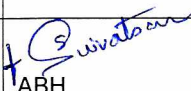
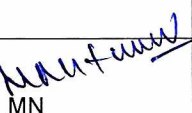


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		REV.: 00

**BHARAT HEAVY ELECTRICALS LIMITED,
RANIPET- 632 406**

**TECHNICAL SPECIFICATION
FOR
SIDE STREAM FILTRATION PLANT
YADADARI- TPS 5 x 800 MW
DAMERACHERLA**

00	30.06.17	 ABH	 SM	 MN	Fresh issue
Rev.No	Date	Prepared	Checked	Approved	Remarks

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SECTION -1

1. SCOPE OF ENQUIRY/ 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 5X800 MW TSGENCO YADADRI TPS, DAMERCHERLA.
- 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 Side Stream Filtration.
- 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

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format enclosed with this 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 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 equipment are being manufactured or tested and all test records shall be made available to him.

Pre-bid meeting shall be held before bid submission. Bidder to ask all their queries in pre-bid meeting.

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SECTION -2

2.0 PROJECT INFORMATION

1	Name of the Project	Yadadri Thermal Power Station
2	Station Capacity	5x800 MW (Coal Based)
3	Owner	Telangana State Power Generation Corporation Limited (TSGENCO)
4	Site Location	Site is located 7 km from the NH5. Veerlapalem Village, Dameracherla Mandal, Nalgonda District, Telangana State
5	Latitude	16° 40' 19" N
6	Longitude	79° 35' 18" E
7	Nearest Town	30km Miryalaguda and 170 KM from Hyderabad by road.
8	Nearest railway Station	12km Damercherla
9	Nearest Airport	130 km Vijayawada 170 km Hyderabad
10	Site Conditions	
	Elevation above MSL	91 m
	Temperature –Minimum	10°C during Winter
	- Maximum	47°C during Summer
	- Design Ambient	50°C
	- Ambient (performance)	38°C
	Relative Humidity for deign / efficiency	48 – 84 %
	Annual Rainfall - Average	753 mm
	- Maximum	1043 mm
	- Lowest	383
	Mean Wind Speed	8 kmph
	Wind Pressure	As per the latest revision of IS 875/1987
	Siesmic Co-efficient	Zone –III, as per IS 1893 (Part-IV)
11	Source of water	Source of water is Krishna River near Madachelu area which is about 1 km ie on upstream side of confluence point of Tungapahad Vagu and Krishna River. Water will be pumped through pipe line (of length 7 km) from this point to the project site.
12	Source of Coal	The boiler is designed for pulverised coal either 100% imported or 50% imported & 50% indigenous coal.

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SECTION - 3

3.0 SCOPE OF SUPPLY

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

3.1 SIDE STREAM FILTRATION PLANT (SSF):

- 3.1.1 26 Numbers (24 working +2 standby /under backwash) for Units 1&2 and 38 Numbers (36 working +2 standby /under backwash) for Units 3, 4 & 5 Side Stream Filters (SSF) as per the datasheet and P&ID.
- 3.1.2 The SSF shall be complete with inlet, outlet connections, and bed support system, Inlet water distribution, siphon breaker, back wash facility etc.
- 3.1.3 Internals, fittings and appurtenances of SSF as per system requirement.
- 3.1.4 All necessary drains, vents and valves, sampling point etc. as specified and as required.
- 3.1.5 All interconnection piping & valves, fittings, instruments (as minimum) as shown in the P & ID and as mentioned in Data Sheet-A.
- 3.1.6 Hangers and supports as per the requirement.
- 3.1.7 Filtration media for all SSF.
- 3.1.8 Start-up & Commissioning spares.
- 3.1.9 Mandatory spares.
- 3.1.10 Counter flanges, blank flanges, isolation valves at all the terminal points as required as per system requirements.
- 3.1.11 All special tools necessary for proper maintenance or adjustment of the equipment packed in permanent box.
- 3.1.12 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.
- 3.1.13 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 equipment being supplied under this specification for opening/maintenance purpose.
- 3.1.14 All auxiliary steel structures (U-clamps, nuts, bolts, channels etc.) for fixing the pipe on the pedestal or trestles.
- 3.1.15 Wrapping, coating and protection of all the buried pipe shall be as per IS 10221 or AWWA C 203.
- 3.1.16 Finish paint for touch-up painting of equipment after erection at site in sealed containers.
- 3.1.16 Set of special tools and tackles if required for maintenance and erection of equipment supplied.
- 3.1.17 All necessary flanges and counter flanges to interconnect the piping.

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3.2 SCOPE OF SERVICE:

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

- 3.2.1 Erection and commissioning, unloading, storage and handling at site.
- 3.2.2 Arrangement of all instruments and lab facilities to carry out trial run, commissioning and PG test.
- 3.2.3 In site transportation.
- 3.2.4 Monitoring gadgets, instruments and equipment required for maintenance (till PG test and plant handed over).
- 3.2.5 All personal required during commissioning and PG test.
- 3.2.6 Complete grouting for equipment, fixing and any concreting inside the vessels and lining.
- 3.2.7 Trial run for requisite period.
- 3.2.8 Performance testing.
- 3.2.9 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.
- 3.2.10 SSF shall be either site fabricated or shop fabricated.

3.3 TERMINAL POINTS:

- 3.3.1 SSF plant inlet header: Single piping connection near SSF area (Twenty (20) meter from SSF boundary). Working pressure of inlet water of SSF is 3.5-7.5 Kg/Cm² (g). Bidder to take care this to design the system.
- 3.3.2 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.
- 3.3.3 Back Wash water outlet: Backwash water outlet piping shall be terminated at common RCC trench passing near each filter as shown in P&ID (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.

3.4 MAJOR EXCLUSIONS

- 3.4.1 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.
- 3.4.2 Pedestals for pipe supports, however, auxiliary structure, supports components for piping is in bidder's scope.

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

- 3.5.1 Deviation if any in enclosed deviation schedule with mention of specification clause with page no. for which clarification/deviation is being asked.
- 3.5.2 Deviation schedule duly fill for deviation, if any.

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3.5.3 Price Schedule duly filled.

3.5.4 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.

3.6 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.

3.7 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.

3.8 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 equipment, machinery, piping and instruments. All pipes should be indicated with diameter, pipe class, pipe number, fluid flowing through it.
- Equipment layout.
- Datasheets.
- Quality plans.

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- Foundation Design drawings indicating foundation design, load data, anchor bolt location, pocket details etc.
- General arrangement drawings for all the equipment showing dimensions and detail of materials.
- All the data and drawings necessary for civil design and construction.
- Sizing calculations for all equipment 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 equipment.
- 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.

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NOTE-5 All equipment 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.

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

S.No.	CONSTITUENTS	As	CONTENT
1.	Calcium	CaCO ₃	76.9 ppm
2.	Magnesium	CaCO ₃	59.5 ppm
3.	Sodium	CaCO ₃	148.2 ppm
4.	Potassium	CaCO ₃	2.5 ppm
5.	Iron in Soln.	Fe	0.7 ppm
6.	Hydrogen (FMA)	CaCO ₃	0.0 ppm
7.	Strontium (Sr)	CaCO ₃	0.0 ppm
8.	Barium	CaCO ₃	4.6 ppm
9.	Ammonia (NH ₄)	NH ₄	0.0 ppm
	TOTAL CATIONS (Except Fe)	CaCO₃	291.7 ppm
10.	Bicarbonate	CaCO ₃	116 ppm
11.	Sulphate	CaCO ₃	82.9 ppm
12.	Chloride	CaCO ₃	82.6 ppm
13.	Nitrate	CaCO ₃	7 ppm
14.	Phosphate	CaCO ₃	0.6 ppm
15.	Fluoride	CaCO ₃	2.6 ppm
	TOTAL ANIONS	CaCO₃	291.7 ppm
16.	Boron	B	0.52 ppm
17.	Reactive Silica	SiO ₂	14 ppm
18.	Colloidal Silica	SiO ₂	2.9 ppm
19.	Total Silica	SiO ₂	16.9 ppm
20.	Nitrites	NO ₂	1.8 ppm
21.	Total Hardness	CaCO ₃	109.7 ppm
22.	Total Suspended Solid		15 ppm
23.	Total Dissolved Solids		411 ppm
24.	Conductivity at 25°C		610 µS/cm
25.	pH value at 25°C	-	8.3
26.	Turbidity		15 NTU
27.	TOC		8.9 ppm
28.	BOD ₃ at 27°C		12 ppm
29.	COD		40 ppm
30.	Dissolved Oxygen		6.3 ppm
31.	Oil & Grease		<1 ppm

NOTE: THE CYCLE OF CONCENTRATION (COC) SHALL BE CONSIDERED AS 6.5.

[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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SECTION-4

LIST OF SUB VENDORS (TABLE-3)

SR No.	Items	Approved Vendor	Place / Location
1.0	Fittings (metallic)	M.S. Fittings	Kolkata
		Metal lloyds	Mumbai
		True Forge	Faridabad
		Tube Products	Baroda
		NL Hazra	Kolkata
		Gujrat Infra Pipes	Baroda
		Edwards	USA
		Pipefit Engineers	Baroda
		Siddarth & Gautam	Faridabad
		EBY	Mumbai
		Reliance Forge	Mumbai
2.0	MS/GI ERW Pipes	SAIL	Rourkela
		Jindal	Ghazibad/ Hissar
		Surya Roshni	Bahadur Garh
		TATA Tube	Jamshedpur
		PSL	Chennai/Vizag/Kutch/Daman
		Lalit Profile	Thane
		Samshi Pipes Industries	Vadodara
		Mukut Pipes	Rajpura
		Indus Tubes	G B Nagar
		Mann Ind	Indore
		Surendra Engg	Rajpura
		Pratibha Pipes & Structure Pvt Ltd	Thane
		JCO Gas Pipe	Chindwara
		Nukat Tanks and Vessels	Tarapur
		DADU Pipes	Sikrandrabad
		Good Luck Tubes	Sikandrabad
		Advance Steel Tubes	Sahibabad

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		Bihar Tubes	Sikandrabad
		Hi Tech Pipes	Sikandrabad
		Ratnamani	Kutch/Ahmedabad/Chhatral
		Maharashtra Seamless	Raigad
		Welspun	Anjar/Bharuch
3.0	Seamless Pipes	ISMT	Ahmednagar/Baramati
		Maharashtra Seamless	Raigad
4.0	S.S. Pipes (For small Quantity 500 m)	REMI	Mumbai
		Ratmani	Ahmedabad
		Apex Tubes	Behror
		Choksi	Ahmedabad
5.0	CI Gate/ Globe/NRV/ SRV (Manual and motorized)	H.Sarkar	Howrah
		A.V. VALVES LTD	Agra
		Leader	Jalandhar
		SURYA VALVES AND INSTRUMENTS MFG CO.	Chennai
		ATAM VALVES PVT. LTD.	JALANDHAR
		FLUIDLINE VALVES COMPANY PVT.LTD.	Mumbai
		G.M. DALUI AND SONS PVT.LTD.	Howrah
		KBL	Kondhapuri
		Bankim	Kolkata
		VENUS PUMPS AND ENGG. WORKS	Kolkata
6.0	GM valve	A.V. VALVES LTD	Agra
		ATAM VALVES PVT. LTD.	Mumbai
		Leader	Jalandhar
		VALTECH INDUSTRIES	
		SANT VALVES PVT. LTD.	Jalandhar
7.0	Steel Plate , Structural Steel & Rolled Sections	SAIL	
		Essar Steel	
		TISCO	
		RINL	
		Jindal	
		Lloyd	
		Ispat	

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		Indian Iron & Steel Co. Ltd	
8.0	Pressure Gauge/DP Gauge	Gluck (I) Manufacturing Co	Mumbai,
		H Guru	Rishra/Muzaffarpur/Bangalore
		AN Instruments	Kolkata
		ASHCROFT INDIA PVT LTD.	GIDC Chhatral Kalol
		FORBES MARSHALL (HYD) LTD.	HYDERABAD
		GAUGE BOURDON INDIA PVT. LTD.	Mumbai,
		H.GURU INSTRUMENTS (SOUTH INDIA) P. LTD	BANGALORE
		WIKA	Pune
		Manometer India	Mumbai,
		Baumer Technologies India Pvt. Ltd.	VAPI
		GIC(Gauges Bourdon)	Panvel
9.0	Pressure Transmitter and Diff. pressure Transmitter	Emerson	USA/Pawane
		Laxons Automation	Daman
		YIL	Bangalore
		Siemens	Thane
		Fuji	China
		Yokogawa	Japan
		Honeywell	USA/Pune
		CROMPTON GREAVES	AHAMADNAGAR
10.0	ORIFICE PLATE	MICRO PRECISION	FARIDABAD
		INSTRUMENTAION LTD	PALGHAT
		CARLO DYNAMICS	HYDRABAD
11.0	BUTTERFLY VALVE	ADVANCE VALVES PVT. LTD.	NOIDA
		FLUIDLINE VALVES COMPANY PVT.LTD.	GHAZIABAD
		INSTRUMENTATION LTD.	PALAKKAD-KERALA
		INTERVALVE (INDIA) LTD.	PUNE
		R AND D MULTIPLES (METAL CAST) PVT LTD	MUMBAI
		SURYA VALVES AND INSTRUMENTS MFG CO.	CHENNAI

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		PENTAIR VALVES AND CONTROLS INDIA PRIVATE LIMITED	NAVI MUMBAI
		UPADHAYA VALVES MANUFACTURERS PRIVATE LIMITED,	KOLKATA
		VENUS PUMPS AND ENGG. WORKS	KOLKATA
		WEIR BDK VALVES- A UNIT OF WEIR INDIA PVT. LTD.	NEW DELHI
12.0	DUAL PLATE CHECK VALVE	ADVANCE VALVES PVT. LTD.	NOIDA
		ASIAN INDUSTRIAL VALVES & INSTRUMENTS.	CHENAI
		FLUIDLINE VALVES COMPANY PVT.LTD.	GHAZIABAD
		R AND D MULTIPLES (METAL CAST) PVT LTD	MUMBAI
		VENUS PUMPS AND ENGG. WORKS	KOLKATA
13.0	INSTRUMENT FITTING	AURA INCORPORATED	NEW DELHI
		ASTEC VALVES & FITTINGS PVT. LTD.,	MUMBAI
		ARYA CRAFTS & ENGINEERING PVT. LTD.	MUMBAI
		COMFIT & VALVE PVT. LTD.	AHMEDABAD
		FLUIDFIT ENGINEERS PVT LTD	MUMBAI
		FLUID CONTROLS PVT. LTD.	MUMBAI
		HP VALVES & FITTINGS INDIA Pvt Ltd.,	CHENNAI
		PRECISION ENGINEERING INDUSTRIES	MUMBAI
		PANAM ENGINEERS,	MUMBAI
		PERFECT INSTRUMENTATION CONTROL (INDIA) PVT. LTD.	MUMBAI
		VIKAS INDUSTRIAL PRODUCTS	NOIDA

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14.0	ROTAMETER	EUREKA INDUSTRIAL EQUIPMENTS PVT.LTD.	PUNE
		FLOW STAR ENGINEERING PVT. LTD.,	FARIDABAD
		FLOWTECH INSTRUMENTS SERVICRS	GUJARAT
		INSTRUMENTATION ENGINEERS PVT LTD	HYDERABAD
		SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	NAVI MUMBAI
15.0	SIGHT FLOW INDICATORS	B.K.EQUIPMENTS PVT.LTD.	CHENNAI
		BLISS ANAND PVT. LTD.	GURGAO N
16.0	BALL VALVE	BDK	
		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
17.0	DIAPHRAGM VALVE	PROCON ENGINEERES	MUMBAI
		HAWA VALVES	MUMBAI
		BDK VALVES	HUBLI
		FOURESS	BANALOR E
		INERVALVE	GUJRAT

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18.0	3 WAY VALVE	HI TECH	AHMEDABAD
		ADVANCE VALVES PVT.LTD	NOIDA
		BDK	HUBLI
		FOURESS ENGG.INDIA LTD.	MUMBAI
		FLUIDLINEVALVES COMPANY	MUMBAI
		PRIVATE LTD.,	
		INSTRUMENTATION LTD.	PALAKAD
		KIRLOSKAR BROTHERS LTD.	PUNE
		VENUS PUMP & ENGG. WORKS	KOLKATA
		SURYA VALVES AND INSTRUMENTS MANUFACTURING COMPANY	CHENNAI
		STAFFORD CONTROLS LTD	PUNE
		MICON VALVES (INDIA) PVT.LTD	MUMBAI
19.0	PLUG VALVE	FISHER SANMAR LIMITED	CHENNAI
		BDK	HUBLI
		LARSEN & TOUBRO LTD.	MUMBAI
		LEADER	JALANDHAR
		MICON VALVES (INDIA) PVT.LTD	MUMBAI
20.0	FLANGES (SS/CS)	BHARAT FORGE	PUNE
		RELIANCE FORGE	MUMBAI
		MS FITTINGS	KOLKAT A
		L&T	MUMBAI
21.0	PAINT	BERGER	
		ASIAN PAINTS	
		SHALIMAR	
		J&N	
		HIND RECTIFIER	NASIK
22.0	STRUCTURE STEEL	SAIL	
		TISCO	
		JINDAL	
		BHUSWAL	

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Notes:-

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

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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.

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SECTION -5

LIST OF MANDATORY SPARES TABLE-5

Sl.no.	Mandatory Spares	Total Quantity
1.0	Valves	1 No each type, class and size.
2.0	Indicators/Gauges etc. along with relevant accessories	10% of total or at least two (whichever is higher) for each type along with accessories.
3.0	PP Nozzles	5% of installed qty.

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

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SECTION- 6

PAINTING SPECIFICATION

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 huge 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 :
- a) 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.
 - b) 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.
 - c) 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 :
- a) 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.
 - b) 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.
 - c) 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)
- $$\text{Testing Voltage } V = 7900 \sqrt{T} \pm 10 \text{ percent where } T \text{ is the average coating thickness in mm.}$$
- 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.

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

6.03.06 Adhesion Test Procedure

- a) Attach the adhesion tester to the dolly by rotating the hand wheel counter clockwise to lower the jaw of the device.
- b) 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.
- c) Slide the dragging indicator pin on the black column to zero by pushing it downward.
- d) 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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SECTION - 7

QUALITY PLAN

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SECTION - 8

DATA SHEETS FOR SSF SYSTEM

SL NO.	PARTICULARS	DESCRIPTIONS
1.0	SIDE STREAM FILTERS (AUTO VALVE LESS GRAVITY FILTER)	
1.1	Number	26 Nos (24+2 under Backwash) For Boiler Units 1 & 2 38 Nos (36+2 under Backwash) For Boiler Units 3, 4 & 5
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 m3/hr for each vessel	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/m3/ 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/m3/ 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.

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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 / PP
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.
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

	SPECIFICATION FOR SIDE STREAM FILTRATION PLANT	SPEC.NO.ROS: 6177
		REV.: 00

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.

	SPECIFICATION FOR SIDE STREAM FILTRATION PLANT	SPEC.NO.ROS: 6177
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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: Nitrile rubber, 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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	SPECIFICATION FOR SIDE STREAM FILTRATION PLANT	SPEC.NO.ROS: 6177
		REV.: 00

SECTION-9

INSTRUMENT DATA SHEET

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
10. **Adjustment** : For Zero adjustment (Micrometer screw external)
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 OC
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
d) 5-valve SS316 manifold from barstock for differential pressure gauge
e) Siphons for steam and hot water services
17. **Nameplate** : Tag number, service engraved in stainless steel tag plate

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
7. **Scale Board** : Anodized Aluminium with engraved marking (Minimum graduation 10mm), 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

	SPECIFICATION FOR SIDE STREAM FILTRATION PLANT	SPEC.NO.ROS: 6177
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11. Accessories : All mounting accessories including counter flange, nuts & bolts

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

	SPECIFICATION FOR SIDE STREAM FILTRATION PLANT	SPEC.NO.ROS: 6177
		REV.: 00

SECTION – 10

GENERAL TECHNICAL REQUIREMENT

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:

Parameters		Values for Unit 1 &2 (Case-1)	Values for Units 3, 4 & 5 (Case-2)
Total CW and ACW flow	=	174214 m ³ /hr.	261321 m ³ /hr.
2.5% of total CW and ACW flow including margin	=	4650 m ³ /hr.	6975 m ³ /hr.
Capacity of each AVGF	=	200 m ³ /hr.	200 m ³ /hr.
AVGF @200 m ³ /hr	=	23.25 nos	34.875 nos
AVGF selected	=	26 Nos (24W+2S/ Backwash)	38 Nos (36W+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 24 out of 26 filters will be in service for Case-1 and 36 out of 38 filters will be working for Case-2. The backwash waste from Side Stream Filtration System shall be routed to Waste Water Treatment System.

	SPECIFICATION FOR SIDE STREAM FILTRATION PLANT	SPEC.NO.ROS: 6177
		REV.: 00

SECTION – 11

PUMPS & PIPE SELECTION CRITERIA

Sl. No.	Pipe Size	Velocity in m/sec		
		Below 50mm	50mm-150mm	200mm & above
1	Pump Suction for Water		1.2-1.5	1.2-1.8
2	Pump Discharge for Water	1.2-1.8	1.8-2.4	2.1-2.5
3	Header		1.5-2.4	2.1-2.4
4	Compressed Air Below 2Kg/cm2(g)	15-20	20-30	25-35
5	Compressed Air Above 2Kg/cm2(g)	20-30	25-40	35-45
6	Suction to compressor/Blowers		7-8	
7	Pump Suction for Chemical Solution	1.0-1.2	1.1-1.3	
8	Pump Discharge for chemical solution	1.2-1.4	1.3-1.5	
GRP PIPES				
9	For GRP Pipe with negative suction		1.2 (Max)	2 (Max)
10	For GRP Pipe with pressurized suction		1.5 (Max)	
11	For GRP Pipe Delivery		2.0 (Max)	2.0 (Max)

SECTION – 12

LIST OF ATTACHMENTS

- | | |
|---------------------------------------|--------------------------|
| 1) P&ID CW & ACW SYSTEM (SHEET 1 & 2) | : PE-DG-417-165-N001 |
| 2) P&ID FOR SSF SYSTEM (UNIT 1 & 2) | : 1-WT-070-01050, REV:00 |
| 3) P&ID FOR SSF SYSTEM (UNIT 3,4 & 5) | : 1-WT-070-01049, REV:00 |
| 4) Key Plan for SSF(Unit 1 & 2) | |
| 5) Key Plan for SSF (Unit 3,4 &5) | |
| 6) Plot Plan | : PE-DG-417-100-M00 |



SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT

SPEC.NO.ROS: 6177

REV.: 00

FORM FOR TECHNICAL DEVIATIONS (If any)

Annexure-1

Sl. No	SEC / CLAUSE NO.	Specification	Statement of Deviations/variations	Reason for deviation	Cost of withdrawal

Date:

Signature & seal of the Bidder



BHEL : BAP : RANIPET Water Business

Qualification requirement for Side Stream Filtration (Auto valveless Gravity Filter)

1. Supplier should have capabilities for design / manufacture and having in-house / out-sourced facility for testing of side stream Filtration.

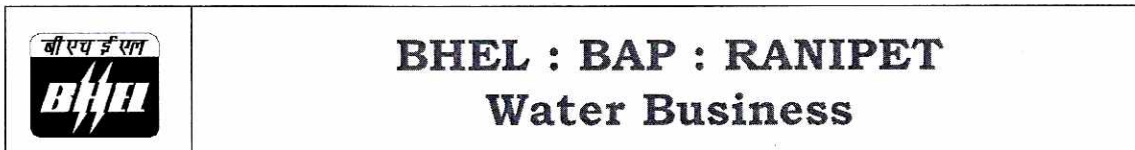
Each plant comprise of minimum 4 nos (3W+1S) of automatic valve less gravity filter, having minimum individual filter capacity of 150 m³/hr. Plant must have generated outlet, total suspended solids level not more than 5 ppm.

2. The supplier has to submit either of following supporting documents meeting above mentioned prequalifying requirement.
 - a. Copy of minimum one (1) performance certificate in English from end user along with copy of related Purchase order (PO) or letter of award (LOA) or work order (WO) specifying that the system / package is running successfully for one (1) year from date of commissioning meeting the minimum pre-qualifying requirement.
OR
 - b. Minimum two PO / LOI / LOA / WO placed with a minimum gap of one (1) year from same purchaser meeting the minimum prequalification requirement.
OR
 - c. Minimum one PO / LOI / LOA / WO after commissioning of first order from same purchaser meeting the minimum prequalification requirement.
OR
 - d. In case vendor has executed contract (s) for BHEL-Ranipet, internal assessment by BHEL, Ranipet shall be followed for evaluation for satisfactory performance. For this vendor to submit the request along with relevant documents.
OR
 - e. Minimum three Customer's / third party's inspection reports / test certificates / commissioning certificates meeting the minimum prequalification requirement.
3. Minimum two (2) nos Purchase orders, shall be submitted which should not be more than twenty (20) years old as on date of bid submission, for establishing continuity in business.

Supplier to comply general points of PQR in case supplier is not OEM, the offer shall be evaluated as per point no 1 of general PQR.

General Points of PQR

1. Offers of the JV companies/ Joint Bidders/ bidders having collaboration/ licensing agreement/ MOU / Indian subsidiaries shall be evaluated as follows:



- a. If bidder happens to be an Indian subsidiaries of foreign OEM, then the credentials of the foreign OEM can also be considered for meeting PQR.
- b. If bidder happens to be the Joint Venture Company, then the credentials of any of JV partners can be also considered for meeting PQR.
- c. If bidder happens to bid jointly with their partner, then credentials of both the partners will be considered for meeting PQR as per distribution of the work. In all such cases, lead bidder as specified in bid documents shall be responsible for overall execution of the contract and all guarantee/warranty.
- d. If bidder happens to be the having valid collaboration agreement/ MOU/ licensing agreement with some other company, then the credentials of collaborator/ MOU partner/ licensing company can also be considered for meeting PQR.

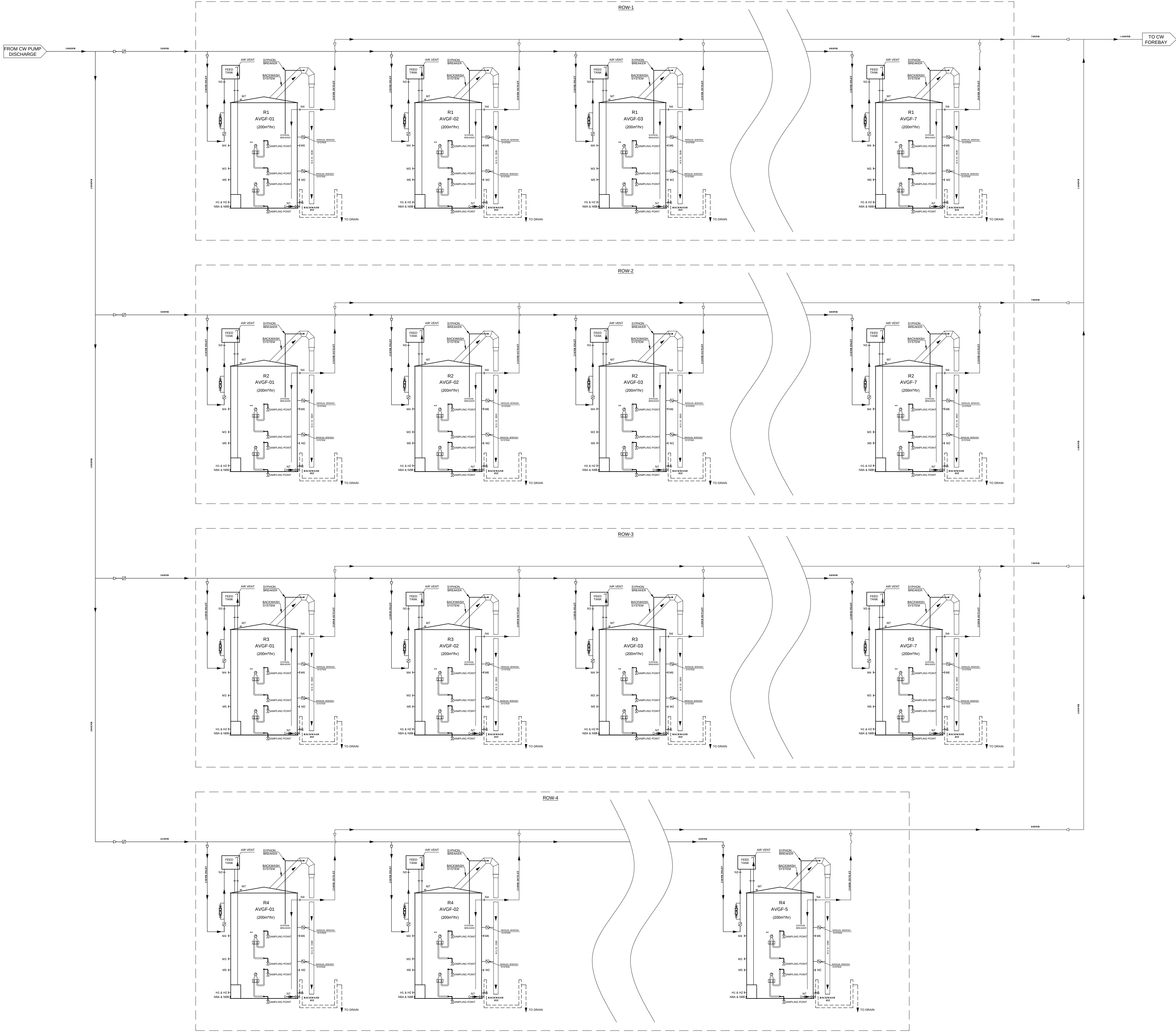
Note: If bidder(s) qualifies on the basis of credentials of his principal/ JV partner/ Collaborator/ joint bidder etc., then the principal/ JV partner/ Collaborator/ MOU partner/ joint bidder shall be responsible for overall design vetting and warranty/ guarantee of the package. The scope matrix clearly defining their respective roles including design vetting, manufacturing of critical component, E&C etc. etc. and warranty/ guarantee shall be submitted along with the offer.

2. Bidder to note that the arrangement of bidding (joint bid partners/ collaborator/ MOU partner/ licensing company etc.) once offered to BHEL as a part of bidding documents cannot be changed till the execution of the project.
3. Consideration of offer shall be subject to customer's approval of bidders, if applicable.
4. Bidder to submit all supporting documents in English. If documents submitted by bidder are in language other than English, a self-attested English translated document should also be submitted.
5. Any other project specific requirement bidder shall submit relevant supporting documents.
6. Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities and capacity of the bidder/collaborators to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL.
7. After satisfactory fulfillment of all the above criteria/ requirement, offer shall be considered for further evaluation as per NIT and all the other terms of the tender.

A. Kumar
30/06/17
Prepared

H. K. Gupta
30/06/17
Checked

M. K. Singh
30/06/2017
Approved



AUTO WASH GRAVITY FILTERS
26 NOS (24W+2S)

MATERIAL SPECIFICATION	
1. PIPE	UP TO & INCLUDING 150NB M.S. IS 1209 (K), ABOVE 150 NB M.S. IS 2062 ROW 5 THK & ALL INSTRUMENT LINE SIZE SHALL BE 15NB S.S.-304.
2. FLANGE	IS 2062, Gr.B, FLANGE ANSI B 16.5, 150#
3. FITTING	UP TO 50NB SA 105 SOCKET WELD ABOVE 50NB SA 224 Gr. WPB
4. FASTNERS	SA 193 Gr.B7 / SA 194 Gr.2H
5. BUTTERFLY VALVE	AS PER DATA SHEET
6. GATE VALVE	AS PER DATA SHEET
7. DIFFERENTIAL PRESSURE GAUGE	AS PER DATA SHEET (LINE SHALL BE SS 316)

NB	OD	THK
200	219.1	6.0
250	273.0	6.0
300	323.9	6.0
350	355.6	6.0
400	406.4	6.0
450	457.0	6.0
500	508.0	6.0
600	610.0	6.0
700	711.2	7.0
800	813.0	8.0
900	914.0	10.0
1000	1016.0	10.0
1200	1219.0	12.5
1400	1422.0	14.2

LEGEND:

- BUTTERFLY VALVE
- BY-PASS ROTAMETER
- M MAN HOLE
- N NOZZLE
- DPG DIFFERENTIAL PRESSURE GAUGE
- AVGF AUTO VALVE-LESS GRAVITY FILTER

NOTES:

- ALL ITEMS SHOWN IN THE P&ID ARE TENTATIVE AND THE ARRANGEMENTS SHOWN IS INDICATE ONLY. HOWEVER, VENDOR SHALL FULFILL THE TENDER SPECIFICATION & PROCESS REQUIREMENTS.
- FOR SCOPE & TERMINAL POINTS, REFER THE TENDER SPECIFICATION ROS:6172.
- ** - APPLICABLE IN CASE OF TWIN BED FILTER ARRANGEMENT.

PRELIMINARY

FOR INDENT PURPOSE ONLY

OWNER		TELANGANA STATE POWER GENERATION CORPORATION LIMITED			
OWNER'S CONSULTANT					
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		YADADRI THERMAL POWER STATION (5X800 MW)			
DEPT. NO. GRADE OF UNTO. DIM. CODE 9776		PR: QA: 500		SCALE	
TITLE		P & ID FOR SSF SYSTEM (UNITS - 1 & 2)		REV	
OWNER		NAME		SIGN	
DRN. S.VIVEK		DATE		NO. OF	
CHD. S.SRIVATSAN		29.06.17		VAR.	
APPD. M.SALAIMANALAN		29.06.17			
REF. DRG. NO.		ITEM NO.		NO. OF	
				ITEMS	
DRAWING NO.		REV			
U 01		1-WT-070-01050		00	

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BHARAT HEAVY ELECTRICALS LTD.,
UNIT: BOILER AUXILIARIES PLANT,
RANIPET - 632 406.

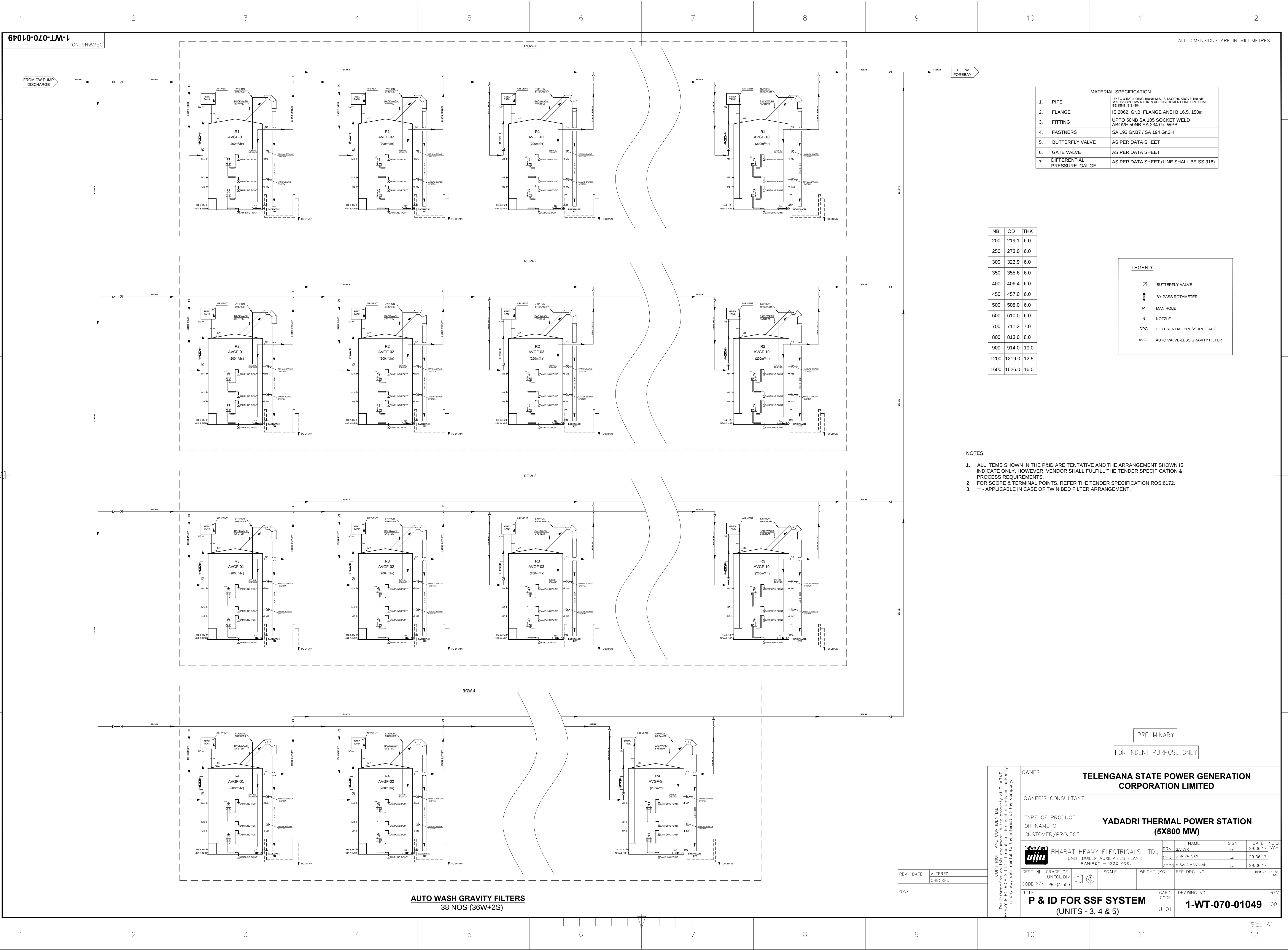
NAME
SIGN
DATE
NO. OF
VAR.

DRN. S.VIVEK
CHD. S.SRIVATSAN
APPD. M.SALAIMANALAN

29.06.17
29.06.17
29.06.17

REF. DRG. NO.
ITEM NO.
NO. OF
ITEMS

DRAWING NO.
REV
1-WT-070-01050
00



MATERIAL SPECIFICATION	
1. PIPE	UP TO & INCLUDING 150NB M.S. IS 1239 (H), ABOVE 150 NB M.S. IS 3546 ERW 6 THK. & ALL INSTRUMENT LINE SIZE SHALL BE 150NB, S.S. 304
2. FLANGE	IS 2062, Gr.B, FLANGE ANSI B 16.5, 150#
3. FITTING	UPTO 50NB SA 105 SOCKET WELD ABOVE 50NB SA 234 Gr. WPB
4. FASTNERS	SA 193 Gr.B7 / SA 194 Gr.2H
5. BUTTERFLY VALVE	AS PER DATA SHEET
6. GATE VALVE	AS PER DATA SHEET
7. DIFFERENTIAL PRESSURE GAUGE	AS PER DATA SHEET (LINE SHALL BE SS 316)

NB	OD	THK
200	219.1	6.0
250	273.0	6.0
300	323.9	6.0
350	355.6	6.0
400	406.4	6.0
450	457.0	6.0
500	508.0	6.0
600	610.0	6.0
700	711.2	7.0
800	813.0	8.0
900	914.0	10.0
1200	1219.0	12.5
1600	1626.0	16.0

LEGEND:

- ☒ BUTTERFLY VALVE
-  BY-PASS ROTAMETER
- M MAN HOLE
- N NOZZLE
- DPG DIFFERENTIAL PRESSURE GAUGE
- AVGF AUTO VALVE-LESS GRAVITY FILTER

NOTES:

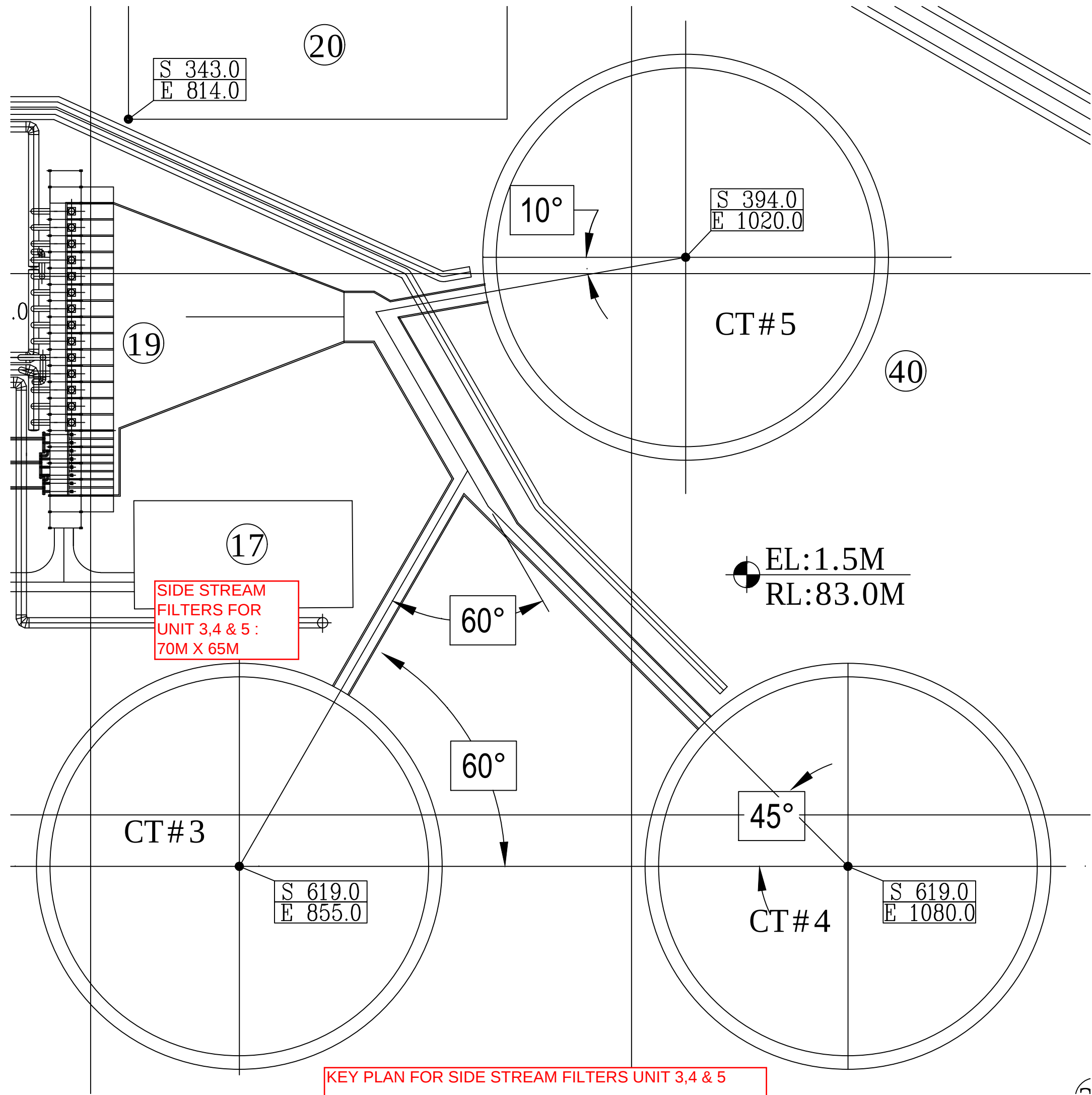
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- FOR SCOPE & TERMINAL POINTS, REFER THE TENDER SPECIFICATION ROS:6172.
- ** - APPLICABLE IN CASE OF TWIN BED FILTER ARRANGEMENT.

PRELIMINARY

FOR INDENT PURPOSE ONLY

OWNER		TELENGANA STATE POWER GENERATION CORPORATION LIMITED			
OWNER'S CONSULTANT					
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		YADADRI THERMAL POWER STATION (5X800 MW)			
 BHARAT HEAVY ELECTRICALS LTD., UNIT: BOILER AUXILIARIES PLANT, RANIPET - 632 406.		NAME	SIGN	DATE	NO. OF VAR.
		DRN CHD	S.SRIVATSAN	29.06.17	
DEPT. NO. 9776		SCALE	REF. DRG. NO.	ITEM NO.	NO. OF ITEMS
GRADE OF UNTOLO.DIM PR: 0A:500		---	---	---	---
TITLE		CARD CODE	DRAWING NO.	REV	
P & ID FOR SSF SYSTEM (UNITS - 3, 4 & 5)		U 01	1-WT-070-01049	00	





KEY PLAN FOR SIDE STREAM FILTERS UNIT 3,4 & 5

THIS DRAWING IS APPLICABLE FOR STAGE-I (UNIT 1 & 2)

[illegible]

DESIGN PRESSURE: $\pm 5.5 \text{ Kg/cm}^2$ (or) 0.7 MPa FOR CRYSTALLINE
DESIGN TEMPERATURE: $\geq 20^\circ\text{C}$ (OR) 68°F
DESIGN OR INLET TEMP: TO MATCH TO VACUUM PUMP HEAT EXCH. = 33°C
DESIGN OR INLET TEMP: TO PCHS = 4.44°C OR 40°F
DESIGN MECHANICAL TEMPERATURE: 60°F

2. INTERFACES OF CONSTRUCTION:-

A). PIPER LAY AND LACULING: 150MM SHALL BE CARBON STEEL ERW (0.125H HEAVY GRADE)
B). PIPING $\geq$ 150MM SHALL BE CARBON STEEL (15.2002), ROLLED AND WELDED CONFORMING TO 15.3889
C). ALL PRESSURE TAPINGS A ROSTER END OF 15.160

D). CW SYSTEM : 150 MM SIZE DRAIN & VENT VALVES SHALL BE PROVIDED AS REQD. AS PER LAYO
ACW SYSTEM : 150 MM SIZE DRAIN & VENT VALVES SHALL BE PROVIDED FOR PIPE SIZES 400 NB & ABOVE AS PER LAYO
E). PIPING $\geq$ 150MM DRINK & VENT VALVES SHALL BE PROVIDED FOR PIPE SIZES 400 NB & ABOVE AS PER LAYO REQUIREMENTS.
F). ALL PIPELINES RUNNING AT SITE SHALL BE PROVIDED WITH SUSTAINABLE VENT AT THE HIGHEST POINT & DRAINS AT THE LOWEST POINT AS NECESSARY
G). INSTRUMENTS MOUNTED AT THIS SHALL BE SUPPLIED ALONGSIDE THE EQUIPMENTS.
H). AIR RELEASE VALVES (150 NB) SHALL NOT BE PROVIDED, IF REQUIRED AS PER SURGE STUDIES.

3. PAINTING/PROTECTION - PIPES

A). INTERNAL SURFACING (FOR PIPE DIA 1000MM AND ABOVE): REFER PIPING CDRN DOCUMENT NO. 7286-CP12, PAINTING SCHEME FOR LP PIPING.
B). EXTERNAL SURFACING - OVERSPOUND PIPING : REFER PIPING CDRN DOCUMENT NO. 7286-CP12, PAINTING SCHEME FOR OVERSPOUND PIPING.

4. EXTERNAL SURFACING - UNDERGROUND PIPING

A). THE ANTI-CORROSIVE PROTECTION FOR BURIED PIPES CAN CONSIST OF AN ANTI-CORROSION PROTECTION COAT. THE TAPES SHALL BE APPLIED AFTER SURFACES SHALL CONTAIN TO 15.537 OR EQUIVALENT. THESE TAPES SHALL BE APPLIED NOT OVER THE GILD COAT. IN STEPS OF 2MM THICKNESS SO AS TO COVER THE SPIRAL EDGES OF THE FIRST TAP BY THE APPLICATION OF SECOND TAP. THE TOTAL THICKNESS OF THE FINISHED PROTECTION COATING SHALL BE 4.0MM MINIMUM.

5. CW PIPE BURIED PORTION CONTACTING ROAD OR ROAD SHALL BE CONCRETE ENCASED / CULVERT SHALL BE PROVIDED.

10. STATUS INDICATION OF ALL WOV SHALL BE PROVIDED AS PER APPROVED DRAWING CONTOLOGY.

11. REFERENCE DOCUMENTS

(1) CW & ACW SYSTEM WRITE-UP : PG-005-417-615-0002
(2) As per ISO philosophy, refer to ISO codes that have assigned to each unit and common system as per following

A). Unit-1 : 01
B). Unit-2 : 02
C). Unit-3 : 03
D). Unit-4 : 04
E). Unit-5 : 05

Common to All Units : 00

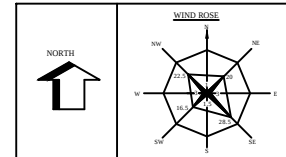
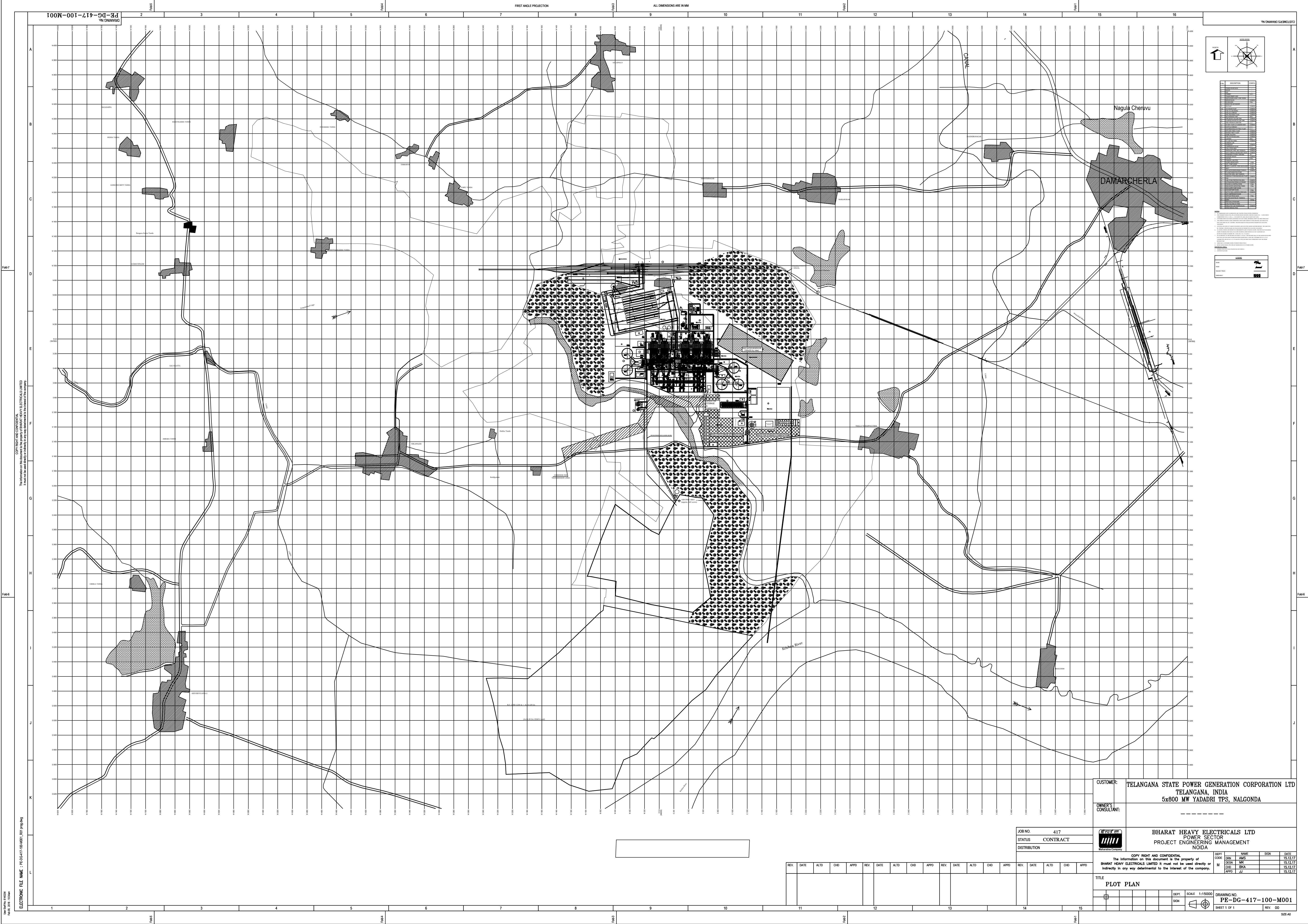
Pipe Sizes for carbon Steel Pipe

Pipe Size (in)	OD (mm)	THK. (mm)
100	115	5.4
150	166.5	5.4
200	219	6.5
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
2100	2143	20.0
3600	3640	20.0

NO.	EQUIPMENT	NOS. WORK BY STATION	CW REQ. PER COOLER CUB M/Hr.	CW REQ. PER UNIT CUB M/Hr.	PRESS. PSI/M	TEMP. IN °C	REMARKS
1	CONDENSER	2 + 0	84210	84210	5.72	9.4	
2	VACUUM PUMPS	2 + 2	100	4910	3.5	2.0	
3	PHE'S (TO AUX)	2 + 1	1358.35	2716.7	7.0	-	
4	PHE'S (SG AUX)	1 + 1	596.5	596.5	7.0	-	
5	HWAC RE-CIRCULATING WATER FOR ESP C.R	1 + 0	40	40	6	5	CONTINUOUS RE-CIRCULATION

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		
	AIR RELEASE VALVE		
	PRESSURE GAUGE		VERTICAL PUMP
	PRESSURE TRANSMITTER		
	DIFFERENTIAL PRESS. GAUGE		
	DIFFERENTIAL PRESS. TRANSMITTER		
	LEVEL TRANSMITTER		ULTRASONIC FLOW TRANSMITTER
	ROTAMETER WITH 4-20mA O/P		CLEAN-ON-TYPE
	TEMPERATURE ELEMENT		M/WN = (MAN/MEAN) VALVE SELECTION
	TEMPERATURE GAUGE		INDICATION
	GATE VALVE		MOTOR OPERATED BUTTERFLY VALVE (NICHING TYPE)

	TELANGANA STATE POWER GENERATION CORP. LTD. TELANGANA, INDIA 5x800 MW DAMERACHERLA NALGONDA Thermal Power Station					
	 BHARAT HEAVY ELECTRICALS LTD. PROJECT ENGINEERING MANAGEMENT NOIDA		DRN. CHD. APPD.	NAME ADK/NS V.K A.K	SIGN —sd— —sd— —sd—	DATE 17.11.17 17.11.17 17.11.17
TITLE :						
PID CW & ACW SYSTEM						
UNIT : NA	SCALE : NA	BHEL DWG. NO. : PE-DG-417-165-N001(SH 2 OF 2)	REV. 0			



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CUSTOMER:	TELANGANA STATE POWER GENERATION CORPORATION LTD TELANGANA, INDIA 5x800 MW YADADRI TPS, NALGONDA																		
OWNER'S CONSULTANT:	-----																		
	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA																		
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REV	DATE	ALTD	CHD	APPD	REV	DATE	ALTD	CHD	APPD	REV	DATE	ALTD	CHD	APPD	REV	DATE	ALTD	CHD	APPD
TITLE										PLOT PLAN									
DEPT.										SCALE 1:15000									
SIGN										DRAWING NO. PE-DG-417-100-M001									
SHEET 1 OF 1										REV. 00									