

1X700 MW BELLARY – 3 STPP

VOLUME: II B. & III

**TECHNICAL SPECIFICATIONS
FOR
SIDE STREAM FILTRATION PLANT**

SPECIFICATION NO.: PE-TS-367-181-A001



BHARAT HEAVY ELECTRICALS LIMITED

**POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, INDIA**



TITLE:
**TECHNICAL SPECIFICATION FOR
 SIDE STREAM FILTRATION PLANT
 1X700 MW BELLARY -3 STPP**

BHEL DOCUMENTS NO.: PE-TS-367-181-A001

REV. NO. 0.0

DATE: 26/07/12

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PREAMBLE

SPECN. NO.:

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1.0 The tender document contains three (3) volumes. The bidder shall meet the requirements of all the three volumes.

1.1 Volume I - CONDITIONS OF CONTRACT

This consists of four parts as below:

Volume - I A : This part contains instructions to bidders for making bids to BHEL.

Volume - I B : This part contains general commercial conditions of the tender and include provision that vendor shall be responsible for the quality of item supplied by their sub-vendors.

Volume - I C : This part contains special conditions of contract.

Volume - I D : This part contains commercial conditions for erection and commissioning site work, as applicable.

1.2 Volume II - TECHNICAL SPECIFICATIONS

Technical requirements are stipulated in Volume II which comprises of:

Volume - II A : General Technical Conditions

Volume - II B : Technical specification including drawings, if any

1.2.1 Volume - II B :

This volume is sub-divided into following sections:

Section - A : This section outlines the scope of enquiry.

Section - B : This section provides "Project Information"

Section - C : This section indicates technical requirements specific to the contract, not covered in Section-D.

Section - D : This section comprises of General Technical Requirement.

1.2.2 Volume - III TECHNICAL SCHEDULES

This volume contains technical schedules which is to be duly filled by the bidder and the same shall be furnished with the technical bid.

2.0 The requirements mentioned in Section C/Data Sheets-A of Section-C shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section -D.



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VOLUME-IIB

SECTION -A

REV. NO. 0

DATE: 26/07/21012

SECTION - A
(SCOPE OF ENQUIRY)



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SECTION -A

REV. NO. 0

DATE: 26/07/21012

1.0 SCOPE:

- 1.1 This specification is intended to cover design, engineering, manufacturing, fabrication, assembly, inspection & testing at manufacturer's/subcontractor's works, packing and forwarding to power station site, unloading and handling at site, in site transportation, erection, supervision, pre-commissioning, erection and commissioning, testing and commissioning, Performance Testing (PG test) and handing over of Side Stream Filtration Plant along with startup and commissioning spares as required and as specified hereinafter for **1X700 MW BELLARY – 3 STPP**.
- 1.2 It is not the intent to specify all the details of the design & manufacturer. However, the equipment shall conform in all respect to high standard of design, engineering & workmanship and shall be capable of performing the required duties in a manner acceptable to Engineer / Owner, who will interpret the meaning of drawing & the specification & shall be entitled to reject any work or material, which is not in full accordance herewith.
- 1.3 In case of any deviation, the Bidder shall indicate the same clause by clause in the deviation schedule attached with this specification. In the absence of the same it will be construed that the bid conform strictly to the specification.
- 1.4 General terms & conditions instructions to the bidder and other attachments referred to elsewhere, make part of tender specification. The bidder shall be responsible for all governed by requirements stipulated hereinafter.
- 1.5 In case of any data/requirement stipulated in the drawings but not in the specification and vice-versa, such data/requirement shall be deemed to be contained in the both. In case of any contradiction between two clauses / requirements of the specification, bidder to point out those contradictions during pre-award stage else BHEL / Customer interpretation shall be followed without any commercial & delivery implication to BHEL.
- 1.6 The equipments covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and shipping release issued by BHEL/Customer.
- 1.7 Items though not specifically mentioned but needed to make the system complete as stipulated under these specifications are also to be furnished unless otherwise specifically excluded.
- 1.8 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.
- 1.9 The omission of specific reference to any component/accessory necessary for the proper performance of Side stream filtration plant shall not relieve the bidder of the responsibility of providing such facilities to complete the supply of equipment at quoted prices.
- 1.10 Un priced copy of the price bid shall be furnished along with the technical bid.



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VOLUME-IIB

SECTION -B

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SECTION B PROJECT INFORMATION



TITLE: **TECHNICAL SPECIFICATION FOR
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VOLUME-IIB

SECTION -B

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- 1.0 Owner : Karnataka Power Corporation Ltd
Shakthi Bhavan
No.82, Race Course Road
Bangalore–560 001
Karnataka, India
- 2.0 Project Title : 1x700 MW Bellary Thermal Power Station Unit No3,
Stage-3
- 3.0 Location : **Kudatini Village
Bellary Dist
Karnataka state INDIA**
- 4.0 Latitude and Longitude : 15° 11' 58" N Latitude
76° 43' 23" E Longitude
- 5.0 Elevation above mean sea level : 478 meters
- 6.0 Climatic Conditions
- (a) Temperature
- i. Monthly basis
- Mean of daily maximum temperature : 42.5° C (in the month of April)
- Mean of daily minimum temperature : 19.5° C (in the month of Dec)
- ii. Monthly basis
- Mean of daily maximum : 37.5° C
- Mean of daily minimum : 19.5° C
- iii Highest temperature recorded : 42.5°C
- iv Lowest temperature recorded : 14.6°C
- (b) Relative Humidity : Varies between 11% and 70%
- (c) Rainfall
- Annual average rain : 492 to 846 mm most of which occurs during August to October
- (d) Wind Speed
- 1 Annual mean wind speed : 8.4 km / hr
- 2 Maximum mean wind speed : 19 km / hr in the month of July.
- 7.0 Wind Load
- (a) Basic wind speed of 39 m/sec as given in Fig.1 of the code.
- (b) Factor K1 shall be taken as 1.06
- (c) Terrain category shall be 2 and corresponding values shall be taken for K2
- (d) Factor K3 shall be taken as 1.0
- 8.0 Wind Loading for Stack
- (a) For wind pressure as per clause 8.0 above
- (b) For RC stacks as per IS: 4998
- 9.0 Seismic data (as per IS:1893 latest issue)
- (a) Zone : Zone III
- (b) Importance factor (I) : 2.5 for electrical equipment 1.5 for others.



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- 10.0 Auxiliary power supply : Auxiliary electrical equipment to be supplied against this specification shall be suitable for operation on the following supply system.
- (a) For motors rated above 175 kW : 11000V, 3 phase, 3 wire, 50Hz medium earthed AC
3300V, 3 phase, 3 wire, 50Hz medium earthed AC
 - (b) For motor control centre : 415V, 3 phase, 3 wire solidly earthed AC
 - (c) For motor rated 175 kW and below : 415, 3 phase, 3 wire solidly earthed AC
 - (d) DC. motor starters, DC solenoids, : 220 V DC, 2 wire, unearthed DC
DC alarm, control and protections
 - (e) AC control & protective devices : 110 V 1 phase, 50Hz, 2 wire AC supply. The single-phase 110V AC supply shall be derived by Contractor by providing 415V/110V control transformers of adequate rating with MCCB /MCB on both the primary and secondary sides.
 - (f) Uninterrupted power supply : 110 V, 1 phase, 50Hz, 2 wire AC supply from UPS system for I&C (including indicator recorders) and UCMS only
 - (g) AC solenoids, indicators/recorders,space heaters : 240V 1 phase, 2 wire, 50Hz AC system with effectively earthed neutral. The power supply shall be derived by Contractor by providing 415V/ 240V transformer of adequate rating with MCCB/MCB on primary/secondary sides.
(for motors rated 30KW and above)
 - (h) Winding heating of motors below 30kW : 24 V 1 phase, 50Hz, AC with one point earthed. This shall be derived by Contractor by providing 415V 3 phase, 3 wire, AC supply through an adequately rated step-down transformer of adequate rating with MCCB / MCB on primary/secondary sides.
 - (i) Solid state controls (including solenoid valves) : 24 V DC, 2 wire, supply from Battery chargers for instrumentation system only.
 - (j) Lighting fixtures : 240 V, 1 phase, 2 wire, 50Hz system.
 - (k) Lighting fixtures and space heaters in panels : 240 V, 1 phase, 2 wire, 50Hz system.
 - (l) Construction supply : 415 V, 3 phase, 4 wire, 50 Hz AC supply with neutral lead solidly earthed. .
 - (m) The above voltages may vary as follows:
All devices shall be suitable for continuous operation over the entire range of voltage and frequency indicated below without any change in their performance.
 - i. AC supply : Voltage variation $\pm 10\%$
Frequency variation $\pm 5\%$
Combined voltage & frequency variation $\pm 10\%$
 - ii. DC supply : Voltage variation $+10\% -20\%$



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SECTION -C

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SECTION – C

SPECIFIC TECHNICAL REQUIREMENTS

C1: SPECIFIC TECHNICAL REQUIREMENTS FOR MECHANICAL

C2: SPECIFIC TECHNICAL REQUIREMENTS FOR C&I



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SECTION –C1

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SPECIFIC TECHNICAL REQUIREMENTS FOR MECHANICAL



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SECTION –C1

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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 12 Numbers (11 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 Common waste effluent header (As shown in P&ID) till termination points.
- 1.1.9 Start-up & Commissioning spares.
- 1.1.10 Counter flanges, blank flanges, isolation valves at all the terminal points as required as per system requirements.
- 1.1.11 All special tools necessary for proper maintenance or adjustment of the equipment packed in permanent box.
- 1.1.12 All necessary structural steel for pipe supporting structure, platforms, walkways / pathways and access stairs, mechanical plant and equipment, mechanical services and pipe work associated with electro chlorination Plant.
- 1.1.13 Permanent ladder (not rungs) for approaching the top of tanks, valves for All steel inserts with lugs, plates, bolts, nuts, sleeves, edge angles and all other embedding components etc as required to grout in civil works and to support/hold the equipments being supplied under this specification for opening/maintenance purpose.
- 1.1.14 All auxiliary steel structures (U-clamps, nuts, bolts, channels etc.) for fixing the pipe on the pedestal or trestles.
- 1.1.15 Wrapping, coating and protection of all the buried pipe shall be as per IS 10221 or AWWA C 203.
- 1.1.16 Finish paint for touch-up painting of equipment after erection at site in sealed containers.
- 1.1.17 Set of special tools and tackles if required for maintenance and erection of equipment supplied.
- 1.1.18 All necessary flanges and counter flanges to interconnect the piping.
- 1.1.19 Recommended Spares: Recommended spares for 3 years normal operation (optional item).

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.



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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 (800 NB , 8 mm thickness) will be 120 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.

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 Layout requirement.
- 5.3 Un priced schedule.
- 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

- 6.1 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 to by the bidder without any delivery and price implication to BHEL.
- 6.2 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 latter 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



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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.
 - 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.



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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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ANNEXURE-1 RAW WATER ANALYSIS

Sl.No	Description	Unit	Water Quality Considered for design
	Physical Parameters		
1	pH		7.5-8.5
2	Temperature	Deg. C	30
3	Conductivity	mic.mhos/cm	1980
4	Total Suspended Solids	mg/l	100.0
5	Total Dissolved Solids	mg/l	1500 (max)
6	Turbidity	NTU	51.0
7	Oil & grease	mg/l	Nil
	Chemical Parameters		
8	Calcium as Ca	mg/l	50.0
9	Magnesium as Mg	mg/l	40.0
10	Sodium as Na	mg/l	347
11	Potassium	mg/l	5.1
12	Iron - Total (Fe)	mg/l	1.0
13	Alkalinity-m as CaCO ₃	mg/l	550.0
14	Alkalinity-p as CaCO ₃	mg/l	50.0
15	Bicarbonate as HCO ₃	mg/l	671
16	Carbonate as CO ₃	mg/l	10
17	Sulphate as SO ₄	mg/l	24.0
18	Chloride as Cl	mg/l	307
19	Silica reactive as SiO ₂	mg/l	32.0
20	C.O.D	mg/l	60.0
21	Colloidal silica	mg/l	3 to 18
22	Dissolved oxygen	mg/l	5.2
	Additional Parameters		
23	BOD	mg/l	8.2
24	TOC	mg/l	12.4
25	Nitrate	mg/l	19.0
26	Ammonia	mg/l	Nil
27	Total Silica	mg/l	22 to 46
28	Zinc	mg/l	0.37
29	Nickel	mg/l	< 0.005
30	Chromium Total	mg/l	0.009
31	Barium	mg/l	Nil
32	Bromide	mg/l	Nil



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Sl.No	Description	Unit	Water Quality Considered for design
33	Fluoride	mg/l	0.9
34	Hydrogen Sulphide	mg/l	Nil
35	Manganese	mg/l	0.16
36	Strontium	mg/l	Nil
37	Ammonical Nitrogen	mg/l	<0.1
38	Phosphate	mg/l	1 to 2
	Bacteriological Parameters		
39	Coliforms (e coli)	Cfu/ml	present
40	Feacal Colifrms	Cfu/100ml	86.0
41	Total Viable Count at 48 hrs	Cfu/100ml	67×10^{-2}

Clarified water analysis is as follows.

1. Turbidity <20 NTU
2. TSS <20 ppm
3. P^H 7.5 to 8.5
4. Residual chlorine <0.5 ppm



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ANNEXURE -2 DRAWING DOCUMENTS DISTRIBUTION SCHEDULE

	KPCL (Design)	KPCL SITE	VENDOR
CORRESPONDENCE			
KPCL TO VENDOR	S	1*	O
VENDOR TO KPCL	O+1	1*	S
MANUFACTURING			
TEST REPORT	O+1	2	S
INSTRUCTION MANUALS			
- PRELIMINARY	3	2	S
- FINAL	5	10	S
DRAWINGS			
- PRELIMINARY	4P	1P	S
- RETURN PRELIMINARY	S	1P	1P
- FINAL APPROVED	+8P+5CD+	15P + 10CD	S
Erection Drawings	8P+ 10 CD	12P +14CD	S
Spare Parts List	12P + 14CD	15P + 15CD	

LEGEND

* - On technical correspondence only

O - ORIGINAL

S - SOURCE

P - PRINT

R - REPRODUCIBLE

CD - COMPACT DISC

KPCL (DESIGN) - Chief Engineer (Thermal Designs), KARNATAKA POWER CORPORATION LIMITED 22/23 Sudhrshan Complex, Sheshadri Road Bangalore 560 09

KPCL (SITE) - Chief Engineer (C, CE(O&M), KARNATAKA POWER CORPORATION LIMITED, Bellary Thermal Power Plant, Kuduthini, Bellary Dist 56.....

Note :

- Quantity of prints may change during detailed engineering stage based on BHEL / Customer requirement.
- 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.
- 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. Vendor to come for meeting with the concerned dealing persons as per BHEL or customer (KPCL) requirement in a short notice.
- Bidder to also furnish the auto cad copy of all the documents as required by BHEL.



**PAINTING SCHEME DETAILS
ANNEXURE – III**

1.0 SCOPE

- 1.1 This section covers the painting requirements for the power plant equipment, structures, piping etc. and any other surface required to be painted.

2.0 CODES AND STANDARDS

Painting of equipment shall be carried out as per the specifications indicated below and shall conform to the relevant IS specification for the material and workmanship.

The following Indian Standards may be referred to for carrying out the painting job :

IS:5	:	Colours for ready mixed paints and enamels
IS:1303	:	Glossary of terms relating to paints
IS:2379	:	Colour code for identification of pipelines
IS:1477	:	Code of practice for painting of ferrous metals in buildings (Parts I & II)
IS:2524	:	Code of practice for painting of non-ferrous metals in buildings (Parts I & II)
IS:2395	:	Code of practice for painting of concrete, masonry and plaster surfaces (Parts I & II)
IS:2338	:	Code of practice for finishing of wood and wood based materials (Parts I & II)
IS:6278	:	Code of practice for white washing and colour Washing
IS:3140	:	Code of practice for painting asbestos cement building products
IS:158	:	Ready mixed paint, brushing, bituminous, black, lead-free, acid, alkali, water and heat resisting
IS:2074	:	Ready mixed paint, air drying, red Oxide Zinc Chrome, priming
IS:104	:	Ready mixed paint, brushing, Zinc Chrome, priming
IS: 2932	:	Enamel , synthetic, exterior (a) undercoating (b) finishing

2.0 PREPARATION OF SURFACES

All surfaces to be painted shall be thoroughly cleaned of all grease, oil, loose mill scale, dust, rust and any other foreign matter. Mechanical cleaning by power tool and scrapping with steel wire brushes shall be adopted to clear the surfaces. However, in certain locations where power tool cleaning cannot be carried out, sand scrapping may be permitted with steel wire brushes and/or abrasive paper. Cleaning with solvents shall be resorted to only in such areas where other methods specified above have not achieved the desired results. Cleaning with solvents shall be adopted only after written approval of the BHEL/Customer.

4.0 PRIMER PAINT

After the surface is prepared, one coat of Zinc Phosphate primer conforming to IS:2074 shall be applied. After this first coat is dried up completely, second coat of red oxide primer shall be applied. Primer shall be applied by brushing to ensure a continuous film without 'holidays'. The dry film thickness of each coat shall be minimum 30 microns.



TITLE:
**TECHNICAL SPECIFICATION FOR
 SIDE STREAM FILTRATION PLANT.**
1X700 MW BELLARY – 3 STPP

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5.0 FINISH PAINT

Synthetic enamel paint conforming to IS:2932 shall be used for finish coats. The colour/shade shall be as approved by the OWNER. After cleaning the dust on the dried up primer, first coat of synthetic enamel shall be applied. After this first coat dries up hard, the surface is wet scrubbed cutting down to a smooth finish and ensuring that at no place the first coat is completely removed. After allowing the water to get evaporated completely, the second finish coat of synthetic enamel paint shall be applied.

6.0 SUGGESTED COLOUR CODES FOR PAINTING

SL. NO.	ITEM/SERVICE	COLOUR	IS-5 Grade	COLOUR (BAND)	IS-5
1.0	Structures, platforms, galleries, ladders and handrails	Dark Admiralty Grey	632	-	-
2.0	Boiler casing, ESP and ducting	Nut Brown	413	-	-
3.0	Crane				
3.1	Crane structure	Golden Yellow	356	-	-
3.2	Trolley and hook	Crimson	540	-	-
4.0	Fans, pumps, motors, compressors	Light Grey	631	-	-
5.0	Tanks (without insulation and cladding)				
5.1	Outdoor	Aluminium	-	-	-
5.2	Indoor	Light grey	631	-	-
6.0	Vessels & all other proprietary equipment (without insulation & cladding)	Light grey	631	-	-
7.0	Switchgear	Light grey	631	-	-
8.0	Control & relay panels	Light grey	631/7078 of IS 1650	-	-
9.0	Turbine	Golden Yellow	356	-	-

SL.NO.	ITEM/SERVICE	COLOUR	IS-5 Grade	COLOUR (BAND)	IS-5
10.0	Generator & exciter	Light grey	631	--	-
11.0	Transformers	Aluminium	-	-	-
12.0	Machinery guards	Signal red	537	-	-
13.0	Piping (without insulation and cladding)				
13.1	Water System				
	Boiler feed	Sea green	217	-	-
	Condensate	Sea green	217	Light brown	410
	D M Water	Sea green	217	Light orange	557



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	Soft water	Sea green	217	French blue	166
	Bearing cooling water	Sea green	217	French blue	166
	Potable & filtered water	Sea green	217	French blue	166
	Service & clarified water	Sea green	217	French blue	166
	Raw water	Sea green	217	White	-
	Cooling water	Sea green	217	French blue	166
13.2	Air System				
	Station air	Sky blue	101	-	-
	Control air	Sky blue	101	White	-
13.3	Oil system				
	Fuel oil	Light brown	410	French	166
	Light oil	Light Brown	410	Brilliant green	221
	Lubricating oil	Light brown	410	Light grey	631
	Transformer oil	Light brown	410	Light orange	557
13.4	Gas system				
	Carbon dioxide	Canary yellow	309	Light grey	631
	Hydrogen	Canary yellow	309	Signal red	537
13.5	Fire services	Fire red	536	-	-
13.6	Ash slurry pipes	Black	-	-	-
13.7	Vacuum pipes	Sky blue	101	Black	-
13.8	Fuel pipes (pulverised coal)	Light brown	410	-	-
13.9	Drainage	Black	-	-	-

Notes :

1. This colour code basically refers to IS:2379 for piping with necessary modifications
2. Where band colour is specified, same shall be provided at 30 meter intervals on long uninterrupted lines and also adjacent to valves and junctions.
3. The above mentioned painting requirements are bare minimum. Any variation as required by BHEL/customer during detailed engineering stage shall be adhered to the bidder without any delivery/commercial implication to BHEL.



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**LIST OF APPROVED SUB VENDORS
ANNEXURE - IV**

S NO.	ITEM	APPROVED SUPPLIERS	PLACE
1	TANK	BELCO POLLUTION CONTROL PVT LTD.	GRATER NOIDA
		FABTECH	PUNE
		TECHNOFAB	NEW DELHI
2	STRAINER	BHATIA ENGINEERING CO.	DELHI
		FILTRATION ENGINEERS (I) PVT. LTD.	MUMBAI
		JAYPEE INDUSTRIES PVT. LTD	NEW DELHI
		MULTITEX FILTRATION ENGRS LTD	NEW DELHI
		OTOKLIN GLOBAL BUSINESS LIMITED	MUMBAI
		SUNGOV ENGINEERING PVT. LTD.	CHENNAI
3	ORIFICE PLATE	MICRO PRECISION	FARIDABAD
		INSTRUMENTAION LTD	PALGHAT
		CARLO DYNAMICS	HYDERABAD
4	BALL VALVES	AKAY INDUSTRIES PVT.LTD.	MUMBAI
		ASIAN INDUSTRIAL VALVES & INSTRUMENTS.	CHENNAI
		CRESCENT VALVES MFG. CO. PVT. LTD	MUMBAI
		CHEMTECH INDUSTRIAL VALVES PVT. LTD.	MUMBAI
		KSB PUMPS LTD.	MUMBAI
		VALTECH INDUSTRIES	MUMBAI
		WEIR BDK VALVES- A UNIT OF WEIR INDIA PVT. LTD.	NEW DELHI
5	GATE VALVES	TECHNO VALVE	MUMBAI
		BDK	HUBLI
		LEADER	JALANDHAR
6	GLOBE VALVE	TECHNO VALVE	MUMBAI
		LEADER	JALANDHAR
7	3/5 WAY VALVE	TECHNO VALVE	MUMBAI
		HI TECH	AHMEDABAD
8	PIPING	CHOKSHI TUBES	AHMEDABAD
		REMI	MUMBAI
		RATNAMANI	AHMEDABAD
9	FITTINGS	BHARAT FORGE	PUNE
		RELIANCE FORGE	
		PRADEEP METALS LTD	MUMBAI
10	FLANGES	PRADEEP METALS LTD	MUMBAI
		BHARAT FORGE	PUNE
		RELIANCE FORGE	
11	PRESSURE GAUGE/DPG	A N INSTRUMENTS	KOLKATA
		BOSE PANDA INSTRUMENTS PVT.LTD.	KOLKATA
		DRESSER INDUSTRIES INC.	
		FORBES MARSHALL (HYD) LTD	HYDERABAD
		GENERAL INST	MUMBAI/GOA
		H.GURU INDUSTRIES	KOLKATA/BANGLORE/ GHAZIABAD
		BAUMER TECHNOLOGIES INDIA PVT. LTD.	MUMBAI
12	ROTAMETER	EUREKA INDUSTRIAL EQUIPMENTS PVT.LTD.	PUNE
		FLOW STAR ENGINEERING PVT. LTD.,	FARIDABAD



TITLE: TECHNICAL SPECIFICATION FOR
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		FLOWTECH INSTRUMENTS SERVICRS	VADODARA
		INSTRUMENTATION ENGINEERS PVT LTD	HYDERABAD
		TRANSDUCERS AND CONTROLS PVT.LTD.	HYDERABAD
13	SIGHT FLOW INDICATORS	B.K.EQUIPMENTS PVT.LTD.	CHENNAI
		BLISS ANAND PVT. LTD.	GURGAON
		CHEMTROLS SAMIL (INDIA) PVT.LTD.	MUMBAI
		FLOWTECH INSTRUMENTS SERVICRS	VADODARA
		INSTRUMENTATION ENGINEERS PVT LTD	HYDERABAD
		SIGMA INSTRUMENTS CO.	MUMBAI
		TELACE EQUIPMENT PVT.LTD.	CHENNAI
14	FLOW ELEMENT - NOZZLE	ASIAN INDUSTRIAL VALVES & INSTRUMENTS	CHENNAI
		INSTRUMENTATION LTD	PALALKKAD,
		MICRO PRECISION PRODUCTS	FARIDABAD
		MINCO (INDIA) PRIVATE LIMITED	MUMBAI
		STAR-MECH CONTROLS (I) PVT.LTD.	PUNE
		TM TECHNOMATIC SPA	CREMONA
14	FLOW ELEMENT - ORIFICE	ASIAN INDUSTRIAL VALVES & INSTRUMENTS.	CHENNAI
		FLOW STAR ENGINEERING PVT. LTD.,	FARIDABAD
		INSTRUMENTATION LTD.	FARIDABAD
		MICRO PRECISION PRODUCTS	MUMBAI
		MINCO (INDIA) PRIVATE LIMITED	PUNE
		STAR-MECH CONTROLS (I) PVT.LTD.	CREMONA
		TM TECHNOMATIC SPA	

NOTE: - Any other sub-vendor and the sub vendor as listed above shall be subject to approval of BHEL/CUSTOMER during detailed engineering without any price and delivery implication to BHEL.



TITLE:

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**ANNEXURE –)
QUALITY PLAN**

MANUFACTURING QUALITY PLAN													
MANUFACTURER'S NAME AND ADDRESS		ITEM:	Atmospheric tank and Proprietary & Misc Items.					PROJECT	1X700 MW BELLARY – 3 STPP				
		SPEC NO:	PE-TS-367-181-A001					PACKAGE	SIDE STREAM FILTRATION PLANT (SSF)				
		QAP No.	PE-QP-367-181-A001					Rev:	0				
		Page No	1 of 3					Date:	26/07/21012				
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						
			M: MANUFACTURER, S: SUB-CONTRACTOR, C: CONTRACTOR/, N: BHEL, P: PERFORM, W: WITNESS, V: VERIFICATION, CHP: CUSTOMER HOLD POINT				REVIEWED BY						
CONTRACTOR		FOR BHEL						NAME & SIGN OF APPROVING AUTHORITY					

MANUFACTURING QUALITY PLAN													
MANUFACTURER'S NAME AND ADDRESS		ITEM:	Atmospheric tank and Proprietary & Misc Items.					PROJECT	1X700 MW BELLARY – 3 STPP				
		SPEC NO:	PE-TS-367-181-A001					PACKAGE	SIDE STREAM FILTRATION PLANT (SSF:				
		QAP No.	PE-QP-367-181-A001					Rev:	0				
		Page No	2 of 3					Date:	26/07/21012				
SL NO.	COMPONENETS/ OPERATION	CHARACTE RSTICS	CLASS	TYPE OF CHECK	QUANTU M OF CHECK	REFEREN CE DOC	ACCEPTANC E NORMS	FORMAT OF RECORD	D *	AGENCY**			REMARKS
										S/M	C	N	
1	2	3	4	5	6	7	8	9	10			11	
2.0	In Process												
2.1	Welding procedure	Welder's ability to perform	Major	Document review	100%	ASME Sec IX.	ASME Sec IX.	QW 482, 483 & 484.		P/V	V	V	
2.2	Checks of dished end (wherever applicable)	Dimension and profile	Major	Measurement	100%	Approved drawing/do cuments.	Approved drawing/docum ents.	IR		P/W	V	V	
2.3	DP test on edges, SF and Knuckle.	Surface defects on edges, SF and Knuckle.	Major	Visual & DP Test.	100%	ASME Sec VIII, Div 1 Appendix 8.	ASME Sec VIII, Div 1 Appendix 8.	IR		P/W	V	V	
2.4	All "L" seam & "C" seam set up for dish to shell and shellto shell	Edge preparation, 'V' angle, Root gap, Matching, etc.	Major	Measurement	100%	Appd. Dgr.	Appd. Dgr	IR		P	-	-	
2.5	Back chip & DP test of jointsFlanges & Nozzle pipes	Detection of internal defects	Major	DP Test	100%	ASME Sec VIII, Div 1 Appendix 8.	ASME Sec VIII, Div 1 Appendix 8.	IR		P	V	V	
		b) Dimension	Major	Measurement	At random	Appd Doc/Drg.	Appd Doc/Drg.	Log Book.		P	V	V	
			Legend: * RECORD INDETIFIED WITH "TICK" SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION. M: MANUFACTURER, S: SUB-CONTRACTOR, C: CONTRACTOR/NOMINATED INSPECTION AGENCY, N: BHEL, P: PERFORM, W: WITNESS, V: VERIFICATION, CHP: CUSTOMER HOLD POINT				FOR CUSTOMER USE						
CONTRACTOR		FOR BHEL					REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY					

MANUFACTURING QUALITY PLAN													
MANUFACTURER'S NAME AND ADDRESS		ITEM:	Atmospheric tank and Proprietary & Misc Items.					PROJECT	1X700 MW BELLARY – 3 STPP				
		SPEC NO:	PE-TS-367-181-A001					PACKAGE	SIDE STREAM FILTRATION PLANT (SSF:				
		QAP No.	PE-QP-367-181-A001					Rev:	0				
		Page No	3 of 3					Date:	26/07/21012				
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
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 AGENCY, N: BHEL, P: PERFORM, W: WITNESS, V: VERIFICATION, CHP: CUSTOMER HOLD POINT				FOR CUSTOMER USE						
CONTRACTOR		FOR BHEL					REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY					

Note: The above mentioned inspection requirements are bare minimum. However any additional inspection/modification required by customer/BHEL has to be compiled by the bidder without any delivery and price implication to BHEL.



TITLE:

TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT.

1X700 MW BELLARY – 3 STPP

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ANNEXURE – 6
DATA SHEET-A



TITLE:
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DATA SHEET-A

SL NO.	PARTICULARS	DESCRIPTIONS
1.0	SIDE STREAM FILTERS (AUTO VALVE LESS GRAVITY FILTER)	
1.1	Number	12 Nos (11W+1S/Backwash)
1.2	Type	Auto Valve less gravity filter The filters shall primarily consist of a vertical steel tank divided into three (3) sections viz. backwash water storage space, filter bed compartment and filter water collecting chamber.
1.3	Thickness	
1.3.1	Base plate thickness	8 mm (minimum)
1.3.2	Shell plate thickness	6 mm (minimum)
1.3.3	Top cover plate thickness or roof	6 mm (minimum)
1.4	Flow rate, m ³ /hr (each)	150
1.5	Design code	IS: 803/Manufacturer standard.
1.6	Maximum Design Inlet Total Suspended Solid (TSS)	100 PPM
1.7	Design TSS in Treated Water (Guarantee)	10% of the inlet suspended solids concentration or 5 ppm whichever is higher.
1.8	Design Temperature, °C	50°C
1.9	Filter media	
1.9.1	Type	Bed of Graded Sand and Anthracite supported/Manufacturer's design specific.
1.9.2	Bed type	Single/twin bed type
1.9.3	Bed depth	Shall be as per system requirement/ Manufacturers standard.
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 Gr.B or SA 515 Gr. 70
	b) Dish/Bottom Plate	
	c) Bottom collector plate	
	d) Strainers	
1.12	Protection	PVC/PP
	a) Internal	Three coats of Solvent Free Epoxy (DFT: 150 micron)
	b) External	External painting required of chlorinated rubber (DFT: 150 micron).
1.13	Diff. Pressure gauge across the filter bed in each filter.	Shall be provided by the bidder.
1.14	Flow meter/Bypass Rota meter at inlet and outlet of each filter.	Shall be provided by the bidder.
1.15	Piping	Carbon Steel to IS 1239 or IS 3589. The pipe thickness of pipe < 200 NB will be as per IS 1239 Heavy grade. For pipe ≥ 200 NB the pipe thickness will be as per the table indicated in the P&ID.
1.16	Valves	Carbon Steel
1.17	Manhole	Two (2) nos. of Davit Type and 500 mm diameter.
1.18	Hand hole	One (1) no. of 150 mm diameter for removal of media inside.
1.19	Backwash interval for each bed	24 Hrs (approx.)
1.20	Manual backwashing facility	Shall be provided by the bidder.



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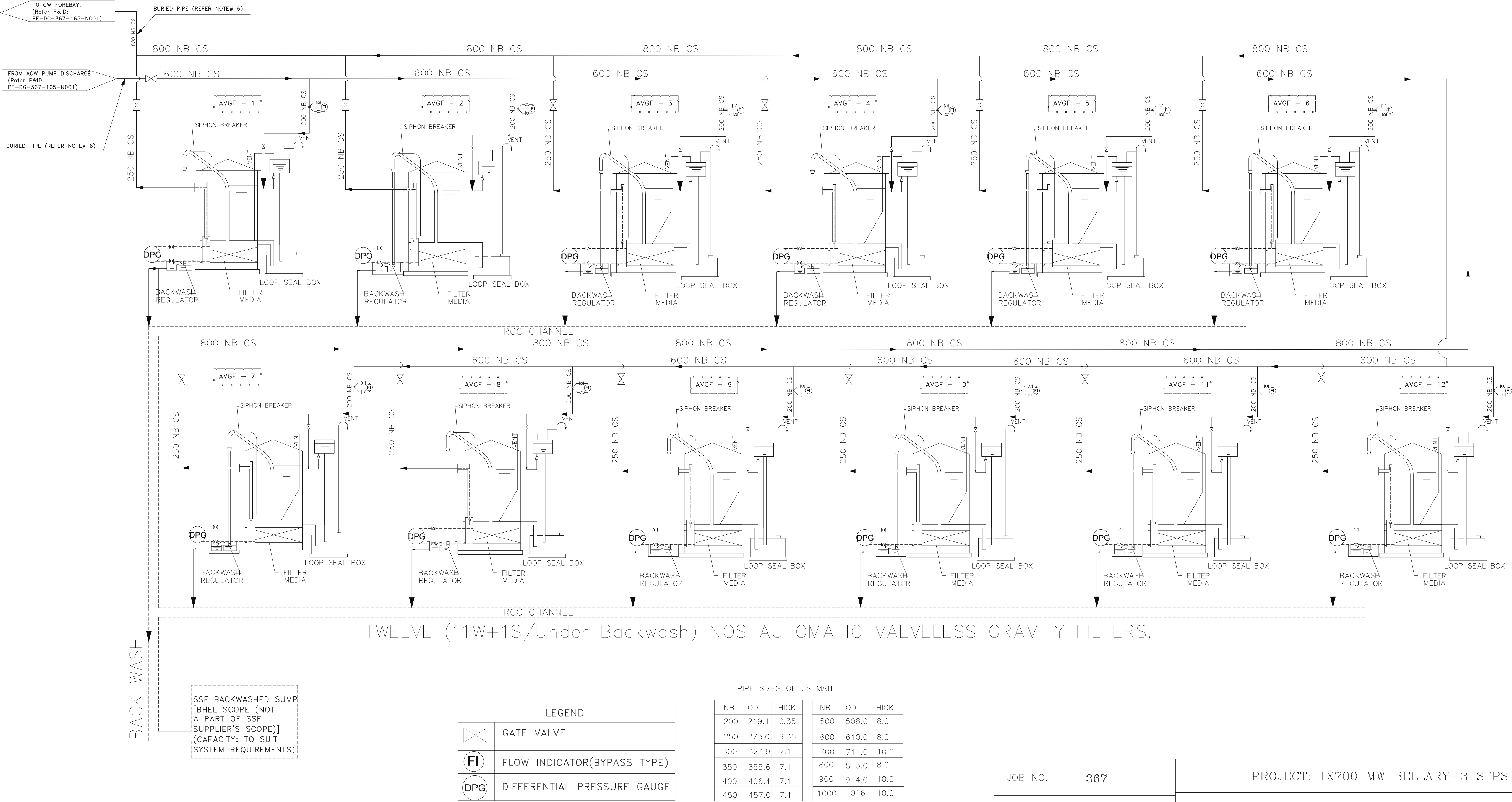
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**ANNEXURE – +
P&ID**



TWELVE (11W+1S/Under Backwash) NOS AUTOMATIC VALVELESS GRAVITY FILTERS.

PIPE SIZES OF CS MATL.

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

NB	OD	THICK.	NB	OD	THICK.
200	219.1	6.35	500	508.0	8.0
250	273.0	6.35	600	610.0	8.0
300	323.9	7.1	700	711.0	10.0
350	355.6	7.1	800	813.0	8.0
400	406.4	7.1	900	914.0	10.0
450	457.0	7.1	1000	1016	10.0

- NOTES:
- 1) ALL THE PRESSURE INSTRUMENTS SHALL BE PROVIDED WITH DIAPHRAGM SEAL.
 - 2) 3 WAY VALVE MANIFOLD FOR PG/PS, 5 WAY VALVE MANIFOLDS FOR DPG/DPS SHALL BE SUPPLIED BY THE BIDDER.
 - 3) BLANK FLANGES, COUNTER FLANGES & ISOLATION VALVES SHALL BE PROVIDED BY THE BIDDER AT THE TERMINAL POINTS WHEREVER APPLICABLE
 - 4) ALL THE EQUIPMENTS , VESSELS, TANKS, VALVES, INSTRUMENTS, PIPING ETC SHOWN IN THIS DRAWING IS VENDOR'S SCOPE UNLESS EXCLUSIVELY MENTIONED.
 - 5) ALL INSTRUMENT ISOLATION VALVES ARE OF SS FULL BORE BALL VALVES UNLESS OTHERWISE SPECIFIED.
 - 6) THE INLET PIPE UPTO THE SSF PLANT ANF OUTLET PIPE FROM SSF PLANT UPTO THE CW FOREBAY WILL BE BURIED PIPE. ALL THE WRAPPING,COATING & PROTECTION OFF ALL BURRIED PIPE SHALL BE AS PER IS 10221 OR AWWA C 203 AND IS IN BIDDER'S SCOPE.

JOB NO.	367	PROJECT: 1X700 MW BELLARY-3 STPS			
STATUS	CONTRACT	CUSTOMER: KARNATAKA POWER CORPORATION LIMITED			
DISTRIBUTION		CONSULTANT: TRACTEBEL ENGINEERING PVT. LTD.			
TO		BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA			
No. OF					
		TITLE P & I D FOR SIDE STREAM FILTRATION PLANT (SSF).			
		DEPT.	SCALE	DRAWING NO.	
		SIGN		PE-DG-367-181-A001	
		DATE		SHEET 1 OF 1	REV. 00



TITLE:

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1X700 MW BELLARY – 3 STPP

BHEL DOCUMENTS NO.: PE-TS-367-181-A001.

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SPECIFIC TECHNICAL REQUIREMENTS FOR C&I


KPCL/BTPS/03/EPC 	KARNATAKA POWER CORPORATION LIMITED BELLARY TPS, UNIT-3 OF 700 MW TITLE DESIGN, PERFORMANCE AND FUNCTIONAL REQUIREMENTS	SECTION: D3.3 VOLUME-IV Sheet 21 of 46
	<ol style="list-style-type: none"> 2. Differential Pressure: mm of H₂O column / Kg/cm² 3. Draught: mm of H₂O column 4. Vacuum : mm of H₂O column 5. Temperature : Degree Celsius (O C) 6. Flow (Steam, Water): Tonnes / hr. 7. Flow (Oil) : Tonnes/hr 8. Flow Air : Tonnes / hr 9. Density : gms/c.c 10. Level : mm 11. Conductivity : Micro-mho / cm 12. Gas Analyzer: Percentage by weight or as specified in respective case. 13. Dissolved Oxygen / Silica / : ppm or ppb Sodium / Hydrogen 14. Coal flow : Tones / hr 15. Speed : RPM <p>6.3.00 The general guidelines for various instruments, which have to be provided on Plant equipments/systems are elaborated below.</p> <p>6.3.01 <u>Pressure indicators</u> shall be provided for</p> <ol style="list-style-type: none"> 1. Suction and discharge lines of pumps/fans, including on suction/discharge header if two or more pumps are employed for the same service. 2. All input and output lines of process equipment. 3. Inlets and outlets of heaters, heat exchangers and desuperheaters. <p>6.3.02 <u>Pressure Switches</u> shall be provided</p> <ol style="list-style-type: none"> 1. On all process lines/Equipment where parameter abnormality/status including pre trips alarms to be communicated to the operator in control room. 2. For all permissive conditions governed by safety operation of the equipment. eg. pr. adequate, conditions. 3. For all protection conditions. Eg. pr. very high/very low conditions 4. For all interlock conditions which governs starting of standby equipment or subsequent equipment for safety operation of the system. 5. 3 switches shall be employed for protection in case of critical applications 6. Inlet and outlet of filters/strainers. <p>6.3.03 <u>Differential Pressure Switches</u> shall be provided</p> <ol style="list-style-type: none"> 1. Across filters/strainers for remote monitoring 2. Across condenser CW line for remote monitoring and interlocks <p>6.3.04 <u>Differential Pressure Indicators</u> shall be provided</p> <ol style="list-style-type: none"> (a) Across filters/strainers for local monitoring (b) Across condenser CW line for local monitoring <p>6.3.05 <u>Pressure Transmitters</u> shall be provided</p> <ol style="list-style-type: none"> 1. At suction and discharge of all major pumps/fans. 2. For all control and monitoring applications as demanded by the process. It shall be noted that for all critical analog/binary controls applications 3 	


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6.3.06	<p>transmitters shall be provided.</p> <ol style="list-style-type: none"> 3. Pressure conditions of all major vessels/tanks like Deaerator, Hotwell, Boiler Drum etc. 4. All inputs for equipment/unit performance calculation. <p>Differential Pressure Transmitters shall be provided,</p> <ol style="list-style-type: none"> 1. For all the requirements of differential pressure, flow and level measurements. For critical control applications 3 transmitters shall be provided. 2. All inputs for equipment/unit performance calculation. 3. Auxiliary cooling water services flow measurement instead of variable area flow meters. 	
6.3.07	<p>Temperature indicators (Thermometers) shall be provided</p> <ol style="list-style-type: none"> 1. On all process lines where local indication is warranted by the system either for monitoring or testing. 2. On the inlet/outlet equipments such as heaters, desuperheaters, Heat Exchangers & Coolers for both the fluid media. 3. Capillary type temperature indicators shall be used in vibration prone areas. 4. Thermowell shall be provided for all temperature indicators. 	
6.3.08	<p>Temperature Switches shall be provided</p> <ol style="list-style-type: none"> 1. For all process lines where parameter abnormality to be communicated to the operator in control room where redundant transmitters are not provided 2. For all permissive & interlock conditions governed by the safety operation of the equipment where redundant transmitters are not provided and for protection of the equipment. 3. For all critical services 3 nos. shall be provided for protection application. 	
6.3.09	<p>Resistance temperature detectors(RTD's) shall be provided for all services where maximum temperature does not exceed 150 degrees centigrade.</p> <ol style="list-style-type: none"> 1. The element shall be 3 wire type/4 wire, duplex with all thermowell. 2. The RTD is employed for remote display for providing necessary information to the operator about the performance of the related equipment such as pumps, fans, Motors..etc <u>Eg :</u> Suction/Discharge of pumps and fans inlet/outlet of heat exchangers, fans / pumps bearings, motor windings, motor bearings etc. 	
6.3.10	<p>Thermocouples shall be provided for all services where normal operating temperature exceeds 150 deg C.</p> <ol style="list-style-type: none"> 1. The element shall be duplexed integral with thermowell. K-type for temperature upto 600 degC and R- type for temperature above 600 degC. 2. The thermocouple is employed for remote display, for control applications, density correction for flow measurements. 3. All thermocouple shall be directly connected to the respective input modules in DDCMIS through Extension/Compensating cables. The extension/compensating cables shall be laid from T/C till DDCMIS 	


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	<p>cabinets and the cold junction compensation shall be carried out at DDCMIS. Extension cables shall be supplied for K & T type Thermocouples and Compensating cables for all R & S Type Thermocouples.</p> <p>4. Metal temperature thermocouples shall be provided for the services like pipe metal, separator/Drum, SH/RH tube metal temperature. For metal thermocouples suitable pads with clamps etc., shall be provided. The termination of these thermocouples shall be at low temperature area with adequate extension length of thermocouples.</p> <p>6.3.11 <u>Thermo wells</u> shall be provided along with Temperature elements of RTD & Thermocouples except for metal/bearing/winding temperature measurements.</p> <ol style="list-style-type: none"> 1. For measurement of flue gas temperature, Inconel coated with tungsten carbide or suitable abrasion resistant thermo wells shall be provided. 2. For measurement of pulveriser outlet temperature tungsten carbide block thermo wells abrasion resistant not tungsten carbide coated thermowell shall be used. Also the terminals of Thermocouple shall not be at the top of Mills itself. The thermocouple wires are to be laid up to JB through SS tubing of required diameter and the head shall be placed nearer to the JB. Compensating cable exposed to atmosphere in the conventional method melts away due to high temperature at the top of Mill. 3. For measurement of water & steam temperature SS thermo wells or better, shall be used. <p><u>Temperature Transmitters</u> are not envisaged.</p> <p>6.3.12 <u>Level gauges</u> shall be provided</p> <ol style="list-style-type: none"> 1. On all tanks and the maximum length of one gauge glass shall not exceed 1 metre. The gauge glasses shall be stacked to cover the complete height of the tanks including over flow level. There shall be an overlap of minimum 150 mm, when more than one level gauge is required. Suitable platforms shall be provided for purpose of taking measurements during maintenance.. 2. All high pressure vessel shall be provided with level gauges on either end as per Boiler statutory requirement. <p>6.3.13 <u>Level switches</u> shall be provided,</p> <ol style="list-style-type: none"> 1. On all equipment (storage vessel) where parameter abnormality/status to be communicated to the operator in the control room. 2. All permissive and interlock conditions governed by the safety operation of the equipment and for protection conditions. 3. For all critical services, 3 switches shall be provided for protection application. 4. The instrument shall be external cage type with SW connection with isolation facility for surface mounted tanks and top mounted with still pipe for all sumps. <p>6.3.14 <u>Level transmitters</u> shall be provided on process equipment where continuous remote monitoring and/or control of level is envisaged.</p>	

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	<ol style="list-style-type: none"> The instrument shall be displacement type for all pressure/vacuum applications involving two phase media like Hotwell, LPH services..etc The instrument shall be differential pressure type for other applications with pressure. Other type of level transmitters viz., Ultrasonic, RF Type, Radar Type, capacitance Type ..etc for special applications. <p>6.3.15 Flow Glasses at the outlet of the pipe line shall be employed under the following conditions:</p> <ol style="list-style-type: none"> Coolant from the equipment (coolers) The instrument shall be rotary type with glass mounted for indication. Upto 4 inch on-line flow glasses shall be supplied and above 4 inch bypass type flow glasses shall be provided. <p>6.3.16 Flow Switches shall be provided at different outlet header of identical equipment to alarm in the event of inadequate coolant requirement (or) lube oil, cooler outlet on cooling water line.</p> <p>6.3.17 Speed Measurement shall be provided, where variable speed drives are to be controlled from remote e.g., BFP, ID fans, Feeders etc.</p> <p>6.3.18 Coriolis type mass flow Meters shall be provided for the measurement of HFO, LFO and DM Water flow measurement.</p> <p>6.3.19 Flow Elements shall be provided as mentioned below.</p> <ol style="list-style-type: none"> Orifice plate shall be provided for spray water, condensate, makeup water, DM water, soot blowing system. Flow nozzle shall be provided for BFP suction, Feedwater, HP Bypass, Aux. steam system. Impact head type element (Annubar) type/Orifice shall be provided for condenser cooling water system. Aerofoil for secondary air flow Venturi for primary air flow measurement or as per proven standard and practice of boiler supplier. The flow element connection shall be Butt welded except for applications, where flanged connection have to be used. Flow elements shall be provided with three (3) sets of tap points with independent root valves. <p>6.3.20 Control valves shall be provided</p> <ol style="list-style-type: none"> For all control application as required and in line with the system requirement. If the process demands any other control, then control valves shall be provided for those applications also. Where a single control valve can not meet the turned down ratio as dictated by the process, control valves with split range application shall be provided. All bypass valves of control valves as detailed in section - D1 shall be suitable for inching operation and provided with position transmitters. Control valves for HP & LP Bypass system shall be hydraulic operated. 	

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14.00.00	<u>Differential Pressure Indicators:</u> <p>Direct reading type, pipe mounted, bellows or diaphragm operated differential pressure indicators; aluminium casing (epoxy coated) with six (6) inch dial (white dial with black numerals), with micrometer type pointer, 316 SS pressure element; an accuracy of $\pm 0.5\%$ of span including accessories like snubbers for pump discharge application, chemical diaphragm with 15 m PVC covered SS armoured capillary for each limb for corrosive and oil services and 5 way manifold. Material of accessories will be SS. IP 65 or equivalent degree of protection. Over range protection will be 50% above maximum pressure.</p>	
15.00.00	<u>Differential Pressure Switches:</u> <p>Bellows or diaphragm operated non-indicating field mounted type; aluminium casing (epoxy coated); 316 SS pressure element nylon movement; an accuracy of $\pm 1\%$ of span with an adjustable contact including accessories like snubbers for pump discharge applications, chemical diaphragm with 15 m capillary for each limb for all corrosive and oil services and 5 way manifold. Material of accessories will be SS. Auto reset micro switch with adjustable set values with 2 SPDT contacts rated for 0.2 A at 220 V DC. IP 65 or equivalent degree of protection over range protection 50% above maximum pressure. Repeatability shall be $\pm 0.5\%$ FSR.</p>	
16.00.00	<u>Thermometers:</u> <p>Indicating type, field mounted, filled system with 5 metre capillary and six (6) inch dial housed in aluminium casing (epoxy coated) with an accuracy of $\pm 1\%$ of span, response time of 2-4 seconds, auto temperature calibration, linear calibration over the range and 316 SS thermowell having a process connection of M33 x 2 thread. Material of accessories will be SS. IP 65 or equivalent degree of protection for enclosure. Thermowell with Hex head of fabricated assembly for air and flue gas system for rest of the services bar stock assembly. The thermowell construction shall meet the ANSI 19.3-1994 (latest) requirements.</p>	
17.00.00	<u>Temperature Switch:</u> <p>Non Indicating type, field mounted, filled system with 5 metre capillary housed in Aluminium casing (epoxy coated) with an accuracy of $\pm 1\%$ span, auto temperature calibration, linear calibration over the range and 316 SS thermowell having a process connection of M33x2 thread. Micro switch with reset type with adjustable set values with 2 SPDT contacts rated for 0.2 A, 220 DC. IP 65 or equivalent degree of protection for enclosure. Thermowell with hex head of fabricated assembly for air and flue gas system, for rest of the services bar stock assembly. Material of accessories will be SS. The thermowell construction shall meet the ANSI 19.3-1994 (latest) requirements.</p>	

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<p>18.00.00 <u>Level gauges:</u></p> <p>Tubular type level gauges for low pressure upto 7 kg/cm² & reflex type for high pressure water & steam services & vacuum services with automatic ball check valves, illuminator (240 AC), pyrex / borosilicate glass, mica shield, brass guard rods & brass holders. Material of accessories (name plate, etc.) will be SS. Tubular glass OD will be 5/8". Vent & drain valves shall be provided. Connection shall be screwed or flanged (ANSI class 150 RF). Enclosure shall be IP 65.</p> <p>19.00.00 <u>Level Switches:</u></p> <p>External float operated level switches for tanks and vessels and top mounted level switches and underground tanks. The top mounted level switches shall be supplied with steel tubes to suit Purchaser's requirement. Micro switch with 2 SPDT contacts rated for 0.2 A, 220 V DC. Material of float & float chord will be 316 SS & cage material shall be fabricated steel and the material of accessories will be SS. IP 65 or equivalent degree of protection for enclosure.</p> <p>Accessories like name plate, drain valve for external case type level switches, mating flange, gaskets (asbestos), fasteners, bolts & nuts, etc. shall be supplied.</p> <p>20.00.00 <u>Flow Glasses:</u></p> <p>Online flow glasses for pipe size up to 4" with a rotary wheel (not a flapper type) suitable for installation on vertical or horizontal pipe lines, material pyrex tempered glass. Body material will be carbon steel, rotor & wetted parts will be bronze. The material of accessories will be SS. IP 65 or equivalent degree of protection for enclosure. Upto 50 NB size, connection shall be screwed above 50 mm NB size it shall be flanged - ANSI, 150 RF. Accessories like name plate, mating flanges with gaskets (neoprene), bolts & nuts, etc. shall be supplied. Enclosure shall be IP65.</p> <p>21.00.00 <u>Flow Elements:</u></p> <p>SS 316 flow nozzles for all steam and feed water services with D and D/2 pressure tappings; 316SS flow orifice plate assembly for all water services with flange tap connections; B ratio of 0.5 & 0.7. Element material of SS 316. The material of accessories will be SS. All the flow elements shall have 3 pairs of differential pressure tappings complete with root valves. Orifice plate shall not be less than 3 mm thick for nominal pipe diameter upto 300 mm & not less than 6 mm thick for pipe diameter > 300 mm. The flow elements shall be supplied as assemblies with High/low pressure tappings, root valves as required. Performance Guarantee flow elements shall be provided</p>		

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	<p>separately. Butt welded edges shall be prepared as per ANSI 16.25 & flanged connections shall be as per ANSI 16.5 standards. Orifice assembly complete with nipples & valves to be supplied by Bidder shall be one metre long with ANSI class 150 RF SS flanges at the ends including gaskets, bolts & nuts. Isolating valves shall have SW end connection. Accessories like name plate, gaskets, bolts & nuts, reservoirs (condensing chambers), 6 nos. shut off valves per assembly, nipple, welding adapters, etc. shall supplied.</p> <p>Bidder shall submitted certified flow calculation and differential pressure Vs. flow curves for each element for OWNER's approval. Sizing calculation, precise flow calculation for all the flow elements, fabrication and assembly drawings and installation drawings shall be submitted for OWNER's approval. Bidder shall provide three Tappings per flow elements.</p> <p>22.00.00 <u>Flow Switches:</u></p> <p>Indicating, Differential pressure, flapper type on line flow switches for line sizes up to 80 mm with an accuracy of $\pm 2\%$ of span and dial size of min. 50 mm having 316 SS flapper housed in die cast aluminium. Micro switch with adjustable range with 2 SPDT contacts rated for 0.2 A, 220 V DC. IP 65 or equivalent degree of protection for enclosure. The material of accessories will be SS.</p> <p>23.00.00 <u>Flow integrators(Electronic Type):</u></p> <p>Flush mounted receiver type electronic digital flow integrators with accuracy 0.2%; linearity within 0.2%; six (6) digits, 24 V DC power supply. IP65 or equivalent degree of protection for enclosure; Accessories like square root extractor shall be provided.</p> <p>24.00.00 <u>Air Filter Regulator (AFR):</u></p> <p>Constant bleed type AFR with an accuracy of $\pm 0.1\%$, inlet pressure range of 5-8 kg cm² and suitable spring ranges (AFR) for use with positioners in control valves, control damper, E/P converters and shut off valves, transmitter purging lines etc; Filtering particles above five microns having phosphor bronze filter element. Material of accessories will be SS. Built in blow down valve shall be provided. AFR shall have automatic drain feature. All accessories shall be supplied. Degree of protection shall be IP65</p> <p>25.00.00 <u>Electro-Pneumatic Converters (E/P):</u></p> <p>Two wire type E/P convertors with an accuracy of $\pm 0.25\%$ accepting 4-20 mA DC signals from control system and converting to 0.2 to 1 kg/cm² air pressure to operate valve positioner of all final control elements; Housed in cast aluminium casing (with polyurethane paint); IP65 degree of protection for enclosure. Material of accessories will be SS. Direct/reversing acting, 4 SCFM and above capacity</p>	

 PEM :: C&I		STANDARD QUALITY PLAN FOR ROTA METER							QUALITY PLAN NO.: PE-QP-999-145-I010			
									VOLUME IIB			
									SECTION D			
									REV. NO. 03 DATE: 09.03.2012			
									SHEET 1 OF 1			
Sl. No.	Component / operation	Characteristics Checked	*Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency ^{\$}			Remarks
									P	W	V	
1.0	Material / Components											
1.1	Orifice Plate, Flanges, By-pass piping	1. Physical, Chemical properties	MA	Physical, Chemical Test	One sample from each lot	Approved drg./ data sheet/ BHEL spec.	Approved drg./ data sheet/ BHEL spec.	Test Certificate	3/2	---	2,1#	# Compliance certificate to be verified
		2. Workmanship, finish and dimensions	MA	Visual, Measurement	100%	Manufacturing standards / drgs.	Manufacturing standards / drgs.	Inspection Report / Log Book	3/2	---	2	
1.2a	Metal Tube	Strength	MA	UTS/YS/ES	One sample from each lot	Approved drg./ data sheet	Approved drg./ data sheet	Test Certificate / Inspection Report	3	---	2,1#	
1.2b	Glass Tube	Transparency, Toughness		Toughness & Thermal shock, Visual, Measurement								
2.0	Assembly	1. Marking – Tag No., Model, Range	MA	Visual	100%	Approved drg./ data sheet	Approved drg./ data sheet	Inspection Report	2	1**	1	⊙⊙ End connection to be checked with "GO" & "NO-GO" gauge.
		2. Workmanship	MA	Visual	100%	-----	-----	- do -	2	1**	1	
		3. Scale graduation	MA	Visual	100%	Approved drg./ data sheet	Approved drg./ data sheet	- do -	2	1**	1	
		4. Dimensions & End connections ^{⊙⊙}	MA	Measurement	100%	Approved drg./ data sheet	Approved drg./ data sheet	- do -	2	1**	1	
3.0	Routine Test	1. Calibration	CR	Measurement	100%	Approved drg./ data sheet	Approved drg./ data sheet	- do -	2	1**	1	**10% qty. or minimum of 2 no's / type & size
		2. Hydro Test	CR	Measurement	100%	Approved drg./ data sheet	No Leakage	- do -	2	1**	1	
4.0	Painting	Shade & finish	MA	Visual	100%	Vendor Std./BHEL spec	Vendor Std./BHEL spec	- do -	2	1**	1	
5.0	Packing	Soundness of packing	MA	Visual	100%	Vendor Std./BHEL spec	Vendor Std./BHEL spec	- do -	2	---	---	

Note - Contact Rating, Repeatability $\pm 1\%$, HV & IR tests (applicable for Alarm contacts) to be carried out as per relevant standard.
Sea worthy / Air worthy packaging shall be applicable as per project requirement if applicable.

LEGEND: * CR - Critical characteristic \$ P - Agency Performing the Test. UTS -Ultra Tensile Strength 1 - BHEL
 MA - Major characteristics W - Agency Witnessing the Test. YS -Yielding Strength 2- Vendor
 MI - Minor characteristics V - Agency Verifying the Test. ES -Elongation Strength 3- Sub-vendor



TITLE:

**TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT.**

1X700 MW BELLARY -3 STPP

BHEL DOCUMENTS NO.: PE-TS-367-181-A001.

VOLUME **II-B**

SECTION -D

REV. NO. 00

DATE: 26/07/21012

GENERAL TECHNICAL REQUIREMENT

D1: GENERAL TECHNICAL REQUIREMENTS FOR MECHANICAL

D2: GENERAL TECHNICAL REQUIREMENTS FOR C&I



TITLE:

**TECHNICAL SPECIFICATION FOR
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1X700 MW BELLARY – 3 STPP

BHEL DOCUMENTS NO.: PE-TS-367-181-A001

VOLUME-IIB

SECTION –D1

REV. NO. 0

DATE: 26/07/21012

SECTION-D1

GENERAL TECHNICAL REQUIREMENT-MECHANICAL

BHEL – PS - PPEI: NOIDA, SECTOR-16A, U.P. – 201301



TITLE:
**TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT.**

1X700 MW BELLARY – 3 STPP

BHEL DOCUMENTS NO.: PE-TS-367-181-A001

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SECTION –D1

REV. NO. 0

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1.0 SYSTEM DESCRIPTION

The Side Stream Filtration System shall consist of 12 numbers Automatic Valve less Gravity (AVGF) Filters and accessories. The System shall receive the supply of circulating water from ACW pump discharge header and after filtration, the filtered water will be returned to the CW Fore bay.

The Side Stream Filtration System shall be located outdoor.

The backwash waste from Side Stream Filtration Plant shall be collected in SSF Backwashed sump for further disposal to effluent treatment plant.

2.0 OPERATION PHILOSOPHY:

The Auto Valve-less Gravity Filter operates automatically on the siphon principle.

Raw 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 11 out of 12 filters will be in service. Pressure filters after isolation shall be backwashed. Backwashed water shall be led to SSF Backwashed sump for further disposal to Effluent treatment plant.

3.0 FILTER OUTLET WATER QUALITY (GUARANTEE)

The outlet guarantee for the side stream filtration plant shall be 10% of the inlet suspended solids concentration or 5 ppm whichever is higher.



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SECTION –D1

REV. NO. 0

DATE: 26/07/21012

**TECHNICAL SPECIFICATION
FOR
PIPING AND FITTINGS**

BHEL – PS - PPEI: NOIDA, SECTOR-16A, U.P. – 201301



TITLE:
**TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT.**

1X700 MW BELLARY – 3 STPP

BHEL DOCUMENTS NO.: PE-TS-367-181-A001

VOLUME-IIB

SECTION –D1

REV. NO. 0

DATE: 26/07/21012

1.00.00 INTENT OF SPECIFICATION

This specification covers the design, manufacture, shop testing, erection, testing and commissioning at site of all the piping, valves and all other accessories as required.

2.00.00 SCOPE

2.01.00 The item and material to be supplied other than straight run pipe under this specification shall include but not be limited to the following :

Bends, elbows, tees, branches, laterals, crosses, reducing unions, couplings, cap, expansion joints, flanges, blank flanges, saddles, shoes, sampling connections, etc. necessary for making a reliable piping system.

2.02.00 Gaskets, ring joint, backing rings, jointing material, etc. as required.

2.03.00 Instrument tapping connection, stub and thermo wells.

2.04.00 Supply and matching work of flanges, pipe spools and matching pipes to connect flow measuring orifices, nozzles, etc. pressure accumulators as necessary.

2.05.00 Valve and gates, to start/stop and regulate flow.

2.06.00 Strainers.

2.07.00 Anchors, hangers and supports, vibration dampener etc. required.

2.08.00 Bolts, nuts, fasteners as required for interconnection piping, valves, and fittings as well as for terminal points.

2.09.00 Secondary steel for pipe supports from embedded steel wherever provided. Also pipe supports and necessary embedment required to be embedded in concrete for underground/above ground pipes.

2.10.00 Painting, anticorrosive coatings etc. inside and outside pipes as necessary.

2.11.00 All embedded parts required for all tanks/water retaining structures made of RCC including puddle pipes shall be supplied by the Bidder.

3.00.00 DESIGN, CONSTRUCTION AND ERECTION

3.01.00 Piping

3.01.01 A standard followed for Material of Construction of pipes under various services is reproduced below:

	<u>Service</u>	<u>Material</u>
1.	Sulphuric Acid (98%)	ERW Carbon Steel pipe to ASTM A53 Gr. B/IS: 1239 Part-I, Heavy grade,
2.	Dilute Sulphuric Acid	Rubber Lined ERW Carbon Steel pipe to ASTM A53 Gr. B/IS: 1239 Part- I, Heavy grade,
3.	Scale Inhibitor, Corrosion Inhibitor, Biocide	Stainless Steel to ASTM 312 Type 316 welded, schedule-10.
4.	Chlorine (gaseous under vacuum)	IS-4985, schedule-80. PVC.
5.	Chlorine (both liquid and dry gaseous under pressure)	Carbon steel as per ASTM-A-106, Gr.B /Seamless, Sch 80.
6.	Chlorinated water	Rubber Lined ERW Carbon Steel pipe to ASTM A53 Gr. B/IS: 1239 Part- I, Heavy grade and rubber lining 3.0 mm

BHEL – PS - PPEI: NOIDA, SECTOR-16A, U.P. – 201301



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		thick as per IS: 4985.
8.	Instrument Air	Galvanized Steel Pipe to ASTM A 53 Gr. B.

3.01.02 Pipe lines carrying water, chemicals, air etc. should be sized on the following velocities :

		Velocity in m/sec.		
		Pipe Size		
	<u>Pipe Size</u>	<u>Below 50 mm</u>	<u>50 - 150 mm</u>	<u>200 mm & above</u>
a)	Pump Suction for Water	-	1.2 - 1.5	1.2 - 1.8
b)	Pump Discharge for Water	1.2 - 1.8	1.8 - 2.4	2.1 - 2.5
c)	Header for Water	-	1.5 - 2.4	2.1 - 2.4
d)	Pump suction for chemical solution	0.8 - 1.2	0.8 - 1.3	-
e)	Pump discharge for chemical solution	1.2 - 1.4	1.2 - 1.7	-
f)	Compressed air below 2 kg./sq.cm(g)	15 - 20	20 - 30	25 - 35
g)	Compressed air [2kg./sq.cm (g) & above]	20 - 30	25 - 40	35 - 45

3.01.03 All piping system shall be capable of withstanding the maximum pressure in the corresponding line.

3.01.04 Hangers and support shall be capable of carrying the sum of all concurrently acting loads. They shall be designed to provide the required supporting effects and allow pipe line movements as necessary. All guides, anchors, braces, dampener, expansion joint and structural steel to be attached to the building/structure, trenches etc. shall be provided. Type of hangers and components for all piping shall be selected and approval obtained from the Owner.

3.01.05 For rubber lined pipe, lining should be applied in two (2) layers, giving rise to a total thickness not less than 3 mm. The lining shall conform to IS:4682 Part-I.

3.01.06 For overground exposed steel pipe and underground pipe, the supply and application of painting shall be as per Subsection: M6.

3.02.00 **Pipe Fittings**

3.02.01 Fittings for Black Carbon Steel Pipe other than Steam services.

a) Bends/Elbows

For carbon steel pipe, sizes 50 mm NB and below, site fabricated cold pulled bends made from parent pipe with minimum radius of bending equal to five times the pipe diameter shall be employed.

For sizes above 50 mm NB, bends as per ASTM A 234 Gr. WPB having plain and levelled ends shall be used.

b) Reducer

For sizes 50 mm NB and below, socketweld carbon steel reducer of ASTM A 234 Gr. WPB having dimension as per ANSI B16.11, 3000 lb. rating shall be used. For sizes above 50 mm NB, it will be butt weld type, standard wall thick as per ANSI B 16.9, with material as per ASTM A 234 Gr. WPB.

c) Other Fittings, such as branching, etc.

BHEL – PS - PPEI: NOIDA, SECTOR-16A, U.P. – 201301



TITLE:

**TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT.****1X700 MW BELLARY – 3 STPP**

BHEL DOCUMENTS NO.: PE-TS-367-181-A001

VOLUME-IIB**SECTION –D1**

REV. NO. 0

DATE: 26/07/21012

For sizes 50 mm NB and below, socketweld fitting of ASTM A 234 Gr. WPB material, 3000 lb. rating as per ANSI B16.11 shall be used. For higher size, site fabricated branching made from parent pipe can be used.

d) Pipe Joints

For erection joint socketweld coupling shall be used for sizes below 50 mm NB and butt weld joint for higher sizes. For maintenance joint, three piece socket weld union for lower size and flanged joint for higher size shall be used.

e) Flanges

Slip on raised face flange to ANSI B16.5, Class150 of carbon steel construction (A-105) shall be used. Flanges shall be either forged or machined from plate/casting of above material.

3.02.02 For galvanised pipes, specification for G.I. bends/elbows and all other fittings shall be same as stated above. Ends of all fittings will however be screwed type. Pipe joints shall be screwed for lower size and flanged for higher size. No hot work on G.I. pipes shall be done. Flanges shall be screwed type hot dipped galvanised carbon steel, with specification same as applicable for flange of black carbon steel pipe.

3.02.03 For rubberlined pipes, the specification for fittings shall be same as stated for black carbon steel pipe, but the fittings will be inside rubberlined with 3 mm thick (minimum), natural rubber in two layers as per IS:4682. Flanges shall be slipon type, 150 lb. class, flat face as per ANSI B 16.5 full face rubberlined. Pipe to pipe joint will be flanged only. For small size fittings (below 50 mm NB) where rubber lining of carbon steel fittings will not be possible, SS-316 fittings shall be used.



TITLE:

**TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT.**

1X700 MW BELLARY -3 STPP

BHEL DOCUMENTS NO.: PE-TS-367-181-A001.

VOLUME **II-B**


SECTION –D2

REV. NO. 00

DATE: 26/07/21012

SECTION D2

GENERAL TECHNICAL REQUIREMENTS FOR C&I

	DATA SHEET FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE		SPECIFICATION NO.:	
			VOLUME	
			SECTION	
			REV. NO.	DATE:
			SHEET 1	OF 2
TAG No. Qty.....			Data Sheet No.: PE-DC-999-145-1026	
Data Sheet A & B				
DATA SHEET-A FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE (TO BE FILLED BY PURCHASER)			DATA SHEET-B (TO BE FILLED-UP BY BIDDER)	
GENERAL	MANUFACTURER			
	MODEL NUMBER			
TECHNICAL	PRESSURE ELEMENT	<input type="checkbox"/> BOURDON <input checked="" type="checkbox"/> DIAPHRAGM <input type="checkbox"/> BELLOW		
	MATERIAL	SENSING ELEMENT – AISI 316 SS MOVEMENT – AISI 304 SS CASING – <input checked="" type="checkbox"/> DIE CAST AL <input type="checkbox"/> SS		
	ENCLOSURE	<input type="checkbox"/> IP-55 <input checked="" type="checkbox"/> IP-65 <input type="checkbox"/> FUEL GAS HAZARDOUS APPL. EXPL. PROOF		
	DIAL	SIZE: <input type="checkbox"/> 100MM <input checked="" type="checkbox"/> 150MM COLOR: WHITE NUMERALS: BLACK SCALE: <input checked="" type="checkbox"/> LINEAR <input type="checkbox"/> SQUARE ROOT		
	CASE	COLOUR : BLACK		
	ADJUSTMENT	<input checked="" type="checkbox"/> EXT. MICROMETER SCREW <input type="checkbox"/> INT. MICRO SCREW		
	MOUNTING	<input checked="" type="checkbox"/> LOCAL <input type="checkbox"/> PANEL OR RACK		
	OVER RANGE PROTECTION	<input checked="" type="checkbox"/> 150% OF MAX. PRESSURE <input type="checkbox"/> 125% ABOVE 150 KG/CM2 FSD <input type="checkbox"/> AS REQUIRED		
	BLOW OUT DISC	SUITABLE MATERIAL		
	SWITCHING FACILITY NO./TYPE OF CONTACTS CONTACT RATINGS SETTING RANGE REPEATABILITY POWER SUPPLY	NOT REQUIRED		
PERFORMANCE	ACCURACY	± 0.5% OR BETTER OF FULL SCALE DEFLECTION		
CONNECTION	PROCESS	AS APPLICABLE		
	LOCATION	<input type="checkbox"/> BACK <input type="checkbox"/> BOTTOM <input checked="" type="checkbox"/> AS REQUIRED		
ACCESSORIES	NAME PLATE / METAL TAG	SS		
	MOUNTING	<input type="checkbox"/> WALL <input checked="" type="checkbox"/> PIPE – U CLAMPS & BOLTS <input type="checkbox"/> PANEL / RACK <input type="checkbox"/> AS REQUIRED		
	OTHER	AS PER ENCLOSED DIAGRAM OR CUSTOMER SPECIFICATION		
NAME				NAME
SIGNATURE				SIGNATURE
DATE				DATE



DATA SHEET FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE

SPECIFICATION NO.:

VOLUME

SECTION

REV. NO.

DATE:

SHEET 1 OF 2

TAG No. Qty.....

Data Sheet No.: **PE-DC-999-145-I026**

Data Sheet C

DATA SHEET-C FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE
(TO BE FILLED BY CONTRACTOR AFTER AWARD OF CONTRACT)

GENERAL	MANUFACTURER			
	MODEL NUMBER			
TECHNICAL	PRESSURE ELEMENT			
	MATERIAL			
	ENCLOSURE			
	DIAL			
	CASE			
	ADJUSTMENT			
	MOUNTING			
	OVER RANGE PROTECTION			
	BLOW OUT DISC			
	SETTING RANGE			
	PERFORMANCE	ACCURACY		
CONNECTION	PROCESS			
	LOCATION			
ACCESSORIES	NAME PLATE / METAL TAG			
	MOUNTING			
	OTHER			
NAME SIGNATURE DATE				NAME SIGNATURE DATE



CHECK LIST FOR PRESSURE / DIFFERENTIAL PRESSURE GAUGE (MECHANICAL AUXILIARY PACKAGES)

SPECIFICATION NO.:

VOLUME

SECTION

REV. NO.

00

DATE:

SHEET

SL NO	TESTS/CHECKS	QUANTM OF CHECK	REFERENCE DOC. ACCEPTANCE NORMS	AGENCY			REMARKS
				P	W	V	
1.0	CHECK FOR		APPROVED TECHINCAL REQUIREMENT/ DATA SHEET				MFR TO CARRY OUT ROUTINE TEST ON 100%. WHEN MATL CORELATION ARE NOT AVAILABLE MFR'S COMPLIANCE TO BE PROVIDED
	1.1 DIAL SIZE	100%		M	C	C	
	1.2 MODEL NO/TAG NO	100%		M	C	C	
	1.3 RANGE/SCALE	100%		M	C	C	
	1.4 END CONNECTION	100%		M	C	C	
	1.5 SWITCH CONTACT RATING & NOS	100%		M	C	C	
2.0	CALIBRATION						
	2.1 ACCURACY	100%		M	C	B	
	2.2 REPEATABILITY (FOR SWITCH)	100%		M	C	B	
	2.3 SET POINT ADJUSTMENT FOR SWITCH	100%		M	C	C	
3.0	OVER PRESSURE & LEAK TEST	100%		M	C	C	
4.0	OPERATION OF PR. RELEIF DEVICE	ONE PER TYPE		M	C	C	
5.0	REVIEW OF T.C. FOR MATERIAL OF--						
	5.1 SENSOR	FOR LOT		-	-	B	
	5.2 MOVEMENT			-	-	B	
	5.3 PROCESS CONNECTION			-	-	B	
	5.4 HOUSING			-	-	B	
6.0	REVIEW OF T.C. FOR DEGREE OF PROTECTION	TYPE TEST		-	-	B	
7.0	REVIEW OF T.C. FOR CONTACT RATING OF SWITCH	ONE PER TYPE		-	-	B	
8.0	ACCESSORIES AS APPLICABLE	100%		M	C	C	

LEGEND:

M: MANUFACTURER/ SUB CONTRACTOR, C: CONTRACTOR/ NOMINATED INSP AGENCY, B: BHEL. P: PERFORM, W: WITNESS, V: VERIFICATION.

NOTE:

CONTRACTOR TO PROVIDE COMPLIANCE CERTIFICATE FOR TESTS/CHECKS VERIFIED BY CONTRACTOR AND SUBMIT THE SAME ALONGWITH TEST CERTIFICATES TO BE VERIFIED BY BHEL.



TITLE

TYPICAL INSTALLATION DIAGRAM FOR PRESSURE GAUGE

SPECIFICATION NO. PES-145-26A

VOLUME IIB

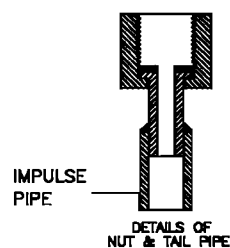
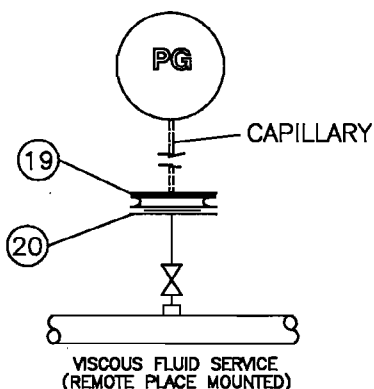
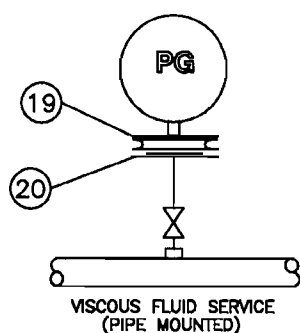
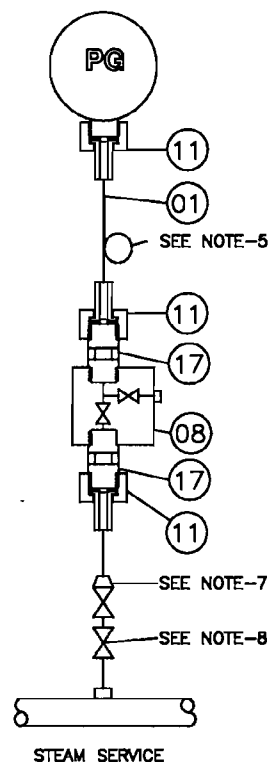
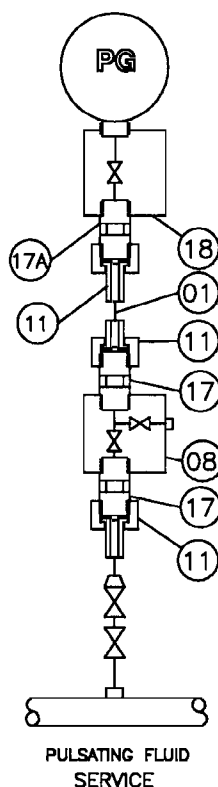
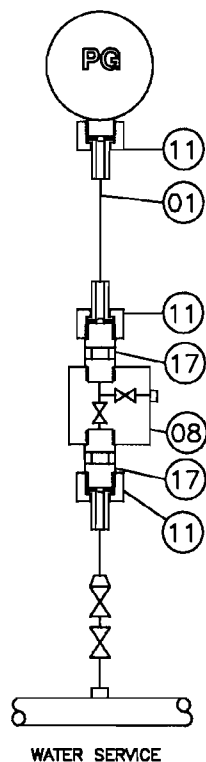
SECTION D

REV. NO. 02

DATE 20.08.97

SHEET 3

OF 4



ITEM NO	ITEM/DESCRIPTION	MATERIAL	SIZE	QTY			
				WATER	PULSATING	STEAM	VISCOUS
01	SEAMLESS STEEL IMPULSE PIPE	ASTM A106/A335	1/2" / 15NB	1.5M	1.5M	1.5M	
08	TWO VALVE 3-WAY MANIFOLD	STAINLESS STEEL SS316	1/2" NPT(F) ENDS	01	01	01	
17	MALE CONNECTOR	STAINLESS STEEL SS316	1/2" NPT(M) x M20x1.5(M)	02	02	02	
17A	MALE CONNECTOR	STAINLESS STEEL SS316	M20x1.5(M) ENDS		01		
18	SNUBBER	STAINLESS STEEL SS316	M20x1.5(F) ENDS		01		
19	CHEMICAL SEAL	STAINLESS STEEL SS316	2" ANSI 300				01
20	MATING FLANGE	ASTM A105	2" ANSI 300				02
11	M20x1.5 SS NUT WITH ANNEALED COPPER WASHER & 100mm LONG TAIL PIPE TO SUIT 1/2" NB PIPE	STAINLESS STEEL SS316	M20x1.5x 1/2" NB	03	03	03	



TITLE

TYPICAL INSTALLATION DIAGRAM FOR PRESSURE GAUGE

SPECIFICATION NO. PES-145-26A

VOLUME IIB

SECTION D

REV. NO. 02 DATE 20.08.97

SHEET 4 OF 4

NOTES :-

- IMPULSE PIPES SHALL BE OF SEAMLESS AND ANNEALED CARBON STEEL OR ALLOY STEEL (CONFORMING TO ANSI B36.10) IN LINE WITH THE MAIN PIPE MATERIAL. STAINLESS STEEL TUBES SHALL BE USED FOR ANALYTICAL MEASUREMENTS.
- ALL IMPULSE PIPES AND FITTINGS SHALL BE OF RATING TO SUIT THE ASSOCIATED PROCESS PARAMETERS IN THIS REGARD THE GENERAL GUIDELINES ARE GIVEN BELOW

SERVICE	IMPULSE PIPE		PIPE FITTINGS	
	MATERIAL	SCHEDULE	MATERIAL	CLASS
i) MAINSTM/HP BYPASS UPSTREAM/ UPSTREAM OF AUX PRDS FROM MS	SA335 Gr P22	SCH.160	ASTM A182 Gr F22	6000
ii) FEED & SPRAY WATER	SA106 Gr C	SCH.160	ASTM A105	6000
iii) HRH/ LP BYPASS STEAM	SA335 Gr P22	SCH.80	ASTM A182 Gr F22	6000
iv) CRH TILL HPBP/HPBP DOWN STREAM/ EXTRN TO HPH5	SA106 Gr B	SCH.40	ASTM A105	3000
v) CRH LINE AFTER HPBP/EXTRN/ HEATER DRAINS/CONDENSATE AND OTHER LOW PRESS LINES	SA106 Gr B	SCH.40	ASTM A105	3000

- PIPE FITTINGS SHALL BE OF FORGED MATERIAL CONFORMING TO ANSI B16.11-1991.
- SNUBBER SHALL BE PROVIDED FOR PUMP DISCHARGE PRESS MEASUREMENTS AND CHEMICAL SEAL DIAPHRAGM FOR HEAVY FUEL OIL SERVICES.
- IN CASE OF STEAM SERVICE SYPHON SHALL BE MADE BY BENDING THE TUBE OR PIPE.
- VALVE MANIFOLDS & SNUBBER SHALL BE OF FORGED SS-316.
- 25NB x 15NB WELDED REDUCER SHALL BE USED FOR ROOT VALVE OF 25NB SIZE.
- ROOT VALVES AND REDUCERS (IF APPLICABLE) SHALL BE IN THE SCOPE OF AGENCY SUPPLYING THE MAIN PIPE/EQUIPMENT. THE SELECTION CRITERIA FOR ROOT VALVES SHALL BE AS FOLLOWS :-

OPERATING PRESS Kg/Cm2	OPERATING TEMP DEG. C	SIZE NB	BODY MATERIAL	QUANTITY NOs.
< 40	< 425	15	FCS	01
40-60	< 425	15	FCS	02
> 60	< 425	25	FCS	02
--	> 425	25	FAS	02

- INSTALLATION FOR DIFF. PRESS GAUGE SHALL BE SIMILAR TO PRESS GAUGE EXCEPT THE FOLLOWING
 - IT SHALL HAVE TWO LIMBS FOR PROCESS CONNECTIONS AND EACH CONNECTION SHALL BE SIMILAR TO THAT SHOWN FOR PRESS GAUGE
 - IT SHALL HAVE FIVE VALVE MANIFOLD IN PLACE OF THREE WAY MANIFOLD



DATA SHEET FOR ROTAMETER (Variable Area Type)

SPECIFICATION NO.:

VOLUME

SECTION

REV. NO.

DATE:

SHEET

1

OF


2

Data Sheet No.: PE-DC-999-145-I 010-01

TAG No. GDB01CF501, GDB02CF501, GDB03CF501, GDB04CF501, GDB05CF501, GDB06CF501, GDB07CF501, GDB08CF501, GDB09CF501, GDB10CF501, GDB11CF501, GDB12CF501

Data Sheet A & B

Sr. No.	DESCRIPTION	DATA SHEET-A (To be filled by DE)	DATA SHEET-B (To be filled by Vendor)
1	GENERAL		
	Service		
	Tag No		
2	PROCESS PARAMETERS		
	Line Specifications (Specifications (OD x Thk)219x6.35.....	
	Process Fluid	<input checked="" type="checkbox"/> Cooling Water <input type="checkbox"/> Air <input type="checkbox"/> Gas	
	Direction of Flow	<input type="checkbox"/> Horizontal <input type="checkbox"/> Vertical (Upward) <input checked="" type="checkbox"/> Vertical (Downward)	
	Operating / Max Press Kg/Cm ²7.0..... /10.0.....	
	Operating / Max Temp, °C /60.....	
	Normal / Max Flow, M ³ /HR150..... / ...200.....	
	Flow Range, M ³ /HR0--200.....	
	Test Pressure (Hydraulic)	<input checked="" type="checkbox"/> Twice the Maximum Pressure	
3	Manufacturer	Bidder to specify	
4	Model No	Bidder to specify	
5	TECHNICAL		
	Type	<input type="checkbox"/> Online <input checked="" type="checkbox"/> Bypass	
	Body	<input type="checkbox"/> Glass Tube <input checked="" type="checkbox"/> Metal Tube	
	End Connections	<input type="checkbox"/> Screwed with necessary fittings <input checked="" type="checkbox"/> Flanged with counter Flanges, Gaskets, and Fasteners.	
	Accuracy	(+) / (-) 2% of Span	
	Rangeability	<input type="checkbox"/> 10 to 1 <input type="checkbox"/> 7 to 1 <input checked="" type="checkbox"/> 5 to 1 <input type="checkbox"/> 3 to 1	
	Encl. Class (Indicator)	<input checked="" type="checkbox"/> IP-55 <input type="checkbox"/>(other)	
	Alarm Contact	<input type="checkbox"/> Required <input checked="" type="checkbox"/> Not Required <input type="checkbox"/> Direct <input type="checkbox"/> Through Relay	
	Relay Mounting	<input type="checkbox"/> Near Rotameter <input type="checkbox"/> Remote	
	Type of Contact	<input type="checkbox"/> Potential Free <input type="checkbox"/> Proximity Type	
	Contact Configuration	<input type="checkbox"/> One <input type="checkbox"/> Two <input type="checkbox"/> SPDT	
	Contact Rating	<input type="checkbox"/> 5 Amp 240 V. AC <input type="checkbox"/> 0.2 Amp 220 V. DC <input type="checkbox"/> 0.2 Amps 24V DC <input type="checkbox"/>	
	<u>Repeatability</u>	<u>+ 1%</u>	
	Relay Coil Voltage	<input type="checkbox"/> 240 VAC <input type="checkbox"/> 110 VAC <input type="checkbox"/> 220 VDC <input type="checkbox"/> 24 VDC <input type="checkbox"/>(other)	
	Material:		
	a. Metering Tube	<input type="checkbox"/> Borosilicate <input checked="" type="checkbox"/> Toughened Glass <input type="checkbox"/> SS-316	
	b. Vetted Parts	<input checked="" type="checkbox"/> SS-316	
	c. Scale	<input checked="" type="checkbox"/> SS-316 <input type="checkbox"/> Acrylic	
	d. Name Plate	<input checked="" type="checkbox"/> SS-316	
	e. Engraving fill colour	<input checked="" type="checkbox"/> Red <input type="checkbox"/> Black	
	e. Rotameter Flange with mating Flanges	<input checked="" type="checkbox"/> SS-316 <input type="checkbox"/> SS-304 <input type="checkbox"/> CS	
	f. Gasket	<input checked="" type="checkbox"/> Neoprene <input type="checkbox"/> Teflon	

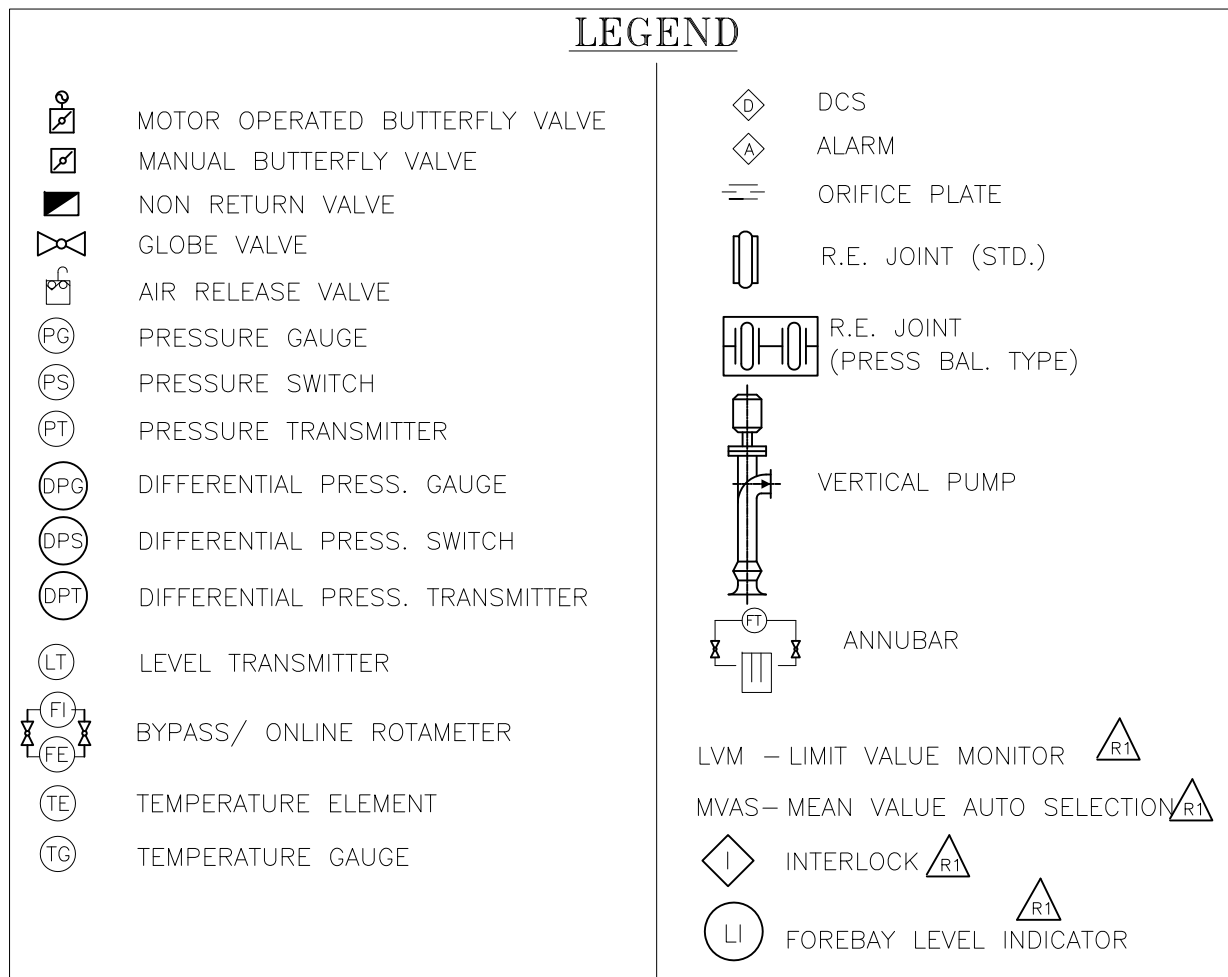
	DATA SHEET FOR ROTAMETER (Variable Area Type)	SPECIFICATION NO.:	
		VOLUME	
		SECTION	
		REV. NO.	DATE:
		SHEET 2	OF 2

Data Sheet No.: **PE-DC-999-145-I 010-01**

TAG No. GDB01CF501, GDB02CF501, GDB03CF501, GDB04CF501, GDB05CF501, GDB06CF501, GDB07CF501, GDB08CF501, GDB09CF501, GDB10CF501, GDB11CF501, GDB12CF501

Data Sheet A & B

Sr. No.	DESCRIPTION	DATA SHEET-A (To be filled by DE)	DATA SHEET-B (To be filled by Vendor)
6	Colour	<input checked="" type="checkbox"/> Vendor's standard <input type="checkbox"/> (other)	
7	Direction of Flow to be marked on Rotameter	<input checked="" type="checkbox"/> YES	
8	Pressure Drop	Bidder to specify	
9	Permanent Pressure Loss across Main Orifice (Kg/CM2)	<input checked="" type="checkbox"/> ...0.15 (Max).....	
10	Straight Length Requirement At the inlet of Rotameter At the inlet of Orifice Assy.	Bidder to specify Bidder to specify	
11	Installation Diagram	<input checked="" type="checkbox"/> Required	
12	Additional Requirements for Bypass type Rotameter	<input checked="" type="checkbox"/> Applicable <input type="checkbox"/> Not Applicable	
	Main line Orifice Assy	<input checked="" type="checkbox"/> Flanged BW (weld neck) <input type="checkbox"/> Flanged SW	
	Main line Orifice Flange Assembly	<input type="checkbox"/> With carrier Ring <input checked="" type="checkbox"/> without Carrier Ring <input type="checkbox"/> Without Carrier Ring with extension pipes welded on Both sides of the flange.	
	Standard for Flanges	<input type="checkbox"/> ANSI 16.36 <input type="checkbox"/>(other)	
	ANSI Rating of Flanges	<input type="checkbox"/> # 150 <input type="checkbox"/> # 300 <input type="checkbox"/> # 600 <input type="checkbox"/> # (other)	
	Orifice design standard	<input checked="" type="checkbox"/> BS-1042 <input type="checkbox"/>(other)	
	Beta Ratio	<input checked="" type="checkbox"/> 0.4 to 0.7 <input type="checkbox"/>(other)	
	DP across Orifice	Bidder to specify	
	Orifice Tapings	<input type="checkbox"/> on Carrier Rings <input type="checkbox"/> on Flanges <input type="checkbox"/> on D & D/2 of extension pipe	
	Range Orifice	<input checked="" type="checkbox"/> Required <input type="checkbox"/> Not Required	
	Direction of Flow on Flange Assy & orifice plate	<input checked="" type="checkbox"/> Marking Required	
	Mounting Bracket / Rack	Required	
	Main Orifice Flange material	<input type="checkbox"/> SS-316 <input type="checkbox"/> SS-304 <input checked="" type="checkbox"/> CS	
	Bypass Tubing material	<input type="checkbox"/> SS-316 <input type="checkbox"/> SS-304 <input checked="" type="checkbox"/> CS	
	Orifice material	<input checked="" type="checkbox"/> SS-316 <input type="checkbox"/> SS-304 <input type="checkbox"/>(other)	
	Isolating valves size	<input checked="" type="checkbox"/> 15NB <input type="checkbox"/> 20 NB <input type="checkbox"/> 25 NB].....(other)	
	Isolating valves Rating	<input checked="" type="checkbox"/> # 800 <input type="checkbox"/> # 1500 <input type="checkbox"/> # 2500].....(other)	
	End to End dimension of Orifice assembly	Bidder to specify	
	Weight of Orifice assembly	Bidder to specify	
			Signature with Date and Seal of the Vendor



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	77100	77100	3.13	9.79	
2	VACUUM PUMPS OF ONE UNIT	1 + 1	100	100 200	3.5	2.0	*DURING START UP BOTH PUMPS WORK.
3	PHE'S (TG AUX) OF ONE UNIT	2 + 1	1121	2242	7.0	7.2	
3	PHE'S (SG AUX) OF ONE UNIT	1 + 1	718	718	7.0	8.7	

NOTES:

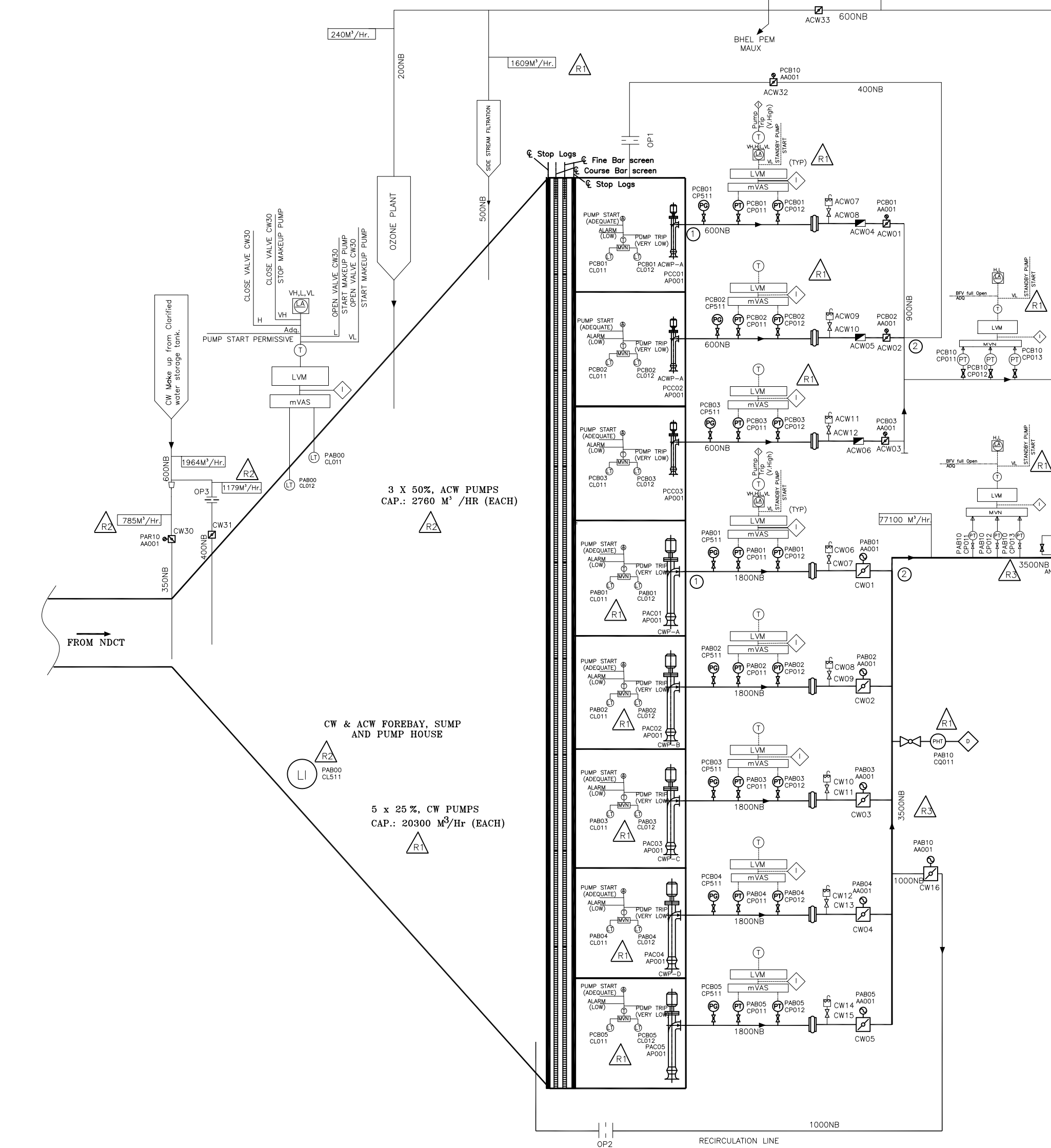
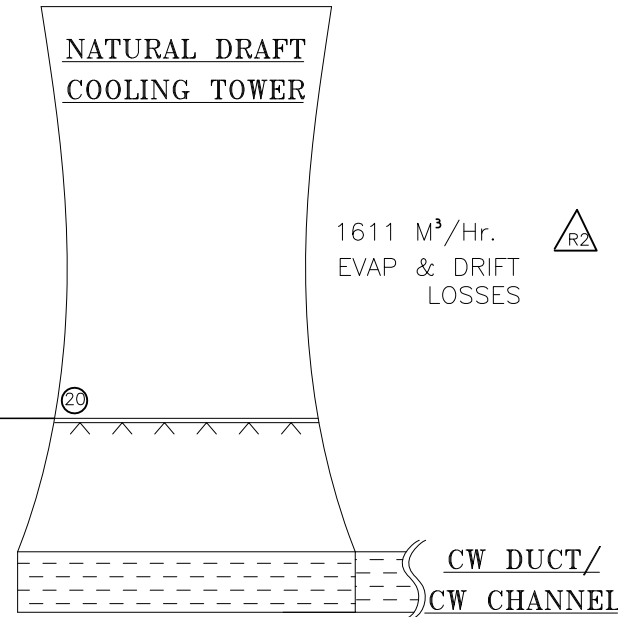
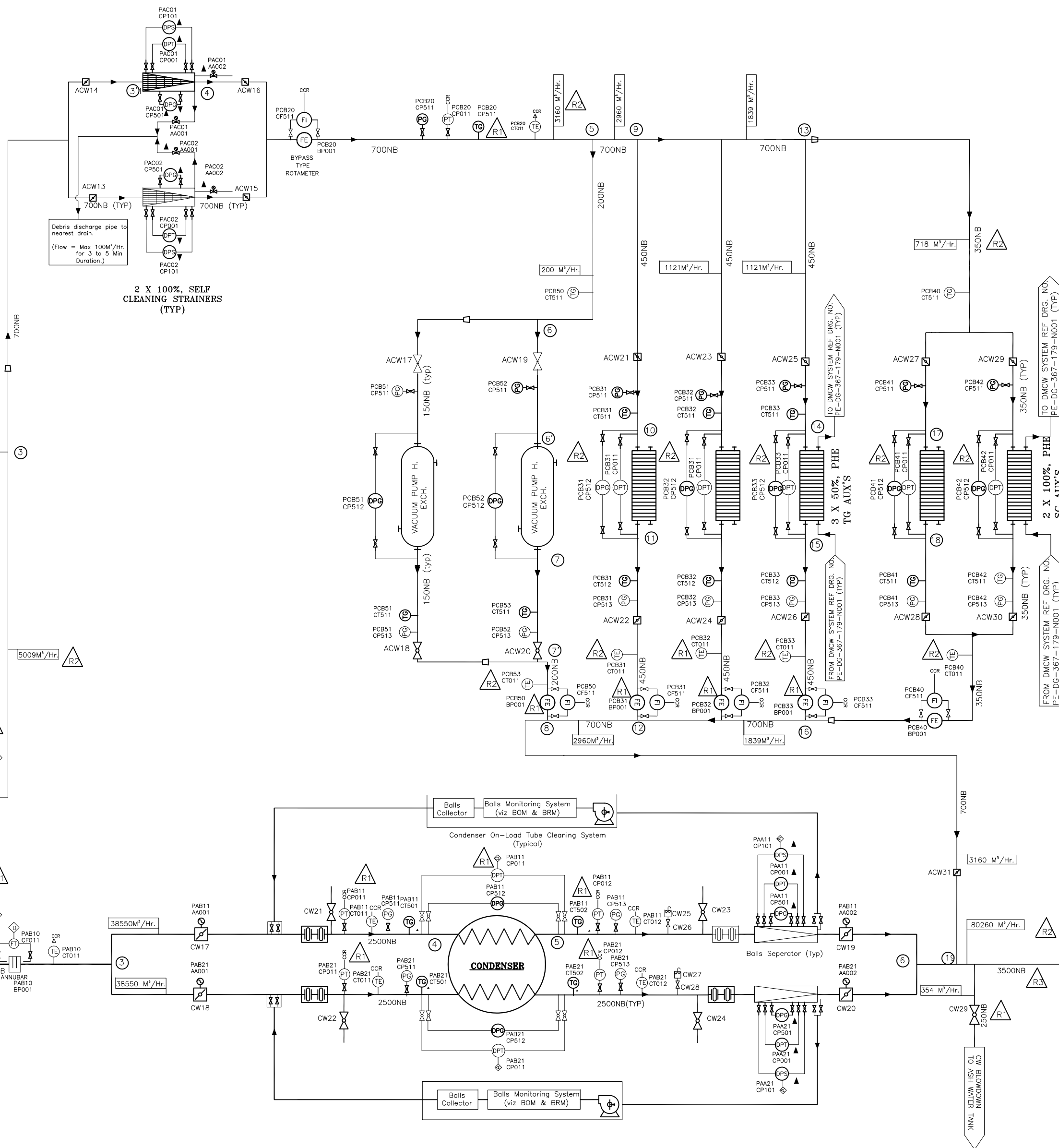
- DESIGN PRESSURE : 5.0 Kg/sq.cm (g) FOR C.W.SYSTEM,
DESIGN PRESSURE : 7.5 Kg/sq.cm (g) FOR A.C.W.SYSTEM,
DESIGN CW INLET TEMP. TO CONDENSER AND VACUUM PUMPS= 32 °C
DESIGN ACW INLET TEMP. TO PHE'S = 36 °C
DESIGN MECHANICAL TEMPERATURE : 50 °C
- MATERIALS OF CONSTRUCTION (PIPEWORK):**
 - PIPING UPTO & INCLUDING 50NB SHALL BE OF SS CONFORMING TO ASTM-A-312 GR.316 SCH. 40S
 - PIPING FROM 65 NB TO 150NB(INCLUDING) SHALL BE OF SS CONFORMING TO ASTM-A-312 GR.316 SCH. 10S
 - PIPING 200 NB AND ABOVE SHALL BE CARBON STEEL ROLLED AND WELDED AS PER IS:3589 FROM CS PLATES AS PER IS:2062 WITH PU (POLYURETHANE) COATING INTERNALLY (POLYURETHANE) COATING INTERNALLY WITH MIN. 2MM DFT AS PER AWWA-C-222.
- ALL PRESSURE TAPPINGS & ROOT VALVES TO BE OF 15 NB.
- DRAIN VALVES : (A) 150 NB SIZE SHALL BE PROVIDED FOR CW SYSTEM AS PER LAYOUT REQUIREMENTS.
(B) 50 NB SIZE SHALL BE PROVIDED FOR ACW SYSTEM FOR PIPE SIZES 400 NB & ABOVE AND 25 NB FOR PIPE SIZES UPTO 350 NB AS PER LAYOUT REQUIREMENTS.
VENT VALVES : (A) 150 NB SIZE SHALL BE PROVIDED FOR CW SYSTEM AS PER LAYOUT REQUIREMENTS.
(B) 50 NB SIZE SHALL BE PROVIDED FOR ACW SYSTEM FOR PIPE SIZES 400 NB & ABOVE AND 25 NB FOR PIPE SIZES UPTO 350 NB AS PER LAYOUT REQUIREMENTS.
- INSTRUMENTS MARKED (▲) THUS SHALL BE SUPPLIED ALONGWITH THE EQUIPMENTS.
- PAINTING/ PROTECTION – PIPES :**
 - EXTERNAL SURFACE – OVERGROUND PIPING.
 - SURFACE CLEANING BY SAND BLASTING/ WIRE BRUSH.
 - APPLICATION OF TWO COAT OF RED OXIDE ZINC CHROMATE PRIMER (CONFORMING TO IS 2074) WITH MIN DFT OF 25 MICRONS PER COAT FOLLOWED BY 2 COATS OF FINISH PAINTS USING ENAMEL PAINT TO GIVE A MIN TOTAL DFT OF 100 MICRONS. (AFTER TWO COATS OF PRIMER & TWO COATS OF FINISH PAINT) SHADES BE AS PER IS5.
 - CW PIPES SHALL BE ENCASED IN RCC WITH MINIMUM THICKNESS OF 250 mm WITH REINFORCEMENT.
- REFERENCE DRAWINGS :**
 - CW & ACW SYSTEM DESIGN PHILOSOPHY AND SYSTEM WRITEUP – DRG. NO. PE-DC-367-165-N002
 - COLTCS FLOW DIAGRAM – DRG. NO. PE-V2-367-165-N001
 - SCS FLOW DIAGRAM – DRG. NO. PE-V4-367-165-N001
- PEM DOCUMENTS :**
 - CW & ACW SYSTEM DESIGN PHILOSOPHY AND SYSTEM WRITEUP – DRG. NO. PE-DC-367-165-N002
- PUMP BEARING TEMPERATURE REMOTE MEASUREMENT/INTERLOCK/PROTECTION SHALL BE PROVIDED FOR CWP AS PER DESIGN PHILOSOPHY.
- CWP SHALL BE PROVIDED WITH BEARING VIBRATION SWITCH/DEVICE FOR INTERLOCK/PROTECTION OF PUMP/MOTOR AS PER DESIGN PHILOSOPHY.
- RECIRCULATING VALVE OPERATION IS ENVISAGED FOR INITIAL COMMISSIONING & DURING MAINTENANCE SINCE NO OPERATION IS ENVISAGED DURING NORMAL RUNNING THUS NO CONTROL/LOGIC IS ENVISAGED FOR NORMAL RUNNING.
- INSTRUMENTS SHOWN IN THE PID ARE ADEQUATE FOR PADO PACKAGE.

Pipe Sizes for carbon Steel Pipes

Pipe Size (NB)	OD (mm)	THK. (mm)
200	219.1	6.35
350	355.6	7.1
400	406.4	7.1
450	457	7.1
500	508	8.0
600	610	8.0
700	711.0	10.0
900	914	10.0
1000	1016	10.0
1800	1829	16
2500	2540	20
3450	3494	22

PIPE SIZES OF SS PIPING

NB	OD	THICK.
25	33.4	3.38
40	48.26	3.68
50	60.33	3.91
65	73.03	3.05
150	168.28	3.4



KARNATAKA POWER CORPORATION LIMITED
BELLARY TPS UNIT # 3, 1X 700MW

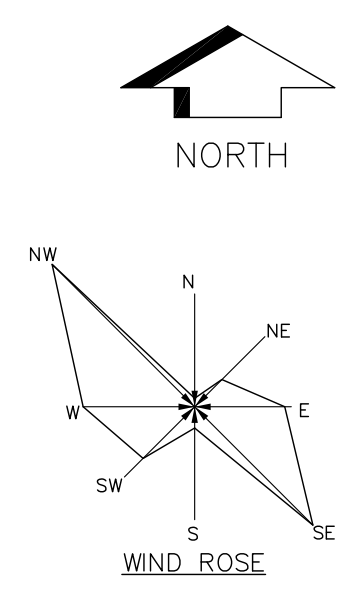
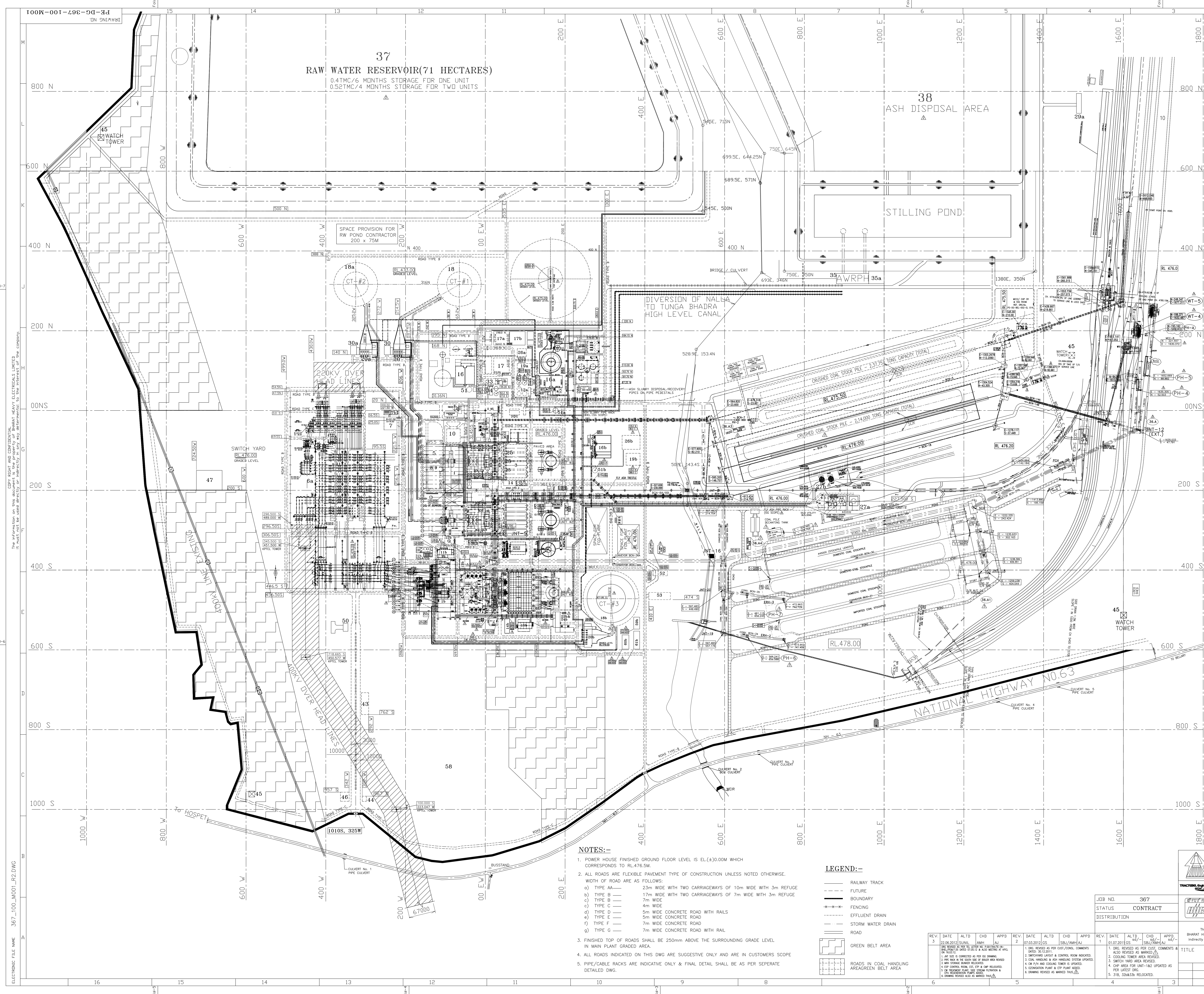
TRACTEBEL ENGINEERING
Consultant

TRACTEBEL ENGINEERING Pvt. Ltd.
POWER SECTOR
PROJECTS ENGINEERING MANAGEMENT
NEW DELHI

BHARAT HEAVY ELECTRICALS LTD.
DEPT. NAME SIGN DATE
CHD JLR 14.01.11
CHD A.J. 14.01.11
APRO P.K. 14.01.11

P&ID OF CW & ACW SYSTEM

DRAWING NO. PE-DC-367-165-N001
SHEET 01 OF 01 REV. 03



- 1.b. TG BUILDING
- 2.b. BOILER HOUSE
- 3.b. ELECTROSTATIC PRECIPITATOR
- 4.b. CHIMNEY
- 5.b. TRANSFORMER YARD
- 6.b. SWITCH YARD (including 220KV extension)
- 7.b. SWITCH YARD CONTROL BUILDING
- 8.b. DIESEL GENERATOR HOUSE
- 9.b. AIR WISHER UNIT (4.5M FLOOR)
- 10. TECHNICAL OFFICE & WORKSHOP INCLUDING FIRST AID CENTER (COMMON FOR U-1,2&3)
- 11.b. COMPRESSOR HOUSE (FOR UNIT-3)
- 12.b. CONDENSATE STORAGE TANK, CONDENSATE TRANSFER PUMP, BOILER FILL PUMPS & CPU REGENERATION PUMPS.
- 13.b. A/C PLANT ROOM FOR TG BUILDING
- 14.b. VACUUM PUMP HOUSE & TRANSPORT AIR COMPRESSOR HOUSE
- 15.b. ESP/VFD CONTROL ROOM
- 16.b. CLARIFIED WATER PUMP HOUSE/RESERVOIR
- 17.b. RO/DM BUILDING
- 18.b. COOLING TOWER No.-3
- 19.b. CMB (unit-3)
- 20.b. COOLING WATER PUMP HOUSE, ACW PUMP HOUSE,
- 21.b. AIR STORAGE BUNKER.
- 22.b. ASH HANDLING UNIT
 - (a) ASH WATER & ASH SLURRY PUMP HOUSE
 - (b) ASH WATER & ASH SLURRY SUMP
 - (c) GLARIFLOCCULATOR & CLEAR-WELL FOR ASH-POND-RECOVERY-WATER & CHEMICAL-HOUSE-TRANSPORT-AIR-COMPRESSOR-HOUSE.
 - (d)
- 23. FUEL OIL TANK AREA (common for U 1,2&3)
- 24.b. (a) ASH SLURRY PUMP HOUSE/ELECTRICAL SWITCHGEAR & CONTROL ROOM
- (b) ASH SLURRY SUMP
- 25.b. BAG FILTER/BUFFER HOPPERS/METING HEAD/COLLECTOR TANK-TOWER
- 26. EFFLUENT TREATMENT PLANT AREA (unit-3)
- 27.b. FLY ASH SLO/UTILITY BUILDING
- 28.b. LDO UNLOADING & LDO/HFO PRESSURISING & HEATING FACILITIES
 - (a) P & H UNIT
 - (b) MCC/CP ROOM
 - (c) UNLOADING AREA FOR ROAD TANKERS. (common for U 1&2)
 - (d) LDO UNLOADING PUMPS. (common for U 1&2)
 - (e) FOAM HOUSE ETC.
- 29.a. H.F.O. UNLOADING PUMP HOUSE/ FACILITIES (common for U 1&2)
- 30.b. CW-CHLORINATION & ABSORPTION-SYSTEM. (PL REFER SL.No.59)
- 31.b. ACID/ALKALI STORAGE
- 32.b. NEUTRALIZING PIT
- 33.b. CPU REGENERATION BUILDING (Unit-3)
- 34.b. DM STORAGE TANK, DM PUMP HOUSE
- PUMP HOUSE IS TO ACCOMMODATE UNIT-3 DM & CPU/MB REGENERATION PUMPS)
- 35.a. ASH WATER RECOVERY PUMP HOUSE (Common for U 1&2)
- 36.A. COAL HANDLING PLANT
- 36.A.1. COAL STOCK YARD WITH GARLAND DRAINS.
- 36.A2. COAL PILE RINOFF PIT WITH DECONTATION TANK & PUMPS.
- 36.A.3. BULDOZER SHED FOR UNIT-1
- 36.A.4. BULDOZER SHED FOR UNIT-3
- 50. FIRE STATION (Common for U 1&2)
- 51.b. SERVICE WATER OVERHEAD TANK
- 52. ROAD WEIGH BRIDGE/CONTROL ROOM (Common for U 1&2)
- 53. WARE HOUSE & CHEMICAL WAREHOUSE PLANT (EXISTING).
- 55.A. RAW WATER PUMP HOUSE & PIPING
- (RAW WATER PUMP HOUSE Common for U 1&2. ONLY 3 PUMPS, PIPING, MCC & TR. NEED TO BE PROVIDED)
- 56.b. FIRE WATER BOOSTER PUMP HOUSE. (NOT REQUIRED)
- 57.b. FIRE WATER PUMP HOUSE/TANKS - DELETED AS IT IS COVERED IN 16b
- 59b. OZONISATION PLANT
- 60b. CW TREATMENT PLANT
- 61b. SIDE STREAM STEAM FILTRATION.

CUSTOMER SCOPE (EXISTING):

- 37. RAW WATER RESERVOIR
- 38. ASH DISPOSAL AREA
- 39. RAILWAY SIDING / RAIL TRACK
- 40. CANTEN
- 41. GUEST-HOUSE/DORMITORY
- 42. ADMIN-BUILDING-WITH-CONFERENCE-BANK & POST-OFFICE
- 43. PARKING AREA
- 44. SECURITY
- 45. WATCH TOWER
- 46. GATE HOUSE
- 47. 66/11 kV SUBSTATION
- 48. DEVELOPMENT OF GREEN BELT
- 58. COLONY

NOTES:-

- 1. POWER HOUSE FINISHED GROUND FLOOR LEVEL IS EL.(+3)0.00M WHICH CORRESPONDS TO RL 476.5M
- 2. ALL ROADS ARE FLEXIBLE PAVEMENT TYPE OF CONSTRUCTION UNLESS NOTED OTHERWISE. WIDTH OF ROAD ARE AS FOLLOWS:
 - a) TYPE AA 23m WIDE WITH TWO CARRIAGEWAYS OF 10m WIDE WITH 3m REFUGE
 - b) TYPE B 17m WIDE WITH TWO CARRIAGEWAYS OF 7m WIDE WITH 3m REFUGE
 - c) TYPE C 7m WIDE
 - d) TYPE D 4m WIDE
 - e) TYPE E 5m WIDE CONCRETE ROAD WITH RAILS
 - f) TYPE F 5m WIDE CONCRETE ROAD
 - g) TYPE G 7m WIDE CONCRETE ROAD
 - h) TYPE H 7m WIDE CONCRETE ROAD WITH RAIL
- 3. FINISHED TOP OF ROADS SHALL BE 250mm ABOVE THE SURROUNDING GRADE LEVEL IN MAIN PLANT GRADED AREA.
- 4. ALL ROADS INDICATED ON THIS DWG ARE SUGGESTIVE ONLY AND ARE IN CUSTOMERS SCOPE
- 5. PIPE/CABLE RACKS ARE INDICATIVE ONLY & FINAL DETAIL SHALL BE AS PER SEPERATE DETAILED DWG.

LEGEND:-

- RAILWAY TRACK
- FUTURE
- BOUNDARY
- FENCING
- EFFLUENT DRAIN
- STORM WATER DRAIN
- ROAD
- GREEN BELT AREA
- ROADS IN COAL HANDLING AREA GREEN BELT AREA

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD
1	07.06.2013				1	07.03.2013				1	07.03.2013			
1. DRC. REVERSED AS PER CUST. COMMENTS														
2. SWITCHELAY LAYOUT & CONTROL ROOM INDICATED														
3. COOLING TOWER AREA REVERSED														
4. COAL HANDLING & ASH HANDLING SYSTEM UPDATED														
5. COAL PILE AND COOLING TOWER IS UPDATED														
6. COAL PILE AREA FOR UNIT-1&2 UPDATED AS PER LATEST DRC.														
7. DRAINING REVERSED AS MARKED THIS														

JOB NO.	367
STATUS	CONTRACT
DISTRIBUTION	

KARNATAKA POWER CORPORATION LIMITED
BELLARY TPS, UNIT-3 1x700MW

TRACTEBEL ENGINEERING PVT. LTD
CONSULTANT

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

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DEPT	DES	NAME	SIGN	DATE
DEPT	DES	AMH/SSJ	56/-	09.03.2013
CHD	AM	HUSSAIN	56/-	09.03.2013
APPD	ANIL	JOSEPH	56/-	09.03.2013

TITLE
PLOT PLAN

SCALE 1:3000
DRAWING NO. PE-DG-367-100-M001
SHEET 1 OF 1
REV. 3

367-100-M001-R2.DWG



TITLE:

**TECHNICAL SPECIFICATION FOR
SIDESTREAM FILTRATION PLANT
1X700 MW BELLARY -3 STPP**

BHEL DOCUMENTS NO.: PE-TS-367-181-A001

VOLUME **III**

SECTION -

REV. NO. 0

DATE: 26/07/12

LIST OF SCHEDULES



TITLE:
**TECHNICAL SPECIFICATION FOR
SIDESTREAM FILTRATION PLANT
1X700 MW BELLARY -3 STPP**

BHEL DOCUMENTS NO.: PE-TS-367-181-A001

VOLUME **III**

SECTION -

REV. NO. 0

DATE: 26/07/12

SUGGESTIVE PRICE FORMAT FOR SIDE STREAM FILTRATION PLANT (1X700 MW BELLARY -3 STPP).

SI. No.	DESCRIPTION OF EQUIPMENT / ITEM	QTY.	UNIT PRICE EX- WORKS (DULY PACKED)	TOTAL PRICE EX- WORKS (DULY PACKED)
(1)	(2)	(3)	(4)	(5)
(A) 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 for the total scope defined as per BHEL Technical specification PE-TS-367-181-A001 for 1X700 MW BELLARY -3 STPP .			
	NOTES:			
a.	Bidder to note that total price indicated above at 1.0 shall be considered for evaluation and hence should be complete in all respect for the full scope defined and considering all terms and conditions agreed.			
b.	In case, price indicated above does not match with item wise break-up given at 2.0 , the highest price so calculated shall be considered for evaluation but in case of order, the same shall be placed at the lowest price.			
2.0	MAJOR PRICE BREAK-UPOF PRICES GIVEN IN 1.0 ABOVE			
2.1	Total lump sum price on FOR site basis 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 and ancillaries as specified in Technical specification No. PE-TS-367-181-A001 as required for safe and trouble free smooth operation .			
2.2	Total lump sum price on FOR site basis on unloading, handling, storage, and in plant transportation at site, erection, commissioning trial run the entire Side Stream Filtration Plant, as defined subsequently complete with all accessories, auxiliaries and ancillaries as specified in Technical specification No. PE-TS-367-181-A001 as required for safe and trouble free smooth operation .			
2.3	Total lump sum price on FOR site basis on performance guarantee test and handing over to Purchaser the entire Side Stream Filtration Plant as specified in Technical specification No. PE-TS-367-181-A001 as required for safe and trouble free smooth operation and as per agreement/clarifications till date.			



TITLE :

**TECHNICAL SPECIFICATION FOR
SIDE STREAM FILTRATION PLANT.
1X700 MW BELLARY -3 STPP**

BHEL DOCUMENTS NO.: PE-TS-367-181-A001

VOLUME III

REV. NO. 0 DATE 26/07/12

SHEET 1 OF 1

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.) Bidder confirms that all drawings/documents in soft as well as hard copy shall be submitted within 2 weeks from placement of LOI's in the event of order.
Within one (1) week of receipt of BHEL comments a technical representative of bidder shall come for meeting with BHEL alongwith revised documents to resolve all issues and incorporate all comments in the soft copy here for further submission to customer.
Further on receipt of customer comments on the documents a technical representative from bidder shall come for meeting to resolve all issues and incorporate all comments in the soft copy at BHEL and resubmit the drgs/documents for cat I approval and shall visit customer/customer's consultant if required for across the table approval of documents.
- i.) Any special tools & tackles, if required, shall be in bidder's scope.
- j.) Performance Guarantees shall stand valid till the satisfactory completion of performance testing and its acceptance by purchaser/customer
- k.) Prices for recommended spares (if any) for three year operation shall be furnished separately and not to be included in the base price.

BHEL – PS - PPEI: NOIDA, SECTOR-16A, U.P. – 201301.



TITLE:
SCHEDULE OF DEVIATIONS:
() From Conditions of Contract (Volume-I)
() From General Technical Conditions (Volume-IIA)
() From Technical Specification (Volume-IIB)

SPECIFICATION NO. PE-TS-367-181-A001
VOLUME III
SECTION
REV. NO. DATE:
SHEET of

SCHEDULE OF CLARIFICATIONS/DEVIATIONS

All clarification/deviations 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

NOTE: Bidder to furnish the specification clause no. against which the deviation is sought. No general deviation (without mention of the specification clause no.) shall be entertained and the same shall be treated as null and void.

We the undersigned hereby certify that the above mentioned are the only deviations.

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE.

NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

	TITLE * SCHEDULE OF DECLARATIONS	SPECIFICATION NO. PE-TS-367-181-A001. VOL III SHEET..... OF.....
	<p>* Bidder shall include this schedule both in technical and Price offers</p> <p style="text-align: center;">DECLARATION</p> <p>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.</p> <p>I hereby certify that I am duly authorized representative of the Bidder's company whose name appears above my signature.</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Biders Company Name</p> <p>Authorised representative's Signature</p> <p>Name</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Bider's Name</p> </div> <div style="width: 50%; text-align: center;"> <p>The bidder hereby agrees to fully comply with the requirements and intent of this specification for the price indicated</p> </div> </div> </div> </div>	

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