN
GYSESTAT	IN PAN HUMIDIFIER OR NEAR	IN PAN HUMIDIFIER OR NEAR
DIFFERENTIAL PRESSURE INDICATING DEVICE	AS SHOWN	AS SHOWN
TEMPERATURE ELEMENT	AT INLET OF CHILLER, OUTLET OF CHILLER, OUTLET OF CHILLED WATER PUMPS AND OUTLETS OF CONDENSER WATER PUMPS	AT INLET OF CHILLER, OUTLET OF CHILLER, OUTLET OF CHILLED WATER PUMPS AND OUTLETS OF CONDENSER WATER PUMPS

GENERAL:-
1. THIS Dwg. SHALL BE READ IN CONJUNCTION WITH TECH SPEC NO. PE-TS-411-553-A001
NOTES :-
1. ALL PRESSURE & TEMPERATURE GAUGES WILL BE OF 150MM DIAL TYPE.
2. PID MAY CHANGE DURING DETAIL ENGINEERING
5. PID shows only the bare minimum requirement of valves and instruments.
Any instrumentation & valves as required for the completion of the system in line with technical specification shall be provided by bidder during detailed engineering without any commercial implication.

01	06.06.15	Revised as per DESEIN comments received vide mail dated 02.06.15	AK	-sd	SAK	-sd
REV NO.	DATE	REMARKS	NAME/SIGN	NAME/SIGN	NAME/SIGN	NAME/SIGN

CUSTOMER : TSGENCO	
PROJECT: 4X270 MW MANUGURU TPS	
 BHARAT HEAVY ELECTRICALS LTD. POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA, (UP)	
DRAWN NAME SIGN. DATE	
DESIGN	
CHECKED	
APPROVED	
TITLE : P&I DIAGRAM FOR CONDENSER & CHILLED WATER SYSTEM FOR MAIN PLANT-1 FOR UNIT 1&2.	
Drg No. PE-DG-411-553-A001	
SCALE - NTS. SHEET 1 OF 1	
REV. 01	