An ISO 9001 Company

Bharat Heavy Electricals Limited

(High Pressure Boiler Plant**)**
Tiruchirappalli – 620014, TAMIL NADU, INDIA
MATERIALS MANAGEMENT / CAPITAL EQUIPMENT

ENQUIRY	Phone: +91 431 257 79 38 Fax : +91 431 252 07 19 Email : tvenkat@bheltry.co.in Web : www.bhel.com

	Enquiry Number:	**Enquiry Date:**	**Due date for submission of quotation:**
	2620800097	**15.10.2008**	**19.11.2008**
You are requested to quote the Enquiry number date and due date in all your correspondences. This is only a request for quotation and not an order			

Item	**Description**	**Quantity**	**Delivery (Item required at BHEL on)**
10	Online Self Cleaning Filters of 500 cum/hr capacity to improve the Water Quality as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	1 Set	30.06.2009

BHEL commercial terms & conditions with Price Bid and Bank Guarantee formats can be downloaded from BHEL web site http://www.bhel.com or from the Government tender website http://tenders.gov.in (public sector units > Bharat Heavy Electricals Limited page) under Enquiry reference "2620800097".

Tenders should reach us before 14:00 hours on the due date Tenders will be opened at 14:30 hours on the due date Tenders would be opened in presence of the tenderers who have submitted their offers and who may like to be present	Yours faithfully, For **BHARAT HEAVY ELECTRICALS LIMITED** Manager / MM / Capital Equipment

Bharat Heavy Electricals Limited

Tiruchirappalli – 620 014 ,

Tamilnadu,

INDIA

Technical Specification

for

On line Self Cleaning Filters

(Pre-filtration by 25 microns

+Final filtration by 2 microns)

for

Drinking Water

INDEX:

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I) WATER SUPPLY IN BHEL CAMPUS

Information to tenderers

Present Water Supply

Water requirement of Factory and Township is drawn from three head works namely Vengur, Puthapuram and Keelamullakudi, situated on the banks of river Cauvery at a distance of 5 Kms, 8 Kms, 10 Kms respectively. Water is tapped at 3.0 metres below the bed level of river and pumped to Equalizing Reservoir for temporary storage. All the three pumping mains from the head works are of cast iron 450 mm (18") in diameter. In order to balance the supply and demand, water received from head works is stored in 5 nos. of ground level storage reservoirs each of 2000 cum capacity.

Prior to pumping water to Factory and Township from equalizing reservoirs, water is chlorinated by adding liquid chlorine generated at site through electro chlorinators. All the tanks are inter connected. Incidentally the tanks act as sedimentation tanks.

Water pumped to the overhead tanks of Township and Factory is then distributed through gravity distribution lines.

Two sketches on the above is enclosed

Proposed Treatment to Water

It is planned to polish the water pumped from Equalizing Reservoirs through Online self-cleaning mechanical filters in two stages namely through 25-micron filter first and then through 2-micron filter. The polished water is stored in the 14 nos. of overhead tanks of Factory and Township for further distribution.

The filter units will be installed after the delivery mains of existing pumps at equalizing reservoir. Raw water is allowed to pass through 4 nos. of prefiltration units (stage 1 filtration) and then sent to 5 nos. (4 working + 1 stand by) of fine filtration units to treat the pollutants up to 2-micron level (stage 2 filtration). The prefiltration and fine filtration units are housed in between two header pipes. One header collects the raw water from various pumps operated in series for meeting the demand and the second header collects the treated water for subsequent diversion to respective destination Viz. Township and Factory.

Schematic P & I Diagram for the proposed arrangement of filters is enclosed

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II.Scope of work.

The scope of work of tenderer shall cover design, engineering, manufacture, assembly, testing, painting, packing, delivery, erection, commissioning, training & trial running of mechanical on line self cleaning filters for one month in BHEL, Tiruchi.

All interconnecting piping on the skid with accessories like valves, Flow meters, gauges, instruments, pumps, compressor shall be in tenderer scope all as per boundary conditions of the battery limit given in this tender. Each Filter unit should be equipped with a local control panel and all should be connected to a central control system. All electrical wirings on the skid will be done by the tenderer with copper wiring.

Tenderer should furnish a list of commissioning spares and recommended spares for 2 year normal operation for both prefilter and microfilter and also for auxiliaries. The tenderer shall submit GA drawing for approval of purchaser. On completion of engineering the tenderer shall supply O&M manual as part of the contract.

The offer should be strictly inline with the enclosed specification and any deviation in process or equipment selection from this specification shall be clearly indicated and also the objective of deviating from the specification.

III. Basic Design.

The filter shall be designed for following parameters:

. - Normal and maximum flow rate

. - Minimum Inlet Pressure

. - Filtration Degree absolute

. - Inlet TSS in mg/l or ppm

. - Minimum water used for draining / flushing

. - Cleaning Mechanism

. - Mechanical Life of screens and housing

- Control system
- Control and monitoring
- Working philosophy of filters

Normal and Maximum Flow rate: The maximum flow rate the filter should be able to handle shall be minimum 20% of the normal flow rate.

Minimum Inlet Pressure: The minimum inlet pressure provided for the filter shall be in the range of 2.5 bars. No back wash pumps shall be used for cleaning purpose

Filtration Degree absolute**:** The filter design shall be based on weave wire screen – 4 layer wherein the filtration degree to be achieved shall be by 2nd layer screen. The minimum useable area of the screen shall be 6:1 or 32% of the proposed screen area.

Inlet TSS in mg / or ppm **:** Based on the inlet TSS load the filter selection shall be done accordingly with minimum flushing cycles.
Minimum water for flushing: The water used for flushing shall not exceed 1 to 2% of the rated flow and the filter shall always deliver at the outlet of 98% of the rated flow.

Cleaning mechanism: The cleaning mechanism shall be of spring loaded suction nozzles to ensure uniform cleaning of the screen. The cleaning mechanism shall be suitable for number of flushing cycles online basis with no downtime and should be activated either by pressure differential or timer whichever is earlier.

Mechanical life of screens / filter housing: As no standby filters are envisaged for this application the functionality of the system and mechanical parameters shall be of high quality. The screens shall be in SS316L material for surface water (rivers, lakes etc) Housings shall be in high-grade carbon steel with suitable sandblasting and epoxy coating with polyester coating.

Control system:

- Each filter unit is equipped with a local control panel plus solenoids cabinet
- 230 volt 1 ≅ and compressor air connection to each filter unit
- All local control panels are to be connected to a central control system

Control and monitoring:

The control panel shall be provided with common selector switch to operate the systems in following mode.

- PDS mode.
- PDS & Timer Mode

The filters shall be having arrangement to do manual flushing with the help of test button on the front of the control panel as well by simulation locally on the filter by closing the small ball valve for 5 sec and re opening it, thus creating an artificial back flush cycle.

Working philosophy of Filters:

The water from the prefilter shall be fed into the microfibre filters online basis to bring down the treatment to 2 microns. The system should be environmental friendly and no chemical treatment or cleaning shall be done with the filters.

The microfibre filters shall remove the dirt particles through multi layered microfibre cassettes, which are connected to the collector pipes. Once a pressure differential value or time interval is reached the unit shall be activated for self-cleaning cycle.

The self cleaning cycle shall have an inbuilt booster pump which shall discharge water through spray nozzles across the single row of cassettes on each stroke and cover the entire cassettes till the filter is clean. When the spray nozzles reach the end of a row the turn mechanism forces the filter package to index to next row of cassettes for cleaning. This self cleaning operation should not take more than 10 mins for "cleaning all rows of cassettes in the filter" to be back on line. The sequence of the system shall be such arranged that the system should be capable of delivering the required capacity without stoppage of flow of water. The system should be assembled as per enclosed P&ID diagram.

The tenderers are free to put up their pilot plants in BHEL to study and optimize the working of filters.

The tenderers should strictly adhere to design basis given above & should confirm the same in the offer.

IV. Technical Specification

a) For Pre-Filtration with 25 Micron:

1. Flow	: 500 m3/hr (Normal) : 600 m3/hr (Max)
2. Min working pressure	: 2.5 bar
3. Max working pressure	: 10 bar
4. Inlet TSS	: 10 ppm (Normal) : 20 ppm (Max)
5 .Filtration degree	: 25 micron
6. Number of Filter units	: 4 nos. (4 working, no standby) (Each unit to handle max. 180 cum/hr)
7. Minimum Filtration area per unit	: 10000 cm2 ± 5 percent
8. End connections	: Tenderer to specify
9. Max working temp	: 60 deg. C
10. Duration of Flushing cycle	: Max 60 sec
11. Wasted water	: Should not exceed 2% of the rated Flow
12. Electric motor rating on each unit	: 0.5 HP (max)
13. Current consumption	: Tenderer to specify
14. Operating voltage	: 415V
15. Control Voltage	: 24V
16. Life of screens	: Tenderer to specify

Tenderer to confirm the above parameters point wise in the offer.

b) Fine Filtration with 2 micron.

01. Flow	: 500 cum/hr (Normal) : 600 cum/hr (Max)
02. Min working pressure	: 2 to 2.5 bar
03. Max working pressure	: 10 bar
04. Filtration degree	: 2 micron
05. Number of Filter units	: 5 nos (4 working, 1 standby) (Each unit to handle max. 150 cum/hr)
06 Minimum Filtration area per unit	: 370, 000 cm2 ± 5 percent
07. Filtration Element (Cassettes)	: 3640 nos. per unit ± 5 percent
08. End connections	: Tenderer to specify
09. Max working temp	: 60 deg. C
10. Duration of Flushing cycle	: Max. 10 minutes
11. Wasted water	: Should not exceed 2% of the rated flow
12. Flushing Pump characteristic	: Tenderer to specify
13. Current consumption	: Tenderer to specify
14. Operating voltage	: 415 V
15. Control Voltage	: 24 V
16. Life of Cassettee	: Tenderer to specify

Tenderer to confirm the above parameters point wise in the offer.

V Material of Construction:

a) For Pre-Filtration with 25 micron:

1. Filter housing & Lid : Epoxy-coated carbon steel 37.2
2. 4Layer weave wire screen : Stainless Steel 316L
3. Cleaning Mechanism : Stainless Steel 316L
4. Seals : Synthetic rubber / TEFLON
5. Control : Aluminum
6. Fasteners : External Galvanized internal SS
7. Interconnecting Piping : Carbon Steel

b) For Fine filtration with 2 Micron:

1. Filter Housing & Lid : Epoxy-coated Carbon Steel 37-2
2. Cassette : Polyester thread on NORYL molded base
3. Piston : Brass, Bronze, Stainless / Steel
4. Seals : Nitrile rubber
5. Fasteners : External Galvanized internal SS
6. Interconnecting Piping : Carbon Steel

VI. Inspection/Testing/Painting/Packing

a) Inspection/Testing:

Testing and inspection of equipment and materials shall be carried out at the works of the Tenderer or his sub-Tenderer during manufacturing and on final product to ensure conformity of the same with acceptable criteria of Technical Specifications, approved drawings, authenticated manufacturing drawings and reference Indian/ International standards.

The Tenderer shall furnish Quality Assurance Plan (QAP) for each equipment and material for BHEL Consultant's approval at least one month prior to start of manufacturing.

Tests to be conducted at the shop for various assemblies/sub-assemblies of equipment shall include, but not be limited to the following:

i) Material test.
ii) Tests during manufacture/fabrication
iii) Dimensional checking.
iv) Hydraulic test at the shop.
v) Performance test.
vi) Any other test as required.

For each of the items being manufactured/supplied, the following test certificates and documents, as applicable, in requisite copies including original shall be submitted to the Inspection Agency. All test certificates shall be endorsed by the manufacturer and the Tenderer with linkage to the project, purchase order and acceptance criteria.

i) Raw materials identification and physical and chemical test certificates for all materials used in manufacture of the equipment.
ii) Welding procedures and welder's qualification test Certificates.
iii) Static/dynamic balancing certificate for rotating Components/machines.
iv) Pressure test certificates.
v) Performance tests certificates for all characteristics

b) Painting:

Blasting with steel balls on the surface to achieve as SA 2.5 quality according to the requirements of the **Swedish standard organization (SIS)**

Phosphatization according to the American Federal specification procedure TT-C-490D-Type 1. also included degreasing by immersion of the product in tank containing various chemical solution.

Internal Coating:

Coated with two layers of the epoxy powder and then oven-cured according to the German Standard G.S.B Total D.F.T 300 Micron.

External Coating:

Coated with a polyester powder and then oven-cured according to the German Standard G

c) Packing:

The tenderer shall provide for secured packing of all equipment to protect from damage during transit from point of manufacture upto the site of erection which may involve multiple handling, storage & exposure to heat, moisture, rain, etc.

VII. Equipment warrantee and guarantee:

The Tenderer shall warrant for satisfactory performance of the equipment for a period of 18 months from the date of dispatch or 12 months from the date of commissioning whichever is earlier.

The tenderer shall guarantee on various parameters as specified below;

a) The Turbidity should be less then or equal to 1 NTU after fine Filtration.

b) The TSS after fine filtration should be less then or equal to 1 PPM.

c) The silica after fine filtration should be less then or equal to 5 PPM

d) The size of suspended solids at the outlet of pre filtration should not exceed 25 Micron.

e) The size of suspended solids at the outlet of fine filtration should not exceed 2 Micron.

f) The treated water should be free from Algae, Cryptosporidium & Giardiasis.

g) The water wasted should not exceed 2% of the rated flow per day.

VIII) List of Preferred makes:

Ball Valve, Gate Valve, **NRV, Butterfly valve**	Kirloskar, Fouress, B.D.K, Audco, Microfinish
Pressure Gauge.	H Guru, General Instruments, Wika
Pressure Switch	Switzer, Varma, Indfoss
Flow meter	Forbes Marshall, Scientific Device, Endress Hauser, Rittmeyer
Booster pump **Compressor**	Grundfos, Ksb, Equivalent Kay international, Swam pneumatic, Equivalent

IX) S P A R E S

While furnishing the offer, the vendor shall include the cost of requirement of all commissioning spares needed for erection, commissioning & trial operation. The vendor shall furnish the list of all mandatory spares required for running the system for Two years operation for prefilter, micron filter and other accessories like flow meter, various valves, booster, compressor. Separate Purchase order will be placed for the above spares.

While quoting the rate for O&M for one year, minor spares needed for operation of the plant has to be suitably taken care. No separate payment will be made for these spares.

X) Documentation:

The **successful tenderer** have to submit 3 sets of following documents (hard copies) and also in CD ROM.

- Operating Manual
- Detailed maintenance manual of filters
- Commissioning manuals
- Catalogues/O&M manuals of all bought out items
- Complete master list of spares used in the filter, valves, flow meter

XI) Commissioning and Training

- Free of cost for 5 days with Two experienced Engineers
- Trial running for one month

XII) Delivery and Commissioning

- Max. Eight months from the date of Purchase Order.

XIII)Exclusion from the scope of TENDERER

- Any skidding, building foundation or Civil work
- Anti frost lagging
- Third party inspection
- Beyond Flange to flange connection of inlet and outlet of carbon steel pipe headers (as per P & I Diagram)

  a.All pipe line works

  b.Electrical and wiring work

- Waste water conveyance and disposal (as per P& I Diagram)
- Power supply upto Master control panel

XIV) D R A W I N G S

(A) The following drawings are enclosed for the guidance of the vendor:

- Pumping main flow chart
- Equalizing Reservoir Schematic diagram
- Schematic P & I Diagram

(B) DOCUMENTS/DRAWINGS TO BE FURNISHED BY THE BIDDER ALONGWITH BID:

01. Price offer along with price breakup for the offered system as per price schedule.
02. System technical write-up & Control philosophy.
03. Performance Guarantees at the outlet of prefilter and Micro filter.
04. Power consumption guarantee
05. Mass balance diagram
06. Process flow diagram
07. Detailed Piping & Instrumentation diagram (P & ID)
08. Piping & Valves schedule
09. Detailed layout drawing with elevations
10. Drives list
11. PLC system I/O list & system configuration drawing
12. Tender deviations if any
13. List of commissioning spares and spares for 2 years operation along with the price
14. Vendor to furnish activity wise programme of completion of Design, Supply, Erection, Commissioning and Trial operation of the total system within the stipulated period of 8 months.
15. O&M for twelve months

XV)GENERAL

- The vendors shall visit and inspect the site of the Works and its surroundings and obtain, at his own responsibility, expense and risk, all information, which may be necessary to prepare his offer.

- The scope of supply includes works such as Mechanical, Electrical, Piping, Valves, Pumps, Control & Instrumentation etc. complete as a system. The offered price shall be deemed to have included all items which are required for the due and comprehensive physical and functional completion of the offered items to meet the objectives of treatment plant as covered in and not limited to the specifications, drawings, etc. as contained in this document to the vendor.

- General specification of the different systems is provided in this document for guidance. However, it shall be explicitly understood by the vendor that the specifications do not cover the entire minor component required for the installation and the correct operation of the equipment. The vendor is expected to take such components into account while estimating the price.

- Prices shall remain firm till the execution of the order in all respects and no escalation whatsoever on any count shall be allowed.

- Offered makes of equipments are acceptable provided each of such make has at least three reference installations where the equipment of a similar nature and at least 50 % capacity / size has been supplied, delivered, installed, erected, commissioned and satisfactorily obtained the performance guarantee in the last two years in any water treatment plant. Such work can be either in the name of the prospective Vendor or his main contractor in case the work has been a turnkey work.

- The burden of providing the necessary certificates from the clients to the above said effect rests with the vendor and the owner reserves the right to call for any additional information either from the vendor or from the clients referred to directly.

- The vendor will provide product support by way of spares components and services as and when required by BHEL up to 15 years. Vendor's service engineer would be available to BHEL within 24 hrs. of intimation, in case of any break down so as to put the equipment back into operation with minimum down time.

- The vendor should take site insurance towards theft, breakage, accidents, etc until the system is handed over to BHEL.

- The vendor shall ensure that the equipment shall perform as per specifications stipulated. In case the same does not give desired performance, the vendor shall be given maximum 1 (one) month time to carry out necessary modifications/replacement at their cost. If, despite of this, the desired performance is not achieved the equipment shall stand rejected.

- The vendor shall demonstrate specific performance of system meeting the water

- quality requirement indicated in the offer.
- BHEL shall provide utilities needed for construction and O&M such as water, power at site, at free of cost to the vendor.
- Necessary Civil works required for the erection of equipment will be done by BHEL based on the drawings given by vendor.
- The vendor during execution shall take every precaution to ensure protection of all existing Pipes or other services available at site.

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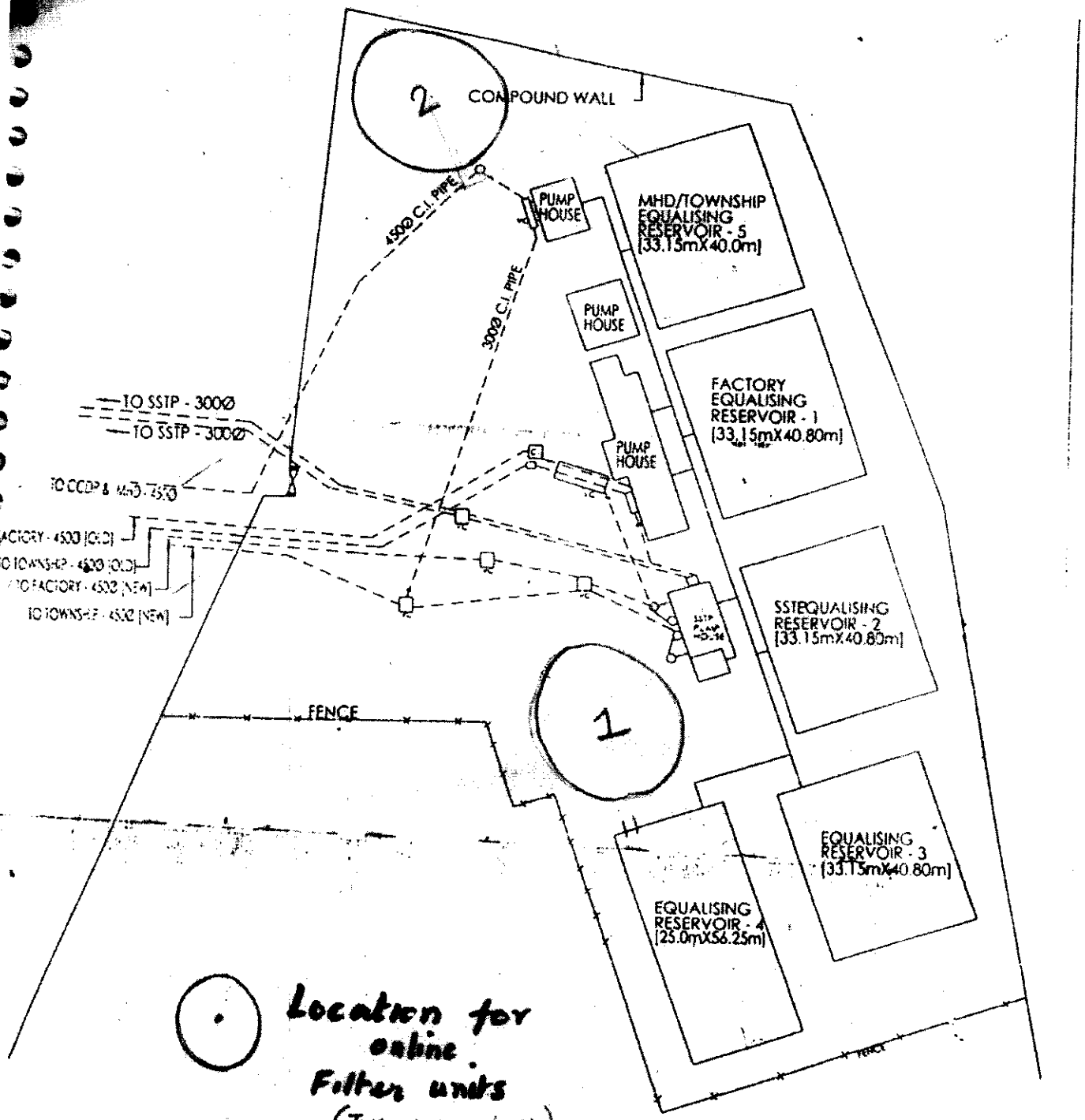
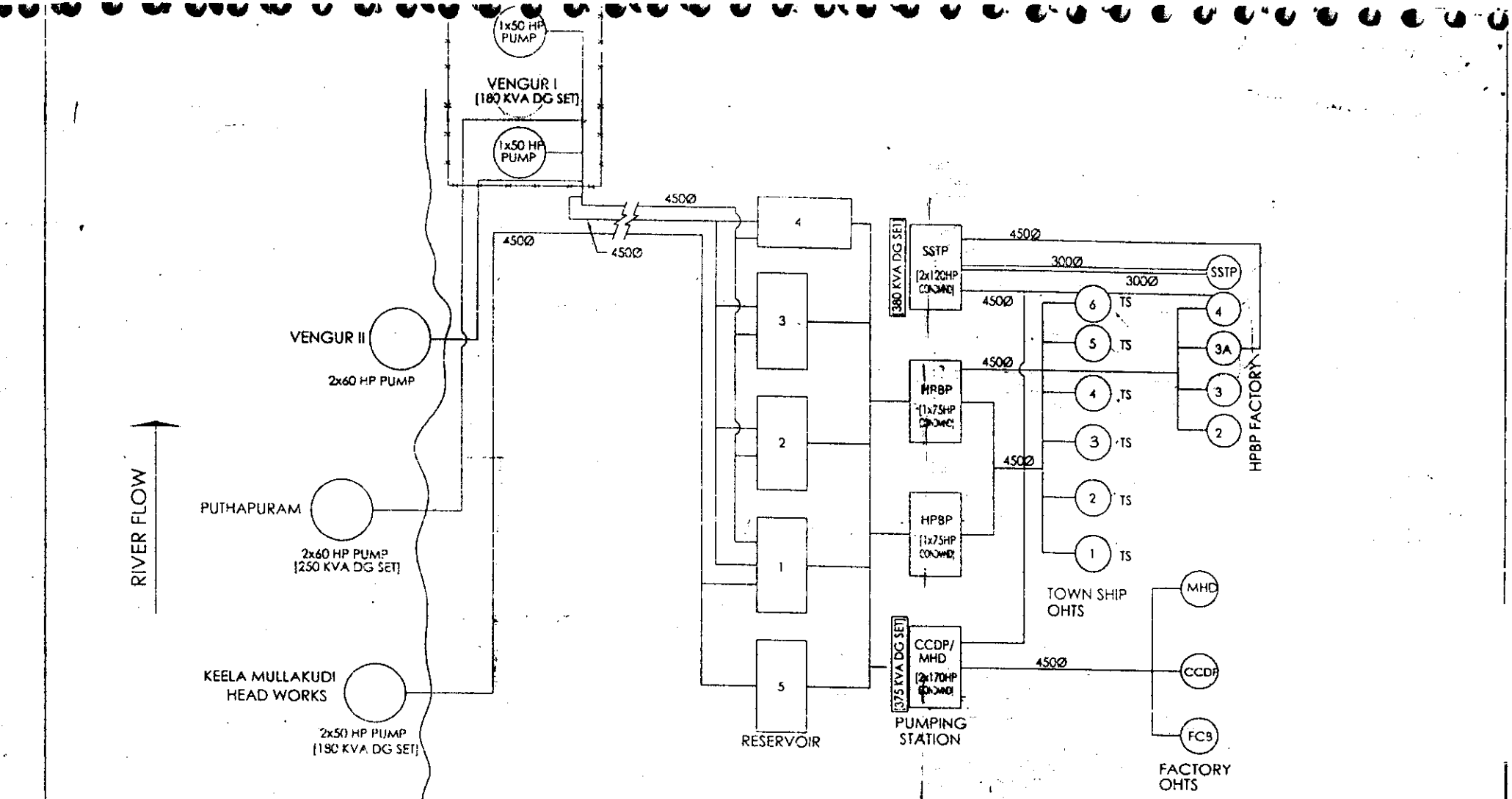


Location for online Filter units (Two Alternatives)

Bharat Heavy Electricals Ltd BOILER PLANT UNIT TIRUCHIRAPALLI – 620014		DRN	J.Anandan		
		CHD	K.Arthanarisamy		
		APPD	A.Arulanandham		
DEPT CIVIL	GRADE OF UNTOL DIM C/M/F	SCALE 1:2000	WEIGHT (Kg) —	REF TO ASSY / OLD DWG —	ITEM NO
CODE 2200					
TITLE EQUALISING RESERVOIR SCHEMATIC DIAGRAM OF PUMPING MAIN TO FACTORY TOWN SHIP, SSTP, CCDP & MHD		CARD CODE U 01	DRAWING NO : BHE:CP:09:138/2005		REV



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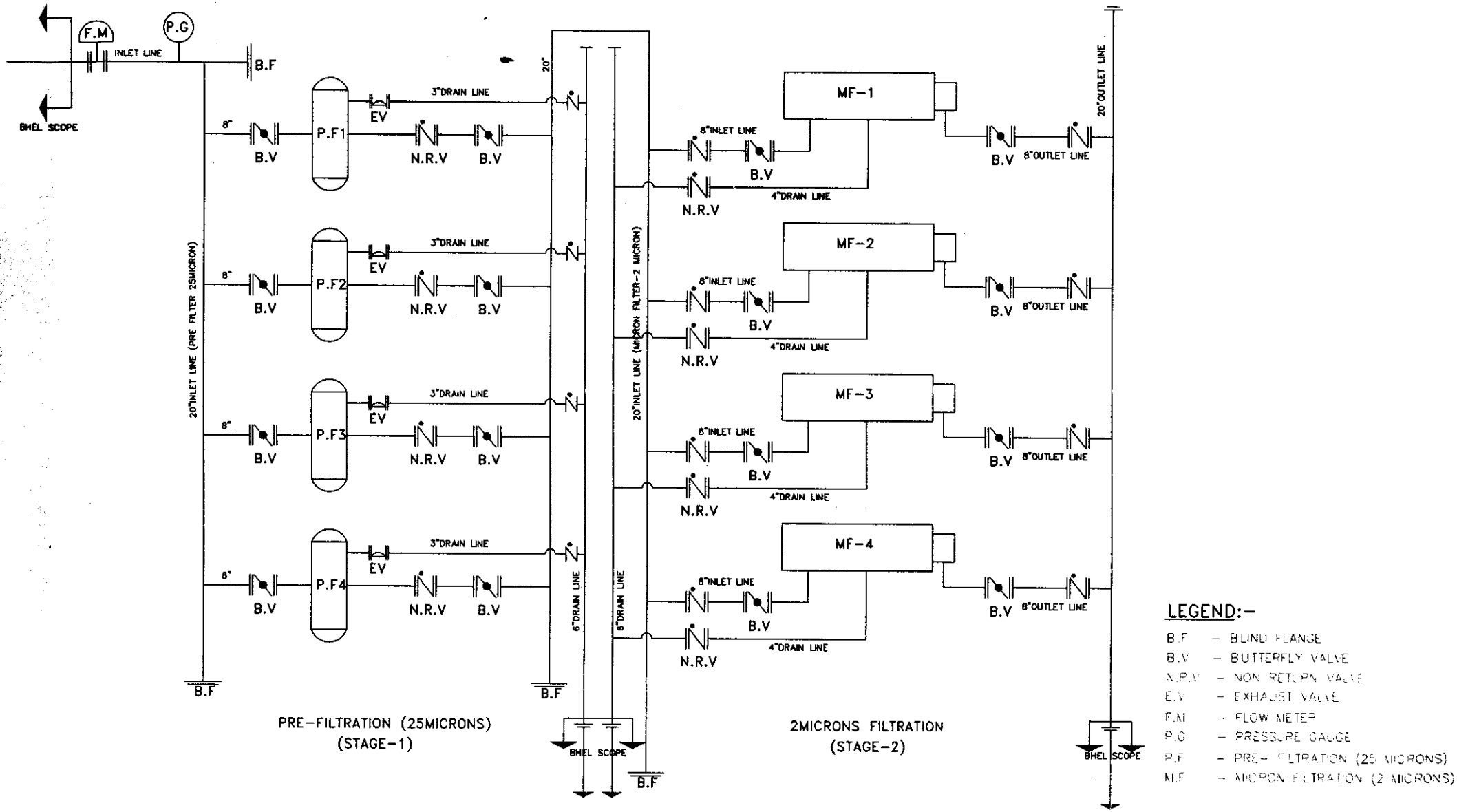
Bharat Heavy Electricals Ltd BOILER PLANT UNIT TIRUCHIRAPALLI – 620014		NAME	SIGNATURE	DATE	NO. OF VAR
	DRAWN	S. Anandan		20-12-2005	
	CHKD	K. Arthanareesamy			
	APPD	A. Arulanandham			
DEPT: CML/PROJ.	GRADE OF UNTOL DIM: C/M/F	SCALE: N. T. S.	WEIGHT (Kg)	REF TO ASSY / OLD DWG	ITEM NO
CODE: 2200					
WATER SUPPLY PUMPING MAINS FLOW CHART	CARD CODE: U 01	DRAWING NO: BHE:CP:03:131/2005			REV

DRINKING WATER SCHEME CAPACITY:500CUM/HR

(P&ID DIAGRAM)



LEGEND:-

B.F – BLIND FLANGE
B.V – BUTTERFLY VALVE
N.R.V – NON RETURN VALVE
E.V – EXHAUST VALVE
F.M – FLOW METER
P.G – PRESSURE GAUGE
P.F – PRE- FILTRATION (25 MICRONS)
M.F – MICRON FILTRATION (2 MICRONS)