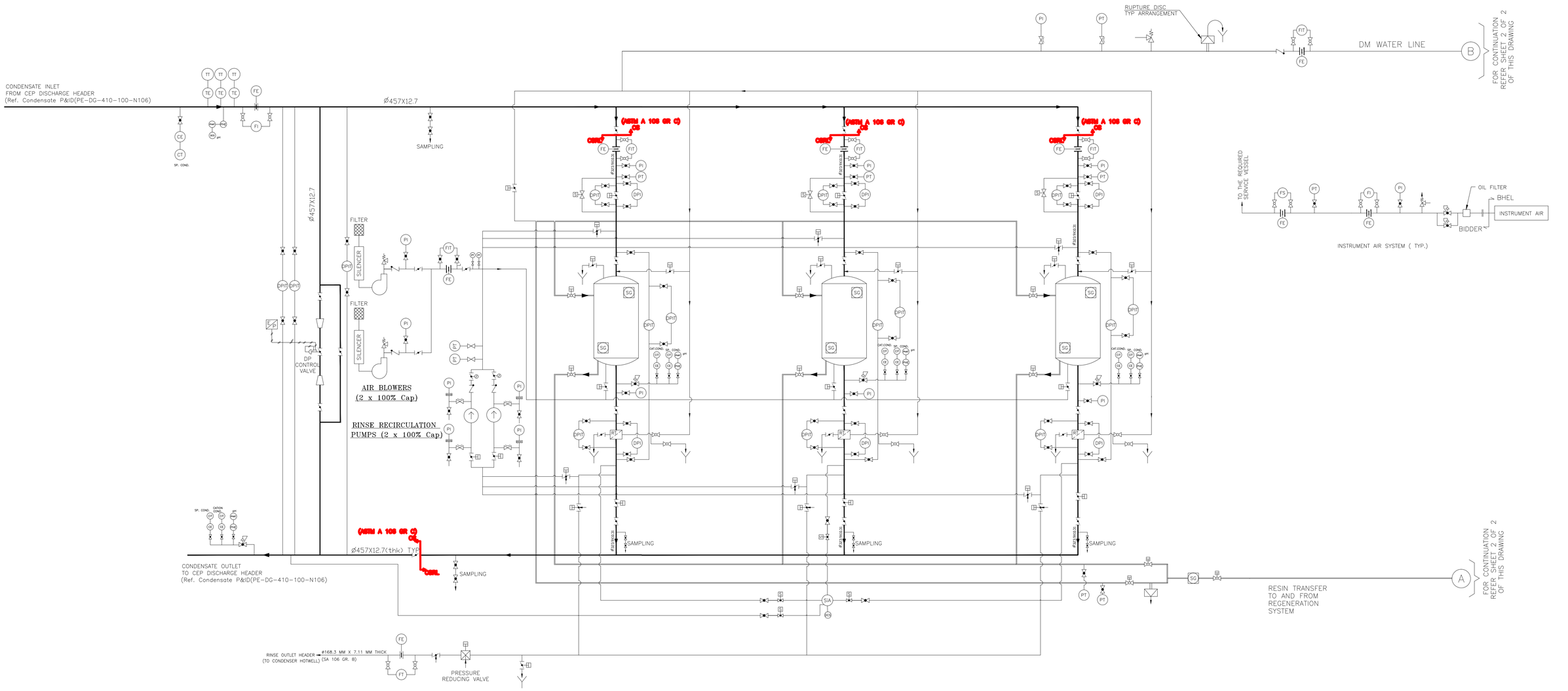
		regeneration of a condensate polisher mixed bed.
(iii)	Temperature of alkali to be heated	To obtain temp. from 15 deg C to 50 deg C at alkali mixing feed out let within 5 hours.
(iv)	Design Pressure	Design pressure shall be the maximum expected pressure to which the vessel may be subjected plus 5% extra margin. Maximum expected pressure for vessels placed in the discharge line of pumps shall be based on the shut-off head of the pumps plus static head at pump suction. .(Min.8 kg/cm2(g).)
(v)	Material of construction	
	Shell	Shell-SA 515 Gr. 60 or 70 / SA 516 Gr. 60 or 70.
	Dished Ends	Shell-SA 515 Gr. 60 or 70 / SA 516 Gr. 60 or 70.
(vi)	Burn out protection	To be provided by the bidder
(vii)	Inside protection	Inside lined with Natural Rubber [8.0 mm thick in (8) layers] Suitable for temperature 70 ^{0} C.
(viii)	Design code	ASME sec VIII div 1 (Latest edition)
(ix)	Accessories	Manhole, vent, drain, sample connection, level transmitter, operating platform, ladders, lifting lugs (4 Nos minimum) etc.
3.7	**D.M. WATER PUMPS FOR REGENERATION AND RESIN TRANSFER**	
(x)	Number	Two (2x100%)
(xi)	Type	Horizontal, centrifugal
(xii)	Operation	Intermittent
(xiii)	Capacity & head	As required
(xiv)	Suction condition	Flooded
(xv)	Material of construction	
•	casing, impeller	SS 316
•	Shaft	SS 410
•	shaft sleeve material	SS 410
(xvi)	Packing seal	Mechanical type
(xvii)	Pump Speed	Maximum 1500 rpm
(xviii)	Accessories required for each	Common base plate, coupling guards, drain plug, vent valve, suction hoses, isolation valves, Y-type strainers etc.
(xix)	Pressure dampener	One number per pump
3.8	**AIR-BLOWERS FOR RESIN MIXING (REGENERATION AREA)**	
(i)	Number	Two (2x100%) with acoustic enclosure.
(ii)	Type	Rotary, Twin Lobe, oil free, positive displacement
(iii)	Duty	Intermittent
(iv)	Capacity and head	As required
(v)	Pressure gauge	One per blower
(vi)	Capacity and head/Noise Level	As required/80 dB (A) Max. at one meter
(vii)	Material of construction	Casing – Cast Iron GR FG 260 to IS 210 Lobe – Cast Iron GR FG 260 to IS 210 Shaft – Carbon Steel to EN 8
4.0	**NEUTRALISING SYSTEM**	
4.1	**NEUTRALIZATION PIT**	
(i)	Number	One (1) no. Pit with two (2) compartments for 1x800 MW Unit
(ii)	Type	Necessary air grid arrangement of polypropylene construction (In bidder's scope) shall be provided in each compartment for effective neutralization of the waste effluent.
(iii)	Material of Construction	RCC .Inside lined with PVC sheet (3 mm thick).

(iv)	No. of compartments	Two compartments	
(v)	Capacity of each compartment	Adequate to hold the quantity of waste effluent generated due to single regeneration of Condensate Polisher Mixed Bed plus 20% overall margin.	
(vi)	Gates	Two Nos (in bidder's scope). MOC of the gates will be Carbon Steel rubber lined.	
4.2	**NEUTRALIZATION PIT DISPOSAL PUMPS**		
(i)	Number	Two nos (1 working + 1 Standby)	
(ii)	Type	Vertical Centrifugal	
(iii)	Capacity & head	Capacity= 100 M3/Hr min. (To be increased by the Bidder if necessary to transfer the waste of single regeneration of the resins of a Condensate Polisher Mixed Bed within four (4) hours) Head=As per system req..(Refer also cl. no.E.6/Section C1)	
(iv)	Material of construction		
	casing, impeller	SS 316	
	Shaft	SS 410	
(v)	Pressure dampener	One number per pump	
4.3)	**CHEMICAL TANKS FOR N PIT**	**ALKALI MEASURING TANK**	**ACID MEASURING TANK**
(i)	Number required	One (1)	One (1)
(ii)	Type	----------Vertical Cylindrical with dished end, over ground----------	
(iii)	Useful capacity	Suitable to meet the requirement for neutralization of excess acid/alkali present in the regeneration waste effluent due to single regeneration of a condensate polisher mixed bed + 20% margin	Suitable to meet the requirement for neutralization of excess acid/alkali present in the regeneration waste effluent due to single regeneration of a condensate polisher mixed bed + 20% margin
(iv)	Type of fluid to be handled	**40-48% Sodium Hydroxide**	**30-33% Hydrochloric Acid.**
(v)	Vent, Overflow, drain connection	Required	
(vi)	Stirrer	Slow speed stirrer driven by motor drive and reduction gear. Speed of stirrer = 200 rpm max Material of Construction of each stirrer and agitator = Stainless Steel – 316.	NA
(vii)	Dissolving Basket per tank	---------- (50-60 mesh B.S.)----------Material of Construction of each Dissolving Basket = Stainless Steel 316.	NA
(viii)	Accessories	Fume absorbers, carbon dioxide absorber, manhole, vent, drain, sample connection, level transmitter, operating platform, ladders, lifting lugs etc.	
(ix)	Material of construction	Shell-SA 515 Gr. 60 or 70 / SA 516 Gr. 60 or 70. Dish end – SA 515 Gr. 60 or 70 / SA 516 Gr. 60 or 70.	
(x)	Internal painting / lining	Inside lined with Natural rubber (4.5 mm thick in three layers)	
5.0	**PIPING**		
(i)	Resin Transfer piping	ASTM A 312 Gr. TP 304 sch 10S Minimum Pipe Size: 80 NB Velocity: 2-3 m/s	
(ii)	DM water line	ASTM A 312 Gr. TP 304 sch 40S for Piping less than and equal to 50 mm NB & ASTM A 312 Gr. TP 304 sch 10S for piping equal to greater than 65 mm NB	
(iii)	Acid piping (All concentration)	CPVC Sch 80	

(iv)	Alkali piping (All concentration)	CPVC Sch 80
(v)	CPU drain, CPU bypass, Rinse Recirculation piping	CS as per ASTM A 106 GR. C
(vi)	Service vessel Inlet and Outlet line.	As per P&ID For CPU attached.(Ref. Dwg. No.- PE-DG-410-155A-A001. Rev-00)
(vii)	Rinse water to hot well	CS as per ASTM A 106 GR. B
(viii)	Instrument air /service air line	ASTM A 312 Gr. TP 304 sch 40S for Piping less than and equal to 50 mm NB & ASTM A 312 Gr. TP 304 sch 10S for piping equal to greater than 65 mm NB
(ix)	Piping for air blower	Hot dip MS galvanized (heavy grade).
(x)	Effluent disposal piping	CSRL
(xi)	Sampling Pipe	Stainless Steel to ASTM Schedule-10.
(xii)	Service water	ERW Carbon Steel Pipe to ASTM 53 Gr. B / IS-1239, Part-I heavy grade for pipe size up to 150mm NB and IS-3589 for 200mm NB & above
6.0	**VALVES**	
(i)	Butterfly valves at inlet of condensate polisher vessel	Body- A 216 WC B Disc-CF8M
(ii)	Butterfly valves at outlet of condensate polisher vessel	Body- CF8M Disc-CF8M
(iii)	Ball valves	Body- CF8M Ball-CF8M
(iv)	Diaphragm valve	Body,Bonnet-Cast Iron Compressor-SS.
7.0	Safety Equipments	Two (2) sets of safety equipment comprising PVC protection suits with hoods, rubber boots, face visors and thick PVC gauntlets shall also be provided. Two number personnel water drench shower/safety shower and eye bath each in regeneration area & acid/alkali storage area shall be provided by the bidder.

DRAWINGS

- **P&ID FOR CONDENSATE POLISHING UNIT(SHEET 1 OF 2 & SHEET 2 OF 2) (PE-DG-410-155A-A001)**
- **SPACE AVAILABLE FOR CPU SERVICE VESSEL AREA (PE-DG-410-155A-A002)**
- **SPACE AVAILABLE FOR CPU REGENRATION AREA (PE-DG-410-155A-A003)**
- **COMPOSITE PIPING LAYOUT PLAN BELOW MEZZANINE FLOOR (PE-DG-410-100-M032.Rev-00)**
- **PLOT PLAN (PE-DG-410-100-M001)**



NOTES :

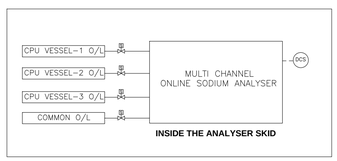
1. THE P&I DIAGRAM IS INDICATIVE AND ONLY MINIMUM REQUIREMENT OF VALVES, INSTRUMENTATION ETC. HAS BEEN SHOWN. BIDDER SHALL FURNISH SCHEME, COMPLETE IN ALL RESPECTS INCLUDING ALL INSTRUMENTS, VALVES ETC. FOR SMOOTH, SAFE, EFFICIENT,TROUBLE FREE OPERATION OF PLANT FOR BHEL/CUSTOMER/CONSULTANT APPROVAL DURING DETAILED ENGINEERING.
2. SERVICE VESSELS SHALL BE OF SPHERICAL DESIGN.
3. ALL THE INSTRUMENT ISOLATION VALVES OTHER THAN FOR ACID/ALKALI APPLICATION SHALL BE GLOBE PATTERN AND DIAPHRAGM TYPE FOR ACID/ALKALI/REG WASTE APPLICATION TO BE PROVIDED AT SOURCE. NEAR THE INSTRUMENT 2-VALVE MANIFOLD FOR PRESSURE MEASURING INSTRUMENTS /3-VALVE MANIFOLD FOR DP MEASURING INSTRUMENTS/5-VALVE MANIFOLD FOR DPTS, BALL VALVE FOR FLOW INDICATORS/ANALYTICAL INSTRUMENT SHALL BE PROVIDED.
4. WHEREVER, PROVIDING 2 VALVE MANIFOLD IS NOT FEASIBLE, TWO NUMBERS OF GLOBE VALVES SHALL BE PROVIDED TO MEET THE FUNCTION OF 2-VALVE MANIFOLD.
5. PR. INSTRUMENTS USED IN ACID, ALKALI, DM LINE, REG WASTE, RESIN LINES, REGENERATION VESSEL AND MIXED RESIN STORAGE VESSELS, SHALL BE PROVIDED WITH DIAPHRAGM SEAL.
6. FLOW TOTALISATION SHALL BE DONE IN SOFTWARE.
7. DP CONTROL VALVE BETWEEN INLET/OUTLET OF CPU SHALL BE MODULATING TYPE DULY PROVIDED WITH PNEUMATIC ACTUATOR, MICRO-PROCESSOR BASED POSITIONER, POS. XMTR, AIR LOCK DEVICE AND SOLENOID VALVE ETC.
8. ALL SOLENOID OPERATED VALVES SHALL BE PROVIDED WITH SOLENOID VALVE, AIR LOCK RELAY ETC. AS REQUIRED BY PROCESS.
9. BLIND FLANGES, COUNTER FLANGES & ISOLATION VALVES SHALL BE PROVIDED BY THE BIDDER AT THE TERMINAL POINTS WHEREVER APPLICABLE.
10. ALL THE ANALYSERS SHALL BE PANEL MOUNTED.
11. ALL THE ISOLATION VALVES OF ALL THE INSTRUMENTS SHALL BE OF SS316 CONFORM TO ANSI 300# CLASS.
12. REFER SHEET 2 OF 2 OF THIS DRAWING FOR ADDITIONAL NOTES.
13. FOR DESIGN PRESSURE BETWEEN 40 BAR TO 60 BAR, DESIGN TEMPERATURE LESS THAN 425 DEG C, 2 NOS. ROUTE VALVES OF 15 NB SIZE OF 800 CLASS FOR INST. (PRESSURE, FLOW, LEVEL MEASUREMENT). HAVE TO BE PROVIDED BY THE BIDDER.
14. ALL THE CONTROL LOOPS SHALL BE INDICATED IN VENDOR DOCUMENT.
15. ALL THE INDIVIDUAL "Y" TYPE STRAINERS SHALL BE PROVIDED WITH DPIS.
16. ALL SOLENOID VALVE SHALL BE PROVIDED BY BIDDER WITH LOCAL LED STATUS DISPLAY AND LIMIT SWITCHES SHALL BE PROVIDED BY BIDDER FOR CRITICAL APPLICATIONS TO FACILITATE REMOTE INDICATION ON OWS.
17. LOCATION OF SODIUM & SILICA ANALYZER SHALL BE INSIDE THE CONTROL ROOM. ALL REQUIRED TUBING AND RACK ALONG WITH DRAIN DISPOSAL PIPES SHALL BE IN BIDDER'S SCOPE.
18. TWO NOS. SLUICE GATES INDICATED IN N-PIT SHALL BE IN BIDDER'S SCOPE.
19. LIMIT SWITCHES SHALL BE PROVIDED BY THE BIDDER FOR ALL THE PUMPS FOR AUTO OPERATION.
20. FOR DETAIL A AND ALL ANALYZERS, ALL REQUIRED ACCESSORIES & VALVES SUCH AS ISOLATION VALVES, PRESSURE REDUCING VALVES, BACK PRESSURE REDUCING VALVES ETC SHALL BE PROVIDED FOR IMPLEMENTING SAMPLE MEASUREMENT AS PER BIDDER'S STANDARD PRACTICE.
21. Ø DENOTES OD (OUTER DIAMETER).
22. INSTRUMENTS, ANALYZERS ETC. USED IN SYSTEM SHOULD SUSTAIN OPERATING & DESIGN PARAMETERS OF SYSTEM. IN CASE OPERATING & DESIGN PARAMETERS OF INSTRUMENTS,ANALYSERS ARE LESS THAN SYSTEM's PARAMETER,NECESSARY ARRANGMENT/ACCESSORIES SHALL BE PROVIDED BY BIDDER FOR SAFE OPERATION.
23. ⌠ INDICATES TERMINAL POINTS BETWEEN BHEL & BIDDER.
24. ALL THE TRANSMITTERS (PRESSURE,LEVEL,TEMPERATURE,DIFFERENTIAL PRESSURE,FLOW ETC.) USED FOR INTERLOCK & PROTECTION, SHALL BE REDUNDANT.

CONDENSATE POLISHING FOR STATION

LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	PRIMING CHAMBER		BLOWER
	PUMP		ISOLATION GATE
	BALL VALVE / PLUG VALVE		DRAIN
	BUTTERFLY VALVE		OVERFLOW SEAL POT/CO_2 ABSORBER
	GLOBE VALVE		RUPTURE DISC
	DIAPHRAGM VALVE		PRESSURE REDUCING VALVE
	MOTORISED VALVE		CONDENSATE LINE
	PRESSURE RELIEF VALVE		D.M.WATER/DRAIN LINE
	NON RETURN VALVE		RINSE WATER LINE
	BUTTERFLY VALVE WITH GLAND SEALING		ACID SOLUTION LINE
S	SOLENOID VALVE		ALKALI SOLUTION LINE
	RESIN TRAP		RESIN TRANSFER LINE
SG	SIGHT GLASS		FIELD MOUNTED INSTRUMENT
	DOUBLE ACTING PNU.CYLINDER OPERATED		PANEL MOUNTED INSTRUMENT
	PNEUMATICALLY OPERATED		PULSATION DAMPER
	'Y' TYPE STRAINER		DIAPHRAGM SEAL
	ORIFICE PLATE		PRESSURE REDUCING VALVE
	AGITATOR WITH MOTOR	FCV	FLOW CONTROL VALVE

CS	CONTROL SYSTEM
LS	LEVEL SWITCH
TT	TEMPERATURE TRANSMITTER
PI	PRESSURE INDICATOR
PT	PRESSURE TRANSMITTER
TI	TEMPERATURE INDICATOR
FI	FLOW INDICATOR
CE	CONDUCTIVITY ELEMENT
FT	FLOW TOTALISIZER
DPI	DIFF. PRESSURE INDICATOR
DPS	DIFF. PRESSURE SWITCH
FT	FLOW TRANSMITTER
FE	FLOW ELEMENT
CT	CONDUCTIVITY TRANSMITTER
DPIT	DIFF. PRESSURE INDICATING TRANSMITTER
FS	FLOW SWITCH
CIT	CONDUCTIVITY INDICATING TRANSMITTER
DT	DENSITY TRANSMITTER
TE	TEMPERATURE ELEMENT
LI	LEVEL INDICATOR
PHE	pH ELECTRODE
PHAT	pH ANALYSER TRANSMITTER
SIA	SILICA ANALYZER (MULTI CHANNEL)
	ORIFICE (Pressure Breakdown)
LT	LEVEL TRANSMITTER
	SAMPLE COOLER
FCV	FLOW CONTROL VALVE



TYPICAL FOR UNIT 1

JOB NO.	410
STATUS	CONTRACT
DISTRIBUTION	

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD

PROJECT: 1X800 MW TSGENCO KOTHAGUDEM TPS STAGE-VII, PALONCHA

OWNER: TELANGANA STATE POWER GENERATION CORPORATION LTD.

OWNER'S CONSULTANT: DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA• MUMBAI• CHENNAI• NEW DELHI

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE		NAME	SIGN	DATE
M	DRN	VK		
	DESN	VK		
	CHD	GS/FS/JP		
	APPD	PK		

TITLE: P & ID FOR CONDENSATE POLISHING UNIT

DEPT. | SCALE 1:100 | SIGN

DRAWING NO. PE-DG-410-155A-A001

SHEET 02 OF 02 | REV. 00

SIZE-A1

FIRST ANGLE PROJECTION
ALL DIMENSIONS ARE IN MM
FOR CONTINUATION REFER SHEET 1 OF 2 OF THIS DRAWING
INSTRUMENT AIR SYSTEM (TYP.)
SERVICE AIR SYSTEM (TYP.)
TO THE REQUIRED REGENERATION VESSELS
OIL FILTER
BHEL
BIDDER
INSTRUMENT AIR
SERVICE AIR
AIR BLOWERS (2x100% Capacity)
FILTER
SILENCER
RESIN MAKE UP HOPPER
EJECTOR
TO REGENERATION VESSEL
OVER PRESSURE PROTECTION DEVICE
RESIN SEPARATION AND CATION REGENERATION UNIT
ANION REGENERATION UNIT
MIXED RESIN STORAGE UNIT
SAMPLING
REFER NOTE 1
TO RESPECTIVE REGENERATION/ RESIN SEPARATION VESSELS
TO DRAIN TRENCH LEADING TO NEUTRALISATION PIT
TO DM WATER STORAGE TANK
REF. PID OF CONDENSATE TRANSFER SYSTEM (PE-DG-410-100-N110)
FROM DM WATER STORAGE TANK OUTLET
REF. PID OF CONDENSATE TRANSFER SYSTEM (PE-DG-410-100-N110)
D.M. WATER PUMPS FOR REGENERATION AND RESIN TRANSFER (2X100%)
SERVICE WATER
ALKALI PREPARATION TANK (FOR ALKALI FLAKES)
ALKALI FLAKE
ULTRASONIC TYPE
ALKALI STORAGE TANK
CO2 ABSORBER (TYP)
ALKALI TRANS.CUM RECIR. PUMPS (2X100%)
AC FILTER (ALKALI)
CORBON TRAP
ALKALI MEASURING TANK
HOT WATER TANK
MIXING TEE
TO TANKS
ALKALI DOSING PUMPS (2X100%)
CUSTOMER
FROM TANKERS CUSTOMER SCOPE
10 Mtrs.
ALKALI UNLOADING PUMPS (2X100%)
TO CENTRAL MONITORING BASIN (EACH COMP.)
EFFLUENT DISPOSAL PUMPS (2X100%)
ALKALI TANK FOR NEUTRALISATION
ACID TANK FOR NEUTRALISATION
FROM THE NEAREST SERVICE WATER LINE
FROM ALKALI STORAGE TANK
FROM ACID STORAGE TANK
RADAR TYPE
N.PIT COMPARTMENT –I (CUST. SCOPE)
N.PIT COMPARTMENT –II (CUST. SCOPE)
ISOLATION GATE (BY BIDDER)
RECIRCULATION & AGITATION
CPU REGENERATION WASTE FROM REGN. AREA
EFFLUENT NEUTRALISING SYSTEM
ACID STORAGE TANK
Fume Absorber (TYP)
ACID MEASURING TANK
ACID DOSING PUMPS (2X100%)
ACID UNLOADING / TRANSFER PUMPS (2X100%)

NOTES :

1) THE REGENERATION VESSELS ARRANGEMENT SHOWN HERE IS INDICATIVE ONLY.
2) FOR OTHER NOTES & LEGENDS REFER SHEET 1 OF 2 OF THIS DRAWING.
3) CUSTOMER – TSGENCO CONSULTANT – DCPL.
4) DIAPHRAGM SEAL SHALL BE PROVIDED IN PRESSURE INSTRUMENTS FOR CHEMICAL APPLICATION.
5) FLUSHING CONNECTIONS WITH VALVES SHALL BE PROVIDED FOR ALL ACID/ALKALI PUMPS/ PIPELINES AS PER REQUIREMENT.
6) PUMPS RECIRCULATION LINE WITH VALVES AT TANK END SHALL BE PROVIDED FOR EACH SET OF PUMPING SYSTEM BY BIDDER.
7) All THE INTERLOCKED TRANSMITTERS SHALL BE REDUNDANT , HENCE LEVEL TRANSMITTERS, PRESSURE TRANSMITTERS; DP TRANSMITTERS WHICH ARE USED FOR INTERLOCK SHALL BE REDUNDANT.

PROJECT: 1X800 MW TSGENCO KOTHAGUDEM TPS STAGE–VII, PALONCHA

OWNER: TELANGANA STATE POWER GENERATION CORPORATION LTD.

OWNER'S CONSULTANT: DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
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JOB NO.	410
STATUS	CONTRACT
DISTRIBUTION	

DEPT CODE		NAME	SIGN	DATE
M	DRN	VK		
	DESN	VK		
	CHD	GS/FS/JP		
	APPD	PK		

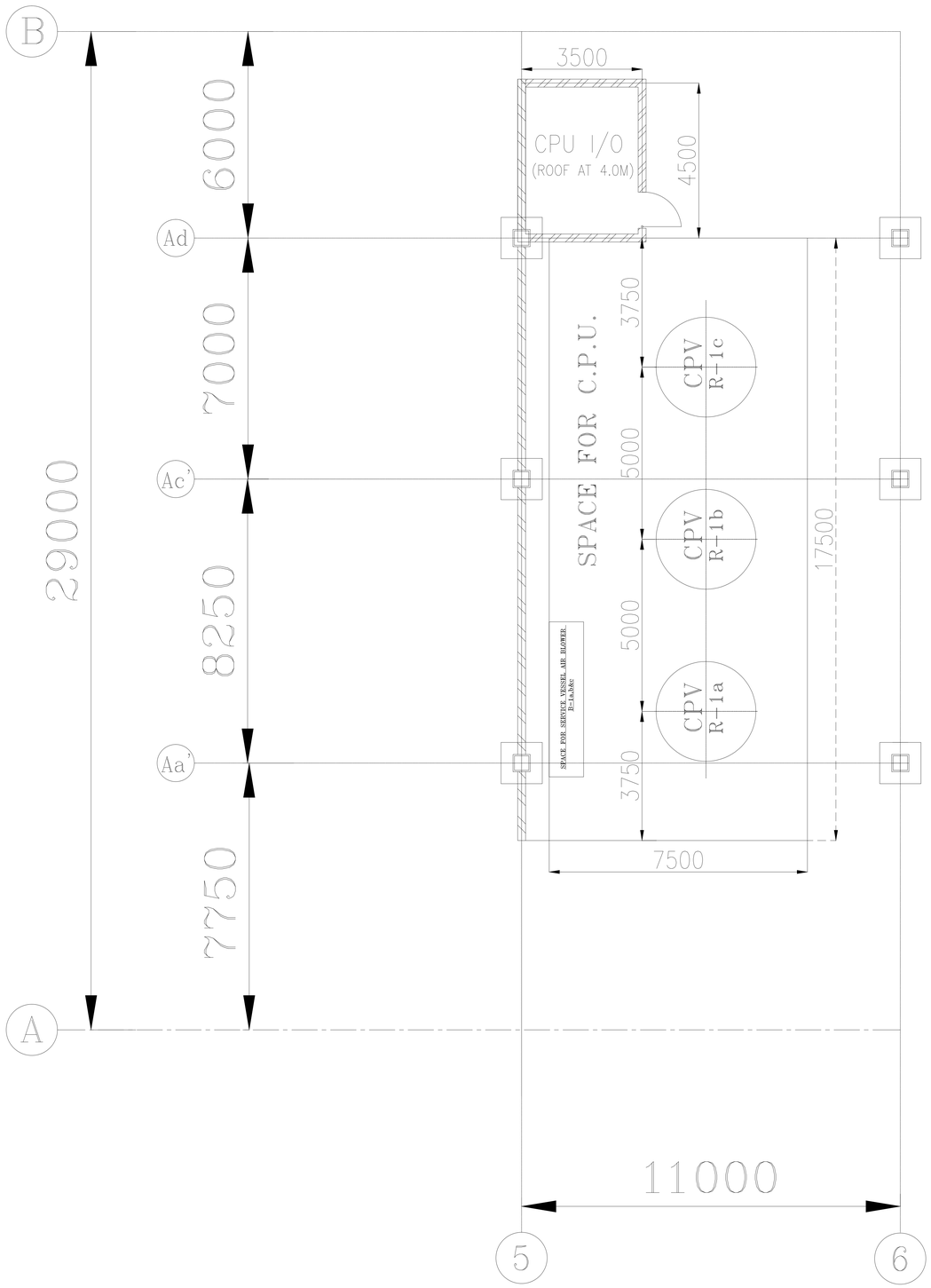
REV.	DATE	ALTD	CHD	APPD

TITLE: P & ID FOR CONDENSATE POLISHING UNIT

DEPT. SCALE 1:100
SIGN

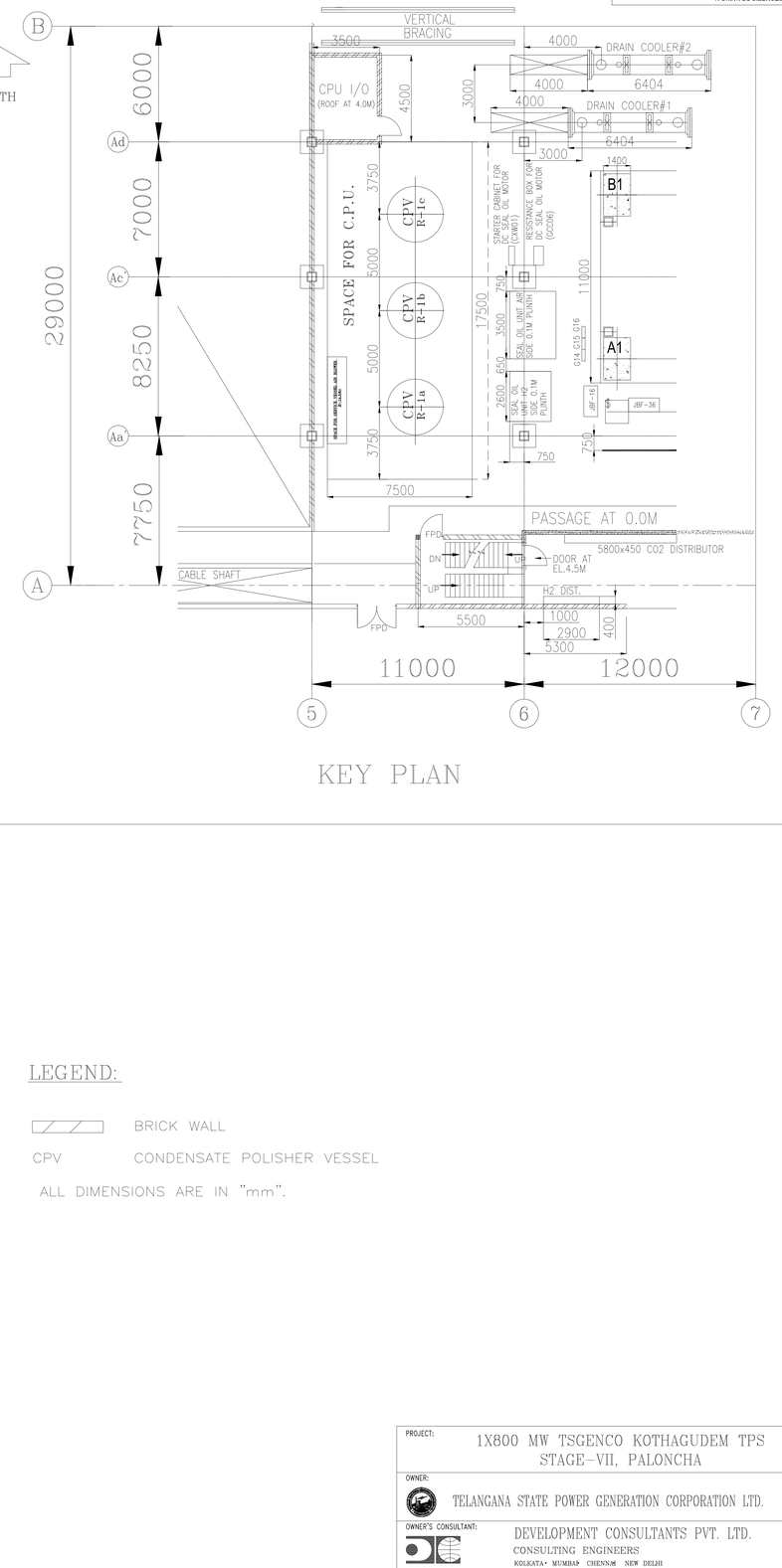
DRAWING NO. PE–DG–410–155A–A001
SHEET 02 OF 02 REV. 00
SIZE–A1

NORTH



CPU SERVICE VESSEL AREA (TG BUILDING)

NORTH



KEY PLAN

LEGEND:

BRICK WALL

CPV CONDENSATE POLISHER VESSEL

ALL DIMENSIONS ARE IN "mm".

REV.	DATE	ALTD	CHD	APPD

REV.	DATE	ALTD	CHD	APPD
01				

JOB NO. 391
STATUS CONTRACT
DISTRIBUTION

DEPT CODE		NAME	SIGN	DATE
M	DRN.	VK		
	DESN	VK		
	CHD	GS/FS/JP		
	APPD	PK		

PROJECT: 1X800 MW TSGENCO KOTHAGUDEM TPS STAGE-VII, PALONCHA

OWNER: TELANGANA STATE POWER GENERATION CORPORATION LTD.

OWNER'S CONSULTANT: DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
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NOIDA

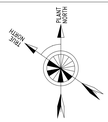
TITLE: SPACE AVAILBLE FOR CPU SERVICE VESSEL AREA

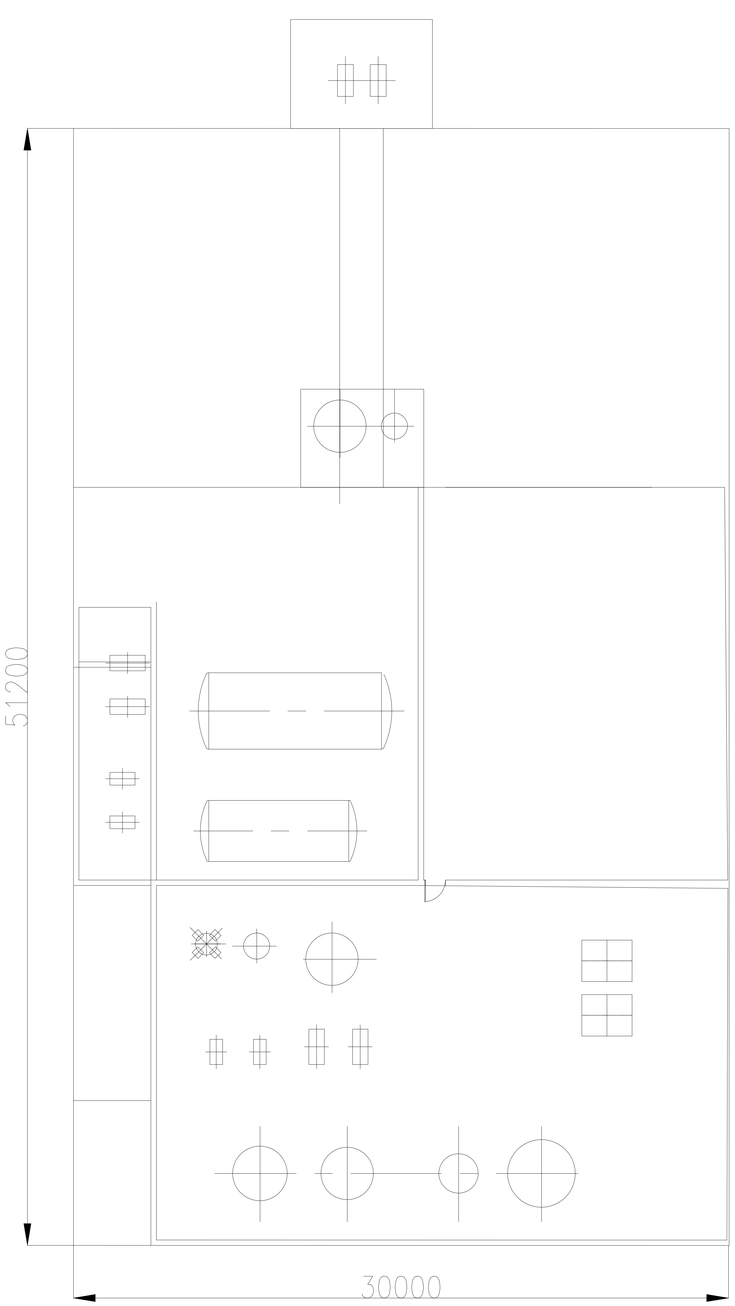
DEPT. SCALE 1:75
SIGN

DRAWING NO. PE-DG-410-155A-A002
SHEET 01 OF 01 REV. 00
SIZE-A1

COMPUTER FILE NAME: SERVICE VESSEL AREA.DWG

DRAWING No.

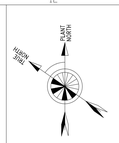


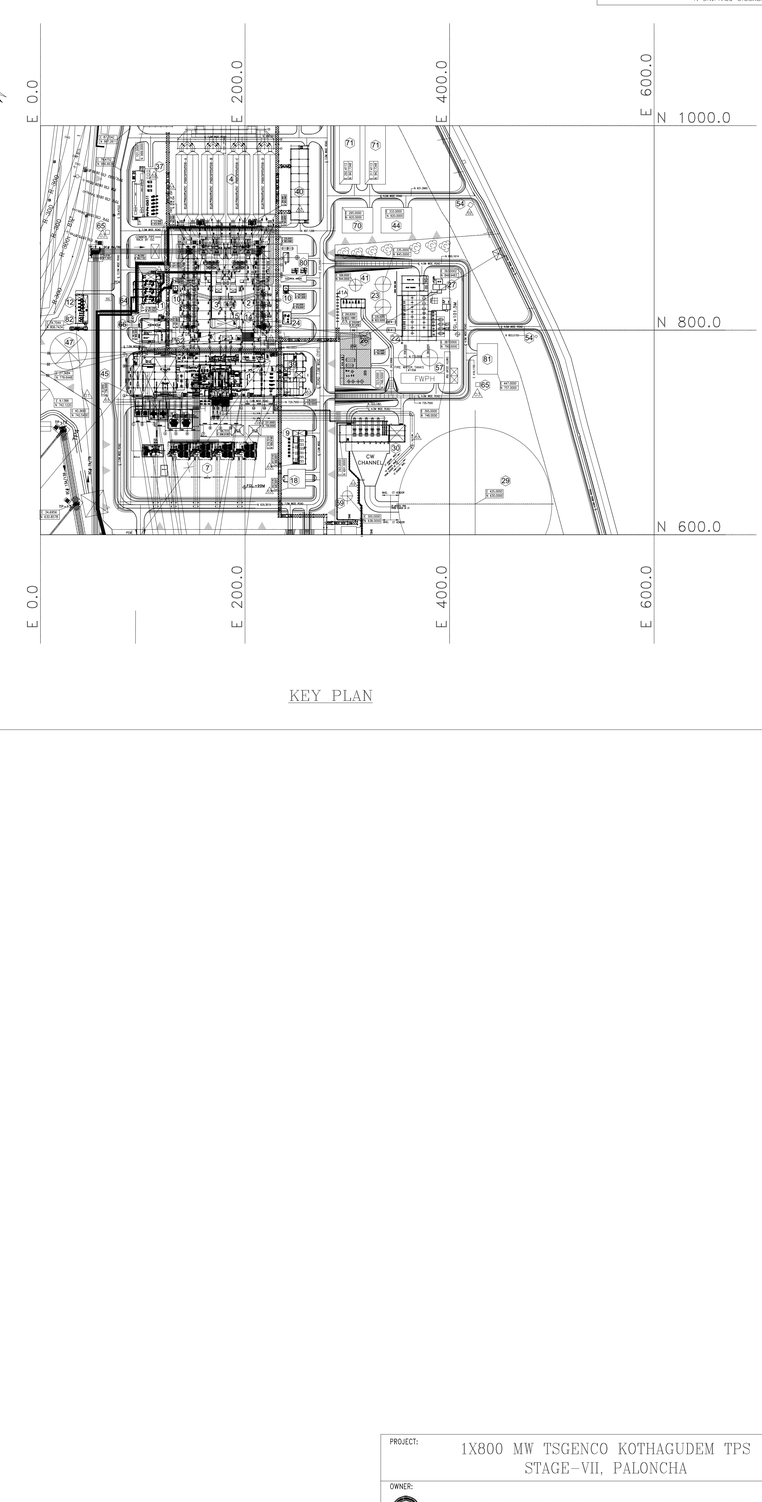


CPU REGENERATION AREA

ALL DIMENSIONS ARE IN "mm".

CUSTOMER'S DRAWING No.





KEY PLAN

COMPUTER FILE NAME: REGEN AREA.DWG

REV.	DATE	ALTD	CHD	APPD

REV.	DATE	ALTD	CHD	APPD
01				

PROJECT: 1X800 MW TSGENCO KOTHAGUDEM TPS STAGE-VII, PALONCHA

OWNER: TELANGANA STATE POWER GENERATION CORPORATION LTD.

OWNER'S CONSULTANT: DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA• MUMBAI CHENNAI NEW DELHI

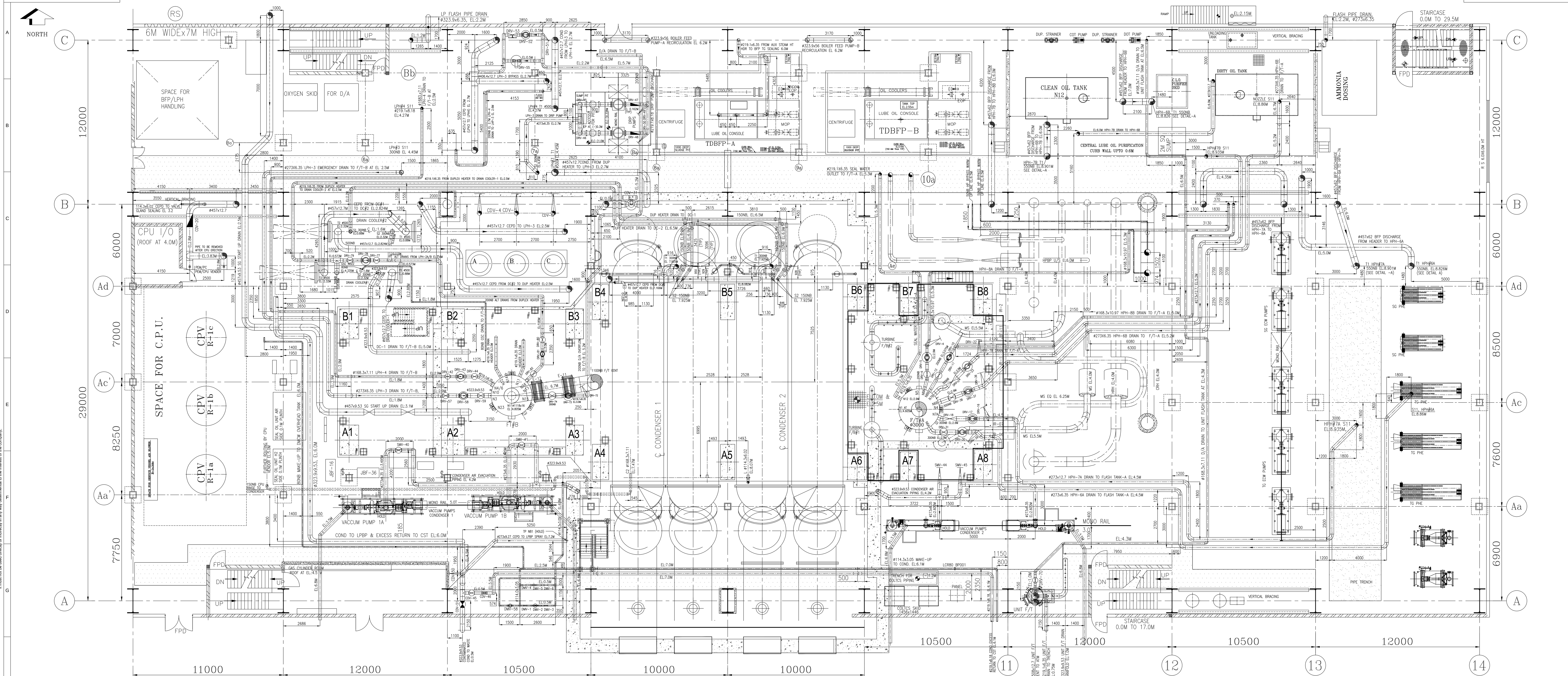
JOB NO. 391
STATUS CONTRACT
DISTRIBUTION

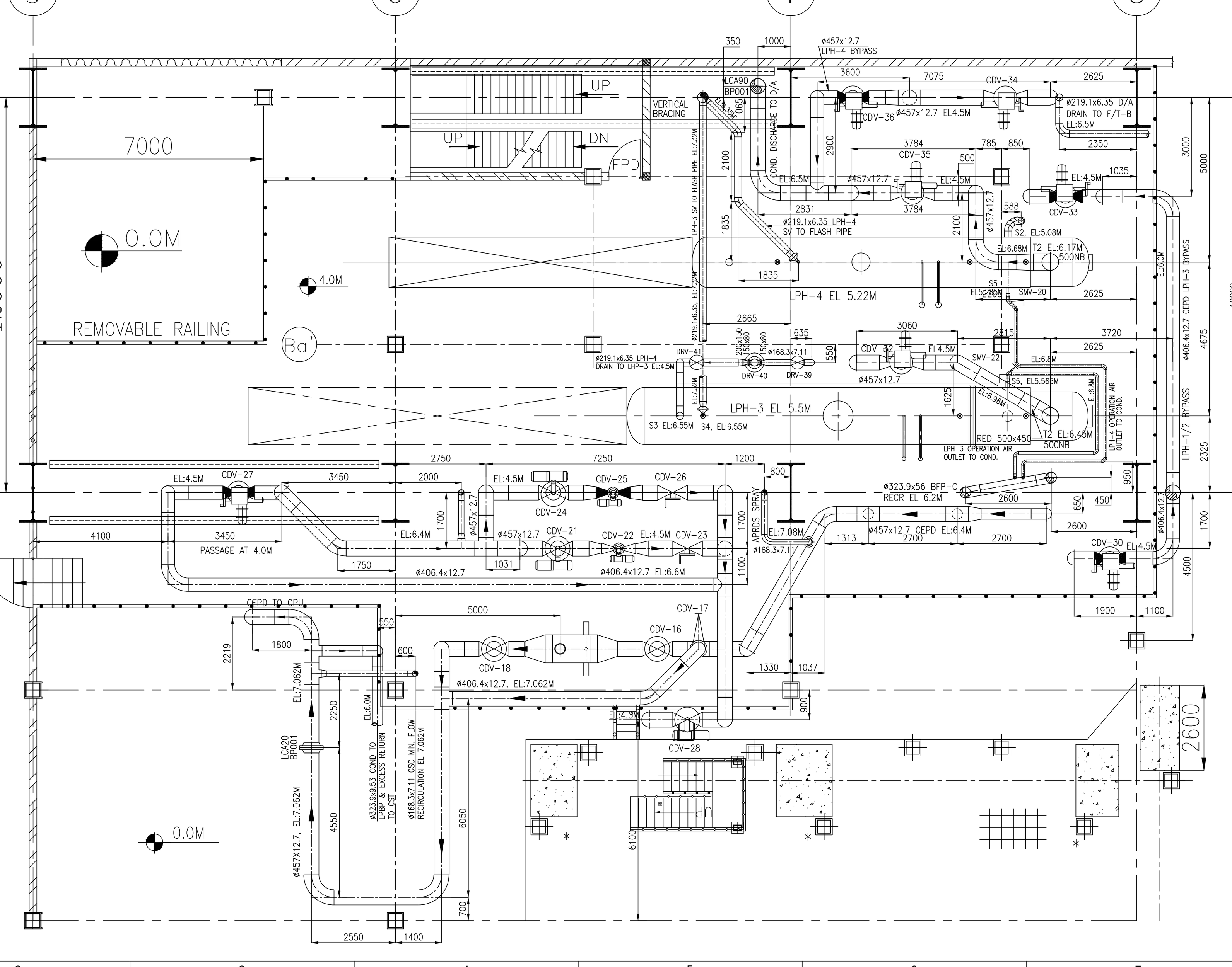
BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

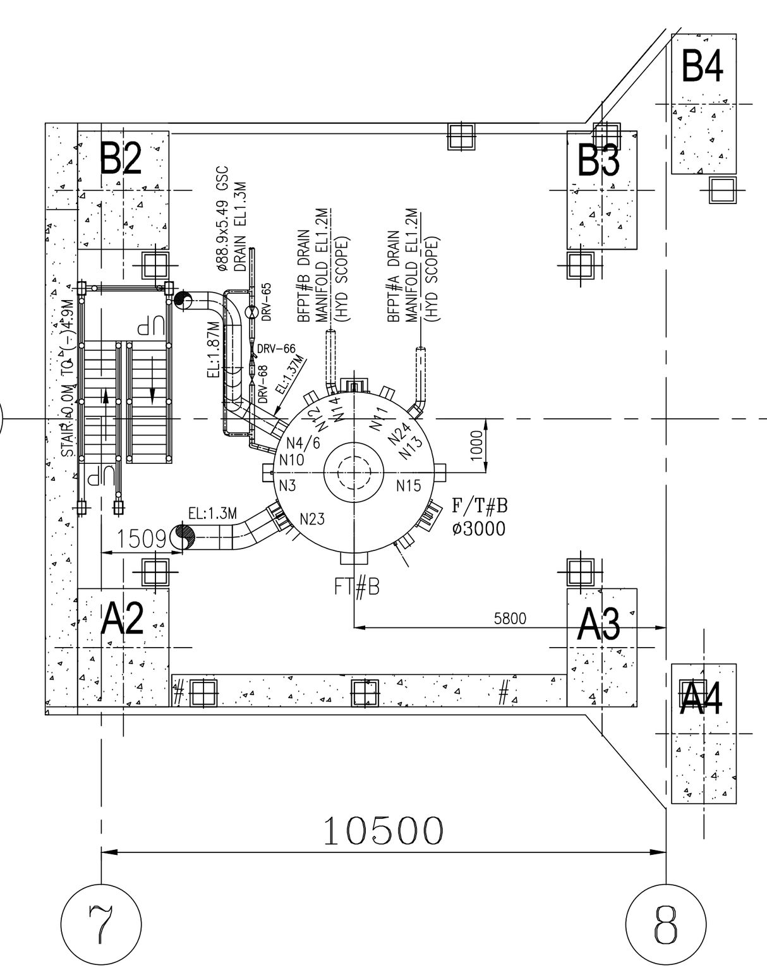
DEPT CODE		NAME	SIGN	DATE
M	DRN.	VK		
	DESN.	VK		
	CHD	GS/RS/JP		
	APPD	PK		

TITLE: SPACE AVAILABLE FOR CPU REGENERATION AREA

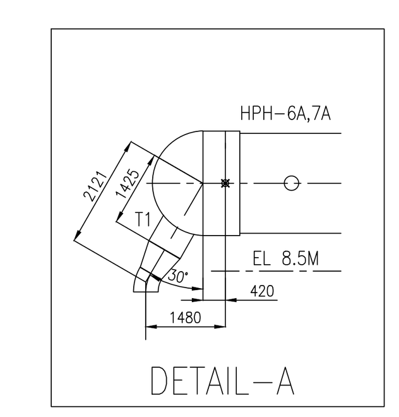
DEPT. SIGN | SCALE 1:100 | DRAWING NO. PE-DG-410-155A-A003 | SHEET 01 OF 01 | REV. 00 | SIZE-A1



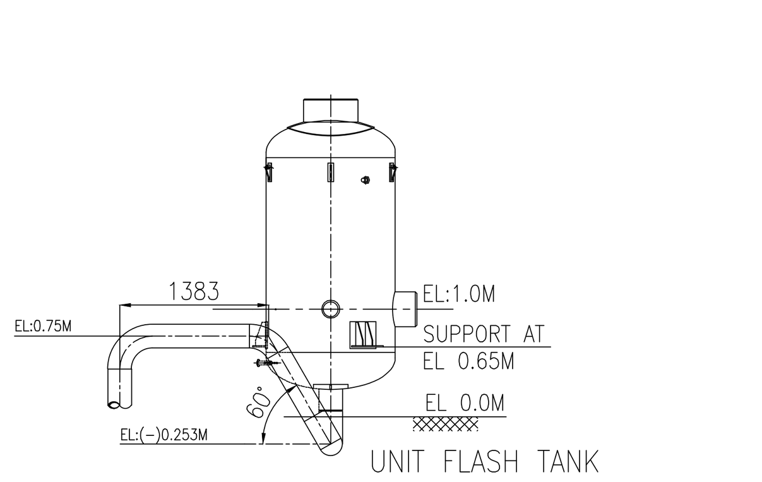




PIPING BELOW EL:3.0M NEAR F/T # A & B



DETAIL-A



Ø219.1x6.35 UNIT F/T DRAIN TO TRENCH

VIEW B-B

REFERENCE DRGS:			
SL NO	TITLE	NUMBER	UNIT
1	TG EQUIPMENT PLAN AT EL 0.0 M	PE-DG-410-100-M003	PEM
2	P & ID EXTRACTION STEAM SYSTEM FOR HEATERS	PE-DG-408-100-N103	PEM
3	P&ID – HP/LP BYPASS SYSTEM	PE-DG-410-100-N102	PEM
4	P&ID – HEATER DRAINS AND VENT SYSTEM	PE-DG-410-100-N104	PEM
5	P&ID – FEED WATER SYSTEM	PE-DG-410-100-N105	PEM
6	P&ID – CONDENSATE SYSTEM	PE-DG-410-100-N106	PEM
7	P&ID – STEAM DRAIN SYSTEM	PE-DG-410-100-N111	PEM
8	COMPOSITE CRITICAL PIPING LAYOUT	PE-DG-410-100-M030	PEM
9	COMPOSITE PIPING LAYOUT BELOW GROUND FLOOR IN AB BAY	PE-DG-410-100-M031	PEM
10	COMPOSITE PIPING LAYOUT PLAN BELOW OPEARTING FLOOR	PE-DG-410-100-M033	PEM
11	COMPOSITE PIPING LAYOUT PLAN BELOW & ABOVE DEARATOR FLOOR	PE-DG-410-100-M034	PEM
12	CONDENSER ASSEMBLY (GENERAL ARRANGEMENT)	01601070071C209	HWR
13	GENERAL ARRANGEMENT OF DRAIN COOLER # 1	HY-DG-2-06201-31801	HYD
14	GENERAL ARRANGEMENT OF DRAIN COOLER # 2	HY-DG-2-06201-31901	HYD
15	GENERAL ARRANGEMENT GLAND STEAM CONDENSER	01620570014C209	HWR
16	GENERAL ARRANGEMENT OF LPH # 3	HY-DG-2-26226-34101	HYD
17	GENERAL ARRANGEMENT OF LPH # 4	HY-DG-2-26231-34201	HYD
18	GENERAL ARRANGEMENT F / T-B	BP-DG-408-102-0002	BPL
19	GENERAL ARRANGEMENT F / T-A	BP-DG-408-102-0001	BPL
20	GENERAL ARRANGEMENT OF VACCUM PUMPS CONDENSER # 1	---	HWR
21	GENERAL ARRANGEMENT OF VACCUM PUMPS CONDENSER # 2	---	HWR
22	TDBFP LUBE OIL	0-313-01-13101	HYD
23	DRIP PUMPS	1-181-005-7236	HYD
24	GA OF PHE	---	PEM
25	GA ECW PUMP	---	PEM
26	GA UNIT FLASH TANK	BP-DG-408-102-0003	BPL

NOTES

1. ALL DIMENSIONS ARE IN MM'S AND LEVELS ARE IN METRES.
2. ALL ELEVATIONS INDICATED IN THE DRG. ARE W.R.T. POWER HOUSE GROUND FLOOR ELEVATION AS 0.00M. EL 0.00M CORRESPONDS TO RL 99.5M
3. EQUIPMENTS SHOWN IN THIS DRAWING WHICH ARE NOT COVERED UNDER BTG PACKAGE ARE INDICATIVE ONLY.
4. EQUIPMENTS & FACILITIES SHOWN FOR PACKAGES OTHER THAN BTG PACKAGE ARE SUGGESTIVE ONLY. HOWEVER IT IS PREFERRED THAT SIMILAR DETAILS BE ENSURED FROM RESPECTIVE PACKAGE VENDORS.
5. PIPE ELEVATIONS INDICATED ARE INDEPENDENT OF PIPE SLOPE. A SLOPE OF 1:200 IN GENERAL TO BE MAINTAINED FOR ALL HORIZONTAL RUN OF PIPES TOWARDS DRAIN POINT.
6. ALL PIPE SIZES 50 NB AND BELOW ARE SITE ROUTED AND ARE NOT SHOWN IN THIS DRAWING.

CUSTOMER: TELANGANA STATE POWER GENERATION CORPORATION LTD
TELANGANA STATE, INDIA
1x800 MW KOTHAGUDAM TPS STAGE-VII UNIT#12, PALONCHA

OWNER'S CONSULTANT: DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA MUMBAI CHENNAI NEW DELHI

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

JOB NO. 410
STATUS CONTRACT
DISTRIBUTION

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD

DEPT CODE		NAME	SIGN	DATE
M	DRN	PK		06.08.2015
	DESN	RA		06.08.2015
	CHD	GSF		06.08.2015
	APPD	PKK		06.08.2015

TITLE
COMPOSITE PIPING LAYOUT PLAN BELOW MEZZANINE FLOOR FLOOR

DEPT. SCALE 1:100
SIGN
DRAWING NO. PE-DG-410-100-M032
SHEET 1 OF 1 REV. 00
SIZE-A0

WIND ROSE DIAGRAM

IDENTIFICATION NUMBER	DESCRIPTION
1	POWER HOUSE BUILDING INCLUDING ELECTRICAL BAY
2	COAL MILL
3	STEAM GENERATOR
4	ESP
5	CHIMNEY
6	SPACE FOR FGD PLANT
7	TRANSFORMER YARD
8	400 kV SWITCHYARD
9	COMPRESSOR HOUSE
10	MILL REJECTS LOADING HOPPERS
11	ASH WATER CUM SLURRY PUMP HOUSE
12	ASH WATER PUMP HOUSE
13	FLY ASH SILOS
14	BA OVER FLOW SUMP
15	BOTTOM ASH HOPPER
16	RAW WATER STORAGE RESERVOIR
17	CLARIFIERS
18	DG SET
19	SIDE STREAM FILTRATION AREA
20	CW TREATMENT & CHLORINATION AREA
21	FOAM PUMP HOUSE
22	DM PLANT
23	DM WATER STORAGE TANK
24	BOOSTER PUMP HOUSE
25	CHEMICAL HOUSE
26	CPU REGENERATION AREA
27	NEUTRALISING PIT
28	SWITCH YARD CONTROL ROOM
29	COOLING TOWER
30	COOLING WATER PUMP HOUSE
31	TRACK HOPPER
32	WAGON TIPPLER
33	CRUSHER HOUSE
34	STACKER CUM RECLAIMER (2 Nos.)
35	CRUSHED COAL PILE
36	CHP CONTROL/ SWITCHGEAR ROOM (MCC-1)
37	AHP COMPRESSOR HOUSE CUM AHP CONTROL / AHP CONTROL/ SWITCHGEAR ROOM
38	THICKENER
39	SERVICE BUILDING
40	ESP CONTROL ROOMS
41	CONDENSATE STORAGE TANK
41A	MAKE-UP PUMP HOUSE
42	COAL PILE SETTLING BASIN
43	SLD UTILITY BUILDING
~~44~~	~~TRAINING & SIMULATOR ROOM (DELETED)~~
45	PIPE/CABLE RACK (ISG)
46	RAW WATER PUMP HOUSE
47	CLARIFIER ASH HANDLING SYSTEM
48	MATERIAL ENTRY GATE
49	CLARIFIED WATER STORAGE TANK & PUMP HOUSE
50	CENTRIFUGE BUILDING
51	SLUDGE PIT
52	HFO & LDO STORAGE TANK DYKE AREA.
53A	HFO & LDO UNLOADING PUMP HOUSE
53B	HFO & LDO FORWARDING PUMP HOUSE
54	WATCH TOWER
55	BULLDOZER SHED
56	FIRE STATION
57	FIRE WATER STORAGE TANK & PUMP HOUSE
58	WEIGH BRIDGE (ISG)
59	SERVICE WATER OVER HEAD TANK (10.0M DIA.)
60	WEIGH BRIDGE FOR INDOOR STORAGE (PEM)
61	PIPE/CABLE RACK (PEM)
62	FIRE OIL WATER SEPARATOR PIT
63	C.M.B. WASTE TREATMENT SYSTEM
64	BOILER WASH WATER SUMP
65	AMBIENT AIR QUALITY MONITORING STATION
66	T.G. WASH WATER SUMP
67	NOT USED
68	TREATED WATER PIT (ISG SCOPE)
69	ADMINISTRATIVE BUILDING
70	CANTEEN
71	INDOOR STORE
72	MAIN GATE
73	NOT USED
74	NOT USED
75	AHP SLO UTILITY MCC ROOM
76	CHP MCC-2
~~77~~	~~DG PUMP HOUSE-1 (DELETED)~~
78	CHP PUMP HOUSE
79	WT CONTROL ROOM-1&2
80	AUXILIARY BOILER
81	CHEMICAL LAB
82	CHEMICAL HOUSE (ISG)
83	SECURITY OFFICE FOR MATERIAL ENTRY GATE
84	GAS CYLINDER SHED
85	CHP MCC-3

NOTES:-

1. ALL DIMENSIONS AND CO-ORDINATES ARE IN METER UNLESS NOTED OTHERWISE.
2. THE FINISHED FLOOR LEVEL (TFL) OF POWER HOUSE BUILDING GROUND FLOOR IS EL 0.00M WHICH CORRESPONDS TO 0.5M (RL. 99.5M) ABOVE FGL.
3. THE EXISTING BUILDINGS SHOWN IN SHADED LINE IN THE POWER PLANT AREA, ETC., AND AS REQUIRED FOR THE CONSTRUCTION OF THE FACILITIES FOR UNIT #12 ARE TO BE DISMANTLED.
4. THE PIPE RACK SHOWN IS INDICATIVE ONLY.
5. 400KV OUTGOING LINES ARE TO BE ALIGNED DULY CLEARING THE RE-ROUTED 220KV LINES RUNNING ALONG THE PLANT BOUNDARY.
6. RE-ROUTING OF EXISTING 400KV LINE NEAR PROPOSED SWITCHYARD AND CHP AREA BE SUITABLY INCORPORATED IN THIS DRAWING BY TSGENCO.
7. CUST. GRIDS HAVE BEEN CONVERTED TO PLANT GRIDS. REFERENCE POINT HAS BEEN INDICATED.
8. DUE TO REVISED MARSHALLING YARD, RAIL TRACKS ARE COMING OVER RAW WATER PIPES. HENCE, CULVERT TO BE PROVIDED AS INDICATED IN THE PLOT PLAN AND NECESSARY APPROVAL FROM RITES/ OTHER AGENCIES TO BE ARRANGED BY TSGENCO.
9. MARSHALLING YARD, RAIL TRACKS ARE CONSIDERED AT FGL 104.0M.
10. THE CORDINATES OF APPROACH ROADS NOT SHOWN IN THIS REVISIO SHALL BE INDICATED IN FURTHER REVISION OF PLOT PLAN AS PER RESPECTIVE FACILITY REQUIREMENTS.

REFERENCE DWG. :-

1. PLOT PLAN (CUSTOMER)	13A06-DWG-M-002 REVA
2. DG ROOM LAYOUT PLAN	IS-1-DG-694-800-A011
3. GATE COMPLEX	PE-DG-410-641-G024
4. ADMINISTRATIVE BUILDING	PE-DG-410-641-C002
5. TRANSFORMER YARD LAYOUT	PE-DG-410-100-E001
6. TG EQUIPMENT LAYOUT DRAWING AT GROUND FLOOR (AT 0.0M)	PE-DG-410-100-M003
7. GENERAL ARRGT. OF BOILER	0-00-022-76919
8. GENERAL ARRGT. OF ESP.	0-00-111-27526
9. LAYOUT OF IG SYSTEM	0-00-020-76876
10. YARD PIPE & TRESSLE LAYOUT	PE-DG-410-100-M051 TO M056
11. SWITCHYARD LAYOUT	TB-0-377-510-00
12. CW CHANNEL LAYOUT SIZING	PE-DG-410-165-N003

FOR AHP AREA
TP1 – 3M AWAY FROM AHP COMPRESSOR HOUSE.
TP2 – 3M AWAY FROM ASH WATER CUM SLURRY P/H
TP3 – 3M AWAY FROM BOUNDARY WALL

FOR CHP AREA
TP4 – 3M AWAY FROM ISG TP-12

LEGEND :-

ROAD
PIPE/CABLE RACK
BELT CONVEYOR
GREEN BELT
PEDESTAL PIPING

REV.	DATE	ALTD	CHD	APPD	DESCRIPTION
07	13.04.16	RA	GSF/PKK	JJ	1. GENERALLY UPDATED FOR CHP & AHP AREA, BOOSTER P/H, CW P/H, TRANSMISSION TOWER, TRANSFORMER YARD, SWITCHYARD, RAW WATER RESERVOIR.
08	03.03.16	RA	GSF/PKK	JJ	2. BOUNDARY. 3. TRANSFORMER YARD UPDATED. 4. SWITCHYARD UPDATED. 5. RE-ROUTING OF 220KV MULTI-CIRCUIT LINE AND 132KV S/C LINE & 400KV LINE PROVIDED AS PER LETTER NO. CE/SE/EAM/STAGE-VII/KTPP/F.16/D.NO.806/16 DT: 03.02.2016
06	03.03.16	RA	GSF/PKK	JJ	1. GENERALLY UPDATED FOR FUEL OIL UNLOADING P/H, RAW WATER PIPE ROUTING, FIRE STATION COORDINATES., RAW WATER & CLARIFIED WATER P/H, ELECTRICAL ANNEXE FOR AUX BOILER, SIMULATOR ROOM DELETED AS THE SAME IS TO BE SHIFTED OUTSIDE PLANT
05	30.11.15	RA	GSF/PKK	JJ	3. MARSHALLING YARD UPDATED AS PER RITES DRAWING RECEIVED ON 19.09.15. 4. RAW WATER PIPE CORDINATES INDICATED/ REROUTED 400KV HT LINES INDICATED/ AS PER TSGENCO LETTER NO CE/SE/ EAM/STAGE-VII (1X800MW)/KTPS/F.16/ D.NO. 630/15, DT:03.11.2015 2. REVISED AS PER DCPL & TSGENCO COMMENTS DTD: 06.07.2015. GENERALLY UPDATED FOR FUEL OIL AREA, CW PUMP HOUSE, PIPE RACK, FW P/H, FIRE STATION, CLARIFIED WATER P/H, ROADS, GATE COMPLEX ETC.
04	23.06.15	RA	GSF/PKK	JJ	1. REVISED AS PER DCPL & TSGENCO COMMENTS DTD: 13.06.2015. 2. GENERALLY UPDATED.
03	22.05.15	RA	GSF/PKK	JJ	1. REVISED AS PER DCPL & TSGENCO COMMENTS DTD: 18.05.2015. 2. GENERALLY UPDATED.
02	30.04.15	RA	GSF/PKK	JJ	1. REVISED AS PER DCPL COMMENTS DTD: 01.04.2015. 2. GAS CYLINDER SHED INDICATED. 3. GENERALLY UPDATED.
01	24.03.15	BS/RA	GSF/PKK	JJ	1. REVISED AS PER CUSTOMER COMMENTS DTD: 26.02.2015 & 27.02.2015. 2. UPDATED AS PER MOM DTD: 10.03.2015 BETWEEN BHEL AND TSGENCO. 3. GENERALLY UPDATED.

CUSTOMER: TELANGANA STATE POWER GENERATION CORPORATION LTD
TELANGANA, INDIA
1x800 MW KOTHAGUDAM TPS STAGE-VII UNIT#12, PALONCHA

OWNER'S CONSULTANT: DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA MUMBAI CHENNAI NEW DELHI

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

JOB NO. 410
STATUS: CONTRACT
DISTRIBUTION:

DEPT CODE		NAME	SIGN	DATE
M	DRN	RA	-Sd-	04.02.2015
	DES	GSF	-Sd-	04.02.2015
	CHD	PKK/SPV	-Sd-	04.02.2015
	APPD	JJ	-Sd-	04.02.2015

TITLE: PLOT PLAN

DEPT. | SCALE 1:3000 | DRAWING NO. PE-DG-410-100-M001
SIGN. | SHEET 1 OF 1 | REV. 07

SIZE-A0

SECTION – C2
SPECIFIC TECHNICAL REQUIREMENT- ELECTRICAL

	TITLE: ELECTRICAL EQUIPMENT SPECIFICATION FOR CONDENSATE POLISHING UNIT (CPU) KOTHAGUDEM TPS (1 X 800MW)	SPECIFICATION NO. VOLUME NO. : II-B SECTION: C2 REV NO. : 00 DATE: 19/03/2015 SHEET: 1 OF 1

CONTENTS

	TITLE: ELECTRICAL EQUIPMENT SPECIFICATION FOR CONDENSATE POLISHING UNIT (CPU) KOTHAGUDEM TPS (1 X 800MW)	SPECIFICATION NO.
		VOLUME NO. : II-B
		SECTION: C2
		REV NO. : 00 DATE: 19/03/2015
		SHEET: 1 OF 1

1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:

The equipment and services to be provided by bidder under this specification shall be as detailed here below but shall not be limited to the following:

a) Services and Equipment as per “Electrical Scope between BHEL and Vendor”.

b) Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the work for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The bidder without any extra charge shall provide the same.

c) Supply of mandatory spares as specified in the specifications of mechanical equipments.

d) Electrical load requirement for Condensate Polishing Unit (CPU)

e) All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information.

f) Bidder to furnish list of makes for each equipment at contract stage, which shall be subject to customer / BHEL approval without any commercial and delivery implications to BHEL.

g) Various drawings including GA drg, data sheet as per required format, quality plans, calculations, test reports, test certificates, operation and maintenance manuals, characteristic curves, wiring diagrams/schemes etc. shall be furnished as specified at contract stage. All documents shall be subject to customer / BHEL approval without any commercial implications to BHEL.

h) The sub-vendor list for various electrical items is subject to BHEL/Customer approval without any commercial implications.

i) Motors shall meet minimum requirement of Electric motor specification.

j) Purchaser will furnish data sheets to the vendor after award of contract. Vendor shall furnish filled in data sheets meeting the specification requirements.

k) Vendor to clearly indicate equipment locations and local routing lengths in their cable listing furnished to BHEL.

l) Cable BOQ worked out based on routing of cable listing provided by the vendor for “both end equipment in vendor’s scope” shall be binding to the vendor with +10 % margin to take care of slight variation in routing length & wastages.

2.0 EQUIPMENT & SERVICES TO BE PROVIDED BY PURCHASER FOR ELECTRICAL & TERMINAL POINTS:

Refer “Electrical Scope between BHEL and Vendor”.

3.0 **DOCUMENTS TO BE SUBMITTED ALONG WITH BID**

3.1 Bidder shall confirm total compliance to the electrical specification without any deviation from the technical / quality assurance requirements stipulated. In line with this, the bidder as technical offer shall furnish two signed and stamped copies of the following:

a) A copy of this sheet "Electrical Equipment Specification for Condensate Polishing Unit (CPU) and sheet "Electrical Scope between BHEL and Vendor" with bidder's signature and company stamp.
b) Electrical load requirement.

3.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer.

4.0 LIST OF ENCLOSURES

4.1 Electrical scope between BHEL & vendor
4.2 Technical specification – Specification for Electric Motors/Actuators
4.3 Datasheets & quality plan for motors.
4.4 Load Data Format. (Annexure –II)
4.5 BHEL Cable listing format (Annexure –III)

REV-0, DATE: 19.03.2015

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (FOR EPC PROJECTS)

PACKAGE : CONDENSATE POLISHING UNIT (CPU)

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

PROJECT: 1 x 800 MW KOTHAGUDEM TPS

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
1	415V MCC	BHEL	BHEL	1. 415 V AC (3 Phase, 3 Wire) supply to motors, 415 V AC (3 Phase, 4 Wire) /240 V AC supply to other equipment etc. shall be provided by BHEL based on load data provided by vendor at contract stage for the equipment supplied by vendor as part of contract. 2. Any other voltage level (AC/DC) required will be derived by the vendor.
2	Local Push Button Station (for motors)	BHEL	BHEL	Located near the motor.
3	Power cables, control cables and screened control cables for a) both end equipment in BHEL's scope b) both end equipment in vendor's scope c) one end equipment in vendor's scope	 BHEL BHEL BHEL	 BHEL Vendor BHEL	1. For 3.b) & c): Sizes of cables required shall be informed by vendor at contract stage (based on inputs provided by BHEL) in the form of cable listing. Finalisation of cable sizes shall be done by BHEL. Vendor shall provide lugs & glands accordingly. 2. Termination at BHEL equipment terminals by BHEL. 3. Termination at Vendor equipment terminals by Vendor.
4	Junction box for control & instrumentation cable	Vendor	Vendor	Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 10-12 mtrs) and trunk cable.
5	Any special type of cable like compensating, co-axial, prefab, MICC, optical fibre etc.	Vendor	Vendor	Refer C&I portion of specification for scope of fibre Optical cables if used between PLC/ microprocessor & DCS.
6	Cable trays, accessories & cable trays supporting system 100/ 50 mm cable trays/ Conduits/ Galvanised steel cable troughs for local cabling	BHEL Vendor	BHEL Vendor	Local cabling from nearby main route cable tray (BHEL scope) to equipment terminal (vendor's scope) shall be through 100/ 50 mm. cable trays/ conduits/ Galvanised steel cable troughs, as per approved layout drawing during contract stage.
7	Cable glands ,lugs and bimetallic strip 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 and control cables.
8	Conduit and conduit accessories for cabling between equipment supplied by vendor	Vendor	Vendor	Conduits shall be medium duty, hot dip galvanised cold rolled mild steel rigid conduit as per IS: 9537.

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (FOR EPC PROJECTS)

PACKAGE : CONDENSATE POLISHING UNIT (CPU)

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

PROJECT: 1 x 800 MW KOTHAGUDEM TPS

S.NO	DETAILS	SCOPE SUPPLY	SCOPE E&C	REMARKS
9	Lighting	BHEL	BHEL	
10	Equipment grounding (including electronic earthing) & lightning protection	BHEL	BHEL	Refer note no. 4 for electronic earthing
11	Below grade grounding	BHEL	BHEL	
12	LT Motors with base plate and foundation hardware	Vendor	Vendor	Makes shall be subject to customer/ BHEL approval at contract stage.
13	Mandatory spares	Vendor	-	Vendor to quote as per specification.
14	Recommended O & M spares	Vendor	-	As specified elsewhere in specification
15	Any other equipment/ material/ service required for completeness of system based on system offered by the vendor (to ensure trouble free and efficient operation of the system).	Vendor	Vendor	
16	a) Input cable schedules (Control & Screened Control Cables) b) Cable interconnection details for above c) Cable block diagram	Vendor Vendor Vendor	- - -	Cable listing for Control and Instrumentation Cable and electronic earthing cable in enclosed excel format shall be submitted by vendor during detailed engineering stage.
17	Electrical Equipment & cable tray layout drawings	Vendor	-	For ensuring cabling requirements are met, vendor shall furnish Electrical equipment layout & cable tray layout drawings (both in print form as well as in AUTOCAD) of the complete plant (including electrical area) indicating location and identification of all equipment requiring cabling, and shall incorporate cable trays routing details marked on the drawing as per PEM interface comments. Cabling arrangement of the same (wherever overhead cable trays, trenches, cable ducts, conduits etc.) shall be decided during contract stage. Electrical equipment layout & cable tray layout drawing shall be subjected to BHEL/ customer approval without any commercial implications to BHEL.
18	Electrical Equipment GA drawing	Vendor	-	For necessary interface review.

REV-0, DATE: 19.03.2015

ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (FOR EPC PROJECTS)

PACKAGE : CONDENSATE POLISHING UNIT (CPU)

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

PROJECT: 1 x 800 MW KOTHAGUDEM TPS

NOTES:

1. Make of all electrical equipment/ items supplied shall be reputed make & shall be subject to approval of BHEL/customer after award of contract.
2. All QPs shall be subject to approval of BHEL/customer after award of contract without any commercial implication.
3. In case the requirement of Junction Box arises on account of Power Cable size mis-match due to vendor engineering at later stage, vendor shall supply the Junction Box for suitable termination.
4. Vendor shall indicate location of Electronic Earth pit in their Civil assignment drawing.

TECHNICAL SPECIFICATION
FOR
A.C. & D.C. MOTORS

CONTENT

TECHNICAL SPECIFICATION
FOR
A.C. & D.C. MOTORS

1.00.00 **SCOPE**

1.01.00 This section covers the general requirements of the drive motors for power station auxiliary equipment.

1.02.00 Motors shall be furnished in accordance with both this general specification and the accompanying driven equipment specification.

1.03.00 In case of any discrepancy, the driven equipment specification shall govern.

2.00.00 **CODES & STANDARDS**

2.01.00 All motors shall conform to the latest applicable IS, IEC and CBIP Standards/ Publications except when otherwise stated herein or in the driven equipment specification.

2.02.00 Major standards, which shall be followed, are listed below other applicable Indian Standards for any component part even if not covered in the listed standards shall also be followed:

i) IS-325

ii) IS-12615

iii) IEC-60034

3.00.00 **SERVICE CONDITIONS**

3.01.00 The motors will be installed in hot, humid and tropical atmosphere highly polluted at places with coal dust and/or fly ash.

3.02.00 Unless otherwise noted, electrical equipment/system design shall be based on the service conditions and auxiliary power supply given in the annexure to this specification.

3.03.00 For motor installed outdoor and exposed to direct sunrays, the effect of solar heat shall be considered in the determination of the design ambient temperature.

4.00.00 **TYPE AND RATING**

4.01.00 **A.C. Motors**

4.01.01 Motors shall be general purpose, constant speed, squirrel cage, three/single phase, induction type.

4.01.02 All motors shall be rated for continuous duty. They shall also be suitable for long period of inactivity.

4.01.03 LT motor & HT motor name-plate rating at 50°C shall have at least 15% margin and 10% margin respectively over the input power requirement of the driven equipment at rated duty point unless stated otherwise in driven equipment specification.

4.01.04 The motor characteristics shall match the requirements of the driven equipment so that adequate starting, accelerating, pull up, break down and full load torques are available for the intended service.

4.01.05 Motors efficiency class shall be IE1, IE2 as per latest version of IEC-60034.

4.02.00 **D.C. Motors**

4.02.01 D.C. motor provided for emergency service shall be shunt/compound wound type.

4.02.02 Motor shall be sized for operation with fixed resistance starter for maximum reliability.

Starter panel complete with all accessories shall be included in the scope of supply.

5.00.00 **PERFORMANCE**

5.01.00 **Running Requirements**

5.01.01 Motor shall run continuously at rated output over the entire range of voltage and frequency variations as given in the annexure.

5.01.02 The motor shall be capable of operating satisfactorily at full load for 5 minutes without injurious heating with 75% rated voltage at motor terminals.

5.01.03 The motor shall be designed to withstand momentary overload of 60% of full load torque for 15 second without any damage.

5.02.00 **Starting Requirements**

Motor shall be designed for direct online starting at full voltage. Breakaway starting current as percentage of full load current for various motor rating shall not exceed the given below-

Motors up to 1500kW	-	600% subject to IS tolerance of plus 20%.
Motors above 1500kW	-	450% not subject to any positive tolerance.

5.02.01 The motor shall be capable of withstanding the stresses imposed if started at 110% rated voltage.

5.02.02 Motor shall start with rated load and accelerate to full speed with 80% rated voltage at motor terminals except mill motor. Mill motor shall start with rated load and accelerate to full speed at 85% of the rated voltage at the motor terminals.

5.02.03 a) Two hot starts in succession with motor initially at normal running temperature.

b) Pump motor subject to reverse rotation shall be designed to withstand the stresses encountered when starting with shaft rotating at 125% rated speed in reverse direction.

5.02.04 The motors shall be designed to withstand 120% of rated speed for 2 minutes without any mechanical damage.

5.03.00 **Stress During Bus Transfer**

5.03.01 The motor may be subjected to sudden application of 150% rated voltage during bus transfer, due to the phase difference between the incoming voltage and motor residual voltage.

5.03.02 The motor shall be designed to withstand any torsional and/or high current stresses, which may result, without experiencing any deterioration in the normal life and performance characteristics.

5.04.00 **Locked Rotor Withstand Time**

5.04.01 The locked rotor withstand time under hot condition at 110% rated voltage shall be more than motor starting time by at least 3 seconds for motors up to 20 seconds starting time and by 5 seconds for motor with more than 20 seconds starting time.

5.04.02 Starting time mentioned above is at minimum permissible voltage of 80% rated voltage.

5.04.03 Hot thermal withstand curve shall have a margin of at least 10% over the full load current of the motor to permit relay setting utilising motor rated capacity.

6.00.00 **SPECIFIC REQUIREMENTS**

6.01.00 **Enclosure**

6.01.01 All motor enclosures for outdoor, semi-outdoor & indoor application shall conform to the degree of protection IP-55 unless otherwise specified. Motor for outdoor or semi-outdoor service shall be of weather-proof construction with canopy.

6.01.02 For hazardous area approved type of increased safety enclosure shall be furnished.

6.02.00 **Cooling**

6.02.01 The motor shall be self ventilated type, either totally enclosed fan cooled IC 411(TEFC), totally enclosed tube ventilated IC 511(TETV) or closed air circuit air- cooled IC 611(CACA).

6.02.02 For large capacity motors not available with above type of cooling may be accepted with IC 81W or IC 91W, closed air circuit water cooled (CACW) subject to the approval of the owner.

6.03.00 **Winding and Insulation**

6.03.01 All insulated winding shall be of copper.

6.03.02 All motors shall have class F insulation but limited to class B temperature rise.

6.03.03 Windings shall be impregnated to make them non-hygroscopic and oil resistant.

6.04.00 **Tropical Protection**

6.04.01 All motors shall have fungus protection involving special treatment of insulation and metal against fungus, insects and corrosion.

6.04.02 All fittings and hardwares shall be corrosion resistant.

6.05.00 **Bearings**

6.05.01 Motor shall be provided with antifriction bearings, unless sleeve bearings are required by the motor application. Bearings shall be rated for minimum service life of 40,000Hrs.

6.05.02 Vertical shaft motors shall be provided with thrust and guide bearings. Thrust bearing of tilting pad type is preferred.

6.05.03 Bearings shall be provided with seals to prevent leakage of lubricant or entrance of foreign matters like dirt, water etc. into the bearing area.

6.05.04 Sleeve bearings shall be split type, ring oiled, with permanently aligned, close running shaft sleeves.

6.05.05 Grease lubricated bearings shall be pre-lubricated and shall have provisions for in-service positive lubrication with drains to guard against over lubrication. LT motors 15kW and above shall be provided with external greasing arrangement.

6.05.06 Oiled bearing shall have an integral self cooled oil reservoir with oil ring inspection ports, oil sight glass with oil level marked for standstill and running conditions and oil fill and drain plugs.

6.05.07 Forced lubricated or water cooled bearing shall not be used without prior approval of Owner.

6.05.08 Lubricant shall not deteriorate under all service conditions. The lubricant shall be limited to normally available types with IOC equivalent.

6.05.09 Bearings shall be insulated as required to prevent shaft current and resultant bearing damage.

6.06.00 **Noise & Vibration**

6.06.01 All HT motors shall be provided with vibration pads for mounting of vibration detectors. Vibration monitoring devices shall be provided on DE and NDE side in x&y direction with remote DCS monitoring, alarm and tripping.

6.06.02 The maximum double amplitude vibrations for HT motors upto 1500 rpm shall be 25 microns and 15 microns upto 3000 rpm. For 415V motors, maximum double amplitude vibrations upto 1500 rpm shall be 40 microns and 15 microns upto 3000 rpm.

6.06.03 The noise level shall not exceed 85db (A) at 1.5 meters from the motor.

6.07.00 **Motor Terminal Box**

6.07.01 Motor terminal box shall be detachable type and located in accordance with Indian Standards clearing the motor base- plate/ foundation

6.07.02 Terminal box shall be capable of being turned 360 Deg. in steps of 180 Deg. for HT motors and 90 Deg. for LT motors unless otherwise approved.

6.07.03 The terminal box shall be split type with removable cover with access to connections and shall have the same degree of protection as motor.

6.07.04 The terminal box shall have sufficient space inside for termination/connection of XLPE insulated armoured aluminium cables.

6.07.05 Terminals shall be stud or lead wire type, substantially constructed and thoroughly insulated from the frame.

6.07.06 The terminals shall be clearly identified by phase markings, with corresponding direction of rotation marked on the non-driving end of the motor.

6.07.07 The terminal box shall be capable of withstanding maximum system fault current for a duration of 0.25 sec.

6.07.08 For 11000V and 3300V motor, the terminal box shall be phase-segregated type. The neutral leads shall be brought out in a separate terminal box (not necessarily phase segregated type) with shorting links for star connection.

6.07.09 Motor terminal box shall be furnished with suitable cable lugs and double compression brass glands to match with cable used.

6.07.10 The gland plate for single core cable shall be non-magnetic type.

6.07.11 Minimum clearances to be provided between phase to phase and phase to earth shall be as under-

Voltage Rating of Motor		Minimum Ph-Ph & Ph-Earth clearance
0.415 kV	:	25 mm
3.3 kV	:	65 mm
11.0 kV	:	140 mm

Note: In case it is not possible to maintain these clearances, the live parts shall be totally insulated from earth and other Phases. Adequate clearances shall be provided for cable connections.

6.08.00 **Grounding**

6.08.01 The frame of each motor shall be provided with two separate and distinct grounding pads complete with tapped hole, GI bolts and washer.

6.08.02 The grounding connection shall be suitable for accommodation of ground conductors as follows:

Rating			Conductor Size
Above	Up to		
-------	5.5 kW	:	8 SWG GI Wires.
5.5 kW	22 kW	:	25mm X 4mm GS Flat.
23 kW	55 kW	:	40mm X 6mm GS Flat.
56kW	174kW	:	50mm X 8mm GS Flat.
175kW	ABOVE	:	75mm X 10mm GS Flat.

6.08.03 The cable terminal box shall have a separate grounding pad.

6.09.00 **Minimum Cable Size for LT & HT Motors shall as be as follows-**

a) For 415V, 3-Ph, LT Motors-

Rating			Cable Size
Above	Up to		
-------	5.5 kW	:	1R X 3C X 6 Sq.mm
5.5 kW	11 kW	:	1R X 3C X 10 Sq.mm
11 kW	22 kW	:	1R X 3C X 35 Sq.mm
22 kW	37.5 kW	:	1R X 3C X 70 Sq.mm.
37.5kW	55 kW	:	1R X 3C X 150 Sq.mm
55 kW	75 kW	:	1R X 3C X 300 Sq.mm
75 kW	110kW	:	2R X 3C X 150 Sq.mm
110 kW	175kW	:	2R X 3C X 300 Sq.mm

b) For 3.3kV & 11kV, 3-Ph, HT Motors-

Rating			Cable Size
Above	Up to		

175 kW	1000 kW	:	1R X 3C X 240 Sq.mm
1000 kW	2000 kW	:	2R X 3C X 240 Sq.mm
2000 kW	4500 kW	:	2R X 3C X 300 Sq.mm
4501 kW	10,000 kW	:	9R X 1C X 1000 Sq.mm.

Note: During detail engineering if higher cable size is required same shall be provided.

6.10.00 **Rating Plate**

In addition to the minimum information required by IS, the following information shall be shown on motor rating plate :

a) Temperature rise in Deg.C under rated condition and method of measurement.

b) Degree of protection.

c) Bearing identification no. and recommended lubricant.

d) Location of insulated bearings.

7.00.00 **ACCESSORIES**

7.01.00 **General**

Accessories shall be furnished, as listed below, or if otherwise required by driven equipment specification or application.

7.02.00 **Space Heater**

7.02.01 Motor of rating 30 kW and above shall be provided with space heaters, suitably located for easy removal or replacement.

7.02.02 The space heater shall be rated 240 V, 1 Phase, 50Hz and sized to maintain the motor internal temperature above dew point when the motor is idle.

7.02.03 Minimum Cable Size for space heater shall be as listed-

i) For LT motors: 2.5 sq.mm, 2-Core copper cable complying with IS-1554(Part-1).

ii) For HT motors: 6 sq.mm, 2 Core aluminium cable complying with IS-1554(Part-1).

7.03.00 **Temperature Detectors**

7.03.01 All 11000V and 3300V motors shall be provided with twelve (12) nos. simplex type winding temperature detectors, four (4) nos. per phase.

7.03.02 11000V and 3300V motor bearing shall be provided with duplex type temperature detectors.

7.03.03 The temperature detector mentioned above shall be resistance type, 3 wire, platinum wound, 100 Ohms at 0°C.

7.03.04 Leads of all simplex type motor winding RTDS and motor bearing RTDS shall be wired up to respective switchgear metering & protection compartment. From which one set of RTDS will be connected to numerical protection relay and another set shall be kept free for DDCMIS connectivity.

7.03.05 0.5 sq.mm annealed tinned copper conductor complying with IS-1554(Part-1). shall be used for RTD/BTD wiring.

7.04.00 **Indicator/Switch**

7.04.01 Dial type local indicator with alarm contacts shall be provided for the following:

a) 11000 V and 3300V motor bearing temperature.

b) Hot and cold air temperature of the closed air circuit for CACA and CACW motor.

7.04.02 Flow switches shall be provided for monitoring cooling water flow of CACW motor and oil flow of forced lubrication bearing, if used. CACW motor shall be provided with water leakage detector with remote alarm and tripping.

7.04.03 Alarm switch contact rating shall be minimum 2.0 A at 220V D.C. and 10A at 240V A.C.

7.05.00 **Current Transformer for Differential Protection**

7.05.01 Motor 1000 kW and above shall be provided with three differential current transformers mounted over the neutral leads within the enclosure.

7.05.02 The arrangement shall be such as to permit easy access for C.T. testing and replacement. Current transformer characteristics shall match Owner's requirements to be intimated later.

7.06.00 **Accessory Terminal Box**

7.06.01 All accessory equipment such as space heater, temperature detector, current transformers etc., shall be wired to and terminated in terminal boxes, separate from and independent of motor (power) terminal box.

7.06.02 Accessory terminal box shall be complete with double compression brass glands and pressure type terminals to suit owner’s cable connections.

7.07.00 **Drain Plug**

Motor shall have drain plugs so located that they will drain the water, resulting from the condensation or other causes from all pockets of the motor casing.

7.08.00 **Lifting Provisions**

Motor weighing 25 Kg. or more shall be provided with eyebolt or other adequate provision of lifting.

7.09.00 **Dowel Pins**

The motor shall be designed to permit easy access for drilling holes through motor feet or mounting flange for installation of dowel pins after assembling the motor and driven equipment.

7.10.00 **Painting**

PL. REFER PAINTING SCHEDULE OF MECHANICAL SPECIFICATION

8.00.00 **TESTS**

Routine and Type Tests are to be conducted in presence of customer's representative as per IS:325 and in addition,any special test called for in the driven equipment specification shall be performed and required copies of test certificates are to be furnished for approval. In addition, following tests shall have to be carried out on the motors in presence of OWNER's representative on 3.3kV/11kV motors.

a. Impulse test by 1.2 / 50 micro sec. On sample coil of Stator winding insulation as type test as per IEC-60034, part -15 test voltages as under :

Voltage rating of motor	Impulse Test Voltage
3.3 kV	18 kV peak
11 kV	49 kV peak

b. Tan delta, charging current and dielectric loss measurements on each phase of motor stator winding as routine test.

c. Polarization Index Test as per IS: 7816 as routine test

d. Test for suitability of IPW– 55(Weather proof) as per IS 4691 as type test. Type test certificate for first numeral shall be acceptable in lieu to test, provided the test motor is identical to motor being supplied. Second numeral test shall be carried out on one motor of each type and rating.

e. Fault Withstand Test for main terminal box as type test. Type test certificate shall be acceptable, if the test is conducted on exactly identical terminal box.

f. Test for noise level as routine test.

g. Test for vibration as routine test.

h. Tan delta measurement on coils.

i. Surge withstand test for inter turn insulation.

j. Test to diagnose rotor bar failure during manufacture.

k. Over speed test as routine test.

l. Temperature rise test.

Temperature rise under normal condition above ambient temperature shall be limited to-

Specified Design Ambient temperature	Thermometer Method	Resistance Method
50 deg.C	60 deg.C	70 deg.C
45 deg.C	65 deg.C	75 deg.C
40 deg.C	70 deg.C	80 deg.C

Tests indicated at (h), (i), (j) shall be carried out during manufacture of the coils and shall be furnished for verification.

9.00.00 **DRAWINGS, DATA & MANUALS**

9.01.00 Drawings, Data & Manuals shall be submitted in triplicate with the bid and in quantities and procedures as specified in General Conditions of Contract and/or elsewhere in the specification for approval and subsequent distribution after the issue of 'Letter of Intent'.

9.02.00 **To be Submitted with the bid**

a) List of the motors

b) Individual motor data sheet as per format of the proposal data sheets.

c) Scheme & write-up on forced lubrication system, if any

d) Type test report

9.03.00 **To be submitted for Owner / Purchaser's Approval and Distribution**

All relevant drawings and data pertaining to the equipment like GTP, GA drawing, foundation plan, QAP, etc. shall be submitted by the Bidder for approval of Owner/Owner's consultant. ~~Also refer clause no. 1.19.02(u) of Section-I of Volume – V-A: Technical Specifications for Electrical Equipment & Accessories.~~

ANNEXURE-A

DESIGN DATA

1.0 AUXILIARY POWER SUPPLY

Supply		Description	Consumer
H.V. Supply		11000 V, 3Ø, 3W, 50 Hz, Non-effectively earthed Fault level 44 kA symm. for 1 sec.	Motors 1500 kW & above
M.V. Supply		3300 V, 3Ø, 3W, 50 Hz, Non-effectively earthed Fault level 40 kA symm. for 1 sec.	Motors 175 kW and Up to less than 1500 kW.
L.V. Supply	(i)	415V, 3Ø, 3W, 50 Hz effectively earthed Fault level 50 kA symm. for 1 sec.	Motors above 0.2kW and below 175kW.
		240V, 1Ø, 2W, 50 Hz effectively earthed	Lighting, Space heating , A.C supply for Control & protective devices.
D.C. Supply		220V, 2W, unearthed Fault level 25* kA. for 1 sec.	D.C. alarm, control & protective devices

* Indicative only, the actual value will be decided by the Bidder, after substantiating the same by calculation.

Note-

- 415V or 3.3 kV may be adopted by the bidder for the drives in the range of 160-210 kW.
- 3.3 kV AC supply for CHP conveyor motors of rating above 160 kW is to be used.
- The voltage rating of the drives indicated above is for basic guideline. Minor variations can be accepted on case to case basis based on techno-economic considerations of the various sub-systems.
- Voltage rating for special purpose motors viz, VFD and screw compressors, shall be as per manufacturer's standard. All the motors ratings on Stacker/ reclaimer shall be 415V ac supply only.

2.0 RANGE OF VARIATION

A.C. Supply :

Voltage	:	± 10%
Frequency	:	+3% to -5%
Combined Volt + frequency	:	10% (absolute sum)

During starting of large motor, the voltage may drop to 80% of the rated voltage for a period of 60 seconds. All electrical equipment while running shall successfully ride over such period without affecting system performance.

D.C. Supply :

Voltage	:	187 to 242 Volt

TECHNICAL SPECIFICATION
FOR
ELECTRIC MOTOR ACTUATORS

CONTENT

TECHNICAL SPECIFICATION FOR ELECTRIC MOTOR ACTUATORS

1.00.00 SCOPE

1.01.00 This Section covers the general requirements of Electric Motor Actuators for valves/dampers.

1.02.00 All electric motor actuators shall be furnished in accordance with this general specification and the accompanying driven equipment specification. All the electrical actuators shall be INTEGRAL type only.

2.00.00 STANDARDS

2.01.00 All electrical equipment shall conform to the latest applicable IS, ANSI and NEMA Standards, except when stated otherwise herein or in driven equipment specification.

2.02.00 Major standards, which shall be followed, are listed below. Other applicable Indian Standards for any component part even if not covered in the listed standards shall also be followed

i) IS-9334

ii) IS-325

3.00.00 SERVICE CONDITIONS

3.01.00 The actuator shall be suitable for operation in hot, humid and tropical atmosphere, highly polluted at places with coal dust and/or fly ash.

3.02.00 Unless otherwise noted, electrical equipment/system design shall be based on the service conditions and auxiliary power supply given in the general specification.

3.03.00 For actuator motor installed outdoor and exposed to direct sun rays, the effect of solar heat shall be considered in the determination of the design ambient temperature.

4.00.00 RATING

4.01.00 For isolating service, the actuator shall be rated for three successive open-close operation of the valve/damper or 15 minutes, whichever is longer.

4.02.00 For regulating service, the actuator shall be suitably time-rated for the duty cycle involved with necessary number of starts per hour, but in no case less than 150 starts per hour.

5.00.00 **PERFORMANCE**

The actuator shall meet the following performance requirements:

5.01.00 Open and close the valve completely and make leak-tight valve closure without jamming.

5.02.00 Attain full speed operation before valve load is encountered and imparts an unseating blow to start the valve in motion (hammer blow effect).

5.03.00 Operate the valve stem at standard stem speed and shall function against design differential pressure across the valve seat.

5.04.00 The motor reduction gearing shall be sufficient to lock the shaft when the motor is de-energised and prevent drift from torque switch spring pressure.

5.05.00 The entire mechanism shall withstand shock resulting from closing with improper setting of limit switches or from lodging of foreign matter under the valve seat.

6.00.00 **SPECIFIC REQUIREMENT**

6.01.00 **Construction**

6.01.01 The actuator shall essentially comprise the drive motor, torque/ limit switches, gear train, clutch, hand wheel, position indicator/ transmitter, in-built thermostat for over load protection, space heater and internal wiring.

6.01.02 The actuator enclosure shall be totally enclosed, dust tight, weather-proof suitable for outdoor use without necessity of any canopy. Degree of protection of enclosure for motor actuator shall be IP-65.

6.01.03 All electrical equipment, accessories and wiring shall be provided with tropical finish to prevent fungus growth.

6.01.04 The actuator shall be designed for mounting in any position without any lubricant leakage or operating difficulty.

6.02.00 **Motor**

6.02.01 The drive motor shall be three phase, squirrel cage, induction machine with minimum class B insulation and IPW-55 enclosure, designed for high torque and reversing service. Canopy shall be provided for outdoor service.

6.02.02 The motor shall be designed for full voltage direct on-line start, with starting current limited to 6 times full-load current.

6.02.03 The motor shall be capable of starting at 85 percent of rated voltage and running at 80 percent of rated voltage at rated torque and 85 percent rated voltage at 33 percent excess rated torque for a period of 5 minutes each.

6.02.04 Motor leads shall be terminated in the limit switch compartment.

6.02.05 Motor actuators for valves/dampers shall be with integral starter with 3phase/3wire, 415V AC and operable from remote.

6.02.06 Earthing terminals shall be provided on either side of the motor.

6.03.00 **Limit Switches**

Each actuator shall be provided with following limit switches: -

6.03.01 2 torque limit switches, one for each direction of travel, self-locking, adjustable torque type.

6.03.02 4 end-of-travel limit switches, two for each direction of travel.

6.03.03 2 position limit switches, one for each direction of travel, each adjustable at any position from fully open to fully closed positions of the valve/damper.

6.03.04 Each limit switch shall have 2 NO + 2 NC potential free contacts. Contact rating shall be 5A at 240V A.C. or 0.5A at 220V D.C.

6.04.00 **Hand Wheel**

Each actuator shall be provided with a hand wheel for emergency manual operation. The hand wheel shall declutch automatically when the motor is energized.

6.05.00 **Position Indicator/Transmitter**

The actuator shall have:

6.05.01 One (1) built-in local position indicator for 0-100% travel.

6.05.02 One (1) position transmitter, 4-20 mA current signal as position feedback, for remote indicator.

6.06.00 **Space Heater**

A space heater shall be included in the limit switch compartment suitable for 240V, 1 phase, 50 Hz supply.

6.07.00 **Wiring**

All electrical devices shall be wired up to and terminated in a terminal box. All wiring shall be done with 1100V grade fire resistance PVC insulated stranded copper conductor of not less than 2.5 Sq.mm cross section. All wiring shall be identified at both ends with ferrules. All the electrical actuators shall have uniform wiring.

6.08.00 **Terminal Box**

The terminal box shall be weather proof, with removable front cover and cable glands for cable connection. The terminal shall be suitable for connection of 2.5 Sq.mm copper conductor.

7.00.00 **ACCESSORIES**

As required for the driven equipment, the actuator shall be furnished with starting equipment mounted on the actuator. This shall include:

7.01.00 One (1) triple pole MCCB

7.02.00 One (1) reversing starter with mechanically interlocked contactors, 3 thermal overload relays, 2 NO + 2 NC auxiliary contacts for each contactor.

7.03.00 One (1) remote-local selector switch.

7.04.00 CLOSE-STOP-OPEN oil tight push buttons with indication lights.

7.05.00 415/240 V control transformer with primary & secondary fuses.

8.00.00 **TEST**

The actuator and all components thereof shall be subject to tests as per relevant Standards. In addition, if any special test is called for in equipment specification, the same shall be performed.

9.00.00 **DRAWINGS, DATA & MANUALS**

9.01.00 Drawings, Data & Manuals shall be submitted in triplicate with the bid and in quantities and procedures as specified in General Conditions of Contract and/or elsewhere in the specification for approval and subsequent distribution after the issue of 'Letter of Intent'.

9.02.00 **To be submitted with Bid**

Data sheet for each type of actuator shall be furnished along with internal wiring diagram, suggested control schematic and torque limit switch contact development and manufacturer's catalogues. Drawings, Data & Manuals shall be submitted in triplicate with the bid and in quantities and procedures as specified in General Conditions of Contract and/or elsewhere in the specification for approval and subsequent distribution after the issue of 'Letter of Intent'.

9.03.00 **To be submitted for Owner / Purchaser's Approval and Distribution**

All relevant drawings and data pertaining to the equipment like GTP, GA drawing, foundation plan, BOM, control & schematics, QAP, etc. shall be submitted by the Bidder for approval of Owner/Owner's consultant. ~~Also refer clause no. 1.19.02(u) of Section I of Volume – V-A: Technical Specifications for Electrical Equipment & Accessories~~.

ANNEXURE-A

DESIGN DATA

1.0 AUXILIARY POWER SUPPLY

Supply		Description	Consumer
L.V. Supply	(i)	415V, 3Ø, 3W, 50 Hz Effectively earthed Fault level 50 kA symm. for 1 sec.	Motors above 0.2kW upto less than 175kW.
		240V, 1Ø, 2W, 50 Hz effectively earthed	Lighting, Space heating , A.C supply for Control & protective devices.
D.C. Supply		220V, 2W, unearthed Fault level 25* kA. for 1 sec.	D.C. alarm, control & protective devices

* Indicative only, the actual value will be decided by the Bidder, after substantiating the same by calculation.

2.0 RANGE OF VARIATION

A.C. Supply :

Voltage	:	± 10%
Frequency	:	+3% to -5%.
Combined Volt + frequency	:	10% (absolute sum)

During starting of large motor, the voltage may drop to 80% of the rated voltage for a period of 60 seconds. All electrical equipment while running shall successfully ride over such period without affecting system performance.

D.C. Supply :

Voltage	:	187 to 242

	TITLE	SPECIFICATION NO.
	MOTOR	VOLUME II B
		SECTION D
	DATA SHEET - C	REV NO. 00 DATE 08/09/2010
		SHEET 1 OF 7

LT MOTORS

A. GENERAL

1.	Manufacturer & Country of origin. (Shall be as per approved QA make)	
2.	Equipment driven by motor	
3.	Motor type	
4.	Quantity	

B. DESIGN AND PERFORMANCE DATA

1.	Frame size		
2.	Type of duty		
3.	Type of enclosure /Method of cooling/Degree of protection		
4.	Applicable standard to which motor generally conforms		
5.	Efficiency class as per IS 12615		
6.	(a)	Whether motor is flame proof	Yes/No
	(b)	If yes, the gas group to which it conforms as per IS:2148	
7.	Type of mounting		
8.	Direction of rotation as viewed from DE END__		
9.	Standard continuous rating at 40 deg.C. ambient temp. as per Indian Standard (KW)		
10.	Derated rating for specified normal condition i.e. 50 deg. C ambient temperature (KW)		
11.	Maximum continuous load demand of driven equipment in KW		
12.	Rated Voltage (volts)		
13.	Permissible variation of :		

NAME OF VENDOR				REV.	
NAME	SIGNATURE	DATE	SEAL		