

**1X660MW BHUSAWAL TPS-UNIT:6
MAHARASHTRA, INDIA.**

VOLUME: II B & III

**TECHNICAL SPECIFICATIONS
FOR
SIDE STREAM FILTRATION PLANT**

SPECIFICATION NO.: PE-TS-415-156-A101



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



TITLE:
TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X660MW BHUSAWAL TPS-UNIT:6
MAHARASHTRA, INDIA.

SPEC NO: PE-TS-415-156-A101

VOLUME: II-B

SECTION: A

REV NO: 00

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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 **1X660 MW BHUSAWAL TPS-UNIT-6, MAHARASHTRA.**
- 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 Plant.**
- 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 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 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

**TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X660MW BHUSAWAL TPS-UNIT:6
MAHARASHTRA, INDIA.**

1.0 INTRODUCTION

The proposed 1x 660 MW Bhusawal Thermal Power Project will be set up by Maharashtra State Power Generation Co. Ltd. (MAHAGENCO) in Dipnagar near Bhusawal, Maharashtra, India.

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 herein 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.

2.0 APPROACH TO SITE

Deepnagar is well connected by rail and road. By road, it is about 8 Km from Bhusawal city. Nearest railway station is at Bhusawal. The nearest Airport is at Aurangabad. The nearest sea port is at Mumbai. The site is located on the Mumbai-Nagpur Highway.

3.0 LAND

Bhusawal Thermal Power Plant is already having 1x62.5 MW + 2x210 MW Units and Two (2) Units of 500 MW each are under execution stage. About 108.94 Hectares of land is acquired by MAHAGENCO near existing TPS. It is proposed to install 1x 660 MW unit on this land.

4.0 SOURCE OF COAL

Indian coal would be sourced from Machaakata coal blocks in Orissa state. The Coal will be received at Plant site directly by rail. The coal from the railway wagons would be unloaded by means of wagon tipplers and will be either bunkered or stacked in the stock pile at site.

5.0 SOURCE OF WATER

The main source of water is considered Ozerkheda Reservoir which is located at around 18 km from plant site.

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6.0 ASH DISPOSAL AREA

The ash generated from 1 x 660 MW unit shall be disposed off in slurry form to the existing Ash Pond located at Velhala, approx. 12 Km from the site.

7.0 PROJECT INFORMATION

- | | | | |
|------|-------------------------|---|---|
| 7.1 | Client / Owner | : | Maharashtra State Power Generation Co. Ltd. |
| 7.2 | Consultant | : | Procon Engineers, Navi Mumbai
(Division of Nimoto Consulting Engineers Pvt. Ltd.) |
| 7.3 | Project Title | : | BHUSAWAL T.P.S. UNIT – 6 : 1X660 MW |
| 7.4 | Location | : | Dipnagar, Near Bhusawal, Maharashtra, India |
| 7.5 | Nearest railway station | : | Bhusawal |
| 7.6 | Nearest Airport | : | Aurangabad |
| 7.7 | Nearest Harbour | : | Mumbai |
| 7.8 | Access Roads | : | NH 6 (Mumbai-Nagpur Highway) |
| 7.9 | Elevation above MSL | : | 210 M |
| 7.10 | Longitude/latitude | : | 75° 51' 10" East / 21° 02' 30" North |
| 7.11 | Seismic Zone | : | Zone III as per IS:1893 |

7.12 AMBIENT TEMPERATURE

- | | | | |
|--------|-----------------------------------|---|------------------------|
| 7.12.1 | Mean of daily maximum temperature | : | 48.25 °C (during May) |
| 7.12.2 | Mean of daily minimum temperature | : | 18 °C (during January) |
| 7.12.3 | Highest temperature recorded | : | 48.7°C |

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- 7.12.4 Lowest temperature recorded : 13°C
- 7.13 Wet bulb temperature : 27°C (Maximum)
- 7.14 Rainfall : 112 mm average annually
- 7.15 Wind Speed : 0 to 39 Km/hr
- 7.16 Wind direction : East North East to West South West

ELECTRICAL

7.17 **MAIN POWER SOURCE FROM GRID**

- 7.17.1 Rated Voltage : 400kV
- 7.17.2 Voltage variation : $\pm 10\%$
- 7.17.3 Frequency Variation : $\pm 5\%$
- 7.17.4 Rated Short Circuit : 50 kA, Three Phase Symmetrical Level

7.18 **AUXILIARY POWER SUPPLY**

Auxiliary electrical equipment shall be suitable for operation on the following supply system:

- 7.18.1 Motors above 1000 kW & other Power devices : 11kV, 3Ph, 3wire, 50Hz system
- 7.18.2 Motors below 1000 kW & above 160kW & other power devices : 3.3kV, 3 ph, 3 wire 50 Hz, Non Effectively earthed
- 7.18.3 Motors upto 160 kW & other power devices : 415V, 3 ph, 4 wire 50 Hz
- 7.18.4 Motor Starting Methods : Direct on Line
- 7.18.5 (a) Lighting fixtures : 240V, 1 phase, 50 Hz
Space heaters, and Supply through suitably rated transformers
single Phase to limit the short circuit level to 9kA – 1 sec.
motors

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- (b) Control & : 240V, 1 Phase, 50 Hz from UPS Instrumentation

7.18.6 Short circuit levels of 11kV, 3.3 kV and 415V system equipments

The equipment shall be suitable for the following short circuit levels

- (a) 11kV Switchgears : 44 kA/3 sec
- (b) 3.3kV Switchgears : 40 kA/3sec
- (c) 415V PCC/ : 50 kA/1sec
PMCC/ MCC
- (d) Lighting : 9 kA/1sec
Distribution
Boards & 240V
A.C. supply

7.18.7 Auxiliary DC supply

The auxiliary DC supply will be used for control, indication & protection, Turbine lube oil system, AVR, Emergency DC lighting of power plant and Control & Instrumentation etc.

- (a) Voltage : (i) 220V DC for utility purpose
(ii) 24V DC for Control and Instrumentation

- (b) Voltage variation : + 10 %, - 15 %

7.18.8 Emergency power supply

- (a) Purpose : (i) Standby power to normal incomer of emergency MCC
(ii) Alternate power source to Fire water Pumps
- (b) Rated voltage and frequency : 415 V, 3 phase, 3 wire, 50 Hz.

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7.18.9 UPS power supply

- (a) Purpose : (i) Vital process loads
(ii) Critical lighting
(iii) Control and Instrumentation
(iv) Office for LAN power supply/Server etc.
- (b) Rated Voltage : 415V, 3 ph, neutral/240V single phase, 50Hz

7.19 The variation in voltage and frequency may be $\pm 10\%$ and $\pm 5\%$ respectively. The combined voltage and frequency variation may be $\pm 10\%$. All devices shall be suitable for continuous operation over the entire range of voltage variation without any change in their performance

7.20 Power socket shall be 415V AC, 50 Hz, 4 pin 32/63 Amps. Power socket outlets for portable tools, hand lamps etc shall be 240 volts, single phase, 3 pin, metal clad industrial type

7.21 All electrical equipment shall be designed for the following ambient conditions

- (a) Maximum ambient temperature : 50°C
- (b) Minimum Ambient temperature : 13°C

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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 8 Numbers (7 working +1 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 Side Stream Filtration 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.
- 2.11 Customer training with study material.

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 70 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.
- Instructions for proper balancing, alignment, adjustment, checking, and calibration as may necessary.
- Other necessary drawings, data etc.

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- 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]

<u>SR. NO.</u>	<u>PARAMETERS</u>	<u>UNITS</u>	<u>VALUES</u>
1.0	pH		8.0 – 8.5
2.0	Temperature	°C	22 - 30
3.0	Conductivity	µS/cm	1300
4.0	Colour	Hazen Units	Not Available
5.0	Odour		Not Available
6.0	Taste		Not Available
7.0	TDS	ppm	870
8.0	P-Alkalinity as CaCO ₃	ppm	Nil
9.0	M-Alkalinity as CaCO ₃	ppm	400
10.0	T – Alkalinity as CaCO ₃	ppm	400
11.0	Organic Matter as KMnO ₄	ppm	50
12.0	Iron (as Fe)	ppm	1
13.0	Turbidity (NTU)	ppm	2 ppm
14.0	CATIONS		
	(a) Ca as CaCO ₃	ppm	295
	(b) Mg as CaCO ₃	ppm	77
	(c) Na as CaCO ₃	ppm	203
	(d) K as CaCO ₃	ppm	10
	Total Cation	ppm	585
15.0	ANIONS		
	(a) HCO ₃ as CaCO ₃	ppm	400
	(b) Chlorides	ppm	149
	(c) SO ₄ as CaCO ₃	ppm	33
	(d) Fluoride as CaCO ₃	ppm	1
	(e) Nitrate as NO ₃	ppm	2
	Total Anion	ppm	585
16.0	Ammonia	ppm	Absent - Traces
17.0	Silica Colloidal (as SiO ₂)	ppm	< 1 (can be present in summer)
18.0	Silica Non - Colloidal (as SiO ₂)	ppm	36
19.0	Free Chlorine	ppm	Nil
20.0	Total Suspended Solids	ppm	Not Available
21.0	Carbonates as CaCO ₃	ppm	Not Available
22.0	Boron	ppm	<1 ppm
23.0	Oil & Grease	ppm	Not Available

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

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[TABLE-2]

GUARANTEE	Total Suspended Solids in effluent water shall be less than 5 ppm with respect to influent total Suspended Solids of around 25 ppm. For suspended solids higher than 25 ppm at inlet, the Suspended Solids in filtered water shall be within 10% of the inlet value 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
5		BELLS CONTROL	KOLKATA
		MANOMETER INDIA	MUMBAI
		GENERAL INST	MUMBAI/GOA
6	PAINT	BERGER PAINTS	MUMBAI
		ASIAN PAINTS	
		SHALIMAR	
7	GATE VALVES	J&N	
		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

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X660MW BHUSAWAL TPS-UNIT:6 MAHARASHTRA, INDIA.	SPEC NO: PE-TS-415-156-A101	
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		VENUS PUMP & ENGG. WORKS	KOLKATA
		VALTECH INDUSTRIES ,MUMBAI	MUMBAI
8	GLOBE VALVE		
		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
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

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		FOURESS	BANGALORE
		LEADER	JALANDHAR
12	3 WAY VALVE		
		HI TECH	AHMEDABAD
		ADVANCE VALVES PVT.LTD	NOIDA
		BDK	HUBLI
		FOURESS ENGG.INDIA LTD.	MUMBAI
		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.

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DRAWING/DOCUMENT DISTRIBUTION SCHEDULE (TABLE-4)

Documents:	PEM-Engineering	CONSULTANT/ CUSTOMER	BHEL SITE OFFICE	CUSTOMER SITE OFFICE
Documents for approval (1 st submission and resubmission)	2+SOFT COPY	6+SOFT COPY	0	0
Documents for information (1 st submission and resubmission)	2+SOFT COPY	6+SOFT COPY	0	0
Schedules, diagrams, lists, tables, calculation, specifications and other documents	2+SOFT COPY	6+SOFT COPY	0	0
Final & as-built drawings				
Final as-built drawings and final approved documents	2+SOFT COPY+2CD	2+SOFT COPY+2CD	6+SOFT COPY+2CD	6+SOFT COPY+2CD
Final O&M manuals	2+SOFT COPY+2CD	2+SOFT COPY+2CD	6+SOFT COPY+2CD	6+SOFT COPY+2CD
Detailed project time schedules	2+SOFT COPY	2+SOFT COPY	2+SOFT COPY	2+SOFT COPY

Note:

- Quantity of prints may change during detailed engineering stage based on BHEL / Customer requirement. However the same will be adhered by the bidder without any delivery/commercial implication to BHEL.
- All the drawing documents along with the O&M manual (of all the revisions) are necessarily to be submitted in soft copies in addition to hard copies.
- Bidder to submit soft copies of all the drawing and document along with quality plans for BHEL review and approval (P&ID in A2 size, Layout (electrical/piping/equipment) in A1/A0, QAP/Data Sheet in A4 size).
- The date of submission of drawing documents shall be considered as the date of submission of hard and soft copies whichever is later.
- All the drawings shall be prepared on computer auto cad and other documents (like datasheet etc.) on MS office software. Bidder not complying to the requirement shall not be considered. For the execution of the contract regular meeting (generally once in 15 days or as per project requirement) is required.
- Bidder has to come for meeting with the concerned dealing persons as per BHEL or customer requirement in a short notice.
- Bidder to submit instrument schedule, cable schedule and valve schedule in MS- Excel format during detailed engineering.
- Bidder to also furnish the auto cad copy / MS-word (as applicable)/MS-Excel (as applicable) of the following documents after award of contract. However any other auto cad copy/MS-Excel/MS-word of any other document as per the insistence of BHEL / customer will also be submitted by the bidder without any delivery/commercial implication to BHEL.
 - P&IDs.
 - Equipment lay out.
 - Equipment Cable tray layout.
 - Equipment earthing layout.
 - Civil scope drawings.
 - Piping lay out drawing.
 - Valve schedule.
 - Instrument schedule.

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X660MW BHUSAWAL TPS-UNIT:6 MAHARASHTRA, INDIA.	SPEC NO: PE-TS-415-156-A101	
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LIST OF MANDATORY SPARES TABLE-5

S.No.	Mandatory Spare	Total Quantity
1.0	Spares for Valves	
1.1	i) Manual Diaphragm valves	10% of total quantity used for each type and size with minimum no. two (2) for each type and size.
	ii) Auto Diaphragm valves	10% of total quantity used for each type and size with minimum no. two (2) for each type and size.
	iii) Spare Diaphragm for above	10% of total quantity used for each type and size with minimum no. two (2) for each type and size.
1.2	i) Non return valves (NRV)	2 nos. of each size & type
	ii) Flaps for above NRV	2 nos. of each size
1.3	Gate/Globe/Ballvalves/plug valve/needle valve	
	i) Upto 4"	20% of total quantity used for each type and size with minimum no. two (2) for each type and size.
	ii) Above 4"	1 no. each type and size.
1.4	Butter fly valve	
	i) Upto 4"	20% of total quantity used for each type and size with minimum no. two (2) for each type and size.
	ii) Above 4"	1 no. each type and size
2.0	Local Gauges like temperature gauges, pressure gauges, differential Pressure gauges, flow gauges, flow meters, rotameters/sight flow indicators with local display etc.	10% of total number of instruments/ transducers offered for each model and type, rating or a minimum of one number for each model, rating and type , whichever is more.

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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15.0 PAINING

15.1 GENERAL

All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coatings. Surfaces not easily accessible after shop assembly shall be treated before-hand and protected for life of the equipment. Surfaces to be finish painted after installation shall be shop painted with at least two (2) coats of primer. Steel surfaces, which are not to be painted, shall be coated with suitable rust preventive compound subject to the approval of the Owner.

All paints shall be used in accordance with the manufacturer's instructions. No thinners or other substance shall be added to the coating material without the approval of the Engineer. The quality and vendor of the paints shall require approval of the Owner.

All paints, when applied in a normal full coat, shall be free from runs, sags, wrinkles, patchiness, brush marks or other defects.

All primers shall be well marked into the surface, particularly in areas where pitting is evident, and the first priming coat shall be applied as soon as possible after cleaning, within four hours maximum. The paint shall be applied by brush, roller or airless spray, according to the manufacturer's instructions. Spray painting shall be carried out by operators trained and thoroughly experienced in the use of the equipment. If the drying interval between successive coats, which should not exceed one week, has been so long as to endanger the adhesion of the following coat, the paint already applied shall be lightly rubbed down with fine abrasive paper before putting on the next coat.

Paint spraying on large surfaces shall not normally be done indoors, except with the approval of the Engineer. Spray guns shall not be used outdoors in

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windy weather or near unprotected surfaces of a contrasting colour and under no circumstances shall spray guns be used where spray may be carried into or onto exposed electrical equipment.

Paint containers shall not be opened until required and the paint shall be mechanically mixed thoroughly before use, and agitated occasionally during use.

Electrical equipment shall be shop finished with one or more coats of primer and two coats of high-grade oil resistant enamel. The interior of all panels' cabinets and enclosures shall be finished with gloss white enamel.

The Contractor shall furnish sufficient touch-up paint for one complete finish coat on all exterior factory surfaces of each item of equipment. The touch-up paint shall be of the same type and colour as the factory applied paint and shall be carefully packed to avoid damage during shipment. Complete painting instructions shall be furnished.

The Contractor shall select shop primer for steel and iron surfaces, which will have a continuous operating temperature below 35°C, in accordance to the relevant standard. Special high temperature primer shall be used on surface exposed to operating temperature above 35°C.

The Owner/Engineer shall submit the colour scheme during execution of contract for approval.

15.2 PREPARATION

Oil and grease shall be removed from the surface by washing with a suitable detergent, rinsing with clean water, and drying.

Surfaces to be shot blasted shall be cleaned to Swedish Standard SA 2.5 or equivalent, and all dust remaining after cleaning shall be removed.

The priming coat shall be applied without delay.

15.3 DAMAGED PAINTWORK

Any damaged paintwork shall be made good as follows:

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15.3.1 The damaged area, together with an area extending 25 mm around its boundary, shall be cleaned down to bare metal.

15.3.2 A priming coat shall be immediately applied, followed by a full paint finish equal to that originally applied and extending 50 mm around the perimeter of the original damage.

15.3.3 The repainted surface shall present a smooth surface. This shall be obtained by carefully chamfering the paint edges before and after priming

15.4 PAINING SYSTEMS

The requirements for the Dry Film Thickness (DFT) of paint and the materials to be used shall be as stated below, unless otherwise specified elsewhere in this specification.

15.4.1 Surfaces subject to Weathering

All surfaces shall have a minimum of four coats of paint made up as follows:

- | | | | |
|-----|---------------------------|---|------------------------|
| (a) | Primer coat | : | 35 micron DFT |
| (b) | Tie coat | : | 35 micron DFT |
| (c) | Finishing coat (Two Nos.) | : | 35 micron DFT per coat |
| (d) | The total minimum DFT | : | 140 micron |

15.4.2 Surfaces Inside Buildings

All surfaces shall have a minimum of three coats of paint made up as follows:

- | | | | |
|-----|---------------------------|---|------------------------|
| (a) | Primer coat | : | 35 micron DFT |
| (b) | Tie coat | : | 35 micron DFT |
| (c) | Finishing coat (Two Nos.) | : | 25 micron DFT per coat |
| (d) | The total minimum DFT | : | 120 micron |

The Contractor shall select the type and colour of primer & finish coat after approval by the Owner.

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16.0 COLOUR CO-ORDINATION & FINISH

- 16.1 Exterior surfaces throughout the plant shall be finished in colours and textures which will blend harmoniously together and with the surrounding landscape.
- 16.2 Interior surfaces throughout the plant shall be finished in colours and textures which will blend harmoniously together and which will be conducive to; the comfort, well-being and high productivity of the operators. Operating plant and services provided shall be colour coded for ease of identification.
- 16.3 All finishes shall be durable and as far as possible maintenance free. Finishes shall be easily cleaned.
- 16.4 Final colours and finishes shall be to the Approval of the Engineer.

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MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION

After award of LOI, following minimum drawing/documents shall be submitted by the bidder for BHEL and 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.

For the Drawings/Documents Submission Procedure, please refer **Sec-C1**. The submission of soft copy or hard copy of the drawing/document whichever is later will be considered as final date of submission of the drawing/document. The bidder has to submit the revised drawing/document along with the compliance sheet indicating enumerate reply to all BHEL and customer comments or observations. Without compliance sheet the submission of the drawings/documents will not be considered and the delay on this account will be solely on bidder's side only. Bidder to comply with the observations of the BHEL and CUSTOMER without price & delivery implication.

Bidder to note that the drawings to be submitted by bidder in the event of award of contract shall be as per the below given drawing/document list. Bidder to note that any additional drawings/documents requirement during detailed engineering shall be provided by bidder without any technical, commercial and delivery implications to BHEL. Bidder confirmed that every revised submission incorporating comments – within 7 days.

Bidder further confirmed that drawings submitted shall be complete in all respects with revised drawing submitted incorporating all comments. Any incomplete drawing submitted shall be treated as non-submission with delays attributable to bidder's account. For any clarification/ discussion required to complete the drawings, the bidder shall himself depute his personal to BHEL for across the table discussions/ finalizations/ submissions of drawings.

(a) List and schedule of drawings/documents to be submitted after award of contract:-

SL NO.	DOCUMENT / DRAWING NO.	DRAWING / DOCUMENT TITLE	SCHEDULE OF SUBMISSION IN WEEKS
1.	PE-V0-426-156-A127	P&I DIAFRAM FOR SIDE STREAM FILTERS	4
2.	PE-V0-415-156-A129	QAP of SSF	8
3.	PE-V0-415-156-A130	PG test procedure for SSF	10
4.	PE-V0-415-156-A131	DATA SHEET FOR INSTRUMENTS for SSF	6
5.	PE-V0-415-156-A133	Civil Assignment drawing for SSF	10
6.	PE-V0-415-156-A134	GA drawing of Side stream filters.	8
7.	PE-V0-415-156-A135	PIPING LAYOUT DRAWING:- SSF (Both inside SSF Area and Yard Piping)	6
8.	PE-V0-415-156-A136	DESIGN CALCULATION & PLATE THICKNESS CALCULATION for SSF	4
9.	PE-V0-415-156-A137	O&M MANUAL FOR SSF	14
10	PE-V0-415-156-A139	Equipment Layout for Side Stream Filtration	4

(b) Bidder to note that drawings/documents submission shall be through web based Document Management System. Bidder would be provided access to the DMS for drawings/documents 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>)
- DMS user manuals to be used by BHEL PEM vendors for uploading, viewing, revising, commenting and

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tracking documents on PEM's DMS have been uploaded on PEM internet website (www.bhelpem.com) under the Vendor session.

- For quick access bidder may refer the link <http://bhelpem.com/DMSManuals/DMSManuals.html>

NOTES:

1. A= APPROVAL. I = INFORMATION.
2. ANY ADDITIONAL DRAWINGS-DOCUMENTS REQUIRED DURING DETAILED ENGINEERING STAGE SHALL BE PROVIDED BY BIDDER WITHOUT ANY COMMERCIAL, TECHNICAL AND DELIVERY IMPLICATION TO BHEL AND CUSTOMER.
3. BIDDER TO SUBMIT REUSABLE DATABASE FORMATS IN BHEL/NTPC APPROVED FORMATS LIKE MS EXCEL, MS WORD OF DOCUMENTS LIKE INSTRUMENT SCHEDULE, I/O LIST, DRIVE LIST, FIELD JB TERMINATIONS, CABLE SCHEDULE & INTERCONNECTION, ETC. SOFT COPY OF FORMATS SHALL BE PROVIDED TO SUCCESSFUL BIDDERS.
4. DOCUMENTS PERTAINING TO PROVENNESS TO BE SUBMITTED BY THE BIDDER.
5. DWG. / DOCUMENT SHALL BE UPLOADED BY THE SUCCESSFUL BIDDER ON WRENCH /DMS. PROCEDURE FOR THE SAME WILL BE INFORMED AFTER AWARD OF CONTRACT.

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QUALITY PLAN

MANUFACTURING QUALITY PLAN													
MANUFACTURER'S NAME AND ADDRESS		ITEM:	Atmospheric tank and Proprietary & Misc Items.					PROJECT	1X660MW BHUSAWAL TPS-UNIT:6 MAHARASHTRA, INDIA.				
		SPEC NO:	PE-TS-415-156-A101					PACKAGE	SIDE STREAM FILTRATION PLANT (SSF:				
		QAP No.	PE-QP-415-156-A101					Rev:	0				
		Page No	1 of 3					Date:	20/07/2019				
SL NO.	COMPONENETS/ OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTITY 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	1X660MW BHUSAWAL TPS-UNIT:6 MAHARASHTRA, INDIA.				
		SPEC NO:	PE-TS-415-156-A101					PACKAGE	SIDE STREAM FILTRATION PLANT (SSF:				
		QAP No.	PE-QP-415-156-A101					Rev:	0				
		Page No	2 of 3					Date:	20/07/2019				
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	
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/documents.	Approved drawing/documents.	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 shell to 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 joints Flanges & 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 IDENTIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.				FOR CUSTOMER USE						
CONTRACTOR		FOR BHEL	M: MANUFACTURER, S: SUB-CONTRACTOR, C: CONTRACTOR/NOMINATED INSPECTION AGENCY, 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		1X660MW BHUSAWAL TPS-UNIT:6 MAHARASHTRA, INDIA.			
		SPEC NO:	PE-TS-415-156-A101					PACKAGE		SIDE STREAM FILTRATION PLANT (SSF:			
		QAP No.	PE-QP-415-156-A101					Rev:		0			
		Page No	3 of 3					Date:		20/07/2019			
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	
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/Measurement	100%	Appd.Drg/Doc.	Appd.Drg/Doc.	IR	√	P/W	-	-	
			Legend: * RECORD IDENTIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION. M: MANUFACTURER, S: SUB-CONTRACTOR, C: CONTRACTOR/NOMINATED INSPECTION				FOR CUSTOMER USE						
CONTRACTOR		FOR BHEL	AGENCY, N: BHEL, P: PERFORM, W: WITNESS, V: VERIFICATION, CHP: CUSTOMER HOLD POINT				REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY					

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X660MW BHUSAWAL TPS-UNIT:6 MAHARASHTRA, INDIA.	SPEC NO: PE-TS-415-156-A101	
		VOLUME: II-B	
		SECTION: C	
		REV NO: 00	DATE:

DATA SHEET-A

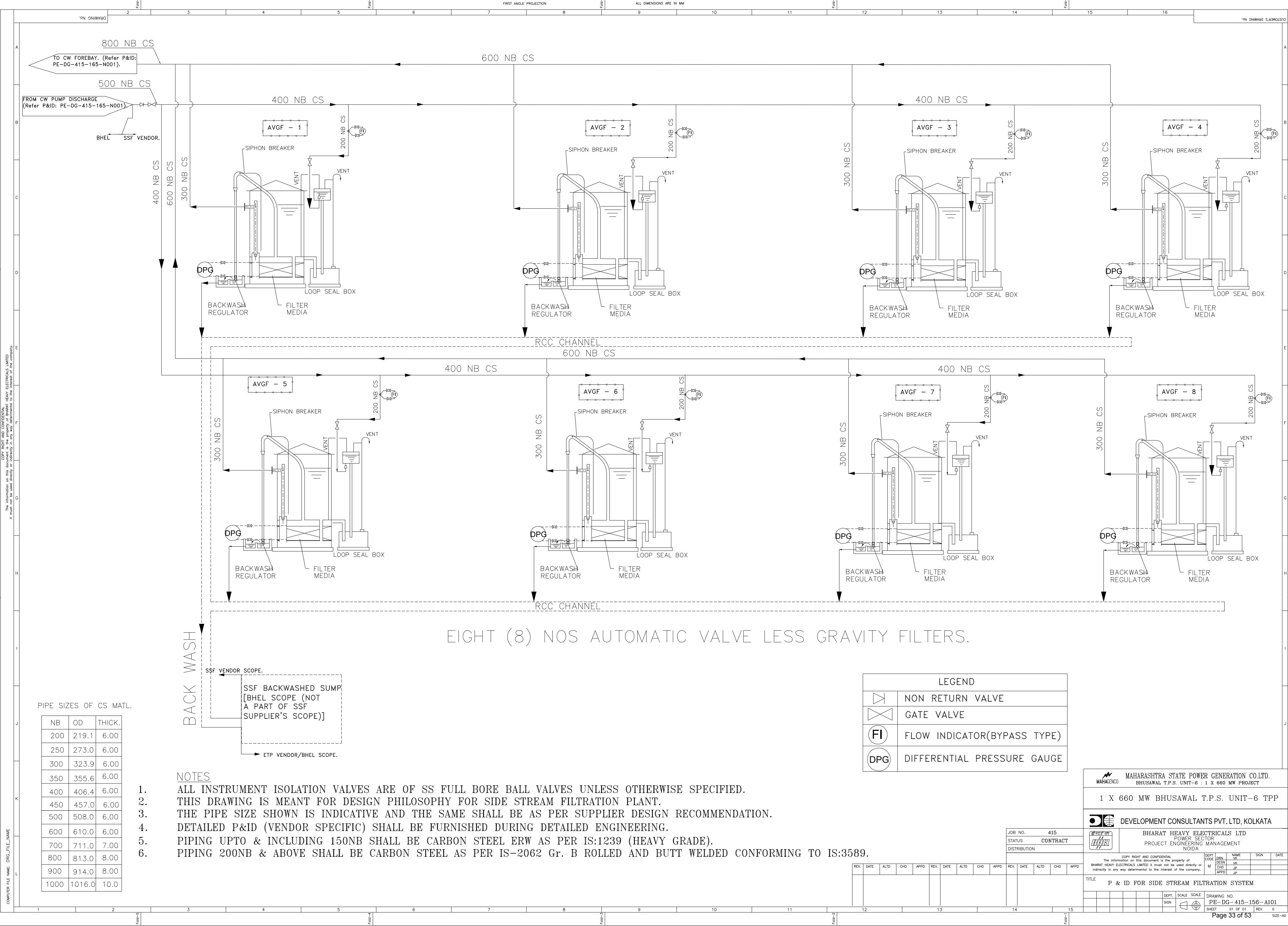
SL NO.	PARTICULARS	DESCRIPTIONS
1.0	SIDE STREAM FILTERS (AUTO VALVE LESS GRAVITY FILTER)	
1.1	Number	8 Nos (7W+1S/Backwash)
1.2	Type	Auto Valve less gravity filter
1.3	Thickness	
1.3.1	Base plate thickness	8 mm
1.3.2	Shell plate thickness	6 mm
1.3.3	Top cover plate thickness or roof	6 mm
1.4	Design Normal Service Flow Rate, in m ³ /hr	Not less than 250
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	Total Suspended Solids in effluent water shall be less than 5 ppm with respect to influent total Suspended Solids of around 25 ppm. For suspended solids higher than 25 ppm at inlet, the Suspended Solids in filtered water shall be within 10% of the inlet value or 5 ppm 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	8 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	Diff. Pressure gauge across the filter bed in each filter.	Provided
1.13	Flow meter/Bypass Rota meter at inlet and outlet of each filter.	Provided.
1.14	Piping	Carbon Steel (IS 1239, Heavy Grade or IS 3589)
1.15	Valves	Carbon Steel
1.16	Manhole	Two (2) nos. (minimum) each of Davit Type and minimum 500 mm diameter.
1.17	Hand hole	One (1) no. of 150 mm diameter for removal of media inside.
1.18	Manual backwashing facility	Shall be provided.
2.0	VALVES	
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.

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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	Butterfly 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).

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X660MW BHUSAWAL TPS-UNIT:6 MAHARASHTRA, INDIA.	SPEC NO: PE-TS-415-156-A101	
		VOLUME: II-B	
		SECTION: C	
		REV NO: 00	DATE:

P&ID

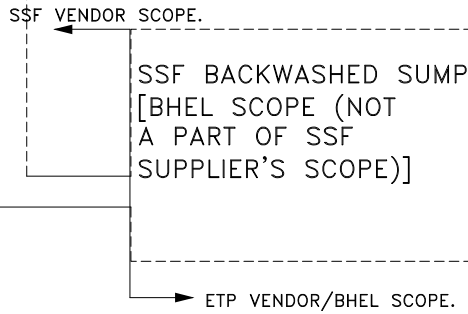


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PIPE SIZES OF CS MATL.

NB	OD	THICK.
200	219.1	6.00
250	273.0	6.00
300	323.9	6.00
350	355.6	6.00
400	406.4	6.00
450	457.0	6.00
500	508.0	6.00
600	610.0	6.00
700	711.0	7.00
800	813.0	8.00
900	914.0	8.00
1000	1016.0	10.0

BACK WASH



NOTES

1. ALL INSTRUMENT ISOLATION VALVES ARE OF SS FULL BORE BALL VALVES UNLESS OTHERWISE SPECIFIED.
2. THIS DRAWING IS MEANT FOR DESIGN PHILOSOPHY FOR SIDE STREAM FILTRATION PLANT.
3. THE PIPE SIZE SHOWN IS INDICATIVE AND THE SAME SHALL BE AS PER SUPPLIER DESIGN RECOMMENDATION.
4. DETAILED P&ID (VENDOR SPECIFIC) SHALL BE FURNISHED DURING DETAILED ENGINEERING.
5. PIPING UPTO & INCLUDING 150NB SHALL BE CARBON STEEL ERW AS PER IS:1239 (HEAVY GRADE).
6. PIPING 200NB & ABOVE SHALL BE CARBON STEEL AS PER IS-2062 Gr. B ROLLED AND BUTT WELDED CONFORMING TO IS:3589.

LEGEND	
	NON RETURN VALVE
	GATE VALVE
	FLOW INDICATOR(BYPASS TYPE)
	DIFFERENTIAL PRESSURE GAUGE

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

MAHARASHTRA STATE POWER GENERATION CO.LTD.
BHUSAWAL T.P.S. UNIT-6 : 1 X 660 MW PROJECT

1 X 660 MW BHUSAWAL T.P.S. UNIT-6 TPP

DEVELOPMENT CONSULTANTS PVT. LTD, KOLKATA

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

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DEPT. DRN NAME SIGN DATE

CHD DESN VK.

M CHD APPD JP

TITLE
P & ID FOR SIDE STREAM FILTRATION SYSTEM

DEPT. SCALE SCALE

DRAWING NO.
PE-DG-415-156-A101

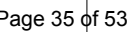
SHEET 01 OF 01 REV. 0

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SIZE-A0

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X660MW BHUSAWAL TPS-UNIT:6 MAHARASHTRA, INDIA.	SPEC NO: PE-TS-415-156-A101	
		VOLUME: II-B	
		SECTION: C	
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KEY PLAN



	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X660MW BHUSAWAL TPS-UNIT:6 MAHARASHTRA, INDIA.	SPEC NO: PE-TS-415-156-A101	
		VOLUME: II-B	
		SECTION: D	
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SECTION-D
(GENERAL TECHNICAL REQUIREMENT)

	TITLE: TECHNICAL SPECIFICATION FOR SIDE STREAM FILTRATION PLANT 1X660MW BHUSAWAL TPS-UNIT:6 MAHARASHTRA, INDIA.	SPEC NO: PE-TS-415-156-A101	
		VOLUME: II-B	
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1.0 DESIGN PHILOSOPHY:

To reduce the Suspended Solids in the cooling water, at least 2.0 % 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/Cooling tower basin/CW pump House.

2.0 CAPACITY SELECTION:

CW Flow	=	68780 m ³ /hr
ACW flow	=	3544 m ³ /hr
Total CW and ACW flow	=	(68780+3544)=72324 m ³ /hr
2.0% of total CW and ACW flow	=	1446.48 m ³ /hr
Flow selected with margin	=	1448 m ³ /hr
Capacity of each AVGF	=	250 m ³ /hr
AVGF @250 m ³ /hr	=	5.78 nos
AVGF selected	=	8 Nos (7W+1S/Backwash) each of 250 m ³ /hr is in bidder's scope

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 **7 out of 8 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

TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X660MW BHUSAWAL TPS-UNIT:6
MAHARASHTRA, INDIA.

SR. NO.	ITEM	DESCRIPTION
		engineering units or 0-100%
1.6.10	Output	2-off isolated 4-20mA DC output
1.6.11	Load	< 750 ohms.
1.6.12	Power supply	240V AC, 50 Hz.
1.6.13	Turn Down	100:1.
1.6.14	Accuracy	± 0.2 % of measured value.
1.6.15	Enclosure	NEMA4X (IP67) aluminum, Epoxy coated
1.6.16	Nameplate	Tag number, service engraved in stainless steel tag plate.
	Notes:	
1.	The above on-line flow meter shall not create any obstruction on flow.	
2.	Users' list shall be submitted to support on proven satisfactory performance for similar process applications.	
1.7	<u>PRESSURE GAUGE AND DIFFERENTIAL PRESSURE GAUGE</u>	
1.7.1	Type	Bourdon / Bellows / Diaphragm.
1.7.2	Sensing & Socket	AISI-316 SS.
1.7.3	Movement Material	AISI-304 SS.
1.7.4	Case Material	Stainless steel, IP-65.
1.7.5	Dial Size	Generally 150 mm.
1.7.6	Scale	Black lettering on white in 270 ° arc.

**TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X660MW BHUSAWAL TPS-UNIT:6
MAHARASHTRA, INDIA.**

SR. NO.	ITEM	DESCRIPTION
1.7.7	Window	Shatterproof glass.
1.7.8	Range Selection	Normal process pressure: 50~70% of range.
1.7.9	Over-range Protection	125% of maximum range by internal stop. External stop at zero.
1.7.10	Adjustment	Micrometer screw for zero. Internal micrometer screw for range.
1.7.11	Element Connection	Argon welding.
1.7.12	Process Connection	1/2" NPT(M) Bottom for local, back for panel mounting.
1.7.13	Performance	Accuracy of ± 1.0 % of span or better.
1.7.14	Operating ambient	0 - 50 °C.
1.7.15	Safety Feature	Blow out disc /diaphragm at the back.
1.7.16	Accessories	(a) Snubbers and Glycerin filled for pulsating fluid applications and at pump discharge.
		(b) Stainless steel Diaphragm seals for viscous fluids
		(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.

**TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X660MW BHUSAWAL TPS-UNIT:6
MAHARASHTRA, INDIA.**

SR. NO.	ITEM	DESCRIPTION
1.7.17	Applicable standard	IS-3624 / 1996.
1.7.18	Nameplate	Tag number, service engraved in stainless steel tag plate.
1.8	TEMPERATURE GAUGE	
1.8.1	Type	Mercury or gas filled.
1.8.2	Sensing Element Material	Bourdon AISI 316 SS.
1.8.3	Capillary Armoring	Stainless steel flexible.
1.8.4	Movement Material	AISI 304 SS.
1.8.5	Bulb / Stem Diameter	12 mm.
1.8.6	Bulb / Stem Material	AISI 316.
1.8.7	Capillary	Stainless Steel.
1.8.8	Connection to well	½" NPT.
1.8.9	Case Material	Stainless steel.
1.8.10	Dial Size	150 mm in general.
1.8.11	Scale	Black lettering on white in 270^o arc.
1.8.12	Mounting	Surface/Panel.
1.8.13	Over range Protection	125 % of range or more.
1.8.14	Instrument connection	Bottom for local and back for panel mounting.
1.8.15	Range	Normal temperature - 50-70% of range.
1.8.16	Zero adjuster	Micrometer screw adjustable from front.

**TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X660MW BHUSAWAL TPS-UNIT:6
MAHARASHTRA, INDIA.**

SR. NO.	ITEM	DESCRIPTION
	ORIFICE PLATE	
1.16.1	Application	Low fluid velocity flow measurement.
1.16.2	Design Standard	BS-1042, Part-I.
1.16.3	Number of Tapings	As required plus one additional pair of taps.
1.16.4	Diameter Ratio	Between 0.4 to 0.7.
1.16.5	Thickness	3 mm for main pipe diameter upto 250 mm, 6 mm for main pipe diameter above 250 mm and upto 500 mm and 10 mm for main pipe diameter of 500 mm and above.
1.16.6	Document	Beta ratio calculation, assembly drawing and Flow vs. DP curve.
1.16.7	Meter run pipe	Same as pipe material.
1.16.8	Accessories	Flanges, gaskets, nuts & bolts, root valves jack screw, meter run pipe, Drain & vent hole as per application etc.
1.17	<u>FLOW NOZZLE</u>	
1.17.1	Application	High fluid velocity flow measurement.
1.17.2	Design Standard	ASME PTC 19.5.
1.17.3	Number of Tapings	As required plus one additional pair of taps.
1.17.4	Diameter Ratio	Between 0.4 and 0.7.
1.17.5	Thickness	Suitable for the application.
1.17.6	Document	Beta ratio calculation, assembly

**TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X660MW BHUSAWAL TPS-UNIT:6
MAHARASHTRA, INDIA.**

SR. NO.	ITEM	DESCRIPTION
		drawing and Flow vs. DP curve.
1.17.7	Meter run pipe	Same as pipe material.
1.17.8	Accessories	Meter run pipe, nipples and root valves (Inspection port assembly for nozzles used in plant performance purpose).
1.18	<u>GAUGE GLASS</u>	
1.18.1	Type	Reflex.
1.18.2	Glass	Toughened borosilicate Resistant to mechanical and thermal shocks.
1.18.3	Body material	Carbon steel / stainless steel - As per process requirements (Flanged Connection).
1.18.4	Pressure rating	Twice the maximum working pressure.
1.18.5	Temperature rating	As required.
1.18.6	Bolts and nuts	Rust proof alloy steel.
1.18.7	Accessories	Suitable ball check valves of SS-304 /316 body, gaskets, companion flange etc.
1.19	<u>POWER CYLINDERS (PNEUMATIC)</u>	
1.19.1	Mounting Type	(a) Fixed position mounting. (End mounting)
		(b) Trunnion mounting.
1.19.2	Control Signal	4-20 mA DC to SMART positioner with Superimposed HART protocol for

**TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X660MW BHUSAWAL TPS-UNIT:6
MAHARASHTRA, INDIA.**

SR. NO.	ITEM	DESCRIPTION
1.29.18	Nameplate	Tag number, service engraved in stainless steel tag plate.
1.29.19	Accessories	Mounting accessories, 3/4" ET cable gland.
1.30	<u>ROTAMETER</u>	
1.30.1	Type	On-line up to 2". By-pass above 2".
1.30.2	Metering tube	Borosilicate glass.
1.30.3	Float	AISI 316-SS unless the process fluid demands some other material.
1.30.4	Body MOC	AISI 316-SS.
1.30.5	Scale	Graduated- Engraved black on white background.
1.30.6	Process connection	Flanged.
1.30.7	Accuracy	± 2% of full scale detection or better for on-line type and ±4% of full-scale detection or better for by-pass type.
1.30.8	Nameplate	Tag number, service engraved in stainless steel tag plate.
1.30.9	Accessories	Slip-on orifice plate of 316-SS and taps of Stainless Steel as per application requirements. Applicable SS Isolation valves and SS Range Orifice - for bypass type rotameters.
1.31	<u>TURBIDITY ANALYSER</u>	
1.31.1	Type	Microprocessor based continuous

**TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X660MW BHUSAWAL TPS-UNIT:6
MAHARASHTRA, INDIA.**

SR. NO.	ITEM	DESCRIPTION
		turbidity monitoring system
1.31.2	Wetted parts	Stainless Steel
1.31.3	Insulation Assembly	Yes
1.31.4	Range	As per service application
1.31.5	Accuracy	Better than $\pm 3\%$ of full scale
1.31.6	Sensitivity	Measures suspended solids from 0.001 to 10,000 NTU
1.31.7	Analyser output	4-20 mA DC – Two (2) numbers and contacts
1.31.8	Transmitter display	Digital
1.31.9	Type of Switch	Snap acting
1.31.10	Switch Rating	2 NO + 2NC, SPDT, Electrically isolated 240 V AC/5A,
1.31.11	Power supply	24V DC (for 2 wire type) & 240 V AC (for 4-wire type)
1.31.12	Calibration	Auto & Manual (from Remote)
1.31.13	Transmitter Housing	Die cast aluminium weather proof, dust tight & water proof conforming IP 65. For hazardous area, Explosion proof Enclosure as described in NEC article 500.
1.32	<u>CHLORINE LEAK DETECTOR</u>	
1.32.1	Sensor Type	Electro-Chemical
1.32.2	Resolution	0.1 ppm

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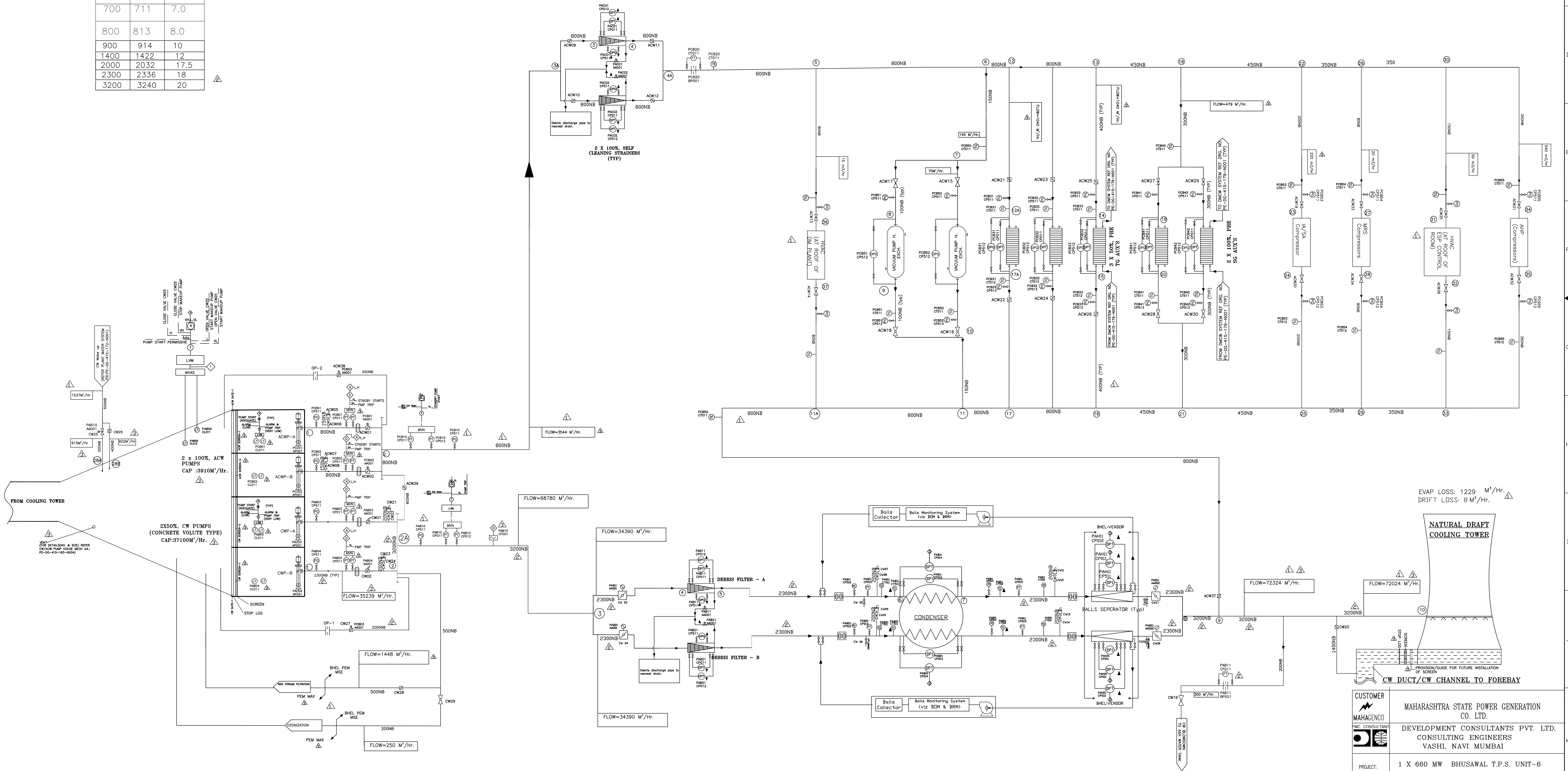
P&ID FOR CW/ACW SYSTEM

NB	OD (mm)	THICK. (mm)
100	115.0	5.4
150	166.5	5.4
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	7.0
800	813	8.0
900	914	10
1400	1422	12
2000	2032	17.5
2300	2336	18
3200	3240	20

	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
	PRESSURE GAUGE		
	PRESSURE SWITCH		
	PRESSURE TRANSMITTER		
	DIFFERENTIAL PRESS. GAUGE		
	DIFFERENTIAL PRESS. SWITCH		
	DIFFERENTIAL PRESS. TRANSMITTER		
	LEVEL TRANSMITTER		
	BYPASS/ ONLINE ROTAMETER		LVM – LIMIT VALUE MONITOR
	TEMPERATURE ELEMENT		MVAS – MEAN VALUE AUTO SELECTION
	TEMPERATURE GAUGE		INDICATION
			TYP – TYPICAL
			ELECTRO-HYDRAULIC ACTUATOR OPERATED BFV

S.NO.	EQUIPMENT	NOS. WORK. + STANDBY	CW REQD. PER COOLER CUB.M/Hr.	CW REQD. PER UNIT CUB.M/Hr	PRESS. DROP MWC	TEMP. RISE °C	REMARKS
1	CONDENSER	1 + 0	68780	68780	3.27	9.96	
2	VACUUM PUMPS	1 + 1	70	140	3.5	2.0	
3	PHE'S (TG AUX)	2 + 1	1040	2080	8	8.5	
4	PHE'S (SG AUX)	1 + 1	479	479	8	5.9	
5	AHP COMPRESSOR	—	—	540	10	5.5	
6	IA/SA COMPRESSOR	—	—	220	10	10	
7	MRS	—	—	20	10	10	

1. DESIGN PRESSURE : 150 kg/cm² (g) for A.C.W. system,
DESIGN TEMPERATURE : 7.5 kg/cm² (g) for C.W. system,
DESIGN CW INLET TEMP TO CONDENSER & W/20MM PUMP HEAT EXCH. = 32 °C
DESIGN A/CW INLET TEMP TO PHE'S = 30 °C
2. MATERIALS OF CONSTRUCTION :
 - a. PIPING UPTO AND INCLUDING 150MM SHALL BE CARBON STEEL, ERW, IS1332 (HEAVY GRADE) B, 150MM AND ABOVE SHALL BE CARBON STEEL (S20802), ROLLED AND WELDED CONFORMING TO IS 5559
 - b. ALL PRESSURE TANGENTS & ROOT VALVES TO BE OF 15 N.
 - c. CW INLET : 150 N SIZE DRAIN & VENT VALVES SHALL BE PROVIDED AS REQD. AS PER A.C.W. SYSTEM : 150 N SIZE DRAIN & VENT VALVES SHALL BE PROVIDED FOR PIPE SIZES 400 AND ABOVE. 150 N SIZE DRAIN & VENT VALVES SHALL BE PROVIDED FOR PIPE SIZES UPTO 350 NB AS PER PAYMENT REQUIREMENTS.
3. INSTRUMENTS MARKUP : THIS SHALL BE SUPPLIED ALONGSIDE THE EQUIPMENTS.
4. ADDITIONAL AIR RELEASE VALVES (200 N) SHALL BE PROVIDED, IF REQUIRED AS PER SURGE
5. PAINTING/PRESTRICTION : -
 1. EXTERNAL SURFACE : - ZINC-PRIMER DUST
 2. AIR SURFACE : - ZINC-PRIMER DUST (SURFACE PREPARATION AS PER S.A.2.2)
 3. APPLICATION OF ONE COAT OF RED LEAD PAINT FOLLOWED BY ADEQUATE (20 ± 3) % OF FINISH COATS OF SYNTHETIC ENAMEL PAINT TO ACHIEVE TOTAL DRY FILM THICKNESS OF 150-200 MICRONS.
 4. AIR SURFACE : - ZINC-PRIMER DUST TO ONE COAT OF COAL TAR BLENDED WITH 10% QUALITY FOLLOWED BY A FINAL COATING OF EPOXY RESIN & COAL TAR BLENDED WITH 10% LAYERS, EACH 2MM THICK COAT OF COAL TAR TAPE AS OTHERS W/APP.
 5. IF PIPE BORE PORTION COMING UNDER LAND OR ROAD SHALL BE CONCRETE ENCASED.
6. REFERENCES DRAWINGS/DOC :
 - a) DRAIN SYSTEM PID-PC-00-415-179-1001
 - b) DRAIN SYSTEM DESIGN P&ID/S&P BY SYSTEM DESIGNER PID-PC-40-415-179-1002
 - c) UG OF PIPE PID-PC-415-179-1001
7. PORTABLE SUMP PUMP MAY BE USED FOR EMPTYING CW PIPE.



03	REVISED INLINE WITH RESOLUTION OF ERM DATE: 24-25/1/19	NK	NR	AJ	10/5/19	The information on this document is the property of BROAD HEAVY ELECTRONICS LIMITED it must not be used directly or indirectly in any way detrimental to the interest of the company. <table><tr><td>CHN</td><td>W</td><td>-SD/-</td><td>16/04/19</td></tr><tr><td>IND</td><td>M</td><td>-SD/-</td><td>16/04/19</td></tr><tr><td>APPD</td><td>N</td><td>-SD/-</td><td>16/04/19</td></tr></table>		CHN	W	-SD/-	16/04/19	IND	M	-SD/-	16/04/19	APPD	N	-SD/-	16/04/19
CHN	W	-SD/-	16/04/19																
IND	M	-SD/-	16/04/19																
APPD	N	-SD/-	16/04/19																
02	REVISED INLINE WITH CUSTOMER COMMENTS	NK	NR	AJ	23/01/19	TITLE ICV/ACW SYSTEM P&ID													
01	REVISED INLINE WITH CUSTOMER COMMENTS	NK	NR	AJ	16/07/18														
REV.	REASONS FOR REVISION	DRAWN	CHECKED	APPROVED	DATE														



TITLE:

TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X660MW BHUSAWAL TPS-UNIT:6
MAHARASHTRA, INDIA

BHEL DOCUMENTS NO.: PE-TS-415-156-A101

VOLUME **III**

REV. NO. 00

LIST OF SCHEDULES



TITLE:

TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT
1X660MW BHUSAWAL TPS-UNIT:6
MAHARASHTRA, INDIA

SPEC NO: PE-TS-415-156-A101

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:-1X660MW BHUSAWAL TPS-UNIT:6****MAHARASHTRA, INDIA****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
1X660MW BHUSAWAL TPS-UNIT:6
MAHARASHTRA, INDIA**

SPEC NO: PE-TS-415-156-A101

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
 1X660MW BHUSAWAL TPS-UNIT:6
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VOLUME **III**

REV. NO. 00

SUGGESTIVE PRICE FORMAT FOR SIDE STREAM FILTRATION PLANT FOR 1X660MW BHUSAWAL TPS-UNIT:6.

Sl. No.	DESCRIPTION OF EQUIPMENT / ITEM	HSN/SAC CODE	UNIT	TOTAL PRICE FOR "FOR" SITE
(1)	(2)		(3)	(4)
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-415-156-A101 as required for safe and trouble free smooth operation.		SET	
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-415-156-A101 as required for safe and trouble free smooth operation.	84212190	LOT	
2.2	Total lump sum price for supply/delivery of mandatory spares as specified in Technical Specification No. PE-TS-415-156-A101 .	84212190	LOT	
2.3	Total lump sum price on unloading, handling, storage, and in plant transportation at site, erection, commissioning trial run, performance guarantee test, and handing over to Purchaser the entire Side Stream Filtration Plant as defined subsequently complete with all accessories, auxiliaries as specified in Technical Specification No. PE-TS-415-156-A101 as required for safe and trouble free smooth operation.	998732	LOT	

Note:

- 1.) PG to consider and suitably incorporate taxes, duties and other commercial aspects.
- 2.) Bidder to quote the Prices in 'figures' along with corresponding 'words'.



TITLE
* SCHEDULE OF DECLARATIONS

BHEL DOCUMENTS NO.: PE-TS-415-156-A101

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				COMPANY SEAL
NAME	DESIGNATION	SIGNATURE	DATE	