An ISO 9001 Company

Bharat Heavy Electricals Limited
(High Pressure Boiler Plant)
Tiruchirappalli – 620014, TAMIL NADU, INDIA
MATERIALS MANAGEMENT / CAPITAL EQUIPMENT

ENQUIRY **NOTICE INVITING TENDER**	Phone: +91 431 257 76 53 Fax : +91 431 252 00 31 Email : skaruna@bheltry.co.in Web : www.bhel.com

	Enquiry Number: 2731300009	**Enquiry Date:** 23.05.2013	**Due date for submission of quotation:** 24.06.2013

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.
Please note that under any circumstances both delayed offer and late offers will not be considered. Hence vendors are requested to ensure that the offer is reaching physically our office before 14.00 hrs on the Date of tender opening.

Sl. No	Description	Quantity
1	**Flushing Stand System** as per the technical specification, general guidelines instructions & commercial conditions applicable (to be downloaded from web site www.bhel.com or http://tenders.gov.in)	01 No.

Important points to be taken care during submission of offer

1. **Checklist to be filled and enclosed along with the offer failing which, the offer will not be considered for evaluation.**
2. **Bidder's response column in the document Part A and Part B shall be duly filled by the bidder.**
3. **Whenever additional detail requested shall be provided with document evidence.**
4. **Third Party inspection by BHEL Engineers.**
5. **Bidders have experience in handling of demineralised water system and stainless steel fabrication by meeting ASMIE sec VIII Division-1 requirements.**
6. **The EMD Amount for this Tender will be (INR) : 2,00,000.00**
7. **Delivery required 6 months from the date of purchase order for supply and 2 months for Erection and Commissioning.**
8. **All updates, amendments, corrigenda etc (if any) will be posted only on the above websites from time to time, as and when required, until tender is opened. There will be no publication of such updates, amendments corrigenda etc. through newspapers or any other media.**

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 above .

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** Sr. Manager / MM / Capital Equipment

S. KARUNANIDHY
Senior Manager
MM / Capital Equipment
BHEL, TRICHY - 620 014

Qualification Criteria for "Flushing Unit"

Qualification Criteria for Flushing Unit

1.0 The supplier shall have minimum five year experience in manufacturing and supply of similar system.

2.0 Supplier shall submit list of companies to whom they have supplied similar kind of systemand having experience in handling of Stainless steel fabrication as per ASME Sec VIII Div-1 along with Name and postal address of the customer Phone number, Fax number and Email address of the contact person.

3.0 Along with the technical offer the vendor should submit one performance certificate from the customer for satisfactory performance of the system supplied to them.

4.0 BHEL reserve the rights right to verify the information provided by the vendor. In case the information provided by the vendor is found to be false or incorrect the offer will be rejected.

5.0 Details of Service after sales set up in INDIA including the addressof agents / service center in South India.

6.0 The bidder / vendor shall submit the offer in TWO parts

- 6.1 Technical offer including qualification criteria
- 6.2 Price Bid

7.0 The technical offer shall contain a comparative statement of technical specification points along with technical supporting documents, product catalogueetc..

Qualification Criteria for "Flushing Unit"

The performance certificate should be produced **on Customer's Letter Head.**

PERFORMANCE CERTIFICATE

1. Name of the supplier of the system	
2. Type of system supplied	
3. Month & Year of Commissioning	
4. Performance of the equipment (Strike off whichever is not applicable)	Satisfactory **/** Good **/** Average **/** Not Satisfactory
5. Any Other remarks	
Date: Signature & Seal of the Authorityissuing the Performance Certificate	

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
1.0	Design, Engineering, Procurement of Standard Rotating Equipment and Components, all Materials and and integrating them with the interconnecting piping on a common portable platform to constitute a 'Flushing Stand' as envisaged in schematic drawing 1-90-117-00619/01, inspection and testing, delivery, installation at BHEL , qualifying the system as indicated in the scope and guarantee. Bidder shall have experience in handling of stainless steel fabrication. Stainless steel fabrication shall be separated from carbon steel fabrication. Bidder shall have to experience in handling of similar kind of system and supplied elsewhere. Supplier shall provide evidence towards manufacture, supply and execution of similar kind of system. Provide evidence for the above point	Vendor to confirm	
2.0	**Description of the 'Flushing Stand'**	Vendor to specify and provide supporting document	
2.1	The objective of the 'Flushing Stand' is to provide clean warm water at about 80+/-10 deg C for circulation at prescribed flow rates for sufficiently long duration through various equipments taken up one at a time for cleaning the interiors. Towards achieving this broad requirement and other detailed specifications described herein, a stand consisting of the following equipment as shown in Schematic drawing No. 1-90-117-00619/01 has been envisaged.	Vendor to confirm	
2.2	Storage tank of 7.5 m^3(min) capacity	Vendor to specify.	
2.3	Set of pumps selected to meet the entire range of flow and head requirement	Vendor to specify.	
2.4	Heater for heating the fluid to the required temperature.	Vendor to specify.	
2.5	Cooler for maintaining temperature of circulating water as intended	Vendor to specify.	
2.6	Set of Filters / strainers for retention of impurities	Vendor to specify.	
2.7	Interconnecting pipelines, valves, pipe fittings	Vendor to specify.	

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
2.8	Control and instrumentation items	Vendor to specify.	
2.9	A local instrumentation and control panel to house various instruments/gauges for monitoring various process parameters to ensure healthy working of stand and switches and starters for pump operation	Vendor to specify.	
2.10	A common circuit breaker for isolating the total system	Vendor to specify.	
2.11	The pumps P1, P2 & P3 take suction from the storage tank (TK-1) and discharge the requisite flow into the equipment to be cleaned through filters in the supply lines. The return line from the equipment return the water back to the storage tank through the filters in the return line. The filters in the supply line are used to arrest suspended particles of size more than 100 microns from entering into equipment being flushed and strainers in the return lines remove impurities and foreign particles of size more than 100 microns. Most of the impurities passing through the return line filters are expected to settle down in the storage tank, which will be periodically blown down through the drain valve.	Vendor to specify.	
2.12	One of the pumps will be brought in to operation according to the flow / head requirement as envisaged in the Table -1. The filters in the supply line and return lines shall be so selected / designed as to cater to all the operating flows rates of different equipments	Vendor to specify.	
2.13	Temperature of flushing medium is raised to the desired level by electrical heaters to be provided in the tank. Heater is to be selected with more number of (minimum 3) banks of heating elements with individual ON/OFF control to facilitate switching on any of the banks at a time.	Vendor to specify.	
2.14	All the above equipment constituting the stand are to be mounted on a single frame of about 5000 mm length X 4000 mm width X 5000 mm in height that can be transported as required and located close to the equipment to be flushed.	Vendor to specify.	
2.15	Refer **Annexure – I** for the list of equipment to be flushed.	Vendor toconfirm.	
3.0	**Scope of Work:** The detailed scopes of work covered under this technical specification are as follows:	Vendor to confirm, specify and provide supporting document	
3.1	Process design of the flushing stand in line with the requirements specified herein		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
3.2	Preparation and submission of Lay out drawing in 3D in line with the schematic drawing with minor modifications (if required). Preparation and submission of Piping lay out and P&I drawings.		
3.3	Mechanical and process design, submission of calculation thereof, preparation of manufacturing drawings (GA and part drawings) and submission thereof for various equipment of the stand (Filters, Heaters and tank)		
3.4	Procurement of materials required for the manufacture of equipment and interconnecting piping constituting the flushing stand. Supplier shall have exclusive experience in manufacturing of stainless steel system meeting ASME sec VIII div-1 requirement. Supplier provide evidence for the above point.		
3.5	Manufacture of process equipment and procurement of bought out items		
3.6	Design and manufacture of skid for mounting of all equipment		
3.7	Procurement of electrical accessories for the pumps and heater		
3.8	Design and procurement of sensors, transmitters, tubes, tube fittings and related hardware for process instrumentation		
3.9	Supply of the complete system as per Scheme drawing No. 1-90-117-00619/01 mounted on a suitable skid which shall include all the items indicated in the Scheme and Specification as well as such of those items which may be required to ensure satisfactory performance of the system, guide rails, ladder and checkered plate.		
3.10	Supply of suitable bridge piece with end flanges, fasteners and gaskets for connecting the inlet and outlet of the system so that the system by itself forms a closed circuit and thereby isolating the equipment.		
3.11	Supply and laying of the total power cables and control / Instrumentation cables from the common supply point. Electrical connections from the panel to individual motors shall be by copper cables.		
3.12	MCC and Instruments mounting panel along with complete cabling for motors and instrumentation items.		
3.13	Fabrication and erection of interconnecting piping along with requisite supports		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
3.14	Design, Fabrication supply and erection of a permanent clean room enclosure around the filters area to maintain clean environment as per attached specification.		
3.15	Installation of instrument sensors, transmitters, cabling up to panel and requisite power supply		
3.16	Hydro testing of equipment and piping in the fully assembled condition on completion of integration at supplier's works		
3.17	Installation of all equipment, erection and commissioning of the system at our works including trial runs to demonstrate the performance of the system. BHEL will provide only power and DM water at single points and also any civil work, if required. For the civil work required from BHEL, the complete details shall be provided well in advance.		
3.18	Testing of flushing stand and corrective action, if any, to meet the design intent		
3.19	Self-cleaning of integrated stand to obtain requisite cleanliness as per clause no.15.0		
3.20	Training of Operation and Maintenance personnel at BHEL works		
3.21	Technical support during actual flushing of first two equipments		
3.22	Guarantee of flushing stand		
3.23	Supply of commissioning spares. List to be enclosed with the offer for approval by BHEL		
4.0	**Applicable standards, specifications and drawings**	Vendor to confirm, specify and provide supporting document	
4.1	The latest editions of standards and specifications are applicable. In case of conflicting requirements between specifications, more stringent of the requirements shall be followed.		
4.2	Wherever not specified, standards normally followed in the respective industry shall be applicable.		
4.3	In the event of any ambiguity or that certain requirements are not described in the specifications, such requirements shall be brought to the notice of the Purchaser for suitable resolution, prior to starting of any manufacturing activity.		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
4.4	List of applicable Codes / Standards and Specifications – Refer Annexure II		
4.5	**Drawings :** Flushing Stand –Schematic Drawing: 1-90-117-00619 / 01 Specification for filter: 2-90-117-00517 / 01 Cloth element for filters : 3-90-117-01185 / 01		
	Operating and design conditions Operating Pressure (max) : 5Kg/Sq. cm Operating temperature : About 70+10deg C Design Pressure : 6 Kg/Sq. cm Design temperature : 100 deg C Operating flushing flow range : 2 to 135 cum/hr		
6.0	**Design Requirements**	Vendor to confirm, specify and provide supporting document	
6.1.0	**General**		
6.1.1	The medium handled by the flushing stand is Demineralized water.		
6.1.2	The stand shall cater to the requirement of flow through various equipment for flushing at the estimated head, details of which are given in Table-1.		
6.1.3	Flushing of equipment is carried out by maintaining flow through the respective equipment for sufficiently long duration until desired cleanliness is achieved. The stand shall therefore be required to be operated continuously for long duration.		
6.1.4	Flushing water supplied to the equipment shall be clean.		
6.1.5	Completeness of flushing of equipment shall be decided based on the deposits observed visually in the return line filters. The flushing operation through the equipment shall be deemed complete when water samples taken from the return lines meet the cleanliness conditions as given Clause No. 15. Hence flushing stand also shall meet the requirement as per clause 15.0.		
6.1.6	The construction of the strainer / filter shall be suitable for ease of frequent opening and removal of filter element for visual inspection.		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
6.1.7	Equipment constituting the flushing stand viz. Storage tank, Filters / Strainers, circulating Pumps, Heater, cooler and the interconnecting pipelines, fittings, valves etc. shall all be made of stainless steel grade 304L		
6.1.8	The stand shall be such that it does not generate impurities during normal operation. Materials for gland packing of valves, standard strainer baskets and gaskets that are likely to degenerate during continuous operation shall not be used. Flange joint design shall be such as to contain the gaskets within the flange facings without protrusions on the ID.		
6.1.9	Provision for self-cleaning of the stand shall be made for ensuring cleanliness of the stand before it can be connected to the equipment for flushing.		
6.1.10	Use of valves and flexible hoses between the equipment being flushed and the filters are not allowed.		
6.1.11	The stand except for the storage tank shall be designed for the specified conditions consistent with the shut off head of the main circulating pumps.		
6.1.12	Design and construction of all the equipment shall comply with the requirements specified in ASME Boiler and Pressure Vessel Code, Section VIII and Division I.		
6.1.13	Flushing stand is to be mounted on a common portable frame to enable installation near the equipment for flushing. Provisions shall be made for lifting the frame and suitably locating it on the floor.		
6.1.14	Overall dimensions of the stand shall be limited approximately to about 5000 long X 4000 wide X 5000 high. However for ease of transportation, it shall be possible to split the system in to smaller despatchable units of size not exceeding 3.5 M in width and 3 M in height so that they can be transported in regular trucks/ trailers.		
6.2.0	**Storage Tank**	Vendor to confirm, specify and provide supporting document	
6.2.1	A storage tank shall be provided to enable filling up of the equipment and to enable the circulating pumps take suction from and maintain circulation through the equipment in a closed cycle. The capacity of this storage tank shall be about 6.5 cum.		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
6.2.2.0	The storage tank shall be provided with nozzle openings with suitable ends to enable the following:		
6.2.2.1	DM water charging with strainer		
6.2.2.2	Complete venting and draining		
6.2.2.3	Measurement of pressure and temperature.		
6.2.2.4	Measurement of water level		
6.2.2.5	Addition of chemicals into flushing medium		
6.2.2.6	Connecting to suction side of pumps		
6.2.2.7	Pump by pass line returning excess flows		
6.2.2.8	Returning of flushing water from the return line filters		
6.2.2.9	Connection of Safety Relief valve		
6.2.2.10	Manhole for cleaning		
6.2.2.11	Connection for heaters		
6.2.2.12	Return line from cooler		
6.2.3	The nozzle at the bottom of tank for pump suction and the nozzle at the top of tank for returning of circulating water from the strainers shall not be located in line and shall be located farther apart at a distance in the axial direction.		
6.2.4	Nozzle provided for connecting to pump suction shall be protruding inside the storage tank at least by 1D in order to avoid sucking in of the settled down impurities in the tank. Moreover, suitable arrangement shall be made at the nozzle end inside the tank for facilitating suction of water over a large area.		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
6.2.5	Nozzle provided for returning of flushing water into tank from the pump by pass as well as from the strainers shall be checked for impingement of flow resulting in churning and turbulence of storage tank water. If required, arrangement shall be provided for reducing the inlet velocity and distribution of flow over larger area.		
6.2.6	Drain nozzle in the tank (100 NB) shall be closed with a blind cover to which another small pipe (~40 NB) with an isolation valve may be connected.		
6.3.0	**Pumps**	Vendor to confirm, specify and provide supporting document	
6.3.1	Requirement of flow for flushing of various equipment ranges from 2 to 135cum/hr(refer Table -1) at the outlet of the respective equipment at a head ranging from 20 to 50m. Flow capacities and heads of the pumps have, therefore, to be chosen judiciously to keep the total number of pumps to the minimum possible (Maximum 3).The capacities of the Pumps are chosen on a higher side to account for certain margin.		
6.3.2	The range of flow rates each pump is required to deliver is provided in the Pump design specification in Clause 7.2. Accordingly the pump characteristics shall be reviewed w.r.t the flushing system characteristics before finalizing the pump selection. Technical details of pump and motor in the form of catalogues, data sheet and their characteristic curves shall be submitted along with the technical offer for BHEL's review.		
6.3.3	Trimming of flow to the exact magnitude through the individual equipment has to be achieved through joint operation of the control valves in the pump discharge line and the bypass line. Hence the design / selection of these two control valves shall meet the varying flow conditions (flow rate and head) during flushing and differential pressure measurement.		
6.3.4	The impurities in the flushing water that are not retained in the strainers are expected to settle down in the storage tank and shall be removed by blowing down of the storage tank drain valve periodically. Also, in order to prevent entry of these impurities into the circulating pumps, suction line shall be provided with a coarse strainer of 300 micron rating and the suction line shall be connected at a level higher than the bottom most level of storage tank.		
6.3.5	Suitable provision must be available for protecting the pumps being started in adverse conditions.		
6.4.0	**Strainers / Filters**	Vendor to confirm, specify and provide supporting document	

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
6.4.1	Return flow from the equipment will be passed through filters of suitable capacity for retention of the impurities before returning to the storage tank.		
6.4.2	Size of the filters shall be chosen such that they are of reasonable size for easy handling and frequent opening for inspection.		
6.4.3	For ensuring entry of relatively cleaner water into the equipment being flushed, filters of 100 microns rating shall be provided in the discharge line of the circulating pumps.		
6.4.4	To preclude the possibility of entry of impurities into the flushing stand tank from the mobile tank during the time of filling, a strainer with a rating of 25 microns shall be provided in the DM water filling line at the inlet to the tank.		
6.4.5.0	Construction of the strainers in the pump suction line(STR-1)shall meet the following requirements:		
6.4.5.1	The filters shall be of in-line removable basket type.		
6.4.5.2	Inlet and outlet nozzles shall be on the filter body and the basket shall be removable from the top.		
6.4.5.3	Flow shall be from inside to outside of the basket		
6.4.5.4	Bypass between the inlet and outlet streams shall not be allowed. The streams shall be separated and leak tightness ensured by use of gaskets		
6.4.5.5	Gasket material shall be suitable for the service conditions and shall not degenerate and get into flushing medium		
6.4.5.6	Pressure drop across the filter shall be as minimum as possible.		
6.4.5.7	Filters are required to be examined periodically for ascertaining the level of cleanliness during flushing operation. The filters, therefore, shall be of quick opening type.		
6.4.5.8	In order to ascertain satisfactory working of filters, the differential pressure across the strainers and filters shall be measured and monitored by gauges and provided with suitable alarms.		
6.4.5.9	Filters shall be provided with independent vent and drain valves / plugs to enable complete venting and draining.		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
6.4.5.10	The strainer shall be of fully welded construction including the cir-seam and long seam joints of the filter element. Use of bonding material for making the joints is NOT permitted. Manufacturing drawings showing the weld details of all the joints shall be submitted for approval before proceeding with the job.		
6.4.6	Constructional features of the filters in the supply line and Return line (FIF, RIF, FOF and ROF) shall be as per the enclosed drawings 2-90-117-00517/01 and 3-90-117-00185/01.		
6.5.0	**Heater**	Vendor to confirm, specify and provide supporting document	
6.5.1	The required temperature of water (80+/-10 deg C)is to be achieved with in a time period of 4 hours and the Electrical heaters shall be suitably sized to meet the above requirement for various operating flow rates. Also the total rating of heaters shall be arrived at as the sum of three or four separate banks so that the temperature variations can be controlled more precisely by using part of the heating capacity.		
6.5.2	The heater shall be electrically operated and of immersion type to be mounted in the tank. The heating element shall not come in direct contact with the DM water and accordingly the heating elements shall be housed in SS Sheath. Heater shall consist of required numbers of heater pins within a bank. Power supply available for the heater pins is 415V, 3 phases, 50 Hz. The heater pins shall be grouped together to form three banks as above and the individual bank shall be provided with ON-OFF switches in the local panel.		
6.5.3	Individual heater pin shall be long enough to limit the heat flux within the permissible limit thereby limiting the heating coil temperature. The heater pin shall consist of inactive zone wherein the heating coil shall not be located up to the heater inlet nozzle axis and the active zone wherein the heat generating coil shall be placed to ensure transfer of heat to the fluid.		
6.5.4	Provision shall be made to cut off the heaters whenever the water level in the tank goes below a level which is 4 inches above the heater surface and also when the temperature of medium in the tank crosses 80 ^{o} C. A level switch to effect this safety measure shall be provided on the tank. Heating element temperature control shall be done by thyrister control.		
6.6.0	**Cooler**	Vendor to confirm, specify and provide supporting document	

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
6.6.1	In order to maintain the flushing water temperature at the desired range of 80+/-10 deg C, a Cooler is provided across the storage tank to remove the excess heat. For this, a flow of 6 cum/hr shall be maintained through the cooler shell side. The cooler shall be capable of removing a heat load of about 45 KW. The Cooler is to be valved in when the circulating water temperature exceeds 90 deg C.		
6.6.2	Flushing water shall be through the shell side and cooling water shall be through the tube side of Cooler. Water available at BHEL site shall be the medium for cooling. Cooling water shall in turn be cooled by circulation through the cooling tower already available at site.		
6.6.3	Cooling water flow rate in the tube side shall be estimated on the basis of an inlet temperature of about 35 deg C and allowing about 10 deg rise in temperature. The process data sheet shall be submitted by the Supplier.		
6.7.0	**Equipment layout and piping**		
6.7.1	The flushing stand consists of storage tank, circulating pumps, cooler, heaters and set of filters interconnected and provided with isolation valves and terminated with flanged ends as shown in the schematic drawing.		
6.7.2	All equipment and piping constituting the flushing stand as described above shall be neatly arranged. Pumps shall be provided with sufficient space all around for accessing and maintaining them, whenever required; handles of manually operated valves shall be positioned at suitable elevation for easy operation; sufficient space for removal of cartridges / strainer baskets and cooler tube bundle shall be provided; ladders and platform for accessing the top of storage tank for addition of chemicals, operation of valves, operation and maintenance of filters etc. shall be provided. Sufficient space shall be provided around filters to allow people to move around the filters and also to accommodate the removable cover of the filter while changing the filter basket. Local control panel for operation of the pumps and mounting of requisite instruments / gauges shall be appropriately located in order to oversee the operations from the panel location.		
6.7.3	The filters shall be located at an elevation so that it's body flange is above the water level in the tank during operating conditions.		
6.7.4	The interconnecting pipelines in the flushing stand are sized based on a flow velocity of less than 3.5 m/sec under the maximum flow conditions.		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
6.7.5	The requirement of pump suction and the return lines described above under storage tank and pump paragraphs shall be met.		
6.7.6	Isolation valves in the flushing stand of size equal to or less than 50 NB shall be of globe type. Isolation valves of larger size shall be of gate type. However, valves meant for adjustment of flow shall be of globe type. All the valves shall be suitable for the maximum pressure rating of the stand.		
6.7.7	The pipelines from the discharge of pumps and the return lines to the storage tank shall be terminated within the boundary of the flushing stand and at the highest possible levels. These lines shall be terminated with flanged ends suitable for facilitating connection to the equipments to be flushed by means of rigid piping using suitable adaptors.		
6.7.8	Sampling points for drawing of water to evaluate the performance of the strainers shall be provided at inlet and outlet ends as sown in the scheme.		
6.7.9	A tapping shall be provided in the suction line of the smallest pump with isolation valve to enable transfer of water from the portable tank to the storage tank during initial filling.		
6.7.10	All the drain lines shall be connected together at suitable point and terminated at a single point.		
6.8.0	**Instrumentation and control**	Vendor to confirm, specify and provide supporting document	
6.8.1	Instrumentation shall be provided for monitoring the working of the flushing stand as listed out in clause no. 7.9.1.		
6.8.2	Indications of those parameters and alarms that will directly necessitate interventions in the plant for corrective action shall be provided on a local control panel in the stand. Hydraulic signals and electrical signals shall be segregated and shall not be brought to the same panel. Electrical connections from the panel to individual motors shall be by copper cables		
6.8.3	Rota meters shall be used for measurement of flow up to about 200 lpm. Orifice flow elements shall be used for measurement of higher flow and in case of line sizes more than 40 NB (irrespective of the flow).		
6.8.4	The filters in the skid shall be provided with differential pressure gauges for direct display or through the differential pressure transmitters to facilitate display of parameter in the local panel.		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
7.0	**Equipment Specifications:**	Vendor to confirm, specify and provide supporting document	
7.1.0	**Storage Tank, TK-1(refer drawing no 1-90-117-00619 / 01)**		
7.1.1	Quantity:1 No.		
7.1.2	Type : Cylindrical tank with dished ends at both the ends are supported on saddles		
7.1.3	Capacity :7.5 Cum		
7.1.4	Inside diameter :2000mm		
7.1.5	Wall thickness : As per design calculation and ASME code recommendation		
7.1.6	Type of end closure : Tori spherical		
7.1.7	Thickness of closure : As per design calculation		
7.1.8	End-to-End Length :2100 mm		
7.1.9	Operating Pressure :2 Kg/sq.cm		
7.1.10	Operating Temperature : 90 deg C (Max)		
7.1.11	Design Pressure :6 Kg/sq.cm		
7.1.12	Design Temperature : 100 deg C		
7.1.13	Design Code :ASME Section VIII, Div. 1		
7.1.14	Material of construction : Stainless Steel - Grade 304L		
7.1.15	Shell and End Closures : ASME SA240 Type 304L		
7.1.16	Nozzles : ASME A-312 TP 304L		
7.1.17	Flanges : ASME A-182 Type 304L		
7.1.18	Manhole : ASME A-240 Type 304L		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details

7.1.19 Supports : Carbon steel (support welding to tank with SS poison Plate of ASME SA 240 Type 304L)

7.1.20 Support type & Nos. : Saddle type – 2 Nos. with one end free

7..1.21

Line Schedule: (Also Refer drawing o.1-90-117-00619 / 01)

Description	Size	Qty.
Pump suction	To be specified	1 No
Filling	40 NB Sch 40	1 No.
Vent	40 NB Sch 40	1 No.
Drain	100 NB Sch 40	1 No.
Water Level measurement	20 NB Sch 40	2 Nos.
From strainers	125 NB Sch40	1 No.
Pumps discharge by pass	To be specified	1 No.
Suction for Cooler pump P4	25 NB Sch 40	1 No.
Return line from cooler	25 NB Sch 40	1 No.
Safety relief valve	40 NB Sch 40	1 No.
Manhole	600 mm ID	1 No.

7.2.0 Pumps, P1, P2, P3, P4

7.2.1 Quantity: 4 Nos.

7.2.2 Type : Horizontal type single / multi stage centrifugal pump with end suction and vertical discharge,
Discharge Capacity :
P1-160 Cum/hr,
P2 - 40 Cum/hr,

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
	P3 - 12 Cum/hr, P4 - 6 Cum/hr		
7.2.3	Operating flow rates : P1: 91 - 135 Cum/hr, P2 : 13 - 34 Cum/hr, P3 : 2 - 10 Cum/hr P4 : 6 - Cum/hr		
7.2.4	Head : P1 - 50 M, P2- 50 M. P3 – 20 M, P4 -75 M (To be confirmed)		
7.2.5	Design pressure : 6 Kg/sq.cm		
7.2.6	Design temperature : 100 deg C		
7.2.7	Type of motor : Squirrel cage induction motor		
7.2.8	Motor Power rating : To suit the pump requirement		
7.2.9	Motor Speed : 1450rpm		
7.2.10	Discharge Nozzle size :To be specified		
7.2.11	Suction Nozzle size : To be specified		
7.2.12	End connections : With corresponding size flanges		
7.2.13	Seal type : Mechanical seal		
7.2.14	**Make : Sulzer**		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details
7.2.15	Material of construction of: Stainless Steel -Grade 304L (all wetted parts) Available Power Supply : 3 phase, 415 V, 50 Hz	
7.3.0	**Heater, HE-1**	
7.3.1	Material of construction : SS 304L	
7.3.2	Heating wire: 80 Ni 20Cr alloy (Nichrome)	
7.3.3	Insulation : 99.4% pure electrically fused magnesium oxide compacted to 70%, at least. Sheath, Surface flux, connecting pin, End sealing material to be furnished in the offer.	
7.3.4	Additional features : i) Heater to be removable ii) Heater pins to be adequately supported iii)Switches for ON-OFF of heater banks iv) Vent and drain connection with isolation valves vi) Relief valve for Overpressure protection of Heater vii) Thyrister On/OFF control	
7.3.5	Make :**M/s Kanthilal Chunilal**	
7.4.0	**Cooler:**	
7.4.1	Quantity : 1 No.	
7.4.2	Type : Shell and Tube Heat Exchanger	
7.4.3	Rating : Shall be same as the Pump P1 Motor rating (Tentatively 45KW)	
7.4.4		

Description	Shell Side	Tube Side
Design Pressure (Kg/cm^2)	6	6
Design Temperature (^{o}C)	100	100
Medium	DM water	Cooling water

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details

	Operating Temperatures				
	Inlet	90 ^{o} C	35 ^{o} C		
	Outlet	To be indicated	45 ^{o} C		
	Rated Flow (m^3 / hr)	6	To be specified		
	Material of construction	SS 304L	SS 304L		
	Applicable Codes	TEMA Class C / ASME Sec VIII Div -1			
7.5.0	**Strainer (Pumps Suction line, STR-1)**				
7.5.1	Quantity : 1 No.				
7.5.2	Type : In line basket type				
7.5.3	Flow rate : 160 cum/hr				
7.5.4	Pressure drop : As minimum as possible				
7.5.5	Inlet : 150NB with flanged end				
7.5.6	Outlet : 150 NB with flanged end				
7.5.7	Rating / Mesh size : 300 microns / 55				
7.5.8	Design pressure across the basket: To be specified by the supplier				
7.5.9	Material i) Housing : SS Type 304L (ASME SA 312 / ASME SA240) ii) Basket : SS Type 304L (ASME SA 312 / ASME SA240) iii) Wire mesh : SS Type 304L				
7.5.10	Additional features : i) Quick opening closure ii) Basket to be removable from top				

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
	iii) Zero by pass flow across inlet and outlet streams iv) Differential pressure gauge indication v) Vent and drain provision with isolation valve		
7.5.11	The strainer STR-1 shall be of standard construction and readily available.		
7.6.0	**Filters : FIF, RIF,FOF, ROF**(Refer Drg No. 2-90-117-00517/01 and 3-90-117-01185/01)		
7.6.1	No. of filters : 4 Nos.		
7.6.2	Type : In line basket type		
7.6.3	Mode of operation : Continuous operation in multiple 8 hrs cycle		
7.6.4	Flow rate : 135 cum/hr		
7.6.5	Pressure drop : As minimum as possible		
7.6.6	Inlet : 125NB with flanged end		
7.6.7	Outlet : 125NB with flanged end		
7.6.8	Rating / Mesh size : 100 microns for FIF, RIF, FOF and ROF		
7.6.9	Material: i) All metal parts except supports : SS Type 304L ii) Gasket : Silicone rubber / Viton iii) Fasteners : SA 193/194		
7.7.0	**Flushing stand Piping**		
7.7.1	Required sizes of pipes are indicated in the flow sheet. The number and type of various pipe fittings and the lengths of pipes required shall be decided based on the piping layout		
7.7.2	Pipes, pipe fittings and valves shall conform to the following dimensional standards i) Pipes : ASME B 36.10		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
	ii) Pipe fittings with BW ends : ASME B16.9 iii) Pipe fittings with SW ends : ASME B16.11 iv) Pipe fitting with threaded ends : ASME B 16.11 v) Flanges : ASME B16.5 vi) Valves : ASME B16.34		
7.7.3	Pipes, pipe fittings, flanges and valves shall be of stainless steel 304L grade or better. Material specifications for the components shall be as given below: i) Pipes : ASME SA-312 TP 304L ii) Pipe fittings : ASME SA 182 F304L / ASME SA 403 Gr WP 304L iii) Flanges : ASME SA 182 F 304L iv) Valves : ASME SA 182 F 304L for forged bodies ASME SA 351 CF 8 for Cast bodies v) Fasteners for flanges: ASME SA 193 (studs & bolts) & ASME SA 194 (nuts) Flange facings shall facilitate containing of gaskets. Material for the gaskets shall be compatible with the flushing medium and shall be suitable for the operating conditions. Gasket and valve packing materials shall be free of halogen content and shall not degenerate during operation. Suggested material for gaskets and valve gland packing is silicone rubber with the above additional requirement.		
7.7.4	Pipes and pipe fittings of both seamless quality and welded type are acceptable. Likewise, either forged or cast valve bodies suitable for the operating conditions are acceptable. Investment castings for valve components are preferred over the sand castings.		
7.7.5	All pipe fittings and valves of sizes up to 40 NB shall be with socket welded ends. The pipe fittings of larger sizes shall be with butt welding ends. Valves of larger size shall be with flanged ends.		
7.7.6	Valves and flanges shall be rated for a design pressure of 6 Kg/sq cm and maximum working temperature of 100 deg C. (suggested rating: ASME Class300)		
7.7.7	All trim components of valves coming in contact with the fluid handled shall be of stainless steel 304L grade.		
7.7.8	Standard pipe fittings shall be used in construction. Branches shall be made by using either standard tees wherever the run and branch sizes are comparable or welded / socket fittings wherever the branch sizes are smaller in comparison with the run size.		
7.7.9	Inspection and tests shall be carried out on the pipes, pipe fittings, flanges and valves as per the respective standards and specifications. Compliance of materials to the respective specifications shall be proven with certified material test reports.		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
7.7.10	Thorough cleaning / pickling and passivation shall be done for all the stainless steel parts as per approved procedure and cleanliness shall be checked for all the components of the flushing system at components stage before assembly. This shall be one of the stages in QAP to be submitted by the supplier.		
7.8.0	Instrumentation and control		
7.8.1.0	The stand shall be provided with the following instrumentation for monitoring the operations, details of which are shown in the flow sheet:		
7.8.1.1	*Water level in the storage tank*		
7.8.1.2	Pressure indication in the tank, discharge line of the pumps and in the return line		
7.8.1.3	Flow indications in the return lines after the filters. Flow meters of different ranges with same end connection details shall be supplied so that the entire range of flow rates can be accurately measured. Suggested ranges : 0 to 5 m^3/hr, 0 to 25 m^3/hr, 25 to 250 m^3/hr,		
7.8.1.4	Temperature of circulating water in the supply line		
7.8.1.5	Temperature of circulating water in the return line		
7.8.1.6	Temperature of circulating water in the tank		
7.8.1.7	Differential pressure across the filters		
7.8.1.8	Level switch to cut off the heaters when the water level in the tank goes below the heater level		
7.8.1.9	Differential pressure Indicator to measure pressure drop across the equipment being flushed. DPI of different ranges with same end connections shall be supplied so that the entire range of pressure drop values can be accurately measured. Suggested ranges : 0 to 150mmWC, 0 to 12 mWC,		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
	0 to 20 mWC and 0 to 50 mWC		
7.8.2	Take off connections in the system piping for further connection to the impulse instrument lines shall be of 20 NB size. Standard sockolets of this size shall be made use of for making these branch connections and shall be provided with 20 NB globe valves to enable isolation whenever required. The isolation valves shall be provided with ½"NPT(F) end connection for further instrument tubing up to the local panel using double compression type of fittings.		
7.8.3	Instrument impulse lines shall be of 9.525 mm (3/8") OD of suitable gauge. Material for instrument tubing shall be Stainless Steel of 304L grade or better and shall conform to ASME/ASTM A213 specifications.		
7.8.4	Required type of instruments for the different parameters (either direct indicating gauge or transmitter for display in the control panel etc.), suggested ranges for the instruments, requirement of local or panel indication shall be as shown in the flow sheet. Data sheet for the instruments selected along with the probable suppliers shall be submitted.		
7.8.5	Irrespective of the specified ranges all the instruments shall be suitable for the maximum operating conditions of 6 Kg/sq cm pressure and 100 deg C temperature.		
7.8.6	Orifice plate with flange assembly conforming to ASME B 16.36 standard shall be provided. Orifice plates shall be designed as per ISA RP 3.2.		
7.8.7	All the instruments shall be calibrated before installation and calibration report shall be submitted for approval.		
7.8.8	All gauges, transmitters and other instrument components shall be of reputed make.		
7.8.9	Indications and alarms of those parameters that will necessitate interventions in the plant for corrective action shall be provided on a local control panel in the stand. Local control panel shall be made of commercially available structural steel. All instruments, gauges that are required to be mounted on the panel shall be neatly laid out at appropriate levels for ease of operation and maintenance. Proper venting provisions shall be made for complete venting.		
7.8.10	Starters for the various pumps shall be available on a local panel and shall be mounted in segregated area of panel if combined with the other instrument panel. Power supply requirements for operation of the instruments, if any, shall be within the scope of the supplier and such power supply packages shall be located on the panel. Hydraulic and electrical signals shall not be terminated on same panel.		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
7.8.11	Separate ON-OFF switches for each of the three heater banks along with a common ON/OFF switch shall be provided in the local control panel.		
8.0	**Design of Stand and preparation of Drawings**	Vendor to confirm, specify and provide supporting document	
8.1	The details provided in this specification and the specification of the individual equipments provided herein, are to be used as design basis. The supplier shall make an independent design review of the total system for the adequacy of the system parameters, including design parameter of the individual equipment, material selection for gaskets etc., so as to achieve the final performance parameters as detailed below. The supplier shall work out and submit along with the bid, a detailed scheme for the flushing stand along with the basic equipment specifications based on the process design of equipment.		
8.2	Process design calculations indicating the broad equipment specifications in the scheme shall be submitted for Purchaser's review and approval. Detailed calculations to be submitted shall include the following: I. Rating / selection of circulating pumps II. Storage tank capacity III. Rating of heater IV. Sizing of cooler V. Sizing of piping and the approximate pressure drops VI. Approximate sizing / selection of strainers / filters VII. Filter sizing calculation including DP across the filters. VIII. Rating of pipe fittings, valves and other accessories		
8.3	On finalization of equipment specifications, detailed mechanical design calculations shall be carried out for arriving at the sizes of various equipments like storage tank, cooler, heater, filter, piping etc. Manufacturing drawings shall be prepared for all the equipment that are to be manufactured and submitted along with the detailed back up calculations for the purchaser's approval.		
8.4	Purchase specifications of long delivery and bought out items like pump-motor units shall be submitted for purchaser's approval prior to initiating action for procurement of these items.		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
8.5	The drawings that are to be submitted include equipment design / manufacturing drawings, equipment and piping layout of the assembly mounted on the skid , filter assemblies and other detailed drawings showing details of the stand and its accessories etc.		
8.6	All the drawings are to be prepared in metric system. The drawings shall be fully dimensioned and include complete bill of materials.		
8.7	At least four copies of drawings shall be submitted for the purpose of approval. Approval of the drawings by the Purchaser shall only be construed as satisfactory detailing and acceptance of general method of construction. The Supplier shall be fully responsible for the design of stand and adequacy of details and satisfactory construction.		
8.8	Upon completion of the construction, testing and acceptance of stand, Supplier shall furnish a complete set of "As built" drawings on reproducible or soft copies, recording all changes and revisions to the original design and showing the as installed dimensions. These drawings shall be submitted to Purchaser for records.		
9.0	**Materials**	Vendor to confirm, specify and provide supporting document	
9.1	All the materials required for carrying out the work are to be procured by the Supplier and is within the scope of this work. The materials shall include the raw materials required for manufacture of equipment, pipes, tubes, pipe and tube fittings, process valves, instrument valves, adaptors, related welding consumables, fasteners, structural materials to be used for supports and manufacture of skid and control panels, thermal insulation etc. required for the manufacture of stand		
9.2	All the materials shall meet the relevant specifications and standards identified in the design drawings. Acceptance of materials shall be based on the inspection and test requirements specified in such relevant material specifications and standards.		
9.3	All the material shall be tested for verification. The test results along with Material Certificates shall be submitted for approval. Acceptance of materials shall be based on the material test certificates and the test reports. In case of non-availability of material certificates from the manufacturers, tests as per the specifications shall be carried out and test results produced.		
9.4	Materials shall be procured only from approved and reputed manufacturers. The requirements specified herein for various materials shall be translated into purchase specifications for the materials and submitted for approval prior to procurement of materials.		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
9.5	Only approved materials are to be deployed for the work. Materials for small items shall be controlled during manufacture and installation of components. Materials and standard parts which are not specifically mentioned herein shall be of good quality and in accordance with good practices of manufacture. Generally, all materials shall be new, free of rust, shop dirt, grease and loose or heavy scales. If materials proposed to be used conform to specifications other than the specified ones the Supplier shall furnish the equivalent specifications and obtain approval from the Purchaser prior to their use.		
10.0	**Manufacture of equipment and interconnecting piping**		
10.1	The equipments that are to be manufactured shall meet the fabrication requirements specified in Section VIII, Division 1 of ASME Boiler and Pressure Vessel Code.		
10.2	Cleanliness of materials shall be ensured during the manufacture and assembly of equipments as well as interconnecting piping.		
10.3	Since the flushing stand is meant for providing clean water for the purpose of further cleaning of equipments, all the construction materials shall be suitable for continuous operation without leaching especially of the packing materials used in valves and gaskets. The flushing system shall not have stagnant zones, long corrugated piping, crevices etc. allowing accumulation/concentration of impurities and contamination.		
10.4	The filters in the supply lines and return lines meeting all the specified requirements shall be bought out only from reputed filter manufacturers. However, the design and construction details of the filters shall be obtained from the manufacturers and submitted for approval prior to procurement or their manufacture.		
10.5	A detailed manufacturing plan for the equipment as well as the stand shall be submitted. The plan shall include details starting from design, material procurement, manufacture, inspection and testing of individual equipment and the further integration to form the stand.		
10.6.0	**Welding requirements**	Vendor to confirm, specify and provide supporting document	
10.6.1	Stainless steel weld joints shall be made using Gas Tungsten Arc welding process.		
10.6.2	All welding operations shall be carried out using approved qualified welding procedures and qualified welders only in accordance with Section IX of ASME Boiler and Pressure Vessel Code. Fresh qualification shall be done for all welds in the filter basket assembly.		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
10.6.3	Every weld joint within the equipment or the flushing stand shall be uniquely identified. Proposed welding procedure specification along with the Procedure Qualification Records for making each of the joints shall be submitted in the form recommended in the Code for approval.		
10.6.4	All the proposed procedures shall be necessarily demonstrated for their satisfactory compliance with the Code for production of sound welds. The Supplier, if desires, can combine such demonstrations with the performance qualification of the welders or welding operators in the presence of the Purchaser.		
10.6.5	Performance qualification of the welders is to be carried out irrespective of the validity of the welders' previous qualifications. Qualification tests shall be performed at the Supplier's premises and the qualifying authority shall be the Quality Surveyor appointed by the Purchaser.		
10.6.6	Only approved consumables shall be deployed for carrying out welding. Manufacturer's Certificates shall be secured for each batch of welding consumable to facilitate approval.		
10.6.7	Surfaces of all pipe / equipment materials shall be cleaned prior to start of welding operations. Surfaces to be welded shall be free from moisture, paint, rust, oil, grease, dust or any other contamination. Cloth used for cleaning shall be lint free with hemmed edges.		
10.6.8	All butt welds shall be of full penetration and the weld thickness shall not be less than the minimum wall thickness requirement.		
10.6.9	Weld shall be cleaned between passes and on completion. The craters at the starting and stopping points of each individual bead shall be carefully examined and any defects shall be removed by grinding. Grinding wheels, wire brushes, chisels etc. used on stainless steel shall not be used on any other material. Grinding wheels should be iron free and the wire brushes should be of austenitic stainless steel to avoid contamination of stainless steel surface.		
10.6.10	Temporary attachments which may be required to retain fit-up for welding shall be made of material compatible with the materials to which they are attached. Such temporary attachments shall be removed after they have served their purpose and the area shall be examined by LPT for defects.		
10.6.11	The external surface of the weld shall be free from undercuts, overlaps and abrupt ridges or valleys. The weld metal reinforcement on the outside surface of the pipe shall not exceed the limits specified in the Code. Surface smoothness of the finished weld shall be suitable for proper interpretation of the non-destructive examination of the weld.		

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10.6.12	Peening of weld joints shall not be permitted.		
10.6.13	Repair of any base material utilized in fabrication is not acceptable. Repairs shall be permissible only in weld joints revealing defects. Any weld repair shall be subject to the approval of the Quality Surveyor.		
10.6.14	On completion of repair, the required area shall be re-examined successfully by the same technique, which revealed the defects.		
11.0	**Specific requirements for the pump-motor units**	Vendor to confirm, specify and provide supporting document	
11.1	The capacities and the head requirements indicated in this specification for various pumps are the minimum required. Indicated pump heads shall be reviewed after detailed DP calculation of the flushing stand. Likewise, nozzle sizes specified herein are indicative and are based on the type of pump selected for meeting the process requirements mentioned above. It is recognized that these data are likely to vary marginally depending upon the make and final selection of pump. The supplier shall therefore prepare and submit a complete data sheet after making the selection.		
11.2	Such data sheet shall be exhaustive giving complete details about the pump and motor assembly and as a minimum shall consist of the following data: manufacturer, model no., type, rated capacity, head, required NPSH, efficiency at rated condition, number of stages, BHP at 20% to 125% capacities, shut off head, minimum flow through pump, material of construction with specification numbers of various components, suction and discharge sizes and the type of end connections, type of bearings and seals, lubrication and cooling requirements, details of accessories, overall size and weight. Data sheet for the proposed motor shall as a minimum consist of the following- make, frame size, kW rating at rated load, motor rating, electrical power input required with the variations permissible, starting current, full load current, restrictions on number of starts, if any, overload capacity, details on insulation like class, material temperature rise expected, types of bearings, requirement of cooling and lubrication, grounding devices, speed-torque characteristics etc.		
11.3	Design and construction of the pumps shall comply with API 610. Pump-motor units shall be suitable for continuous service and designed with regard to ease of maintenance, inspection and service. Workmanship shall be in accordance with the best practice presently followed in the manufacture of centrifugal pumps, adequate to ensure long and trouble free operation and ease of maintenance.		
11.4	Pump manufacturer shall submit cross sectional drawings of the pump indicating constructional details along with the material of construction (with relevant ASME/ASTM) of various components. Outline view of the pump-motor unit indicating mounting details on base plate, overall dimensions, various nozzle terminations		

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	etc. shall also be submitted.		
11.5	The units are to be located in an area where temperature and humidity conditions of a normal industrial area shall be assumed.		
11.6	Pumps shall be directly coupled to the motor by means of flexible coupling which shall be capable of taking care of shaft misalignments during operation. Suitable coupling guards shall be provided.		
11.7	The flanged end connections at the discharge and suction nozzles shall conform to ASME B 16.5 standard.		
11.8	The unit shall be free from undue vibration. The rotating components shall be balanced mechanically and hydraulically. Vibration and noise levels shall be reasonably low and comply with the requirements prescribed in API 610.		
11.9	All the components coming in contact with the fluid pumped i.e. demineralized water shall be of corrosion resistant material only.		
11.10	Pump shaft shall be provided with a balanced mechanical seal suitable for the intended service.		
11.11	Pump end shall be provided with vent and drain connections to enable complete venting and draining.		
11.12	Recommendations for the spare parts required for continuous operation of the pump for one year shall be obtained from the manufacturer and shall be supplied along with the pump.		
11.13	It shall be possible to maintain the unit with normal skills and tools available in a normal power plant. Any special tool or fixture required for the maintenance shall be identified and supplied along with the unit.		
11.14	All major and pressure retaining materials designated to be in conformance with ASME/ASTM specifications shall be tested and examined as per the specifications and certified material test reports shall be provided for proving their compliance.		
11.15	Pressure retaining castings (casing etc.) shall be examined by radiography to the extent possible as per the relevant material specification / Section VIII.		
11.16	Casing, impeller and shaft shall be examined for surface discontinuities by means of LP method.		
11.17	Motor shall be of 3 phase squirrel cage induction type and they shall be procured only from reputed manufacturers. Specifications of the motor in general shall be in compliance with IS: 325 standards. Where ever possible, pump motors shall be low speed motor (1450 rpm)		

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11.18	Motor shall be suitable for operation with the normally observed fluctuations in the supply. Contactors and FSU units shall be SIEMENS / L&T make. 415 V, 50Hz power		
11.19	All the motors shall be High Efficiency (Energy efficient) motors as per IS12615, EFF-1		
11.20	Class of insulation and the motor windings shall be suitable for the rated operating conditions and the specified ambient conditions.		
11.21	Type tests and Routine tests as per IS: 325 shall be carried out by the motor manufacturer, the results of which shall be the basis for acceptance of motor for its performance.		
11.22	The routine quality control checks proposed and followed by the pump and motor manufacturers shall be obtained from them and backed up with documents.		
11.23	The pump end after completion of assembly shall be hydro tested at 1.5 times the design pressure.		
11.24	The complete unit shall be inspected and tested for performance in accordance with Hydraulic Institute standards or ASME PTC 8.2 at rated speed and at rated power supply. Pump total head, power input to motor, pump efficiency, NPSH required vibration and noise levels shall be determined for the unit at flows ranging from shut off to at least 125% of rated flow. The pump characteristics curves shall be generated with appropriate temperature correction factors to indicate performance at operating conditions.		
11.25	The unit shall be run continuously for about 50 hours to demonstrate its satisfactory performance at rated flow and head condition. The motor which shall be part of the final assembly shall only be used for this purpose. During the test, performance shall be judged on the basis of the following measurements- voltage and current drawn by motor, pump flow and head, vibration and noise levels, temperature of bearings and motor body. Problems, if noticed during the course of testing, shall be rectified to the satisfaction of the Purchaser and retested for satisfactory performance.		
11.26	Apart from the relevant drawings, installation instructions, operation and maintenance manuals / schedules for the unit from the manufacturer shall be submitted.		
12.0	**Equipment installation requirements**	Vendor to confirm, specify and provide supporting document	
12.1	The process equipments which are required for the manufacture of the flushing stand shall be mounted on a common skid of the overall approximate size specified.		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
12.2	All the equipments shall be thoroughly cleaned prior to their installation. Cleaning shall cover the entire interior and exterior surfaces of the equipments. Extra care shall be taken in those areas where welding operations will be performed.		
12.3	The erection of equipment shall comprise of hoisting and placing of equipment on the skid, aligning, bolting, leveling in case of static equipment and in addition, greasing or filling with oil, checking for free rotation of shaft without power, fitting dowel pins, jacking screws etc. of rotating equipment. In brief, it includes all the works required to place the equipments in their location and ready to be wired and connected with piping and instrumentation as required so that commissioning tests, if any, can be undertaken.		
12.4	For any equipment or items of proprietary nature, the Purchaser shall follow the manufacturer's data or instruction manual or their recommendations. Any installation requirements specified, such as cleaning, handling, alignment, adjustments, greasing, turning of motors, mounting of particular item on the equipment etc. are to be complied with.		
12.5	Supporting arrangement can be in the form of support lugs, legs, skirts or a separate supporting structures etc. Locating and supporting of equipment shall be in accordance with the best engineering practices.		
12.6	The skid shall be made of standard structural components like I-Beams, Channels, Plates etc. as per IS:2062 specifications which are to be assembled by means of welding / use of fasteners and shall be rigid enough to carry the loads. Provisions in the skid shall be made for its portability and further locating it securely on the foundation in the operation area.		
12.7	All support structures on completion of their installation shall suitably be cleaned and given two coats of rust preventive primer and with additional two coats of rust preventing paint. Likewise, the skid, on completion of manufacture shall also be cleaned and painted. If required, the skid may have to be cleaned and painted again before dispatch,		
12.8.0	**Piping installation requirements :**		
12.8.1	The installation of piping shall comprise of the following: The term piping shall mean and comprise of all pipes, pipe fittings, flanges, reinforcement pads, stiffener rings, thermo-wells, instrumentation taps, bosses, sampling connections, vents, drains, valves, valve operators, strainers, filters, traps, gaskets, nuts, bolts, expansion joints, compact orifice plates, venturies, instruments mounted in line like flow elements, gauges, rotameters, switches, hangers, supports etc., in brief, all items forming part of the piping shown on the drawings along with instrument tubing from the process isolation valves and the accessories required for operation of the stand.		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
	All piping materials shall be adequately protected to prevent damage during handling and erection. Pipes after cleaning operation shall be capped with suitable plastic caps at the ends till such time they are used for further assembly.		
12.8.2	The sub-assemblies mainly consist of various piping components joined together by different types of flanged, threaded or welded joints. Welding shall be carried out using qualified welding procedures and welders as specified in this specification. A record of all welding work carried out shall be maintained.		
12.8.3	Every weld joint in the piping shall be numbered and identified by a distinct number in the drawings. All records pertaining to every weld joint shall be identified by these numbers.		
12.8.4	The orientation of valves for ease of access for their operation shall be ascertained prior to their installation.		
12.8.5	Piping shall be installed without straining them for the purpose of making the joints.		
12.8.6	Thermo wells and such items which are shown in the flow sheet are required to be installed by the Supplier and details showing their installation shall be finalized beforehand and followed.		
12.8.7	The Supplier shall provide valve tags of approved type and shall number the equipment etc. in the manner prescribed by the Purchaser.		
12.8.8	Piping shall be adequately supported on or suspended from structures by using standard pipe clamps, guides, hangers etc. as required and meeting the recommendations in the Code. Supplier shall ascertain the load carrying capability of all the brackets, saddles, clamps, hangers, supports etc. and be responsible for their structural integrity.		
12.8.9	A thin layer of aluminium / Stainless steel foil of about 0.2 mm thickness shall be wrapped around the pipes at the support locations for sufficient length in order to avoid direct contact of the support components of structural steel material with the piping of stainless steel material.		
12.8.10	Cleanliness of parts and assemblies are considered to be satisfactory, if there is no dirt on wiping the surface with clean white lint free napkins wetted with acetone and cavities of the completed equipment do not have surface scaling, untypical deposits of corrosion products or foreign objects (e.g chip, powder, metal spray, weld spatter, slag, dirt, grease)		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
12.8.11	In order to ensure cleanliness of all parts and sub-assemblies before assembly, cleaning, degreasing and drying is done before they become difficult to access. Once cleaned, cleanliness is to be preserved by suitable methods. Cleaned and degreased surfaces are to be handled using clean gloves made from lint free material.		
12.8.12	Prior to final assembly, all parts and sub-assemblies are checked for cleanliness and absence of foreign objects in the inner cavities. Parts and sub-assemblies after cleaning and degreasing are to be dried by wiping the surfaces with clean white lint free napkins and completely dried in air.		
12.8.13	Valve bodies shall be visually inspected, pickled and passivated in the presence of BHEL before assembly as per procedure to be approved by BHEL. Valve stem surface shall be smoothly finished so as to avoid peeling of packing material during opening and closing of valves and the same will be inspected by BHEL during assembly stage.		
12.8.14	All tools and fixtures including the cutting and measuring tools made of carbon steel used for handling SS materials during assembly in the inner cavities must have an anti-corrosion (Chromium or Nickel) coating / wrapping.		
12.8.15	All tools and fixtures used during assembly shall be clean and grease free.		
13.0	**Inspection and testing:**	Vendor to confirm, specify and provide supporting document	
13.1	Inspection of the work covered under this specification shall be carried out at different stages of execution to determine their conformance with the specifications with respect to material, strength, performance, workmanship, finish, marking and dimensions viz. procurement of materials required for the manufacture of equipment, bought out items, during the course of manufacture of equipment and the stand using these materials and on completion of manufacture of the stand.		
13.2	All the inspection and testing specified herein shall be conducted in a manner satisfactory to the Purchaser and shall be subject to his approval. Inspection and testing shall be carried out either in house or at NABL approved agencies in case of non-availability of requisite facilities.		
13.3	The Purchaser or his authorized representative shall have access to the Supplier's premises at all reasonable times to the extent necessary to assess compliance with the provisions of this Specification.		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
13.4.0	A detailed QA plan for the inspection and tests required to be carried out at various stages shall be submitted for approval. Details shall include the stage, type, method, acceptance criteria, format of recording results etc. QA Plans shall be prepared for the following:		
13.4.1	Each of the equipments that are to be manufactured		
13.4.2	Pump-motor units		
13.4.3	Filters		
13.4.4	Each of the bought out items required for the manufacture of stand		
13.4.5	Flushing stand during and on completion of construction		
13.5	All the materials, which are procured by the Supplier shall be inspected and tested as per the respective approved material specifications. Test certificates and reports from the manufacturers of such materials shall be made available along with the materials and approval shall be obtained from the Purchaser prior to deploying them for further use in the construction.		
13.6	Equipment on completion of manufacture shall be inspected and tested as per the requirements of the Code for their conformity and the respective drawings.		
13.7	The rotating equipments shall be inspected and tested for their acceptance in line with the applicable standard which shall be reflected in the QAP and followed.		
13.8	Other bought out items like pipe, tubes, pipefittings, tube fittings, process valves, instrument valves, process instrument sensors, transmitters, thermo wells, fasteners, welding consumables, gaskets and packings and other related items etc. shall be similarly inspected and tested for acceptance in line with the requirements of the respective standards and the approved QAPs.		
13.9	Correctness of the directions of the piping components like valves, orifice flanges, venturies etc. shall be checked at the fit up stage prior to making the sub-assemblies.		
13.10	Piping sub-assemblies after installation shall be parallel or perpendicular to gravity vertical within 0.5 mm.		
13.11.0	Apart from the visual examination at various stages of making, all full penetration weld joints in the equipment and the piping shall be examined by the non-destructive examination methods at the following stages:		
13.11.1	Weld Edge preparation, on completion of root pass and full weld by LP method		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
13.11.2	Radiographic examination on completion of weld. RT technique sheets shall be submitted for all mutually agreed welds joints including weld joints in the filters.		
13.12	The socket welds and the fillet welds shall be examined by LP method on completion.		
13.13.0	All non-destructive examination shall be done as per the requirements stipulated herein and the written approved procedures. All personnel performing any non-destructive examination shall be competent and knowledgeable of the applicable examination requirements and shall be qualified in the general technique and to the specific procedure as per SNT-TC-1A.		
13.13.1	Radiographic examination		
13.13.2	Radiographic examination shall be carried out in accordance with Section V of ASME B&PV Code.		
13.14.0	**Hydro test**		
13.14.1	On completion of manufacture of equipment like storage tank, cooler, filter / strainer, heater etc. hydro test shall be carried out at a pressure of 1.5 times the design pressure of the respective equipment along with the temperature correction to demonstrate the structural integrity as called for in Section VIII Div.1of the ASME Code.		
13.14.2	On completion of manufacture of the flushing stand complete with all equipment and the interconnecting piping work, different sections of the stand shall be similarly hydro tested at a pressure of 1.5 times the design pressure of that particular section with the temperature correction, if any.		
13.14.3	Demineralized water shall be the medium for conducting the hydro test.		
13.14.4	An approved detailed procedure indicating the arrangements for filling, venting, draining of hydro test medium, pressurizing the system, related instrumentation shall be followed for conducting the test.		
13.14.5	The identified sections of the piping shall be hydro tested independently at the corresponding test pressures. The interfaces between the high pressure and low-pressure sections shall be isolated prior to pressurizing. The interfacing components shall be satisfactorily hydro tested for the highest design pressure.		
13.14.7	The pressure shall be held for sufficiently long duration to enable inspection of all joints or likely points for any leakage. However, the minimum holding time shall be one hour.		
13.14.6	Flange joints shall be tightened to predetermined torque values, which shall be determined by the Supplier. Leakages from gasketed joints shall not be cause for failure of hydro test.		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
13.14.8	Absence of leakages from the piping system and drop in hydro test pressures shall be indication of passing of hydro test.		
13.14.9	In case of failure of the test, investigations shall be carried out and corrective actions worked out to the satisfaction of the Purchaser and the hydro test shall be satisfactorily repeated.		
13.14.10	The stand shall be dispatched only after obtaining the written consent from the Purchaser. Necessary particulars about the consignment shall be marked for easy identification		
14.0	**Thermal Insulation**	Vendor to confirm, specify and provide supporting document	
14.1	All the equipment and interconnecting piping in the flushing stand shall be provided with thermal insulation of sufficient thickness and covered with stainless steel / aluminium foil of about 0.2 mm thickness.		
14.2	Minimum requirement of thermal insulation thickness for various equipment and piping in the stand shall be determined for minimizing the heat loss from the stand and for maintaining industrial safety. Calculations for determining the thickness on different sizes of equipment and piping in the stand shall be submitted for review and approval of the Purchaser.		
14.3	Material for thermal insulation shall be light resin bonded rockwool / mineral wool machine stitched mattresses suitable for the operating temperature and conforming to IS: 8183 specifications.		
14.4	Material for insulation shall be tested for its compliance with the identified IS specifications and manufacturer's test reports shall be submitted for approval prior to their use in the work.		
14.5	Supporting arrangement (Cleats of suitable design) wherever required for holding the thermal insulation material in place shall be provided. Box type of construction shall be used for insulation of process valves. The bonnet portion of the valves shall be fully covered with the insulation and the stem and handle portion of the valve shall be left free to enable operation of the valves.		
15.0	**Performance test**	Vendor to confirm, specify and provide supporting document	
15.1	The flushing system after final assembly and before being connected to the equipment shall undergo hot flushing as a closed circuit with hot DM water (will be supplied by BHEL) as per the following sequence and it's performance and cleanliness level as given below shall be demonstrated in the presence of BHEL		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
	inspectors. Chemistry of water to be used for flushing will be as follows: Total mass concentration of salts **Or** Specific electric conductivity: 1 mg/dm^3 or less / 2.0 μ s/cm mass concentration of dense residue: 2 mg/dm^3 or less mass concentration of chloride ions: 0.05 mg/dm^3 or less pH: 6.5 - 7		
15.2.0	**Flushing and Pressure drop measurement of system after Erection and Commissioning at BHEL:**		
15.2.1.0	**Sequence of operation for flushing the system**		
15.2.1.1	Prepare the system pipelines, filters etc. for flushing by closed circuit water circulation. Check their cleanliness and clean them, if required. Visible contamination on filters is prohibited.		
15.2.1.2	Connect the bridge piece across the inlet and outlet lines.		
15.2.1.3	Take DM water sample just before filling the system to check chemistry		
15.2.1.4	Fill the flushing system with DM water. Suitable provision for venting and draining shall be ensured. Start all the three circulating pumps (P1, P2, and P3) and maintain a combined flow rate at 135±10 m^3 / hr.		
15.2.1.5	Switch on the heaters.		
15.2.1.6	Maintain the circulation till the water temperature reaches 80^{o}C. Cooler may be used if temperature exceeds 90 ^{o}C		
15.2.1.7	Record the pressure drop across the filters and the system.		
15.2.1.8	Flush the system at 135±10 m^3 / hr.with flow reversal as required after every 30 minutes. Flushing of system shall be done for min. 8 hrs.		
15.2.1.9	Periodicity of outlet filter inspection for cleanliness is 2-4 hrs.		
15.2.1.10	Clean or Replace filtering elements as they are contaminated, but not later than 8 hrs. of washing.		
15.2.1.11	Final flushing is performed by 2 hrs cycles with flow reversal every 30 min. as required. Each cycle is completed by flushing in forward direction.		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
15.2.1.12	At the end of flushing cycle, flushing water sample shall be taken for water quality analysis.		
15.2.1.13	Outlet filter shall be inspected after washing cycle end. Acceptance as mentioned below		
15.2.1.14	Flushing is treated as satisfactory, if in three samples consecutively taken every 30 minutes : **a)** There are no visible mechanical particles, oil products and other greasing impurities which is confirmed by the results of water sampling analysis. **b)** Growth of mass concentration of dense residue and salt content does not exceed 1.0 mg/dm^3 and 0.5 mg/dm^3 respectively, if compared with initial water. Chloride ion content does not exceed 0.05 mg/dm^3. **c)** The count of Mechanical particles collected in the cloth filter of the outlet filter shall meet the following acceptance criteria		

Sl No	Particle size	No of particles allowed	
		Metallic	Non metallic
01	Greater than 1.0 mm	1	1
02	0.5 – 1.0 mm	2	5
03	0.2 – 0.5 mm	1	15

	d) Absence of oil products, rainbow on water surface and oil spot on white filter paper. **e)** There are no visible mechanical particles and contamination on accessible inner surfaces of adapters, piping etc.		
15.2.2	After completing the flushing cycles satisfactorily as above, measure the pressure drop across the system.		
15.2.3	Complete draining of the system shall be ensured after completion of flushing.		
15.2.4	Finally, outlet filter in the return line shall be inspected to ensure there are no visible mechanical particles, corrosion and other contamination on the mesh		
15.3	The flushing stand after completion performance trial runs should be tested for endurance continuously for about 100 hours.		
15.4	Demineralized water shall be the medium for the operation.		
15.5	The bridge piece which is to be supplied along with the stand for future use for such self-cleaning shall be made use of during this operation.		
15.6	All the instruments used in the stand shall be calibrated and checked for their proper working.		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
15.7	During the continuous operation of the stand performance of equipments shall be evaluated for meeting the design intent by monitoring of various parameters. The process instruments provided shall be monitored for their correctness and satisfactory working.		
15.8	The performance of the filters shall be checked by sampling of inlet and outlet water and also by visual inspection of the filtrate retained in the filters. Absence of degeneration of materials used in the construction of the stand especially of the consumables like gaskets, O-rings, valve packing etc shall be ascertained during the performance test by visually verifying the filtrates.		
15.9	Apart from the process parameters, noise and vibration levels during the operation of stand shall also be monitored.		
15.10	In case of unsatisfactory performance of the stand, the causative factors shall be investigated and corrective measures taken after approval. On correction of such causes, the stand shall be retested for its satisfactory performance.		
16.0	**Preservation, Packing and Shipment**	Vendor to confirm, specify and provide supporting document	
16.1	On completion of the self-cleaning and performance testing of the stand, flushing water shall be drained from the equipment on the skid as well as the filter banks and dried thoroughly for removal of moisture. Procedure for drying shall be submitted for approval of Purchaser.		
16.2	All the openings in the flushing stand and the pipe terminations shall be suitably plugged and sealed.		
17.0	**Quality Surveillance By Purchaser**	Vendor to confirm, specify and provide supporting document	
17.1	Throughout the manufacturing cycle, quality surveillance will be maintained directly by Purchaser or through his authorized representative. It is to be understood clearly that the Quality assurance is the total responsibility of Supplier. Surveillance done by Purchaser or his authorized representative does not relieve Supplier of his responsibility for quality.		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
17.2	The Supplier shall provide to the Purchaser or his authorized representative, free access to areas, facilities and documents / records associated with this work.		
17.3	If inspection / test results do not meet the specification requirements, Supplier must notify the Purchaser of such deviations along with proposals for corrective action, wherever required.. Before attempting any repair, Supplier shall obtain permission from the Purchaser.		
17.4	**Q.A. Records:** Records shall be prepared and maintained to provide objective evidence of quality. Records shall include the results of inspections, tests, non-conformance reports, qualification certificates for personnel, testing and examination procedures and calibration reports of instruments / machines.		
17.5.0	**Document Control**		
17.5.1	Before commencement of material procurement and manufacturing activity, Supplier shall submit for approval of Purchaser, a set of documents in the form of material specifications, inspection and testing procedures, and drawings. Each document should bear document number, revision number and date of revision and shall be duly signed by the persons responsible for the document.		
17.5.2	Preparation, review, approval and issue of documents shall be subject to control. Latest authorized drawings/documents shall only be used in the work areas. Obsolete drawings/documents shall be promptly removed to avoid their use.		
17.5.3	Complete documentation as required by this tender document shall be done by the Supplier. The Supplier shall identify in totality, all the documents, which are being submitted: a) along with the bid; b) after award of work but prior to commencement of manufacture, and c) on completion of work.		
17.6	**Rights and privileges**		
17.6.1	The Purchaser reserves right to inspect any machinery, equipment or tool used by the manufacturer for manufacturing the component. Should the Purchaser waive the right to inspect any equipment, tool, machinery etc., such waiving shall not relieve the manufacturer in any way of his obligations for supplying the stand as per this specification.		
17.6.2	Purchaser or his authorized representative shall be given full assistance in the form of necessary tools, instruments, equipments, qualified operators and other such facilities to facilitate inspection and testing of fittings.		
17.6.3	The Supplier has all the responsibilities of providing the Purchaser or his authorized representative with all		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
	specified information regarding manufacturing and of assuring that the quality control, the detailed examination specified here in are performed to permit them to be meaningful and to the satisfaction of the Purchaser.		
17.6.4	Even though inspection may be carried out by the Purchaser or his representative, such inspection shall not, however, relieve the Supplier of the responsibility for furnishing fittings conforming to the requirements of this specification nor prejudice any claim, right or privilege which the Purchaser may have because of the use of defective and unsatisfactory equipment.		
17.6.5	All external surfaces shall be coated with Aluminum paint.		
17.6.6	If the Supplier fails to adhere to the above approved manufacturing schedule or fails to supply the stand as per this specification, the Purchaser shall have the right to terminate the contract.		
18.0	**Guarantee**: The Supplier shall guarantee satisfactory performance of the entire work executed against any defects and bad workmanship for a period of 12 months from the date of commissioning or 18 months from the date of completion whichever is earlier.	Vendor to confirm,	
19.0	**Documents to be submitted with the bid**	Vendor to submit	
19.1.0	The following information shall be provided with the bid, without which the bid shall be considered incomplete and is liable to be rejected.		
19.1.1	Lump sum cost for design, manufacture, inspection, testing, delivery and guarantee of the stand covered under the specifications		
19.1.2	Details of similar work carried out in the past with references		
19.1.3	Details of in house facilities available for manufacture, inspection and testing of equipment, piping and structural work		
19.1.4	Likely suppliers for various raw materials / bought out items to be procured for manufacture of equipment, piping, instruments		
19.1.5	Likely suppliers for pump-motor units		
19.1.6	Likely suppliers for strainers / filter / cooler		
19.1.7	Details of sub-contractors, if proposed to be employed and the work proposed to be sub-contracted		
19.1.8	Detailed time schedule for execution of work		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
19.1.9	Deviations / reservations, if any, to the specifications		
19.1.10	List of recommended spares for 5 year operation with unit rate		
20.0	**Technical details to be submitted along with the technical Bid.**	Vendor to submit	
20.1	Lay out drawing in 3D indicating the overall dimensions of the system.		
20.2	GA drawings and P&I diagram showing the overall dimension and relative location of all the equipments of the flushing stand. GA drawing should clearly indicate the empty space required to be maintained all around the system and the head room required on the top of the system.		
20.3	Pressure drop calculation for the total system and also across individual strainers and Valves.		
20.4	Bill of materials covering the total scope		
20.5	List of recommended spares for erection and commissioning and for 5 years operation with item wise price.		
20.6	Catalogues and data sheets of pumps, motors, Cooler, Strainers, Cooling tower, flow measurement devices and other instrumentation items.		
20.7	Filters being a very critical component, the constructional features of filters showing the sealing arrangement and fixing details of filter elements, which will illustrate the method of removal and replacement of filter elements shall be furnished.		
20.8	Total power requirement for the system shall be indicated in the offer		
20.9	Detailed quality plan for the total system as well as the individual items like pumps, valves, filters, coolers and instruments for approval.		
20.10	Pressure drop in the total system and also across individual strainers and Valves shall be indicated in the offer.		
20.11	Documents supporting the suitability of the selected pump-motor		
21.0	**Documents to be submitted after placement of order**	Vendor to submit	
21.1	Pressure drop calculation for the total system and also across individual strainers and Valves.		
21.2	The compact orifice calculation for DP and calibration certificate for the transmitter to match with DP		
21.3	Three sets of Operation & Maintenance manual giving the following details to be provided in hard and soft copies (CDs)		

Clause	PARTICULARS AND BHEL SPECIFICATION	Vendor's OFFER With Technical Details	
21.4	Complete step-by-step operating procedure including safety precautions.		
21.5	Maintenance procedures & trouble shooting hints for the system and individual components including preventive maintenance check points.		
21.6	Complete set of assembly & sub-assembly drawings with dimensions & bill of materials and manufacturing part drawings for wearing components.		
21.7	Complete specification and original catalogues of all the bought out items.		
21.8	Complete list of spares with purchase specifications, part numbers, make, etc.		
22.0	**Documents to be submitted along with the equipment. (to be filled by the supplier)**		
22.1			
22.2			
22.3			
22.4			
22.5			
22.6			
22.7			
22.8			

Annexure – I : List of Equipment to be flushed

Equipment	Flow in m^3/ Hr during flushing cycle	Flow in m^3/ Hr during □P measurement cycle	□P across the equipment □in MWC
1-A	91	91	15
1-B	135	135	14
2-A	25	13	26
2-B	30	30	37
2-C	3	2	18
3-A□	31.5	31.5	0.1
3-B	10	10	0.1
4-A	5	5	23
4-B	9.4	Not applicable	5
4-C	9.4	Not applicable	5
5-A	5	Not applicable	
5-B	6	Not applicable	
6-A	33.6	Not applicable	
6-B	9.6	Not applicable	

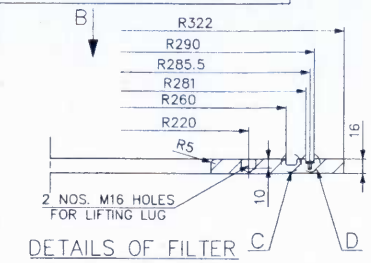
Note:

1. Negative tolerance on the flow rate for selection of pump shall be 0.
2. Positive tolerance on flow rate for selection of pump shall be 20% of rated flow.
3. Tolerance on the operating flow rates shall be +/- 2%
3. The pressure drops indicated are across the respective equipment.

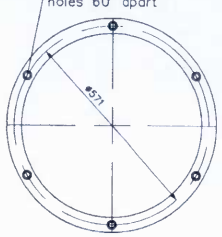
Annexure -II : List of applicable Codes / Standards and Specifications

ASME Boiler and Pressure Vessel Code Section II, VIII, V and IX
API 610 Centrifugal Pumps for petroleum, heavy duty chemical and gas industry services
MSS SP-6 Standard Finish of Contact Faces of Pipe Flanges
ASME B 1.1 Unified Inch Screw Threads
ASME B 2.1 Pipe threads (Except Dry seal)
ASME B 2.2 Dry seal Pipe threads
ASME B 31.1 Pressure Piping Code
ASME B 36.10 Welded and Seamless Wrought Steel Pipe
ASME B 36.19 Stainless Steel Pipe
ASME B 16.5 Flanges and Flanged fittings
ASME B 16.9 Wrought Steel Butt welding fittings
ASME B 16.11 Forged Steel Fittings, Socket Welding and threaded
ASME B 16.21 Nonmetallic Flat Gaskets for Pipe Flanges
ASME B 16.25 Butt Welding Ends
ASME B 18.2.1 Square and Hex Bolts and Screws
ASME B 18.2.2 Square and Hex Nuts
ASTM A-36 / ASME SA 36 Specifications for Structural Steel
ASTM A-182 / ASME SA 182 Alloy Steel Forged or Rolled Bars
ASTM A-193 / ASME SA 193 Alloy Steel Bolting
ASTM A-194 / ASME SA 194 Alloy Steel Nuts
ASTM A-213 / ASME SA 213 Stainless Steel Tubes
ASTM A-233 / ASME SA 233 Mild Steel Covered Arc Welding Electrodes
ASTM A-240 / ASME SA 240 Stainless Steel Plate
ASTM A-312 / ASME SA 312 Stainless Steel Pipe, Seamless or Welded
ASTM A-276 / ASME SA 276 Hot rolled & Cold finished Stainless and Heat resisting Steel Bars
ASTM A-298 Corrosion resisting Cr and Cr-Ni Steel Covered welding electrodes
ASTM A-403 / ASME SA 403 Wrought Austenitic Steel Welding Fittings
ASTM B-297 Specification for Tungsten Arc Welding Electrodes
ASTM E-94 Recommended Practice for Radiographic Testing
ASTM E-142 Controlling Quality of Radiographic Testing
ASTM E-165 Liquid Penetrant Examination
IS 1239 M.S. Tubes, Tube Bars and Other Wrought Steel Fittings (Part-I and Part-II)
IS 1367 Threaded Fasteners
IS 2062 Structural Steel (Standard Quality)

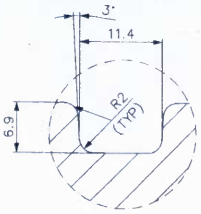
DRAWING NO: 2-90-117-00517



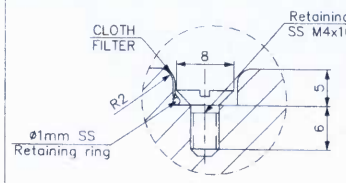
DETAILS OF FILTER BASKET FLANGE



VIEW-B
(Part of the view)

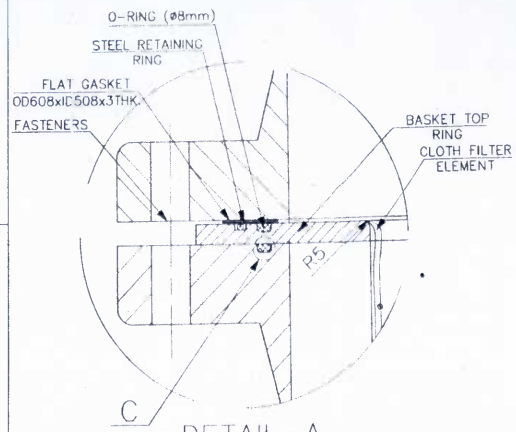


DETAIL-C

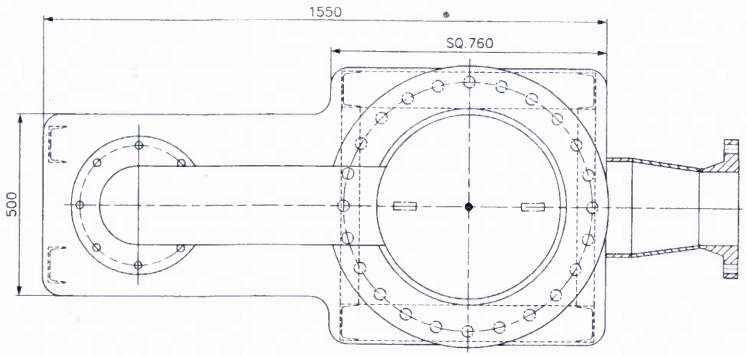


DETAIL-D

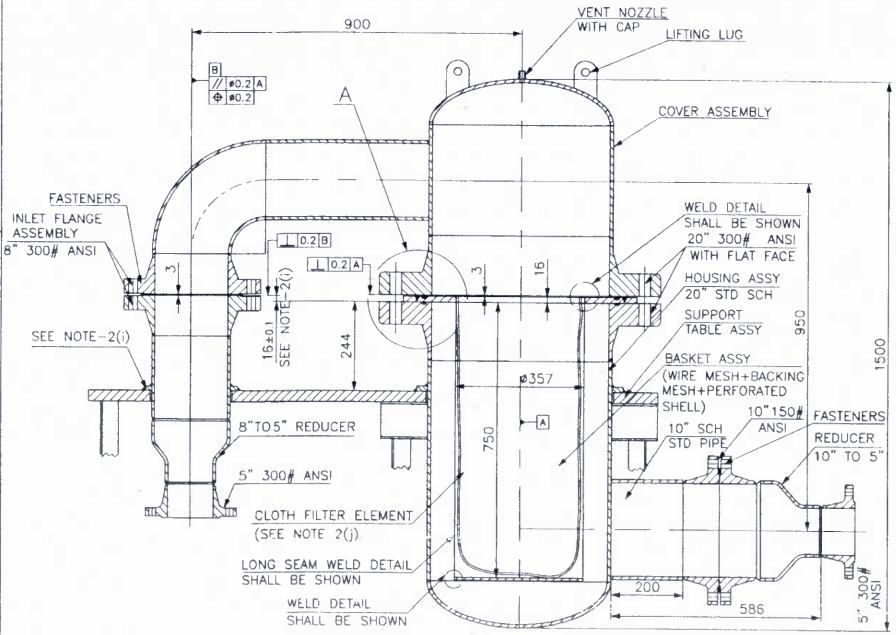
ALL DIMENSIONS ARE IN MILLIMETERS



DETAIL-A



PLAN



1. Design data

1. Code of Construction : ASME Sec. VIII Div.1
2. No. of filters : 6 Nos.
3. Mode of operation : Continuous operation in multiple 8 hrs cycle
4. Design Pressure : 15 Kg/Cm²
5. Design Temperature : 100°C
6. Operating pressure : 12 Kg/Cm²
7. Operating Temperature : 70-80°C
8. Flow rate : 2 tons/hr – 400 tons/hr (Operating condition)
9. Flow medium : Dematerialized water
10. Pressure drop : As minimum as possible
11. Inlet : 125 NB/200 NB with flanged end (ASME B16.5) along with reducers.
12. Outlet : 250 NB/125 NB with flanged end (ASME B16.5) along with reducers.
13. Rating / Mesh size : For FOF & ROF-200μ and For FIF & RIF-100μ 01
14. Material
    1. Housing Assy: SS 304L
    2. Cover Assy : SS 304L
    3. Wire mesh(Including backing mesh and perforated shell : SS 304L
    4. Flat Gasket : Silicone rubber, O-Ring : Viton
    5. Fasteners : SA 193 B7 / 194 2H
    6. Pipe/Elbow /Flange : SS 304L
    7. Support Plate : CS
    8. Cloth filter: Nylon Special Quality (2 side Weaving).

2. Construction of the filters shall meet the following requirements:

a. The filters shall be bought out only from reputed mutually agreed filter manufacturer meeting conceptual design shown here. The design and construction details of the filters shall be obtained from the manufacturers and submitted for approval prior to procurement or their manufacture
b. The filters shall be of in-line removable basket type.
c. To ensure the integrity and strength of the long seam weld joint of the filter element and the joint between the element and the end cap/Top ring suitable welding process and procedure shall be established and the same shall be approved by BHEL before taking up the job.
d. All the pressure retaining welds shall be full penetration welds. Inside surface of the weld shall be Free of cavities/ crevices & smoothly finished to 3.2μm or better.
e. Filters are required to be examined periodically for ascertaining the level of cleanliness during flushing operation. The filters, therefore, shall be of quick opening type, (with in 15-20 minutes) preferably a hydraulically operated clamping/declamping system. Actual arrangement envisaged for meeting this requirement shall be submitted in the form of drawings along with the bid.
f. Filters shall be provided with independent vent and drain valves / plugs to enable complete venting and draining.
g. For easy handling, davit arrangement shall be provided.
h. The wire mesh shall be supported by an additional mesh of 800μ and a suitable perforated shell of ø5mm hole and 8mm pitch.
i. Weld shall be done with distortion control in assembly / fit up condition of the INLET flange assembly. to ensure that the gasket seating faces on the pipe flange and the basket top ring top face are on the same plane.
j. For Cloth Filter Element Refer Sketch 3-90-117-01185/00

3. Tests to be carried out and documents to be submitted

a) All full penetration weld shall be subjected to NDE as follows
   1. Weld EP, on completion of root pass and full weld by LP
   2. RT on completion of weld as per approved technique sheet
b) Socket weld and fillet welds shall be examined by LP method on completion.
c) Hydro test of the equipment with DM water.
d) Mechanical and process design calculation including sizing and pressure drop calculation, manufacturing drawings (GA and part drawings)
e) Microscopic examination of wire mesh & backing mesh at min. 12 randomly selected points by purchaser to confirm mesh size.
f) QAP indicating stages of inspection.
g) Test procedures for all the identified tests.
h) Material's TCs; after placement of PO (mill TC's as well as verification re-test TC's).
i) Procedure for pickling and passivation.
j) Cleaning procedure for all parts.

VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER/SIZE	ITEM NO / VAR NO	MATERIAL CODE / MATERIAL SPECN	A/C / UNIT	UNIT WEIGHT / QUANTITY	GS	ZONE
								D1		

TOLERANCE IF NOT SPECIFIED SHALL BE AS BELOW (REFER IS 2102-n

LINEAR				ANGULAR	
0.5 TO 3	±0.1	400 TO 1000	±0.8	0 TO 10	± 1°
3 TO 6	±0.1	1000 TO 2000	±1.2	10 TO 50	±30'
6 TO 30	±0.2	2000 TO 4000	±2.0	50 TO 120	±20'
30 TO 120	±0.3	–	-	120 TO 400	±10'
120 TO 400	±0.5	–	-	OVER 400	± 5'

REV	DATE	ALTERED :	
01	150313	CHD&APPD :	

TITLE AND NOTE-13 REVISED

CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: FLUSHING SYSTEM

BHEL 06-228/D
Bharat Heavy Electricals Ltd
UNIT: HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI - 620014

	NAME	SIGNATURE	DATE	NO. OF VAR
DRN	NJR		170412	
CHD	RPV		170412	
APPD	AS		170412	

DEPT	GRADE OF UNTOL DIM	SCALE	WEIGHT (Kg)	REF TO ASSY / OLD DWG	ITEM NO	No. OF ITEMS
NC	C/M/F	NTS				
CODE 150						

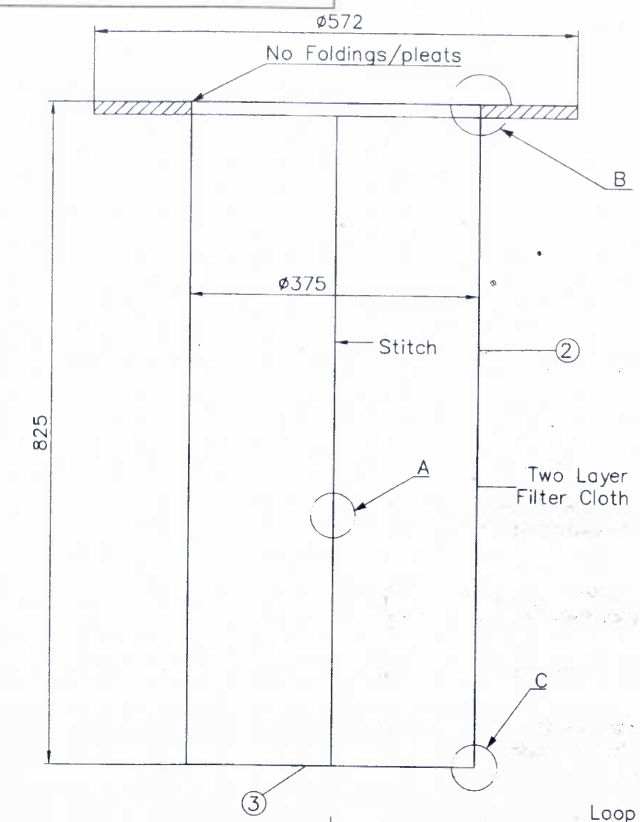
TITLE: SPECIFICATION FOR FILTERS

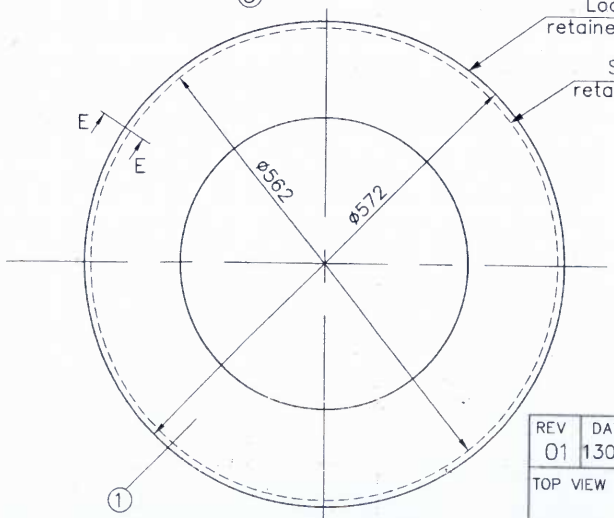
CARD CODE: U 01

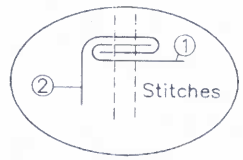
DRAWING NO: 2-90-117-00517 REV 01

Size A2

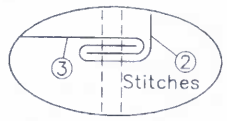
DRAWING NO: 3-90-117-01185



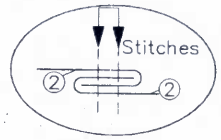




Detail – B



Detail – C



Detail – A

SECTION–EE

ALL DIMENSIONS ARE IN MILLIMETERS

Material : Nylon Special quality (2 side weaving).
Make : Mehata Mills/ Ahmedabad.
Pore Size : 100 microns.
Service to be guaranteed : 16 Hrs operation without physical damage.

Note:

1. Item no 1 to be cut as a ring of OD 572 mm and ID 375 mm (with stitching allowance) and to be stitched to Item no 2 without any pleats or Foldings as per Detail–B
2. Stitching should be done with care so that cloth edge remains within the stitched zone (i.e. two stitches).
3. Use 562 X 357 template of steel/plywood for cutting item no.1, stitching retainer ring loop at OD, stitching item 01 to item 02 and checking for absence of pleats in item 01 after stitching.

VARIANT NUMBER	ITEM NUMBER	DESCRIPTION	STD	DRAWING NUMBER	ITEM NO / VAR NO	MATERIAL CODE / MATERIAL SPECN	A/C	UNIT / D1	UNIT WEIGHT / QUANTITY	GS

REV	DATE	ALTERED / CHD&APPD
01	130213	N.JayaRaj / [illegible]

TOP VIEW ADDED.

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TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT

PRODN. DRG

Bharat Heavy Electricals Ltd
UNIT: HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI – 620014
05-229/D

	NAME	SIGNATURE	DATE	NO. OF VAR
DRN	NJR	N.JayaRaj	170412	
CHD	RRV	[illegible]	170412	
APPD	AS	[illegible]	170412	

DEPT	GRADE OF UNTOL DIM	SCALE	WEIGHT (Kg)	REF TO ASSY / OLD DWG	ITEM NO.	No OF ITEMS
NC	C/M/F	NTS				
CODE 150						

TITLE: CLOTH ELEMENT FOR RETROFIT FILTER

CARD CODE: U 01

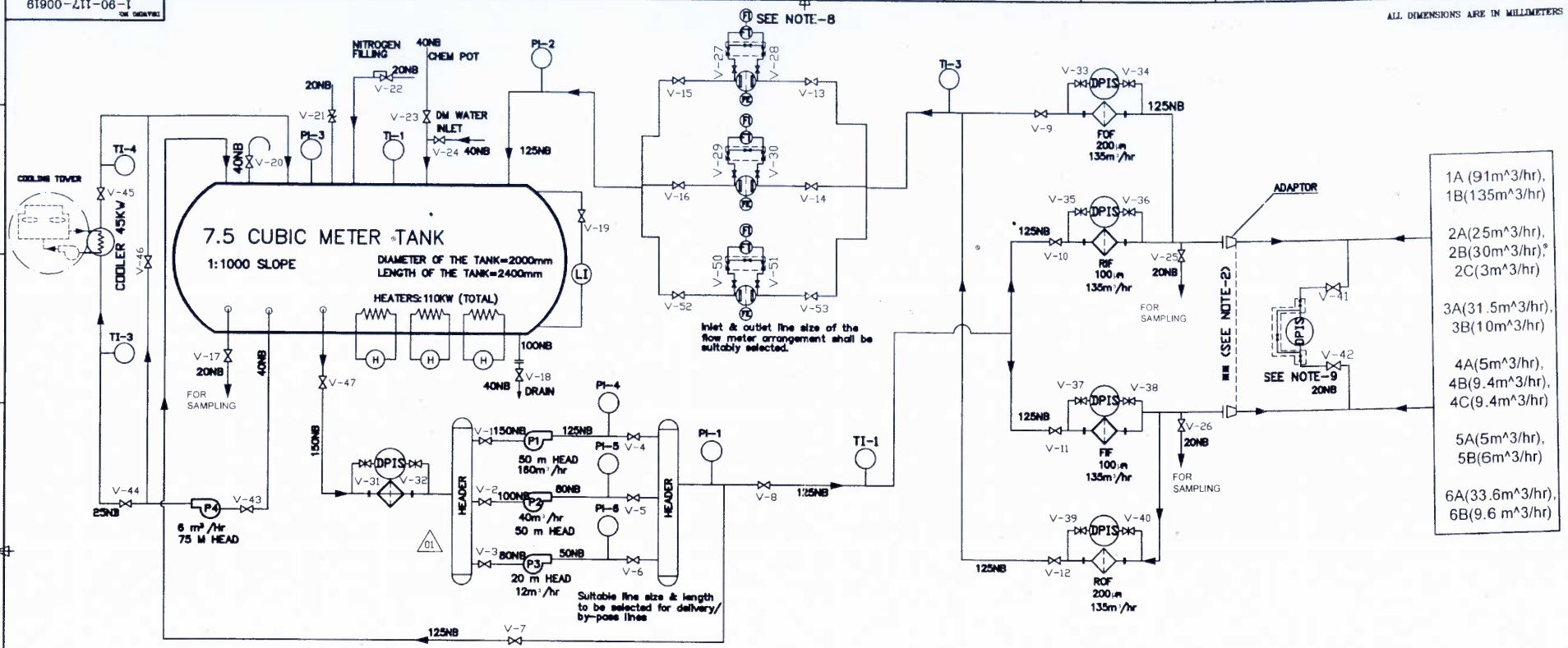
DRAWING NO : 3-90-117-01185

REV: 01

Size A3

1-90-117-00619

ALL DIMENSIONS ARE IN MILLIMETERS



NOTES:

1. THE FLUSHING STAND SHALL BE MADE MEETING THE REQUIREMENT OF TECHNICAL SPECIFICATION.
2. ** BRIDGE PIPE WITH MATING FLANGES ON BOTH ENDS. FLANGE FACES SHALL BE IN BE PLANE.
3. THIS SKETCH GIVES ONLY SCHEMATIC OF THE LOOP. DETAILED DRAWING SHALL BE SUBMITTED FOR APPROVAL.
4. DESIGN, FABRICATION AND TESTING OF THE FLUSHING SHALL MEET REQUIREMENTS OF ASME SEC.VIII DIV.1.
5. SYSTEM SHALL NOT HAVE STAGNANT ZONES (e.g. CREVICES, CORRUGATED PIPING ELEMENTS ETC.)RESULTING IN CONCENTRATION OF CONTAMINATION.
6. FOR DP MEASUREMENT VALVE OPENING AND CLOSING SCHEMES SHALL BE SAME AS FORWARD FLOW SCHEME EXCEPT THAT VALVES V41 & V42 SHALL BE KEPT OPEN.
7. EACH ITEM WILL BE CLEANED SEPARATELY BEFORE ASSEMBLY IN THE LOOP.
8. COMPACT ORIFICE TYPE FLOW METER TO BE CONNECTED FOR THE FOLLOWING RANGE OF FLOW.
   1. 0–5 m³/hr
   2. 0–25 m³/hr
   3. 25–250 m³/hr

   (01)
9. RANGE OF DPI TO BE CONNECTED ALONG WITH CONNECTING PIPES & FITTINGS.
   1. 0–150 mmwc
   2. 0–1.2 mwc
   3. 0–20 mwc
   4. 0–50 mwc
10. COOLING TOWER IS NOT IN THE SCOPE OF SUPPLIER
11. (01) V4, V5, V6, V7 & V8 ARE CONTROL VALVES AND THE VIBRATION AND LOW NOISE LEVELS SHALL BE MAINTAINED FOR THE SAME.
12. PUMPS (P1 or P2 or P3) WILL BE OPERATED ONE AT A TIME.

TAG NO.	DESCRIPTION
LI	LEVEL GAUGE REFLEX TYPE, FLANGED
V	VALVES
FI	COMPACT ORIFICE PLATE WITH FLOW TRANSMITTER
FOF, ROF	FILTER, MESH SIZE: 200 MICRONS REF. 2-90-117-00517
FIF, RIF	FILTER, MESH SIZE: 100 MICRONS REF. 2-90-117-00517
TI	RTD WITH THERMOWELL
PI	PRESSURE INDICATOR DIAPHRAGM TYPE
DPIS	DIFFERENTIAL PRESSURE INDICATOR CUM SWITCH
P1, P2, P3 & P4	HORIZONTAL TYPE CENTRIFUGAL PUMP

OPERATING AND DESIGN CONDITIONS

DESIGN PRESSURE	: 6 Kg/Sq.cm
DESIGN TEMPERATURE	: 100°C
DESIGN FLOW RANGE	: 12 TO 160 cum/hr
OPERATING PRESSURE (MAX)	: 5 Kg/Sq.cm.
OPERATING TEMPERATURE	: 80°±10°
OPERATING FLOW RANGE	: 2 TO 135 cum/hr

REV	DATE	ALTERED: CKD/&APPD.
01	150313	BRANCHING OF PUMP LOOP IS ADDED

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: FLUSHING SYSTEM

Bharat Heavy Electricals Ltd
UNTS HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI - 620014

TITLE: FLUSHING SCHEME

DRAWING NO: 1-90-117-00619 | 01

U 01

Size A1