

**1X800 MW TSGENCO KOTHAGUDEM TPS
STAGE –VII, PALONCHA**

VOLUME: II B & III

**TECHNICAL SPECIFICATIONS
FOR
SIDE STREAM FILTRATION PLANT**

SPECIFICATION NO.: PE-TS-410-181-A001



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, INDIA**



TITLE:	SPEC NO: PE-TS-410-181-A001	
	VOLUME: II-B	
	SECTION: A	
	REV NO: 00	DATE:

TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X800 MW TSGENCO KOTHAGUDEM TPS
STAGE -VII, PALONCHA

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VOLUME-IIB & III

VOLUME-IIB

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SECTION – A SCOPE OF ENQUIRY



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1. SCOPE OF INQUIRY/ INTENT OF SPECIFICATION

- 1.1 The specification is intended to cover design, engineering, manufacture, fabrication, assembly, inspection and testing at vendor's & sub-vendor's works, painting, mandatory spares along with spares for erection and commissioning, startup and commissioning as required, forwarding, proper packing, shipment and delivery at site, unloading, handling & transportation at site, Erection & Commissioning, trial run, on FOR site basis, preparation & submission of "As Built" drawings, PG test at site and handing over of Side Stream Filtration Plant as per the details in different sections / volumes of this specification for **1X800 MW TSGENCO KOTHAGUEDEM TPS,STAGE-VII, PALONCHA**.
- 1.2 The contractor shall be responsible for providing all material, equipment & services, which are required to fulfil the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under this specification, irrespective of whether it has been specifically listed herein or not. Omission of specific reference to any component / accessory necessary for proper performance of the equipment shall not relieve them of the responsibility of providing such facilities to complete the supply, erection and commissioning of Condensate Polishing Units and external regeneration system.
- 1.3 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which in his judgment is not in full accordance herewith.
- 1.4 The extent of supply under the contract includes all items shown in the drawings, notwithstanding the fact that such items may have been omitted from the specification or schedules. Similarly, the extent of supply also includes all items mentioned in the specification and /or schedules, notwithstanding the fact that such items may have been omitted in the drawing.
- 1.5 The general terms and conditions, instructions to tenderer and other attachment referred to elsewhere are made part of the tender specification. The equipment materials and works covered by this specification are subject to compliance to all attachments referred to in the specification. The bidder shall be responsible for and governed by all requirements stipulated herein.
- 1.6 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Vol-III of the specification. In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of BHEL/Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by BHEL/ Customer as and when brought to their notice either by the bidder or by BHEL/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.
- 1.7 Deviations, if any, should be very clearly brought out clause by clause in the enclosed schedule; otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification.
- 1.8 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.
- 1.9 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder/vendor and Customer/Purchaser/Employer will mean BHEL and/or Customer (TSGENCO: Telangana State Power Generation Corporation Ltd.) including their consultant (Development Consultants Pvt. Ltd.) as interpreted by BHEL in the relevant context. Bidder to refer GCC/SCC for more clarity.
- 1.10 The equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and dispatch release issued by BHEL/Customer.
- 1.11 BHEL's/Customer's representative shall be given full access to the shop in which the equipments are being manufactured or tested and all test records shall be made available to him.
- 1.12 Pre-bid meeting shall be held before bid submission. Bidder to ask all their queries in pre-bid meeting.



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SECTION – B PROJECT INFORMATION



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PROJECT SYNOPSIS AND GENERAL INFORMATION

1.00.00 INTRODUCTION

The proposed 1x800 MW Kothagudem Thermal Power Station (KTPS), Stage-VII, Unit-12 would be set up by Telangana State Power Corporation Ltd. (TSGENCO) at Kothagudem, Telangana. The proposed Power Plant will be installed adjacent to the existing D colony of Kothagudem Thermal Power Station, at Kothagudem.

The Bidder shall acquaint himself by a visit to the site, if felt necessary, with the conditions prevailing at site before submission of the bid. The information given here in under is for general guidance and shall not be contractually binding on the Owner. All relevant site data /information as may be necessary shall have to be obtained /collected by the Bidder.

2.00.00 APPROACH TO SITE

Site is located in the existing D Colony of Kothagudem Thermal Power Station, which is at a distance 30 km from temple town of Bhadrachalam and 300 km from Hyderabad by road. The Nearest railway station is Bhadrachalam Road (Known as Kothagudem) at a distance of 12 km. Kothagudem- Bhadrachalam National Highway branches off to the power station site near village Paloncha.

3.00.00 LAND

Land is primarily required for the main plant & auxiliaries (BTG) and balance of plant (BOP) like ash handling, coal storage, cooling tower, switchyard etc., which is available within the existing plant boundary.

The existing colony is to be dismantled, and the land of about 137 acres will be used for the main plant building, water facilities, switchyard, coal handling etc. The raw water reservoir will be located adjacent to the existing raw water reservoirs.

230 acres of land required for Ash Dyke will be procured. Land is available for staff colony, which is to be constructed by the EPC contractor.

4.00.00 SOURCE OF COAL

100% Imported and Blended coal (50% imported + 50% indigenous) will be used. Indigenous coal shall be sourced from Suliyari coal mines, Madhya Pradesh.



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5.00.00

SOURCE OF WATER

Source of water (total quantity of water is 2192 m³/hr) is Godavari River near Burgampahad & water will be pumped through existing GRP pipe line (of length approx. 26 km).

6.00.00

ASH DISPOSAL AREA

Ash shall be dumped in the ash dump area which will be about 9 km from plant. The ash dyke area of 230 acres is adequate for 1x800 MW unit as per MOEF norms.

7.00.00

SALIENT DESIGN DATA

7.01.00

Meteorological data of site is given below:-

Elevation above MSL : 89 m

Monthly highest temperature : 44.9 °C

Monthly lowest temperature. : 12.9 °C

Rainfall

Average.: 1031 mm

Max. : 100 mm/ hr

Mean Wind speed : 5.8 kmph

Relative Humidity

Max : 82%

Min : 35%

Seismic Zone : Zone-III as per IS- 1893 (Part-IV)

[Climatological data of Khammam is attached for reference].

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SECTION – C
(SPECIFIC TECHNICAL REQUIREMENTS)

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1.0 SCOPE OF SUPPLY:

The scope of supply under this specification shall be as follows:

1.1 SIDE STREAM FILTRATION PLANT (SSF):

- 1.1.1 14 Numbers (12 working +2 s/under backwash) side stream filters (SSF) as per the datasheet and P&ID.
- 1.1.2 The SSF shall be complete with inlet, outlet connections, and bed support system, Inlet water distribution, siphon breaker, back wash facility etc.
- 1.1.3 Internals, fittings and appurtenances of SSF as per system requirement.
- 1.1.4 All necessary drains, vents and valves, sampling point etc. as specified and as required.
- 1.1.5 All interconnection piping & valves, fittings, instruments (as minimum) as shown in the P & ID and as mentioned in Data Sheet-A.
- 1.1.6 Hangers and supports as per the requirement.
- 1.1.7 Filtration media for all SSF.
- 1.1.8 Start-up & Commissioning spares.
- 1.1.9 Mandatory spares.
- 1.1.10 Counter flanges, blank flanges, isolation valves at all the terminal points as required as per system requirements.
- 1.1.11 All special tools necessary for proper maintenance or adjustment of the equipment packed in permanent box.
- 1.1.12 All necessary structural steel for pipe supporting structure, platforms, walkways / pathways and access stairs, mechanical plant and equipment, mechanical services and pipe work associated with electro chlorination Plant.
- 1.1.13 Permanent ladder (not rungs) for approaching the top of tanks, valves for All steel inserts with lugs, plates, bolts, nuts, sleeves, edge angles and all other embedding components etc as required to grout in civil works and to support/hold the equipments being supplied under this specification for opening/maintenance purpose.
- 1.1.14 All auxiliary steel structures (U-clamps, nuts, bolts, channels etc.) for fixing the pipe on the pedestal or trestles.
- 1.1.15 Wrapping, coating and protection of all the buried pipe shall be as per IS 10221 or AWWA C 203.
- 1.1.16 Finish paint for touch-up painting of equipment after erection at site in sealed containers.
- 1.1.17 Set of special tools and tackles if required for maintenance and erection of equipment supplied.
- 1.1.18 All necessary flanges and counter flanges to interconnect the piping.

2.0 SCOPE OF SERVICE:

The bidder's scope also includes the following services at site:

- 2.1 Erection and commissioning, unloading, storage and handling at site.
- 2.2 Arrangement of all instruments and lab facilities to carry out trial run, commissioning and PG test.
- 2.3 In site transportation.
- 2.4 Monitoring gadgets, instruments and equipments required for maintenance (till PG test and plant handed over).
- 2.5 All personal required during commissioning and PG test.
- 2.6 Complete grouting for equipment, fixing and any concreting inside the vessels and lining.
- 2.7 Trial run for requisite period.
- 2.8 Performance testing.
- 2.9 Painting as per enclosed painting schedule. However, any variation in the painting schedule as finally approved by customer shall be taken care by the bidder without any commercial and delivery implication. Colour coding scheme shall be intimated to vendor during detailed engineering.
- 2.10 SSF shall be either site fabricated or shop fabricated.

3.0 TERMINAL POINTS:

- 3.1 SSF plant inlet header: Single piping connection near SSF area (Twenty (20) meter from SSF boundary). Working pressure of inlet water of SSF is 3.5-4 Kg/Cm² (g). Design pressure of SSF will be 7.5 kg/cm² (g) minimum.
- 3.2 SSF outlet header: Up to the cooling tower forebay (Refer P&ID for SSF, P&ID for CW & ACW flow and Layout). Minimum length of pipe will be 200 meters.
- 3.3 Back Wash water outlet: Backwash water outlet piping till backwash sump (backwash sump is not in bidder's scope).

Note: Bidder to note that the pipe length indicated in the specification may vary by +10 % for which no extra claim shall be applicable.

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4.0 MAJOR EXCLUSIONS

- 4.1 All civil work including foundation of equipment. However, complete grouting for equipment, fixing and any concreting inside vessels shall be in the scope of bidder.
- 4.2 Pedestals for pipe supports, however, auxiliary structure, supports components for piping is in bidder's scope.

5.0 BIDDER TO FURNISH FOLLOWING DOCUMENT/INFORMATION ALONG WITH THE BID.

- 5.1 Deviation if any in enclosed deviation schedule with mention of specification clause with page no. for which clarification/deviation is being asked.
- 5.2 Deviation schedule duly fill for deviation, if any.
- 5.3 Price Schedule duly filled.
- 5.4 List of Spares (Commissioning spares).

Any other technical document enclosed with the offer will not be considered by BHEL and the same will be considered as null and void.

6.0 QP AND SUB VENDOR APPROVAL

- a) QP requirements part of section-C shall be as per the enclosed QP subject to BHEL/Customer approval. However, any additional comments as given by BHEL/Customer shall be adhered by the bidder without any delivery and price implication to BHEL.
- b) Approved sub vendor list is enclosed elsewhere of this specification. However all the sub vendors including any additional sub-vendor shall be subject to BHEL and Customer approval without any delivery and price implication to BHEL.

7.0 DESIGN/CONSTRUCTION

In addition to the requirements of Section-C & D the following shall also be complied under scope of this specification:

- The P&ID is enclosed herein in this section for bidders compliance.
- The material of construction specified in Data Sheet-A are minimum requirements and material of construction for other components not specified shall be similarly selected by the bidder for intended duty which shall be subjects to customer approval during detailed engineering without any delivery and price implication to BHEL.

8.0 DRAWINGS AND DATA TO BE FURNISHED AFTER AWARD OF CONTRACT

After award of LOI, following minimum drawing/documents shall be submitted by the bidder for BHEL/Customer approval. However any additional drawing/document if found necessary for completion of the engineering, the same shall be submitted by bidder without any commercial & delivery implication to BHEL.

The number of drawing/documents to be submitted by the bidder shall be as per enclosed Annexure-IV. The submission of soft copy or hard copy of the document whichever is later will be considered as final date of submission of the document. The bidder has to submit the revised document along with the compliance sheet indicating enumerate reply to all BHEL comments. Without compliance sheet the submission of the documents will not be considered and the delay on this account will be solely on bidder's side only.

- Detailed piping and instrument diagram for process and utility, showing all equipments, machinery, piping and instruments. All pipes should be indicated with diameter, pipe class, pipe number, fluid flowing through it.
- Equipment layout.
- Datasheets.
- Quality plans.
- Foundation Design drawings indicating foundation design, load data, anchor bolt location, pocket details etc.
- General arrangement drawings for all the equipments showing dimensions and detail of materials.
- All the data and drawings necessary for civil design and construction.
- Sizing calculations for all equipments and thickness calculations for all major vessels and tanks.
- Pipe, Valves and Instrument schedule.
- General arrangement drawings and detailed piping layout drawings showing valves, supports, hangers etc.
- Operating procedures for start up, normal running, shutdown and abnormal operating conditions.
- Instructions for maintenance, assembly and erection of equipments.

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- Instructions for proper balancing, alignment, adjustment, checking, and calibration as may necessary.
- Other necessary drawings, data etc.
- Bar chart and schedules for drawing submission, manufacturing, erection and commissioning.
- Any other drawing required to make the system complete & as required for erection, commissioning & inspection purpose.
- Operation and maintenance manual.
- PG test procedure.
- Sub-vendor list.
- As built drawings

However any other documents as required by BHEL during detailed engineering stage has to be submitted by the bidder without and commercial and delivery implication to BHEL.

NOTE-1 Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the works for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification.

NOTE-2 Bidder shall perform the guarantee parameters as per the specification requirement to the satisfaction of Owner. The exact modalities of verifying guarantee for the parameters indicated in the specification shall be finally as agreed with the Owner during detailed engineering & mutually agreed.

NOTE-3 The Bidder shall arrange all the monitoring gadgets / instruments / equipment required for performing guarantee parameters (returnable after PG test). Site facility as available or as extended by Owner shall only be provided.

NOTE-4 All major drawings/documents shall be approved by BHEL/Customer during detailed engineering stage. Successful vendor shall comply with the comment of the customer/BHEL without price & delivery implication.

NOTE-5 All equipments shall be dimensioned to provide as undisturbed space, free of pipes or similar obstacles of at least 1000 mm between installed equipment and surrounding enclosures or walkway to ensure proper access for maintenance and operation.

NOTE-6 All sub-vendors shall be subject to BHEL/Customer approval during detailed engineering without price & delivery implication to BHEL.

NOTE-7 Bidder to note that the pressure overloaded at the inlet terminal point of the SSF system is 3.5 to 7.5 Kg/Cm²(g). Bidder to take care this to design the system.

NOTE-8 Bidder to note that BHEL reserve the right for drg/doc submission through web based Document Management System. Bidder would be provided access to the DMS for drg/doc approval and adequate training for the same. Detailed methodology would be finalized during the kick-off meeting. Bidder to ensure following at their end.

- Internet explorer version – Minimum Internet Explorer 7
- Internet speed – 2 mbps (Minimum preferred)
- Pop ups from our external DMS IP (124.124.36.198) should not be blocked
- Vendor's Internal proxy setting should not block DMS application's link
(<http://124.124.36.198/wrenchwebaccess/login.aspx>)

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DESIGN CLARIFIED WATER ANALYSIS (MAKE UP WATER) [TABLE-1]

S.No	Parameters	Unit	Results
1	pH	--	7.62
2	Conductivity at 25 °C	Microsiemens/cm	450
3	Total Hardness	ppm as CaCO ₃	144
4	Calcium	ppm as CaCO ₃	128.9
5	Magnesium	ppm as CaCO ₃	53.52
6	Total M-Alkalinity	ppm as CaCO ₃	144
7	Chloride	ppm as CaCO ₃	50.82
8	Sulphate	ppm as CaCO ₃	59.85
9	Reactive Silica	ppm as SiO ₂	10.0
10	Iron	ppm as Fe	0.1
11	Turbidity	NTU	15
12	Total suspended solids	ppm	15

NOTE:

A. THE CYCLE OF CONCENTRATION (COC) SHALL BE CONSIDERED AS 5.

[TABLE-2]

GUARANTEE	Effluent quality at the outlet of filter shall be 10% of influent water or 5 ppm whichever is higher.
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LIST OF SUB VENDORS (TABLE-3)

Sl.No.	Item	PROPOSED SUB SUPPLIER	PLACE
1	MS PIPE/PLATE	AJANTA	GHAZIABAD
		JINDAL	BAHADURGARH
		SURYA ROSHNI	GHAZIABAD
		TISCO	JAMSHEDPUR
		SAIL	ROURKELA
2	FITTINGS/FLANGES	WELL SPUNGUJRAT	BAHRUCH
		RELIANCE FORGE	MUMBAI
		EBY	MUMBAI
		SIDDARTH & GAUTAM	FARIDABAD
3	ROTAMETER	CHEMTROLS SAMIL (INDIA) PVT LTD.	MUMBAI
		M/S INSTRUMENTATION ENGINEERS PRIVATE LIMITED	HYDRABAD
4	PRESSURE GAUGE/DPG	AUXIROL	UK
		SWITZER (FOR DP GAUGES)	CHENNAI
		BUDENBURG	UK
		A N INSTRUMENTS	KOLKATA
		BELLS CONTROL	KOLKATA
5		MANOMETER INDIA	MUMBAI
		GENERAL INST	MUMBAI/GOA
		BERGER PAINTS	MUMBAI
		ASIAN PAINTS	
6	PAINT	SHALIMAR	
		J&N	
7	GATE VALVES		
		BDK	HUBLI
		LEADER	JALANDHAR
		BANKIM	KOLKATA
		H SARKAR	KOLKATA
		AV VALVES	AGRA
		HAWA VALVES	MUMBAI
		STEEL STRON VALVES	MUMBAI
		AKSONS MECH. ENTERPRISES	MUMBAI
		BABCOCK BORSIG ESPANA, S.A.	SPAIN
		CRESCENT VALVES MFG.CO.PVT.LTD.	MUMBAI
		KIRLOSKAR BROTHERS LTD.	PUNE
		KSB PUMPS LTD.	MUMBAI
		MICON VALVES (INDIA) PVT.LTD	MUMBAI
		NITON INDUSTRIES	MUMBAI
		NECO SCHUBERT & SALZER LTD.	NAGPUR
		OSWAL INDUSTRIES LTD.	AHMEDABAD
		SURYA VALVES AND INSTRUMENTS MANUFACTURING COMPANY	CHENNAI
		VENUS PUMP & ENGG. WORKS	KOLKATA
		VALTECH INDUSTRIES ,MUMBAI	MUMBAI
8	GLOBE VALVE		
		BDK	HUBLI
		LEADER	JALANDHAR
		BANKIM	KOLKATA
		H SARKAR	KOLKATA

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		AV VALVES	AGRA
		HAWA VALVES	MUMBAI
		STEEL STRON VALVES	MUMBAI
		AKSONS MECH. ENTERPRISES	MUMBAI
		BABCOCK BORSIG ESPANA, S.A.	SPAIN
		CRESCENT VALVES MFG.CO.PVT.LTD.	MUMBAI
		KIRLOSKAR BROTHERS LTD.	PUNE
		KSB PUMPS LTD.	MUMBAI
		MICON VALVES (INDIA) PVT.LTD	MUMBAI
		NITON INDUSTRIES	MUMBAI
		NECO SCHUBERT & SALZER LTD.	NAGPUR
		OSWAL INDUSTRIES LTD.	AHMEDABAD
		SURYA VALVES AND INSTRUMENTS MANUFACTURING COMPANY	CHENNAI
		VENUS PUMP & ENGG. WORKS	KOLKATA
		VALTECH INDUSTRIES ,MUMBAI	MUMBAI
9	BALL VALVE		
		BDK	HUBLI
		LEADER	JALANDHAR
		BANKIM	KOLKATA
		H SARKAR	KOLKATA
		AV VALVES	AGRA
		HAWA VALVES	MUMBAI
		FLOW CHEM	AHMEDABAD
		STEEL STRON VALVES	MUMBAI
		AKAY VALVES LTD.	MUMBAI
		AQUA VALVES PVT.LTD.	KARNATAKA
		CRESCENT VALVES	MUMBAI
		FISHER SANMAR LIMITED	CHENNAI
		HABONIM VAAS AUTOMATION PVT LTD.,CHENNAI	CHENNAI
		KIRLOSKAR BROTHERS LTD.	PUNE
		KSB PUMPS LTD.	MUMBAI
		MICROFINISH VALVES PVT LTD.	HUBLI
		MICON VALVES (INDIA) PVT.LTD	MUMBAI
		PEC VALVES	MUMBAI
10	DIAPHRAGM VALVE		
		PROCON ENGINEERES	MUMBAI
		HAWA VALVES	MUMBAI
		BDK VALVES	HUBLI
		FOURESS	BANALORE
		INERVALVE	GUJRAT
11	BUTTER FLY VALVE		
		BDK VALVES	HUBLI
		TYCO VALVES	HALOL
		INTERVALVES	PUNE
		FOURESS	BANGALORE
		LEADER	JALANDHAR
12	3 WAY VALVE		
		HI TECH	AHMEDABAD
		ADVANCE VALVES PVT.LTD	NOIDA
		BDK	HUBLI
		FOURESS ENGG.INDIA LTD.	MUMBAI

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		FLUIDLINEVALVES COMPANY PRIVATE LTD.,	MUMBAI
		INSTRUMENTATION LTD.	PALAKAD
		KIRLOSKAR BROTHERS LTD.	PUNE
		VENUS PUMP & ENGG. WORKS	KOLKATA
		SURYA VALVES AND INSTRUMENTS MANUFACTURING COMPANY	CHENNAI
		STAFFORD CONTROLS LIMITED	PUNE

Notes:-

- All the finally selected sub vendors shall be subject to customer approval during detailed engineering without any delivery/ commercial implications to BHEL/ CUSTOMER.
- This vendor list applicable for Mechanical, electrical and C&I items.

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X800 MW TSGENCO KOTHAGUDEM TPS STAGE –VII, PALONCHA	SPEC NO: PE-TS-410-181-A001	
		VOLUME: II-B	
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TABLE-4

DRAWING/DOCUMENT DISTRIBUTION SCHEDULE															
S no.	Description	TSGENCO								DCPL, KOLKATA			Equipment Vendor	PEM	BHEL site
		Director Projects	Director Technical	CE/Civil Thermal Projects Hyd.	CE/TPC-I, Hyd	CE/O&M/KTPS	SE/Civil KTPS	SE/E&M/KTPS	DE Constr. KTPS	Kolkata	HYD	KTPS			
A	Letter Of Intent or Contract Documents	1	1	1	S	1	2	2	1	1	1	1	2	1	1
B	Vendor Drawings														
1	Preliminary	1	1	1	2	1	1	2	2	12	1	-	S	4+S	-
2	Return preliminary with comments	-	-	1	2	1	1	1	1	S	1	-	1	4+S	-
3	Final and any revision thereof														
	a. Civil	1	1	6+1T	1	1	6+1T	1	-	2+1T	1	1	S	4+S	-
	b. E&M	1	1	1	6+1T	1	1	6+1T	1	2+1T	1	1	S	4+S	-
C.	Design Drawings														
1	Preliminary														
	a. Civil	1	1	2	1	1	2	1	1	4	1	1	S	4+S	-
	b. E&M	1	1	1	2	1	1	2	1	4	1	1	S	4+S	-
2	Released for construction														
	a. Civil	1	1	2	1	1	6	1	1	1	1	2	S	1+S	4+S
	b. E&M	1	1	1	1	2	1	6	1	1	1	2	S	1+S	4+S
3	Return marked 'As built'														
	a. Civil	-	-	1	-	-	1	-	-	1	1	S	1	1+S	4+S
	b. E&M	-	-	-	1	-	-	1	1	1	1	S	1	1+S	4+S
4	As built drawings														
	a. Civil	-	-	1+1T	-	2+1T	5+1T	-	1	1+1T	-	1	S	1+S	4+S
	b. E&M	-	-	1	2+1T	2+1T	-	5+1T	1+1T	1+1T	-	1	S	1+S	4+S
D	Progress Report Monthly														
1	Equipment vendor	1	1	1	2	1	1	2	1	1	1	1	S	S	1+S
2	M/s DCPL, Kolkata	1	1	2	2	1	1	2	1	S	1	1	Nil	-	-
E	Test & Inspection Reports														
1	Equipment manufacturer														
	a. Civil	1	1	1	2	1	1	1	-	11	1	1	S	S	S
	b. E&M	1	1	-	2	1	-	1	1	11	1	1	S	S	S
2	M/s DCPL, Kolkata	1	1	-	2	1	-	1	1	S	-	1	-	S	S
F	Instruction Manuals/Data Books														
1	Equipment manufacturer														
	a. Civil	1	1	1+1T	1	1	6+1T	1	1	2+1T	1	1	S	1+S	4+S
	b. E&M	1	1	-	3+1T	1	-	6+1T	2	3+1T	1	1	S	1+S	4+S
2	M/s DCPL, Kolkata	1	1	-	10+1T	1	-	15+1T	-	S	1	1	Nil		
G	M/s DCPL, Kolkata Criteria	1	1	1	8+1T	1	1	2	1	1	1	1	S	1+S	4+S
H	Design Calculations	1	1	1	8+1T	1	1	2	1	1	1	1	S	1+S	4+S
I	Final consulting Engineering Report	1	1	1	10	1	1	2	1	S	1	1	Nil	S	1+S

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

Note: Editable EXcell, Word and Autocad copy of applicable document shall be submitted by bidder/vendor whenever required by BHEL/Customer for review.

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X800 MW TSGENCO KOTHAGUDEM TPS STAGE –VII, PALONCHA	SPEC NO: PE-TS-410-181-A001	
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LIST OF MANDATORY SPARES TABLE-5

S.no.	Mandatory Spares	Total Quantity
1.0	Valve	1 No each type, class and size.
20	Indicators/Gauges etc. along with relevant accessories	10% of total or at least two (whichever is higher) for each type along with accessories.

Note: **Only applicable items shall be considered. Applicable items are those which are installed in the system.**

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PAINTING SPECIFICATION

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TECHNICAL SPECIFICATION

FOR

PROTECTIVE LINING AND PAINTING

1.00.00 INTENT OF SPECIFICATION

1.01.00 This specification addresses the requirements of all labour, material, and appliances necessary with reference to preparations for lining / painting, application as well as finishing of all lining / painting for all mechanical and electrical equipment, piping and valves, structures etc. included under the scope of this Package.

1.02.00 The Bidder shall furnish and apply all lining, primers including wash primers if required, under-coats, finish coats and colour bands as described hereinafter or necessary to complete the work in all respects.

2.00.00 CODES & STANDARDS

2.01.00 The Bidder shall follow relevant Indian and International Standards wherever applicable in cleaning of surface, selection of lining material / paints and their application. The entire work shall conform to the following standards / specifications (latest revision or as specified).

- a) SSPC SP 10 / NACE 2 / : Near White Blast Cleaning
- b) SSPC PA 2 : Measurement of dry film Coating Thickness with magnetic gauges.
- c) ASTM D 4541 : Method for pull off strength using portable Adhesion Tester.
- d) NACE RP 0274 – 2004 : High-Voltage Electrical Inspection of Pipeline Coatings
- e) NACE SP 0188 – 2006 : Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates

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- f) NACE RP 0169 – 2002 : Control of External Corrosion on Underground or Submerged Metallic Piping Systems
- g) AWWA C 210 – 2007 : Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
- h) IS 3589:2001 Annexure B : Steel Pipes for Water and Sewage Specification.
- i) AWWA C222-2000 : Polyurethane Coating for the Interior and Exterior of Steel Water Pipe and Fittings.
- j) IS 13213 : 2000 : Polyurethane Full Gloss Enamel (Two pack)

3.00.00 GENERAL REQUIREMENTS

- 3.01.00 The steel surface preparation prior to actual commencement of coating shall conform to SSPC SP 10 / NACE 2 / Sa2½ (near white metal) with sand blasting.
- 3.02.00 The contractor shall submit a detailed written description in the form of a manual covering coating equipment, procedures, materials inspection test, and repair etc. to Owner/Consultant for approval.
- 3.03.00 The contractor shall also provide copies of test reports from NABL approved laboratory (like National Test House, Kolkata) in support of the paint/primer materials to be used shall conform to the specification requirement.
- 3.04.00 The contractor shall also provide certificates from paint/primer manufacturer mentioning the batch numbers, date of manufacture and shelf life etc. of the materials to be used. In addition to that Manufacturing Quality Plan (MQP) and Field Quality Plan (FQP) shall also be submitted prior to commencement of supply of material and field application.
- 3.05.00 Paint/coating application work at site shall be done either by paint manufacturer or by their authorized applicator. The authorized applicator shall have proper training & certification from manufacturer. Applicator shall possess all the necessary specialized equipment and manpower experienced in similar job.

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- 3.06.00 Applied coating shall be tested for dry film thickness, holiday (electrical inspection for continuity) and adhesion as per relevant standard such as SSPC PA 2, NACE RP 0274 and ASTM D 4541.
- 3.07.00 If necessary, the material may be heated and applied by airless spray / plural component spray system.
- 3.08.00 Manufacturer's specific recommendation, if any, shall be followed during application of lining / paints.
- 3.09.00 In areas where there is danger of spotting automobiles or other finally finished equipment or building by wind borne particles from paint spraying, a Purchaser approved method shall be adopted.
- 3.10.00 The colour scheme of the entire Plant, covered under this specification shall be approved by the Purchaser in advance before application.
- 3.11.00 All indoor and outdoor piping, insulated as well as uninsulated will have approved colour bands painted on the pipes at conspicuous places throughout the system, as approved by Purchaser.
- 3.12.00 Inside surfaces of vessels / tanks shall be protected by anticorrosive paints or rubber lining as required / specified elsewhere in the specification. External surfaces of all vessels / tanks shall be protected by anti corrosive painting.
- 3.13.00 For vessels / tanks requiring lining and epoxy painting all inside surface shall be blast cleaned using non-siliceous abrasive after usual wire brushing.
- 3.14.00 Natural rubber lining shall be provided on the inside of vessels / tanks as required / specified elsewhere in the specification, in three layers resulting in a total thickness not less than 4.5 mm.
- 3.15.00 Surface hardness of rubber lining shall be 65 +/- 5 deg. A (shore).
- 3.16.00 After the lining is completed, the vessels / tanks shall not be subjected to any prolonged exposure to direct sunlight in course of its transportation, erection etc. They shall not be stored in direct sunlight. No further lining or burning shall be carried out on the vessel, after application of the lining.

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3.17.00 All lining projecting outside of the vessel shall be protected adequately from mechanical damages during shipment, handling storage etc.

3.18.00 Suitable warnings, indicating the special care that must be taken with respect to these lined vessels shall be stenciled on their outside surface with the letters at least 12 mm high.

3.19.00 All insulated piping shall have aluminium sheet jacketing.

4.00.00 **EQUIPMENT, MATERIAL AND SERVICES TO BE FURNISHED BY THE BIDDER**

4.01.00 After erection at site, the outside surfaces of all equipment having a shop coat shall be given further priming coat and finished coats of paint as detailed in following clauses. However, if the painting system is such that the shop coat and primer coat to be applied at site are not compatible, then shop coat has to be removed from the surface of equipment before application of primer coat with prior blasting.

All factory finished paints shall be touched up at site as required.

All uninsulated piping shall be finished with final paintings after use of proper wash primer and primer. Aluminium sheet jacketed piping need not be painted. Colour bands of Purchaser's approved shade shall however be applied on jacketed piping near walls or partitions, at all junctions, near valves and all other places as instructed by the Purchaser. All structures shall be painted with approved paint.

4.02.00 **Surface Preparation**

4.02.01 Unless mentioned otherwise, all rust and mill scale shall be removed by blasting to Sa 2-1/2 Swiss Standard before applying the primer.

4.02.02 Special care shall be taken to remove grease and oil by means of suitable solvents like Trichloroethylene or Carbon Tetrachloride.

4.02.03 The minimum degree of surface preparations for all equipment, piping, fittings, valves, structures etc. shall be "Near White" according to Steel Structure, Painting Council-SSPC-SP-10 before application of any primer/paint.

4.03.00 **Painting**

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4.03.01 Specification for application of paints for external surfaces protection of vessels / tanks / equipment / piping / fittings / valves etc. to be installed indoor shall be as follows :

- a) Surface preparation shall be done either manually or by any other approved method.
- b) Primer Coat shall consist of one coat (minimum DFT of 50 microns) of chlorinated rubber based zinc phosphate.
- c) Intermediate Coat (or Under Coat) shall consist of one coat (minimum DFT of 50 microns) of chlorinated rubber based paint pigmented with Titanium Dioxide.
- d) Top Coat shall consist of one coat (minimum DFT of 50 microns) of chlorinated rubber paint of approved shade and colour with glossy finish.
- e) Total DFT of paint system shall not be less than 150 microns.

4.03.02 Specification for application of paints for external surfaces protection of vessels / tanks / equipment / piping / fittings / valves etc to be installed outdoor shall be as follows :

- a) Surface preparation shall be done by means of sand blasting, which shall conform to Sa 2-1/2 Swiss Standard.
- b) Primer Coat shall consist of one coat (minimum DFT of 100 microns) of epoxy resin based zinc phosphate primer.
- c) Intermediate Coat (or Under Coat) shall consist of one coat (minimum DFT of 100 microns) epoxy resin based paint pigmented with Titanium Dioxide.
- d) Top Coat shall consist of one coat (minimum DFT of 75 microns) of epoxy paint of approved shade and colour with glossy finish. Additional one coat (minimum DFT of 25 microns) of Finish Coat of polyurethane shall be provided.
- e) Total DFT of paint system shall not be less than 300 microns.

4.03.03 Specification for application of paints for external surfaces protection of steel pipes and fittings which are buried underground / laid inside a hume pipe & or submerged Under Water and laid under Pipe Trenches (in road/rail/pipe or trench crossings) shall be as follows :

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External surface of the pipe, fittings, specialties etc. handling raw water/clarified water/filter water shall be painted with one coat of two part chemically cured polyurethane primer of min 50 micron dry film thickness followed by three or maximum four coats of two part solvent less polyurethane to build up coating of dry film thickness of 2000 micron including primer coat.

- 4.03.04 Specification for application of paints for internal surface protection of large diameter pipes (sizes above 600 mm NB and above) if any, shall be as follows :
- All Internal surfaces of steel pipes, fittings, specialties etc. buried underground or located within pipe trenches shall be given epoxy coating to protect them from (except for drinking water service, where the compatible painting shall be so selected to meet relevant quality standards) corrosion.
 - Internal surface of the pipe should be coated with one coat of two part epoxy primer with not less than 50 micron DFT (dry film thickness) followed by two part polyamide cured solvent less epoxy.
 - The minimum dry film thickness (DFT) of internal lining shall be 600 micron.
- 4.03.05 Specification for application of paints for protection of internal surfaces of DM Water Storage Tank(s) shall be as follows :
- Primer - One coat of epoxy primer containing high level of Zinc Phosphate anticorrosive pigment. Total Dry Film Thickness (DFT) of primer shall not be less than 125 microns.
 - Finish Paint - Three (3) coats Polyamine HB Epoxy Paint. Total Dry Film Thickness (DFT) of finish paint shall not be less than 125 microns per coat.
 - Total thickness of primer and paint should not be less than 500 microns.
- 4.03.06 All motors, local push button stations, cable racks, structures used for supports etc. are to be painted with acid proof paint.
- 4.03.07 The following surfaces shall not be painted - stainless steel, galvanized steel, aluminum, copper, brass, bronze and other nonferrous materials.
- 4.03.08 No painting or filler shall be applied until all repairs, hydrostatic tests and final shop inspection are completed.

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4.03.09 All machined surfaces shall have two (2) coats of water repellant grease after thorough cleaning.

5.00.00 COATING PROCEDURE AND APPLICATION

5.01.00 Surface Preparation :

Pipe shall be blast cleaned by sand. The cleanliness achieved prior to application shall be in accordance with the requirement of SSPC SP 10 / NACE 2 / Sa2½ of ISO 8501 (near white metal)

- a) The blast pattern or profile depth shall be 40 to 100 micron and shall be measured by dial micrometer.
- b) Before sand blasting is started or during blasting or coating, temperature of the pipe surface should be more than 3°C above dew point temperature. Blast cleaned surface should be primed within 4 hours and shall be protected from rainfall or surface moisture and shall not be allowed to flash rust. If the rust occurs, the surface again to be prepared by sand blasting or wire brushing.

5.02.00 Application of Epoxy Coating

- a) Coating shall be applied when
 - i) When the pipe surface temperature shall be atleast 3°C above dew point temperature.
 - ii) The temperature of mixed coating material and the pipe at the time of application shall not be lower than 10°C or greater than 50°C.
- b) Material preparation shall be in accordance with manufacturer's recommendations.
- c) Application of epoxy coating system :

The epoxy coating system shall be applied as per recommendation of the manufacturer and shall be applied by airless spray / plural component spray machine. For more than one coat, the second shall be applied with the time limits as recommended by the manufacturer.

5.03.00 Application of PU Coating

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- a) PU coating shall be applied when the pipe surface temperature atleast 3°C above dew point temperature (when R.H is more than 85%).
- b) Material preparation and application shall be done as per manufacturer recommendation.

6.00.00 TEST REQUIREMENTS :

6.01.00 Measurement of dry film thickness

Measurement of dry film thickness of coating : Coating thickness shall be in the range of $\pm 20\%$ and as per SSPC PA 2.

6.01.01 Apparatus / Instrument:-

The instrument used for dry film thickness may be Type 1 pull of gauges or Type 2 electronic gauges.

6.01.02 Procedures:-

- a) Number of measurements:
For 100 square feet (9.29 square meters), five (5) spots per test area (each spot is 3.8 cm) in diameter. Three gauge readings per spot (average becomes the spot measurement).
- b) If the structure is less than 300 square feet, each 100 square feet should be measured.
- c) If the structure is between 300 and 1000 sq ft, select 3 random 100 square feet test areas and measure.
- d) For structure exceeding 1000 square feet, select 3 random 100 square feet testing areas for the first 1000 sq ft and select 1 random 100 square feet testing area for each additional 1000 square feet
- e) Coating thickness Tolerance: Individual reading taken to get a representative measurement for the spot are unrestricted (usually low or high readings are discarded). Spot measurements (the average of 3 gauge readings) must be within 80% of the minimum thickness and 120% of the maximum thickness. Area measurement must be within specified range.

6.02.00 Electrical Inspection (Holiday) Test

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- 6.02.01 All the coated / lined pipes shall be tested with an approved high voltage holiday detector preferably equipped with an audio visual signaling device to indicate any faults, holes, breaks or conductive particles in the protective coating.
- 6.02.02 The applied output voltage of holiday detector shall have a spark discharge of thickness equal to at least twice the thickness of the coating to assure adequate inspection voltage and compensate for any variation in coating thickness. The electrode shall be passed over the coated surface at approximately half the spark discharge distance from the coated surface only one time at the rate of approximately 10 to 20m/min. The edge effect shall be ignored. Excessive voltage shall be avoided as it tends to induce holiday in the coated surface thereby giving erroneous readings.
- 6.02.03 While selecting test voltages, consideration should be given to the tolerance on coating thickness and voltage should be selected on the basis of maximum coating thickness likely to be encountered during testing of a particular pipe.

The testing voltage shall be calculated by using following formula. (as per NACE 0274 : 2004)

Testing Voltage $V = 7900 \sqrt{T} \pm 10$ percent where T is the average coating thickness in mm.
- 6.02.04 Any audio visual sound or spark leads to indicate pinhole, break or conductive particle.
- 6.03.00 **Adhesion Pull off Test :**
After holiday the coated surface is subjected to adhesion pull off test as per ASTM D 4541.
- 6.03.01 **Apparatus / Instrument:** Adhesion tester consists of three basic components:

A hand wheel, a black column containing a dragging indicator pin and scale in the middle and a base containing three legs and a pulling "Jaw" at the bottom and also dollies.
- 6.03.02 **Prepare the test surface :**

Once test area is selected, test area shall be free of grease, oil, dirt, water. The area should be flat surfaces and large enough to accommodate the specified number of replicate test.
- 6.03.03 **Prepare Dolly (Test Pull Stub) :**

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The dolly is a round, two sided aluminium fixture. Both sides of the dolly looks same, however, one side sloped on top surface while flat on bottom surface. As the surface of the dolly is polished aluminium, roughen the same using a coarse sand paper.

6.03.04 Select an adhesive:

Use araldite, a 100% solid epoxy adhesive. This adhesive requires at least 24 hours at room temperature to cure.

6.03.05 Attach the dolly to the surface.

- Using a wooden stick, apply an even layer of adhesive to the entire contact surface area of the dolly.
- Carefully remove the excessive adhesive by using a cotton swab. Allow the adhesive to fully cure before performing the adhesion test.
- Attach the dolly to the coated surface and gently push downward to displace any excessive adhesive.
- Push the dolly inward against the surface, then apply tape across the head of the dolly.

6.03.06 Adhesion Test Procedure

- Attach the adhesion tester to the dolly by rotating the hand wheel counter clockwise to lower the jaw of the device.
- Slide the jaw completely under the head of the dolly. Position the three legs of the instruments so that they are sitting flat on the coated surface.
- Slide the dragging indicator pin on the black column to zero by pushing it downward.
- Firmly hold the base of the instrument in one hand and rotate the handwheel clockwise to raise the jaw of the device that is attached to the head of the dolly. The dragging indicator pin will move upward on the black column as the force is increased and will hold the reading. Apply the tension using a moderate speed. Continue to increase the tension on the head of the dolly until (a) the minimum PSI/MPa/Kg/cm² required by project specification is exceeded and the test is discontinued, (b) the maximum PSI/MPa/Kg/cm² of adhesion tester has been achieved and dolly is still attached, (c) The force applied by the adhesion tester causes the dolly to dislodge.

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e) Read the scale and record the adhesion value.

6.04.00 Coating Repair

Defective Coating shall be repaired in accordance with the following subsections.

6.04.01 Surface Preparation:

Accessible areas of pipe requiring coating repairs shall be cleaned to remove debris and damaged coating using surface grinders or other means. The adjacent coating shall be feathered by sanding, grinding or other method. Accumulated debris shall be removed by blowing with contaminant free air or wiping with clean rags.

6.04.02 Areas not accessible for coating repair such as interior surfaces of small diameter pipe shall be reprocessed and recoated.

6.04.03 Coating Application :

The coating system shall be applied to the prepared areas in accordance with procedure.

6.04.04 Repair Inspection :

Repaired portion shall be electrically inspected using a holiday detector.

6.05.00 Welded Field Joints

6.05.01 Preparation :

The weld joints shall be cleaned so as to be free from mud, oil, grease, welding flux, weld spatter and other foreign contaminants. The cleaned metal surfaces of the weld joint shall then be blasted or abraded using rotary abrading pads. The adjacent liquid Epoxy / PU coating shall be feathered by abrading the coating surface for a distance of 25 mm.

6.05.02 Electrical Inspection :

After curing the coating system applied to the welding joints shall be holiday tested. Any holidays indicated by the detector shall be marked with chalk to identify the area of repair.

7.00.00 INFORMATION/DATA REQUIRED

The Bidder shall submit complete list of paints and primers proposed, giving detail information, such as, chemical composition, drying time etc. and also unit rates for application of each type of paint along with supply shall be furnished.

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QUALITY PLAN

MANUFACTURING QUALITY PLAN													
MANUFACTURER'S NAME AND ADDRESS		ITEM:	Atmospheric tank and Proprietary & Misc Items.					PROJECT		1X800 MW TSGENCO KOTHAGUDEM TPS STAGE –VII, PALONCHA			
		SPEC NO:	PE-TS-410-181-A001					PACKAGE		SIDE STREAM FILTRATION PLANT (SSF:			
		QAP No.	PE-QP-410-181-A001					Rev:		0			
		Page No	1 of 3					Date:		10/04/2008			
SL NO.	COMPONENETS/ OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOC	ACCEPTANCE NORMS	FORMAT OF RECORD	D *	AGENCY**			REMARKS
										S/M	C	N	
1	2	3	4	5	6	7	8	9	10			11	
A	Proprietary items												
1.0	a) Filtering sand b) Anthracite	Compliance	Major	Doc. Review.	100%	Prop. Doc of Mfr.	Prop. Doc of Mfr.	Mfr's compliance Certificate		P/V	V	*	
2.0	Strainer	a) Dimension	Major	Measurement	100%	Approved drawing/document	Prop. Doc of Mfr.	Mfr's compliance Certificate		P/W	W	*	
		b) Material of composition	Major	Document review	100%	As per relevant standard	As per relevant standard	Mfr's compliance Certificate		P/V	V	*	
B	Miscellaneous items												
1.0	Structural steel	a) Dimension check	Major	Measurement	100%	Approved drawing/documents.	Approved drawing/documents.	Mfr's compliance Certificate		P/V	-	-	
		b) Material of composition	Major	Document review	100%	As per relevant standard	As per relevant standard	Mfr's compliance Certificate		P/V	-	-	
C	Raw material												
1.0	Palates for shell, top& bottom plate, Nozzle Flanges & Nozzle pipes	a) Physical & chemical prop.	Major	Document review	1/Heat	Appd Doc/Drg.	Appd Doc/Drg.	Mill TC/Lab TC.	√	P/V	V	V	
		b) Dimension	Major	Measurement	At random	Appd Doc/Drg.	Appd Doc/Drg.	Log Book.		P	W	V	
			Legend: * RECORD SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.				FOR CUSTOMER USE						
CONTRACTOR		FOR BHEL	M: MANUFACTURER, S: SUB-CONTRACTOR, C: CONTRACTOR/, N: BHEL, P: PERFORM, W: WITNESS, V: VERIFICATION, CHP: CUSTOMER HOLD POINT				REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY					

MANUFACTURING QUALITY PLAN													
MANUFACTURER'S NAME AND ADDRESS		ITEM:	Atmospheric tank and Proprietary & Misc Items.					PROJECT	2X500 MW, MEJIA PH-II				
		SPEC NO:	PE-TS-270-156B-A001					PACKAGE	SIDE STREAM FILTRATION PLANT (SSF:				
		QAP No.	PE-QP-270-156B-A001					Rev:	0				
		Page No	2 of 3					Date:	10/04/2008				
SL NO.	COMPONENETS/ OPERATION	CHARACTE RSTICS	CLASS	TYPE OF CHECK	QUANTU M OF CHECK	REFEREN CE DOC	ACCEPTANC E NORMS	FORMAT OF RECORD	D *	AGENCY**			REMARKS
										S/M	C	N	
1	2	3	4	5	6	7	8	9	10			11	
2.0	In Process												
2.1	Welding procedure	Welder's ability to perform	Major	Document review	100%	ASME Sec IX.	ASME Sec IX.	QW 482, 483 & 484.		P/V	V	V	
2.2	Checks of dished end (wherever applicable)	Dimension and profile	Major	Measurement	100%	Approved drawing/do cuments.	Approved drawing/docum ents.	IR		P/W	V	V	
2.3	DP test on edges, SF and Knuckle.	Surface defects on edges, SF and Knuckle.	Major	Visual & DP Test.	100%	ASME Sec VIII, Div 1 Appendix 8.	ASME Sec VIII, Div 1 Appendix 8.	IR		P/W	V	V	
2.4	All "L" seam & "C" seam set up for dish to shell and shellto shell	Edge preparation, 'V' angle, Root gap, Matching, etc.	Major	Measurement	100%	Appd. Dgr.	Appd. Dgr	IR		P	-	-	
2.5	Back chip & DP test of jointsFlanges & Nozzle pipes	Detection of internal defects	Major	DP Test	100%	ASME Sec VIII, Div 1 Appendix 8.	ASME Sec VIII, Div 1 Appendix 8.	IR		P	V	V	
		b) Dimension	Major	Measurement	At random	Appd Doc/Drg.	Appd Doc/Drg.	Log Book.		P	V	V	
			Legend: * RECORD INDETIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION. M: MANUFACTURER, S: SUB-CONTRACTOR, C: CONTRACTOR/NOMINATED INSPECTION AGENCY, N: BHEL, P: PERFORM, W: WITNESS, V: VERIFICATION, CHP: CUSTOMER HOLD POINT				FOR CUSTOMER USE						
CONTRACTOR		FOR BHEL					REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY					

MANUFACTURING QUALITY PLAN													
MANUFACTURER'S NAME AND ADDRESS		ITEM:	Atmospheric tank and Proprietary & Misc Items.					PROJECT	2X500 MW, MEJIA PH-II				
		SPEC NO:	PE-TS-270-156B-A001					PACKAGE	SIDE STREAM FILTRATION PLANT (SSF:				
		QAP No.	PE-QP-270-156B-A001					Rev:	0				
		Page No	3 of 3					Date:	10/04/2008				
SL NO.	COMPONENETS/ OPERATION	CHARACTE RSTICS	CLASS	TYPE OF CHECK	QUANTU M OF CHECK	REFEREN CE DOC	ACCEPTANC E NORMS	FORMAT OF RECORD	D *	AGENCY**			REMARKS
									S/M	C	N		
1	2	3	4	5	6	7	8	9	10			11	
3.0	Final inspection												
3.1	Complete tank	Dimension & orientation of Nozzles	Major	Measurement	100%	Appd.Drg/ Doc.	Appd.Drg/Doc.	IR.	√	P/W	W	V	
3.2	Complete tank	Workmanship	Major	Visual	100%	Appd.Drg/ Doc.	Free from visual defects	IR		P/W	W	V	
3.3	R.F. Pad test	Pneumatic test	Major	Pneu. Test at 1.5 Kg/Cm2.	100%	-	No leakage	IR	√	P/W	V	V	
3.4	Complete tank	Hydro test/water fill up test	Critical	Water fill up test	100%	Appd. Dgr.	No leakage	IR	√	P/W	W	V	Duration of holding time=8 hrs.
3.5	Painting	Surface finish/DFT adhesion, uniformity & shade	Major	Visual/Measu rement	100%	Appd.Drg/ Doc.	Appd.Drg/Doc.	IR	√	P/W	-	-	
			Legend: * RECORD INDETIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION. M: MANUFACTURER, S: SUB-CONTRACTOR, C: CONTRACTOR/NOMINATED INSPECTION AGENCY, N: BHEL, P: PERFORM, W: WITNESS, V: VERIFICATION, CHP: CUSTOMER HOLD POINT				FOR CUSTOMER USE						
CONTRACTOR		FOR BHEL					REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY					

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X800 MW TSGENCO KOTHAGUDEM TPS STAGE –VII, PALONCHA	SPEC NO: PE-TS-410-181-A001	
		VOLUME: II-B	
		SECTION: C	
		REV NO: 00	DATE:

DATA SHEET-A

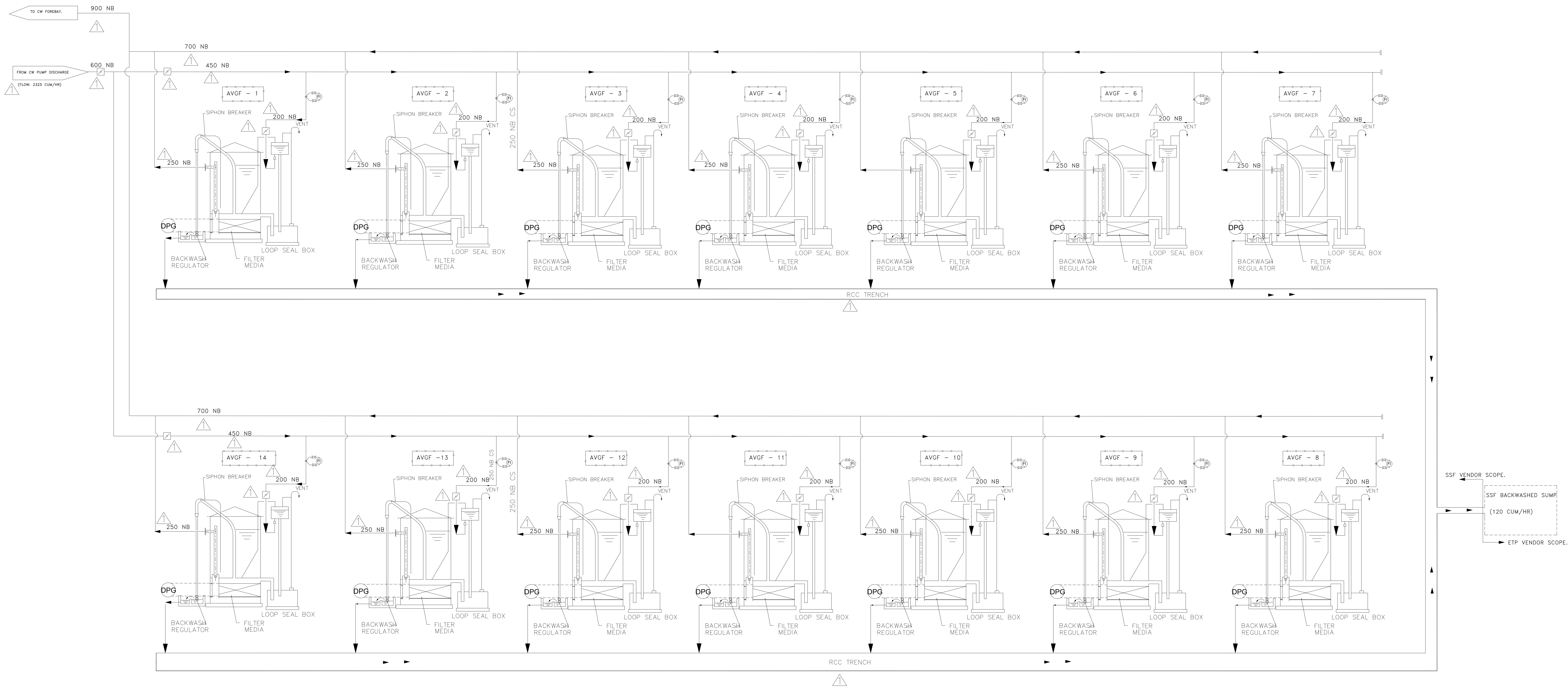
SL NO.	PARTICULARS	DESCRIPTIONS
1.0	SIDE STREAM FILTERS (AUTO VALVE LESS GRAVITY FILTER)	
1.1	Number	14 Nos (12W+2S/Backwash)
1.2	Type	Auto Valve less gravity filter
1.3	Thickness	
1.3.1	Base plate thickness	8 mm
1.3.2	Shell plate thickness	6 mm
1.3.3	Top cover plate thickness or roof	6 mm
1.4	Design Normal Service Flow Rate, in m ³ /hr	Not less than 200
1.5	Design code	IS: 803/ Manufacturer standard.
1.6	Maximum Design Inlet Total Suspended Solid (TSS)	25 PPM
1.7	Design TSS in Treated Water	5 PPM or 10% of the inlet suspended solid whichever is higher.
1.8	Design Temperature, °C	60°C
1.9	Filter media	
1.9.1	Type	Bed of Graded Sand and Anthracite supported over Graded Gravel/ Manufacturers standard.
	Characteristics of Anthracite	
1.9.1.1	Bulk Density	900 kg/m ³ / Manufacturer's standard.
1.9.1.2	Uniformity Coefficient	1.7/ Manufacturers standard.
1.9.1.3	Ash (minimum)	Less than 30 %/ Manufacturer's standard.
1.9.2	Characteristics of Sand	
1.9.2.1	Bulk Density	1400-1600 kg/m ³ / Manufacturer's standard.
1.9.2.2	Acid Solubility	Not to exceed 5% [10% HCL & 24 hrs].
1.9.2.3	Effective size, mm	Around 0.45/ Manufacturer's standard.
1.9.2.4	Uniformity Coefficient	1.6-1.65/ Manufacturer's standard.
1.9.2.5	Silica (minimum)	90 %/ Manufacturer's standard.
1.9.3	Bed type	Single/twin bed type
1.9.4	Bed depth	Shall be as per system requirement/ Manufacturer's standard.
1.9.5	Freed board	50% min
1.10	Design surface flow rate	10 m ³ /hr/m ²
1.11	Material of construction	
	a) Shell	Carbon steel as per IS 2062 or ASTM A 515 Gr. 70
	b) Dish	Carbon steel as per IS 2002 Gr. 2A or ASTM 515 Gr.70.
	c) Bottom Plate	Carbon steel as per IS 2062 or ASTM A 515 Gr.60/70 or better.
	d) Bottom collector plate	Carbon steel as per IS 2062 or ASTM A 515 Gr.60/70 or better.
	e) Strainers	PVC
1.12	Protection	
	a) Internal	Epoxy Painted
	b) Material	Three coats of Solvent Free Epoxy (DFT: 300 micron)
	b) External	Surface preparation shall be done by means of sand blasting, which shall conform to Sa 2-1/2 Swiss Standard. Primer Coat shall consist of one coat (minimum DFT of 100 microns) of epoxy resin based zinc phosphate primer. Intermediate Coat (or Under Coat) shall consist of one coat (minimum DFT of 100 microns) epoxy resin based paint pigmented with Titanium Dioxide. Top Coat shall consist of one coat (minimum DFT of 75 microns) of epoxy paint of approved shade and colour with glossy finish. Additional one coat (minimum DFT of 25 microns) of Finish Coat of polyurethane shall be provided. Total DFT of paint system shall not be less than 300 microns.

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1.13	Diff. Pressure gauge across the filter bed in each filter.	Provided
1.14	Flow meter/Bypass Rota meter at inlet and outlet of each filter.	Provided.
1.15	Piping	Carbon Steel (IS 1239, Heavy Grade or IS 3589)
1.16	Valves	Carbon Steel
1.17	Manhole	Two (2) nos. (minimum) each of Davit Type and minimum 500 mm diameter.
1.18	Hand hole	One (1) no. of 150 mm diameter for removal of media inside.
1.20	Manual backwashing facility	Shall be provided.
2.0	VALVES	Material of Construction
i.	Gate (All gate valves shall have flanged end connections, it shall be outside screw rising stem type with hand wheel). [Design Std-API 602 and Testing Std-API 598 for <50 NB size and Design Std-API 600 and Testing Std-API 598 for >=50 NB size].	Rating: PN 10 (min). Body/Bonnet – Cast Iron. Stem – stainless steel AISI 410/ 13% chrome steel. Disc – Cast iron. Seat & seat rings – 13% Chromium steel. Hand wheel- Cast iron.
ii.	Ball valve	Type :Full bore, Rating: PN 10 (min), Body: cast Iron/carbon steel Ball: stainless steel, Seat ring: PTFE, Stem: Stainless steel Seat: Nitrile rubber, PTFE
iii	Globe valve [Design Std-BS 5352 and Testing Std-BS 6755 for <50 NB size and Design BS 1873 and Testing Std-BS 6755 for >=50 NB size].	Type: Double flanged. Rating: PN 10 (min). Body: Cast iron:IS 210 Gr FG260 Stem: stainless steel.
iv	Butter fly valve	Butterfly valves shall be of Lugged wafer type of low leakage rate confirming to AWWA-C-504 class 150 (min.) or BS:5155 PN 10 (min.) Body: cast Iron IS:210 Gr. FG 260 Disc: SS 316. Shaft:ASTM.A296 Gr. CF8M Seat rings: Nitrilerubber, EPDM,Hypalon All the butterfly valves shall be provided with Hand wheel or lever as per the requirements. All the butterfly valves shall be provided with an indicator to show the position of the disc. Flanges shall conform to ANSI B 16.5 Cl.150 (min).

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P&ID



NOTES

- THIS DRAWING IS MEANT FOR DESIGN PHILOSOPHY FOR SIDE STREAM FILTRATION PLANT.
- THE INSTRUMENTS, VALVES, PIPING AND OTHER ACCESSORIES SHOWING IS TYPICAL.
- FOR ISOLATION PURPOSE GATE VALVE OR BUTTERFLY VALVE SHALL BE USED.
- ALL PIPES SHALL BE CARBON STEEL (AS PER IS 1239 H OR IS 3589) UNLESS EXCLUSIVELY MENTIONED.
- WRAPPING/COATING/PROTECTION OF ALL BURRIED PIPE SHALL BE AS PER IS 10221 OR AWWA C 203.

LEGEND	
	GATE VALVE
	FLOW INDICATOR
	DIFFERENTIAL PRESSURE GAUGE
	BUTTERFLY VALVE

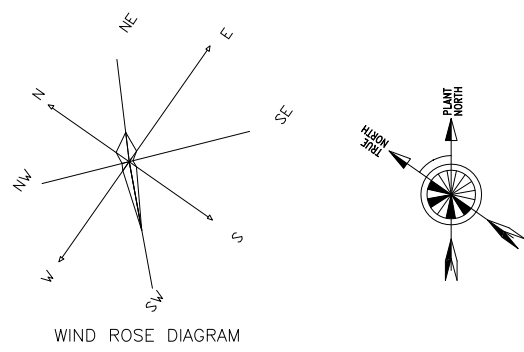
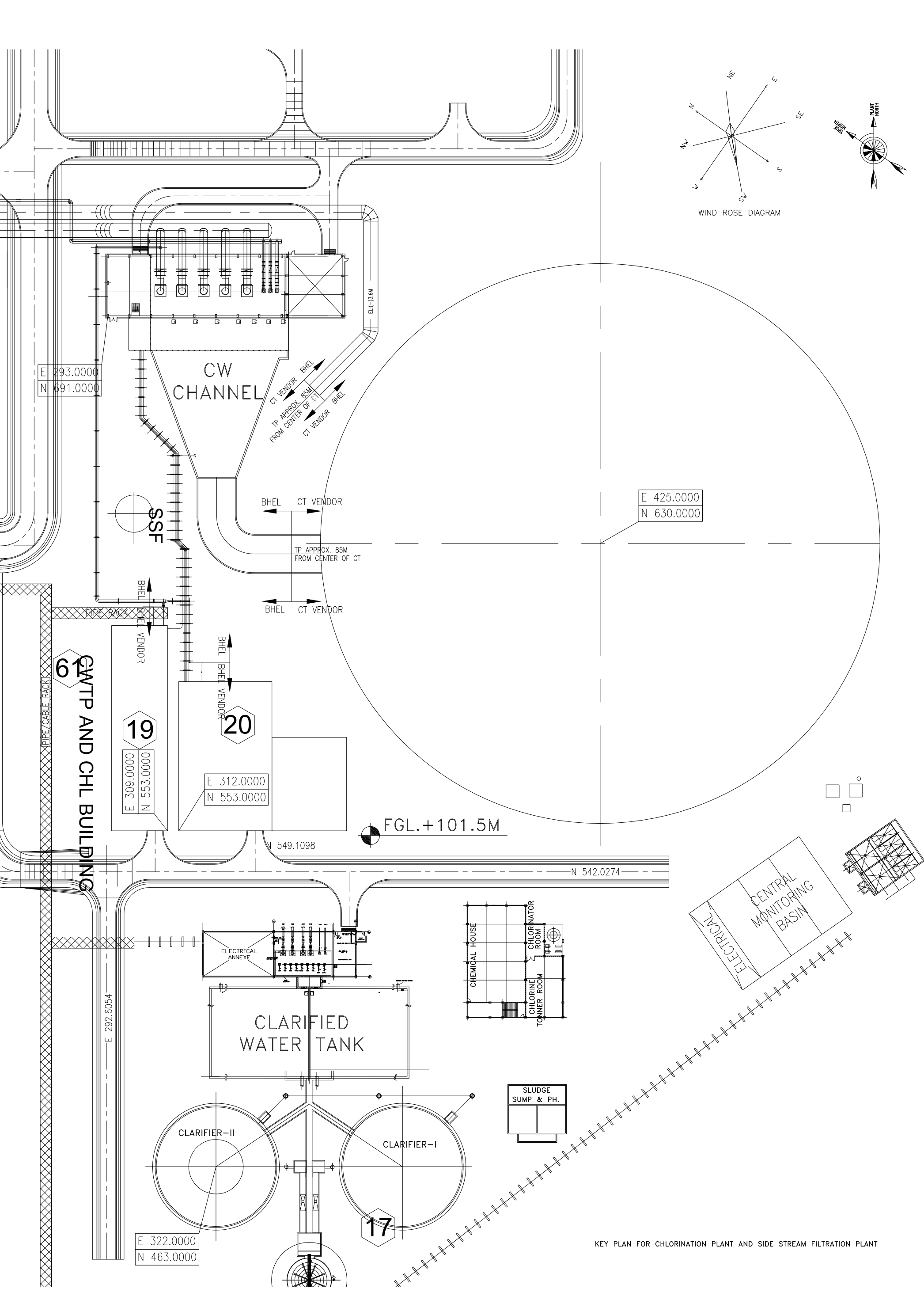
PIPE SIZES OF CS MATL.

NB	OD	THICK.
300	323.9	6.4
350	355.6	8.0
400	406.4	8.0
450	457.0	8.0
500	508.0	8.0
600	610.0	8.0
700	711.2	10.0
800	813.0	8.0
900	914.0	8.0
1000	1016	12.0
200	219.1	6.4
250	273.0	6.4

JOB NO.	410	TELANGANA STATE POWER GENERATION CORPORATION LIMITED					
STATUS	CONTRACT	DCPL					
DISTRIBUTION		1X800 MW KOTHAGUDUM STPP					
TO		BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NEW DELHI	DEPT CODE	NAME	SIGN	DATE	
No. OF			DRN	FS			
			DESN	FS			
			CHD	JP/KK			
			APPD	PK			
TITLE P & I D FOR SIDE STREAM FILTRATION PLANT (SSF).							
			DEPT.	SCALE	DRAWING NO.		
			SIGN		PE-DG-410-181-A001		
			DATE		SHEET 1 OF 1	REV. 1	

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X800 MW TSGENCO KOTHAGUDEM TPS STAGE –VII, PALONCHA	SPEC NO: PE-TS-410-181-A001	
		VOLUME: II-B	
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KEY PLAN



KEY PLAN FOR CHLORINATION PLANT AND SIDE STREAM FILTRATION PLANT

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X800 MW TSGENCO KOTHAGUDEM TPS STAGE –VII, PALONCHA	SPEC NO: PE-TS-410-181-A001	
		VOLUME: II-B	
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SECTION-D
(GENERAL TECHNICAL REQUIREMENT)

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X800 MW TSGENCO KOTHAGUDEM TPS STAGE –VII, PALONCHA	SPEC NO: PE-TS-410-181-A001	
		VOLUME: II-B	
		SECTION: D	
		REV NO: 00	DATE:

1.0 DESIGN PHILOSOPHY:

To reduce the Suspended Solids in the cooling water, at least 2.5 % of the total Circulating Water shall be passed through Automatic Valve less Gravity Filter Units. The filter Units will take the supply of circulating water from discharge header of CW Pumps and after filtration the filtered water will be returned to the CW Fore-bay.

2.0 CAPACITY SELECTION:

CW Flow	=	84210 m ³ /hr
ACW flow	=	3394 m ³ /hr
Total CW and ACW flow	=	(84210+3394)=87604 m ³ /hr
2.5% of total CW and ACW flow	=	2190.1 m ³ /hr
Flow selected with margin	=	2325 m ³ /hr
Capacity of each AVGF	=	200 m ³ /hr
AVGF @200 m ³ /hr	=	11.625 nos
AVGF selected	=	14 NOS (12W+2S/Backwash)

3.0 PLANT OPERATIONS AND CONTROL

The Auto Valve-less Gravity Filter operates automatically on the siphon principle. Water enters the Filter Chamber and then flows down through the filter media. The filtered water is collected in Collection Chamber and then travels up through a pipe to service outlet. As dirt is collected over the filter bed in course of service run, the head loss across the filter bed increases and the water level raises in both inlet and backwash pipes. When the water starts to flow over and into the downward section of the backwash pipe, a siphon action occurs. Once the siphon has been established between the filter and the backwash regulator sump, the pressure immediately above the filter bed is lower when the pressure in backwash storage compartment. This causes water from the backwash compartment to flow down through the filter bed, into the collection chamber.

In course of backwash, water is drawn from backwash storage compartment down through the pipe and up through the strainers. Backwash continues until the backwash water level reaches below the terminal of the siphon breaker. The air gets admitted into the backwash pipe and terminates the siphon action as well as backwash.

A differential pressure gauge shall be provided in each filter for monitoring pressure loss locally. Normally 12 out of 14 filters will be in service. The backwash waste from Side Stream Filtration System shall be routed to Waste Water Treatment System.

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FIELD INSTRUMENT DATA SHEET

approval

4.00.00 **LOCAL INSTRUMENTS**

4.01.00 PRESSURE GAUGE AND DIFFERENTIAL PRESSURE GAUGE

1. Type : Bourdon/Bellows/Diaphragm
2. Sensing & Socket : SS-316
3. Movement Material : SS-316
4. Case Material : Stainless steel. IP-65 (Explosion proof for NEC Class-1, Division 1 area)
5. Dial Size : Generally 150 mm
6. Scale : Black lettering on white in 270 O arc.
7. Window : Shatterproof glass
8. Range Selection : Normal process pressure: 50~70 % of range
9. Over-range Protection : 125% of maximum range by internal stop. External stop at zero
For Zero adjustment (Micrometer screw external)
10. Adjustment : For Range adjustment (Micrometer screw internal).
11. Element Connection : Argon welding
12. Process Connection : 1/2" NPT (M) Bottom for local, back for panel mounting
13. Performance : Accuracy of ± 1.0 % of span or better
14. Operating ambient : 0 - 50 °C
15. Safety Feature : Blow out disc /diaphragm at the back
16. Accessories :
 - a) Snubbers for pulsating fluid application.discharge
 - b) Stainless steel Diaphragm seals

- for corrosive/ viscous/ solid bearing or slurry type fluid applications
- c) 3-Way SS316 Gauge cock for pressure gauges
- 5-valve SS316 manifold from
- d) barstock for differential pressure gauge
- e) Siphons for steam and hot water services
17. Nameplate : Tag number, service engraved in stainless steel tag plate

~~4.02.00 LEVEL INDICATOR (FLOAT & BOARD TYPE)~~

- ~~1. Type : Float and Board~~
- ~~2. Float Material : SS-316~~
- ~~3. Float Cable : SS-316~~
- ~~4. Indicator Assembly : Epoxy painted Aluminium~~
- ~~5. Guide wire spring assembly : SS-316 (2 Nos.)~~
- ~~6. Guide Wire Anchor : SS-316~~
- ~~Anodized Aluminium with engraved marking (Minimum graduation 10mm),~~
- ~~7. Scale Board :~~
- ~~mounting brackets and suitable hardware required as per tank height~~
- ~~8. Elbow Assembly : Anodized Aluminium~~
- ~~9. Flanges : RF , ANSI 150 , SS (3 Nos.)~~
- ~~10. Accuracy : ± 10 mm or better~~
- ~~11. Accessories : All mounting accessories including counter flange, nuts & bolts, suitable~~

4.04.00	SLIGHT GLASS	
1.	Type	: Flap type.
2.	End connection	: Screwed / Flanged
3.	Material	
	a) Body	: SS 304
	b) Cover plate	: SS 304
	c) Indicator	: SS 316
4.	Sight Glass	: Toughened Borosilicate
5.	Gasket	: Neoprene
6.	Bolts & Nuts	: High tensile steel.
7.	Hydraulic Test Pressure	: 1.5 times maximum working pressure
8.	Accessories	: Companion Flanges, Bolts, nuts, gaskets as required, SS Tag plate.
4.05.00	ROTAMETER	
1.	Type	ON-LINE for line upto and including 50 mm NB. : Borosilicate BY-PASS for line size above 50 NB
2.	Metering tube	: Toughened Borosilicate
3.	Float	: SS-316
4.	End fittings	: SS-316
5.	Packing material	: Teflon / PTFE
6.	Casing	: Stainless Steel
7.	Gland Rings /Followers/ Other wetted parts	: Stainless Steel
8.	Orifice Plate	: Stainless Steel (for bypass type)
9.	Operating Temperature	: 0-50 Deg. c

- | | | |
|------------------------|---|--|
| 10. Test Pressure | : | 200% of maximum operating pressure |
| 11. Scale | : | 250 mm nominal length |
| 12. Graduation | : | Direct reading |
| 13. Process Connection | : | Flanged (RF) to line size as per ANSI standards (150#) |
| 14. Tapping | : | D & D/2 |
| 15. Accuracy | : | +/- 2% of full scale reading |
| 16. Reproducibility | : | Within 0.5% of instantaneous reading |
| 17. Accessories | : | SS Tag Plate, orifice plate |

~~5.00.00~~ ~~TEMPERATURE ELEMENTS & ACCESSORIES~~

~~5.01.00~~ ~~RESISTANCE TEMPERATURE DETECTOR~~

- | | | |
|--|--------------|--|
| 1. Type | : | Platinum (Duplex), Ungrounded |
| 2. Platinum (Duplex), Ungrounded | : | 100 ohm at 0 °C |
| 3. Base | : | Wound on ceramic (anti inductive) |
| 4. Wiring | : | 3 Wire |
| 5. Protecting Tube | | |
| a) O.D. | : | 6 mm |
| b) Material | : | SS 316, Seamless |
| c) Filling | : | Magnesium oxide (Purity above 99.4%). |
| 6. Response time | : | a) 15 sec. (bare) |
| | | b) 30 sec. (with thermowell) |
| 7. Calibration | : | DIN 43760 |
| 8. Accuracy | : | ± 0.5% |
| 9. Head | | |
| a) Type | : | IP 65 universal screwed type |

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		SECTION: D	
		REV NO: 00	DATE:

KKS PHILOSOPHY

	DOCUMENT TITLE							
	KKS NUMBERING PHILOSOPHY							
1X800MW KOTHAGUDEM								

KKS NUMBERING PHILOSOPHY

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

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

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

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

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

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

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

THIS DOC IS PART OF PE-TS-410-181-A001

	DOCUMENT TITLE
	KKS NUMBERING PHILOSOPHY
	1X800 MW KOTHAGUDEM

ANNEXURE-1

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

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

ANNEXURE-2

Standard Equipment Codes:

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

Standard Apparatus Codes:

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

THIS DOC IS PART OF PE-TS-410-181-A001



DOCUMENT TITLE

KKS NUMBERING PHILOSOPHY

1X800 MW KOTHAGUDEM

Standard Measuring Circuits Codes:

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

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

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

B) Numerical keys at Equipment Code level:

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

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

N1N2 N3**THIS DOC IS PART OF PE-TS-410-181-A001**

DOCUMENT TITLE			
	KKS NUMBERING PHILOSOPHY		
	1X800 MW KOTHAGUDEM		
Motorised (<i>on/off duty</i>)	-	0	01 to 50
Motorised (<i>inching duty</i>)	-	0	51 to 99
Pneumatic (Control)	-	1	01 to 50
Motorised (<i>thyrestor Control</i>)	-	1	51 to 99
Sol. Operated	-	2	01 to 99
(Open / Close duty (Valves, NRVs, Gate)			
Hydraulic	-	3	01 to 99
NRV (Without actuation)	-	4	01 to 99
Manual	-	5	01 to 99
Manual	-	6	01 to 99
Relief & Safety Valves	-	7	01 to 99
Reserve	-	8	01 to 99
Reserve	-	9	01 to 99
ii) Field Instruments			
Field Transmitters & Analog Signals	-	0	01 to 99
Field Switches & Binary Signals	-	1	00 to 99
PG Test Point	-	4	00 to 99
Gauges	-	5	00 to 99
Automatic Turbine Tester (ATT)-HWR	-	2	00 to 99
(Reserved for protection Signals used by Hardwar)			
Example of Numerical Key Usage:			
In line with the philosophy adopted for Valves / Dampers /instruments etc. pumps and fans in the main systems (having different system code) can be numbered as AP/N100 and as AP/N101, 102, Where system code is same.			

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X800 MW TSGENCO KOTHAGUDEM TPS STAGE –VII, PALONCHA	SPEC NO: PE-TS-410-181-A001	
		VOLUME: II-B	
		SECTION: D	
		REV NO: 00	DATE:

P&ID FOR CW/ACW SYSTEM

Pipe Sizes for carbon Steel Pipes

Pipe Size (NB)	OD (mm)	THK. (mm)
100	115	5.4
150	166.5	5.4
200	219.1	6.0
250	273	6.0
300	323.9	6.0
350	355.6	6.0
400	406.4	6.0
450	457	6.0
500	508	6.0
600	610	6.0
700	711	7.0
800	813	8.0
900	914	10.0
2000	2032	18.0
2700	2740	20.0
3800	3840	20.0

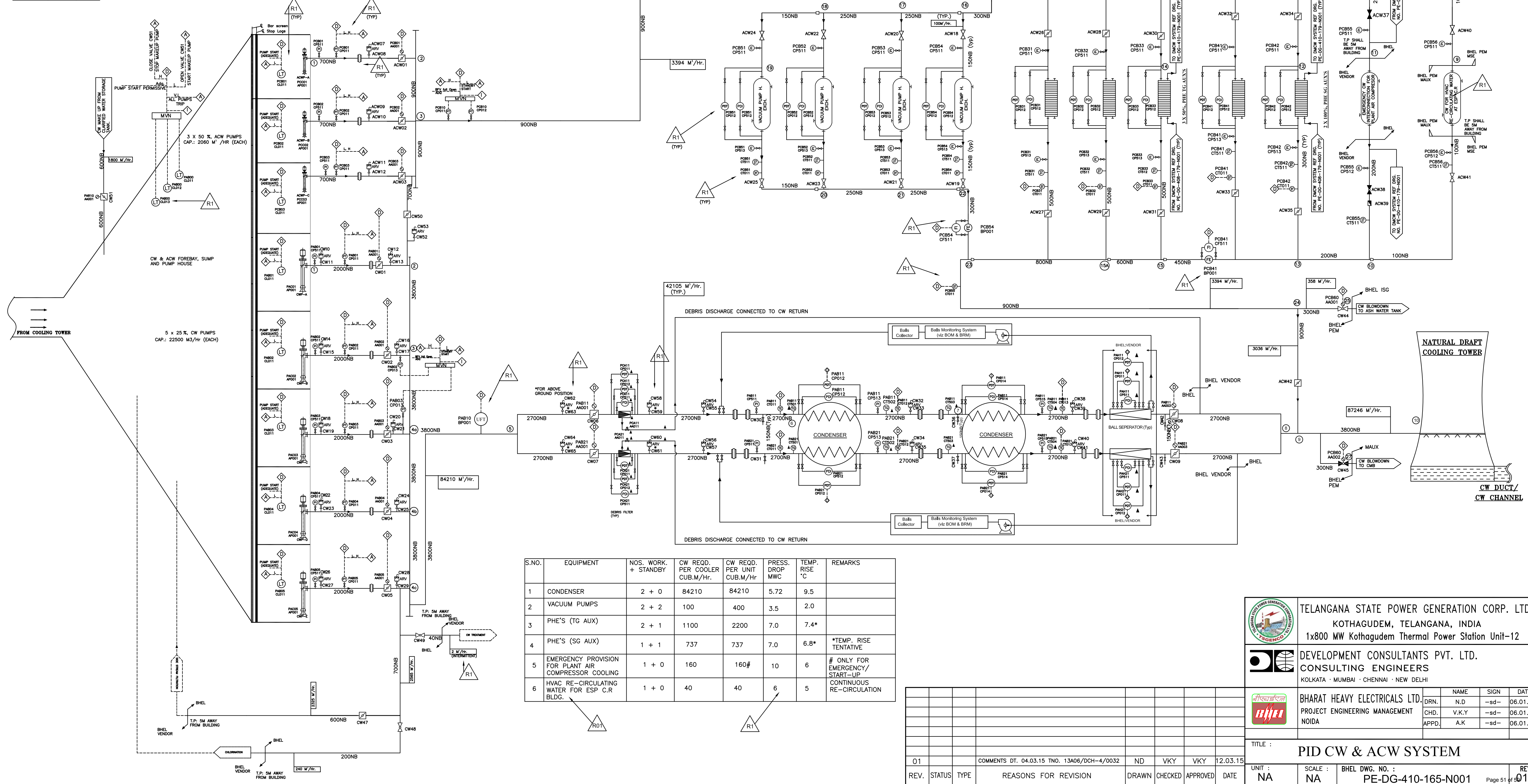
LEGEND			
	MOTOR OPERATED GATE VALVE		DCS
	MOTOR OPERATED BUTTERFLY VALVE		ALARM
	MANUAL BUTTERFLY VALVE		ORIFICE PLATE
	NON RETURN VALVE		R.E. JOINT (STD.)
	GLOBE VALVE		VERTICAL PUMP
	AIR RELEASE VALVE		ULTRASONIC FLOW TRANSMITTER (CLAMP-ON TYPE)
	PRESSURE GAUGE		MVN- MEAN/MEDIAN VALUE SELECTION
	PRESSURE TRANSMITTER		INDICATION
	DIFFERENTIAL PRESS. GAUGE		
	DIFFERENTIAL PRESS. TRANSMITTER		
	LEVEL TRANSMITTER		
	ROTAMETER WITH 4-20ma O/P FACILITY		
	TEMPERATURE ELEMENT		
	TEMPERATURE GAUGE		
	GATE VALVE		

NOTES:

- DESIGN PRESSURE : 5.5 kg/sq.cm (g) FOR C.W.SYSTEM
DESIGN PRESSURE : 7.5 kg/sq.cm (g) FOR A.C.W. SYSTEM
DESIGN CW INLET TEMP TO CONDENSER & VACUUM PUMP HEAT EXCH. = 33 °C
DESIGN A.C.W. INLET TEMP TO PHE'S & AUX. = 33 °C
DESIGN MECHANICAL TEMPERATURE : 60 °C
- MATERIALS OF CONSTRUCTION :-
 - PIPEING UP TO AND INCLUDING 150NB SHALL BE CARBON STEEL ERW, IS1239 (HEAVY GRADE)
 - PIPEING > 150NB SHALL BE CARBON STEEL (SS200), ROLLED AND WELDED CONFORMING TO IS3089
 - ALL PRESSURE TAPPINGS & ROOT VALVES TO BE OF 15 NB.
 - C.W. SYSTEM : 150 NB SIZE DRAIN & VENT VALVES SHALL BE PROVIDED AS REQD. AS PER LAYOUT.
 - A.C.W. SYSTEM : 50 NB SIZE DRAIN & VENT VALVES SHALL BE PROVIDED FOR PIPE SIZES 400 NB & ABOVE AS PER LAYOUT REQUIREMENT.
 - 25 NB DRAIN & VENT VALVES SHALL BE PROVIDED FOR PIPE SIZES UP TO 350 NB AS PER LAYOUT REQUIREMENTS.
 - ALL PIPELINES RUNNING AT SITE, SHALL BE PROVIDED WITH SUITABLE VENT AT THE HIGHEST POINT & DRAINS AT THE LOWEST POINT AS NECESSARY.
 - INSTRUMENTS MARKED - THIS SHALL BE SUPPLIED ALONGWITH THE EQUIPMENTS.
 - AIR RELEASE VALVES (150 NB) SHALL BE PROVIDED, IF REQUIRED, AS PER SURGE STUDIES.
- PAINTING/PROTECTION - PIPES:
 - INTERNAL SURFACE (FOR PIPE DIA 450NB AND ABOVE)
 - SURFACE CLEANING BY WIRE BRUSH, POWER TOOL CLEANING ETC.
 - APPLICATION OF ONE COAT OF EPOXY RESIN BASED RED OXIDE PRIMER FOLLOWED BY ADEQUATE NO. OF FINISH COATS OF COAL TAR EPOXY PAINT TO ACHIEVE TOTAL DRY FILM THICKNESS OF 200 MICRONS.
- EXTERNAL SURFACE - OVERGROUND PIPING:
 - SURFACE CLEANING BY WIRE BRUSH, POWER TOOL CLEANING ETC.
 - APPLICATION OF ONE COAT OF RED LEAD PRIMER FOLLOWED BY ADEQUATE NO. OF FINISH COATS OF SYNTHETIC ENAMEL PAINT TO ACHIEVE TOTAL DRY FILM THICKNESS OF 200 MICRONS.

NOTES:

- EXTERNAL SURFACE - UNDERGROUND PIPING:
 - AS PER IS 10221:
 - SURFACE CLEANING BY WIRE BRUSH, POWER TOOL CLEANING ETC.
 - ALL PRIMER/COATING/WRAPPING MATERIALS AND METHOD OF APPLICATION SHALL CONFORM TO IS10221 EXCEPT ASPHALT/BITUMEN MATERIAL. MATERIALS (PRIMER/COATING/WRAPPING) AS PER ANWW-C-203 ARE ALSO ACCEPTABLE.
 - PROTECTIVE COATING SHALL CONSIST OF COAL TAR PRIMER, COAL TAR ENAMEL COATING, GLASS FIBER, TISSUE INNER WRAP FOLLOWED BY GLASS FIBER OR COAL TAR IMPREGNATED KRAFT OUTER WRAP OR FINISH COAT.
 - NUMBER OF COATS & WRAPS, MIN. THICKNESS FOR EACH LAYER OF APPLICATION SHALL BE AS PER IS-10221. NUMBER OF COATS & WRAPS SHALL BE DECIDED BASED ON SOIL RESISTIVITY AS INDICATED IN IS-10221.
 - TOTAL THICKNESS OF COMPLETED COATING & WRAPPING SHALL NOT BE LESS THAN 4.0MM.
- ALTERNATIVELY, THE ANTI-CORROSION PROTECTION FOR BURIED PIPES CAN CONSIST OF ANTI-CORROSION PROTECTION COAL TAR TAPES. MATERIAL AND APPLICATION OF TAPES SHALL CONFORM TO IS 13337 OR EQUIVALENT. THESE TAPES SHALL BE APPLIED HOT OVER THE COAL COAT PRIMER IN STEPS OF 2MM THICKNESS SO AS TO COVER THE SPIRAL EDGES OF THE FIRST TAPE BY THE APPLICATION OF SECOND TAPE. THE TOTAL THICKNESS OF THE FINISHED PROTECTIVE COATING SHALL BE 4.0MM MINIMUM.
- C.W. PIPE BURIED PORTION COMING UNDER RAIL OR ROAD SHALL BE CONCRETE ENCASED / CULVERT SHALL BE PROVIDED.
- STATUS INDICATION OF ALL MOV SHALL BE PROVIDED AS PER APPROVED DRIVE CONTROL PHILOSOPHY.
- REFERENCE DOCUMENTS:
 - C.W. & A.C.W. SYSTEM WRITE-UP - PE-DC-410-165-N002



S.NO.	EQUIPMENT	NOS. WORK. + STANDBY	CW REQD. PER UNIT CUB.M/Hr.	CW REQD. PER COOLER CUB.M/Hr.	PRESS. DROP MWC	TEMP. RISE °C	REMARKS
1	CONDENSER	2 + 0	84210	84210	5.72	9.5	
2	VACUUM PUMPS	2 + 2	100	400	3.5	2.0	
3	PHE'S (TG AUX)	2 + 1	1100	2200	7.0	7.4*	
4	PHE'S (SG AUX)	1 + 1	737	737	7.0	6.8*	*TEMP. RISE TENTATIVE
5	EMERGENCY PROVISION FOR PLANT AIR COMPRESSOR COOLING	1 + 0	160	160#	10	6	# ONLY FOR EMERGENCY/ START-UP
6	HVAC RE-CIRCULATING WATER FOR ESP C.R BLDG.	1 + 0	40	40	6	5	CONTINUOUS RE-CIRCULATION

REV.	STATUS	TYPE	REASONS FOR REVISION	DRAWN	CHECKED	APPROVED	DATE
01			COMMENTS DT. 04.03.15 TNO. 13A06/DCH-4/0032	ND	VKY	VKY	12.03.15

TELANGANA STATE POWER GENERATION CORP. LTD.
KOTHAGUDEM, TELANGANA, INDIA
1x800 MW Kothagudem Thermal Power Station Unit-12

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA · MUMBAI · CHENNAI · NEW DELHI

BHARAT HEAVY ELECTRICALS LTD.
PROJECT ENGINEERING MANAGEMENT
NOIDA

NAME	SIGN	DATE
DRN. N.D.	-sd-	06.01.15
CHD. V.K.Y.	-sd-	06.01.15
APPD. A.K.	-sd-	06.01.15

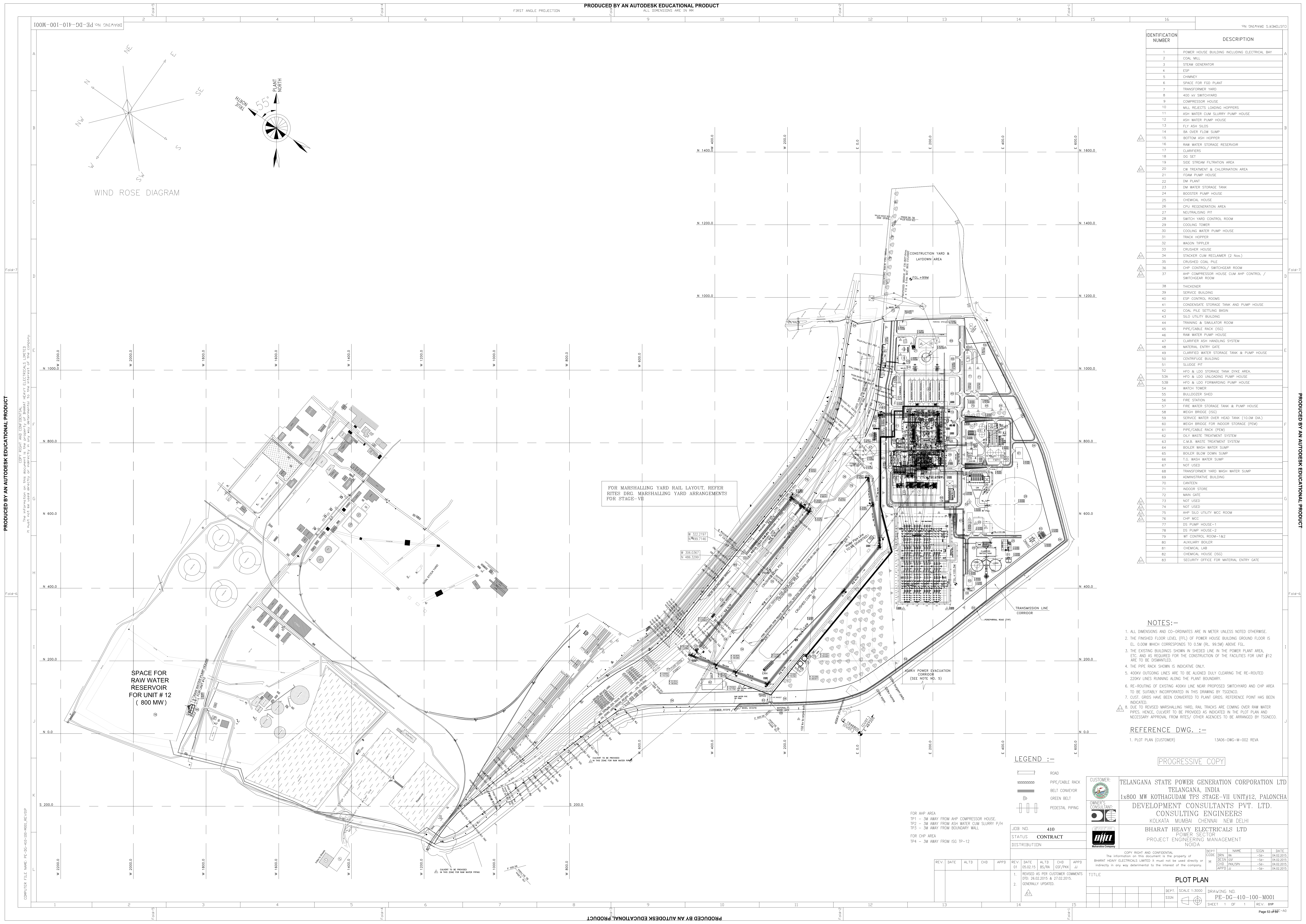
TITLE : PID CW & ACW SYSTEM

UNIT : NA
SCALE : NA
BHEL DWG. NO. : PE-DG-410-165-N001

REV. 01

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X800 MW TSGENCO KOTHAGUDEM TPS STAGE –VII, PALONCHA	SPEC NO: PE-TS-410-181-A001	
		VOLUME: II-B	
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PLOT PLAN





TITLE:

TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X800 MW TSGENCO KOTHAGUDEM TPS
STAGE –VII, PALONCHA

BHEL DOCUMENTS NO.: PE-TS-410-181-A001

VOLUME **III**

REV. NO. 00

LIST OF SCHEDULES



TITLE:

TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X800 MW TSGENCO KOTHAGUDEM TPS
STAGE –VII, PALONCHA

SPEC NO: PE-TS-410-181-A001

VOLUME: III

SECTION:

REV NO: 00

DATE:

SCHEDULE OF PRE-BID CLARIFICATION

All clarification from the Technical Specification shall be filled in by the BIDDER clause by clause in this format only.

VOLUME	SECTION	CLAUSE NO.	PAGE NO.	SPECIFICATION REQUIREMENT	CLARIFICATION	REASONS FOR CLARIFICATION

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE					
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL	

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DEVIATION SHEET (COST OF WITHDRAWAL)**PROJECT:-1X800 MW TSGENCO KOTHAGUDEM TPS ,STAGE –VII, PALONCHA****PACKAGE:- SIDE STREAM FILTRATION PLANT****TENDER ENQUIRY REFERENCE:-****NAME OF BIDDER:-**

SL NO	VOULME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF WITHDRAWAL OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWAL OF DEVIATION IS APPLICABLE	NATURE OF COST OF WITHDRAWAL OF DEVIATION (POSITIVE/ NEGATIVE)	REASON FOR QUOTING DEVIATION
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TECHNICAL DEVIATIONS

COMMERCIAL DEVIATIONS

PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE

NAME	DESIGNATIONS	SIGN & DATE	
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NOTES:

- For self manufactured items of bidder, cost of withdrawal of deviation will be applicable on the basic price (i.e. excluding taxes, duties & freight) only.
- For directly dispatchable items, cost of withdrawal of deviation will be applicable on the basic price including taxes, duties & freight.
- All the bidders have to list out all their Technical & Commercial Deviations (if any) in detail in the above format.
- Any deviation not mentioned above and shown separately or found hidden in offer, will not be taken cognizance of.
- Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawal of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable.
- Bidder shall furnish price copy of above format along with price bid.
- The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
- Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
- For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/ E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawal of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawal of deviation shall be taken as NIL.
- Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
- All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.
- Cost of withdrawal is to be given separately for each deviation. In no event bidder should club cost of withdrawal of more than one deviation else cost of withdrawal of such deviations which have been clubbed together shall be considered as NIL.
- In case nature of cost of withdrawal (positive/negative) is not specified it shall be assumed as positive.
- In case of discrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.



TITLE:

**TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X800 MW TSGENCO KOTHAGUDEM TPS
STAGE –VII, PALONCHA**

SPEC NO: PE-TS-410-181-A001

VOLUME: III

SECTION:

REV NO: 00

DATE:

COMPLIANCE CUM CONFIRMATION SCHEDULE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate and furnishing same with the offer:

- a.) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions/ deviations with regard to same.
- b.) QP/ test procedures shall be submitted in the event of order based on the guidelines given in the specification & QP enclosed therein.
QP will be subject to BHEL/Customer approval in the event of order & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc.
The charges for 3rd party inspection (Lloyds, TUV or equivalent) for imported components shall be included in the base price of the equipment by the bidder
- c.) All drawings/data – sheets etc. to be submitted during contract shall be subject to BHEL/Customer review/ approval. GA drawings, as submitted with offer at tender stage are for reference purpose only and shall be subject to approval during contract stage.
- d.) There are no other deviations with respect to specification other than those furnished in the 'Schedule of Deviations'
- e.) The offered materials shall be either equivalent or superior to those specified. Also for components where material is not specified it shall be suitable for intended duty, materials shall be subject to approval in the event of order.
- f.) The commissioning spares (if any) are supplied on 'As Required Basis' & prices for same included in the base price (If bidders reply to this is "No commissioning spares are required" and if some spares are actually required during commissioning same shall be supplied by bidder without any cost to BHEL).
- g.) All sub vendors shall be subject to BHEL/CUSTOMER approval
- h.) Any special tools & tackles, if required, shall be in bidder's scope.
- i.) Demonstration parameters shall stand valid till the satisfactory completion of demonstration test and its acceptance by BHEL/Customer.



TITLE: TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X800 MW TSGENCO KOTHAGUDEM TPS
STAGE -VII, PALONCHA

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VOLUME III

REV. NO. 00

SUGGESTIVE PRICE FORMAT FOR SIDE STREAM FILTRATION PLANT FOR 1X800 MW KOTHAGUDEM TPS.

Sl. No.	DESCRIPTION OF EQUIPMENT / ITEM	TOTAL PRICE FOR "FOR" SITE
(1)	(2)	(3)
1.0	Total lump sum firm price on FOR site basis for design, engineering, manufacture, inspection, testing at manufacturer's works, supply/delivery duly packed at site including freight, unloading, storage and handling at site, erection and commissioning, trial run at site, PG test, plant handing over to customer etc. inclusive of all prevailing taxes, duties and other levies of Side Stream Filtration Plant complete with all accessories, start up and commissioning spares as required, mandatory spares for the total scope defined as per BHEL Technical specification - PE-TS-410-181-A001 as required for safe and trouble free smooth operation.	
	NOTES:	
a	Bidder to note that total price indicated above at 1.0 shall be considered for evaluation and hence should be complete in all respect for the full scope defined and considering all terms and conditions agreed.	
b	In case, price indicated above does not match with item wise break-up given at 2.0, the highest price so calculated shall be considered for evaluation but in case of order, the same shall be placed at the lowest price.	
2.0	BREAK-UP OF PRICES GIVEN IN 1.0 ABOVE	
2.1	Total lump sum price on Design, engineering, manufacture, assembly, tests at manufacturer's works, forwarding, transportation, delivery of entire Side Stream Filtration Plant to the site including Start up and commissioning spares as required, as defined subsequently complete with all accessories, auxiliaries as specified in Technical specification No. PE-TS-410-181-A001 as required for safe and trouble free smooth operation.	
2.2	Total lump sum price for supply/delivery of mandatory spares as specified in Technical specification No. PE-TS-410-181-A001.	
2.3	Total lump sum price on unloading, handling, storage, and in plant transportation at site, erection, commissioning trial run the entire Side Stream Filtration Plant, as defined subsequently complete with all accessories, auxiliaries as specified in Technical specification No. PE-TS-410-181-A001 as required for safe and trouble free smooth operation.	
2.4	Total lump sum price on performance guarantee test, and handing over to Purchaser the entire Side Stream Filtration Plant, as defined subsequently the Side Stream Filtration Plant and ancillaries as specified in Technical specification No. PE-TS-410-156-A001 as required for safe and trouble free smooth operation.	
2.5	Erection & Commissioning	

	TITLE * SCHEDULE OF DECLARATIONS	BHEL DOCUMENTS NO.: PE-TS-410-181-A001
		VOL III
		SHEET..... OF.....

*** Bidder shall include this schedule both in technical and Price offers**

DECLARATION

Icertify that all the technical data and information pertaining to this specification are correct and are true representation of the equipment/system covered by our format proposal number Dated and there is no deviation to the specification (except indicated in the deviation sheet (cost of withdrawal).

I hereby certify that I am duly authorized representative of the Bidder's company whose name appears above my signature.

Biders Company Name

Authorised representative's
Signature

Name

Bider's Name

The bidder hereby agrees to fully comply with the requirements and intent of this specification for the price indicated

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL