



BHARAT HEAVY ELECTRICALS LIMITED

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ENQUIRY
(INDIGENOUS)

(A Government of India Undertaking)
HIGH PRESSURE BOILER PLANT
PURCHASE DEPARTMENT - Advanced Technology Products
THIRUCHIRAPALLI - 620014
TAMILNADU (INDIA)

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OFFICE COPY	Collective No.	Enquiry Date	Due Date For Quotation
	2670600036	14.11.2006	15.12.2006
Please quote Enquiry No, Date and due date in all correspondences. This is only a request for quotation and not an order			

Item	Description	Unit	Quantity	Delivery Quantity	Schedule Date
10	SYSTEM FOR HOT WATER FLUSHING MEASUREMENT OF DIFFERENTIAL PRESSURE ACROSS STEAM GENERATOR. As per the following Specification attached 1) Specification for hot water flushing and measurement pressure across Steam Generator 2) Scheme for hot water Flushing system 3) Technical Specification for Pumps P1,P2,P3 & P4. 4) Technical Specification for on Pump discharge Line , Strainers on return lines and Strainers for sampling line. 5) Specification for Storage Tank. 6) Schedule of Valves. 7) Schedule of Control and instrumentation items. Hot water flushing measurement system	NO	1.000	1.00	31.01.07

General Note:

- PLEASE SUBMIT YOUR DETAILED OFFER IN THE TWO PART BID SYSTEM ENCLOSED.
- POINT TO POINT CONFIRMATION TO BHEL'S SPECIFICATION AND COMMERCIAL TERMS & CONDITIONS SHOULD BE PROVIDED IN THE ENCLOSED SHEET.

Enclosures:

"LD clause has to be confirmed without fail."

PR Links

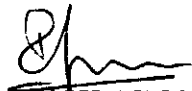
Material.	PR.No	PR.Item.	Quantity	Acc. Assign	Customer Number
	20389913	00010	1.000	/000000	

list of suppliers

RFQ-5100042554

The offers should reach us before the time of opening of tenders.
The offers will be opened at 14:30 hours on the due date in the presence of the tenderers who may like to be present.
Late tenders are liable to be rejected.

Yours faithfully,
For BHARAT HEAVY ELECTRICALS LIMITED


MANAGER / PURCHASE
(Advanced Technology Products)

System for hot water flushing and Measurement of Differential pressure across Steam Generator

1. Purpose :

This flushing system is required to create hot flushing water (DM water) circulation for final cleaning of internals of the equipment (SG) and shall ensure:

- 1. Flushing water flow rate from 40 T/hr to 400 T/hr via the equipment being flushed.*
- 2. Continuous hot flushing water circulation with periodic reversal of flow (in outward and backward direction) for long durations till cleanliness acceptance criteria is met.*
- 3. Flushing water heating upto 90 °C temperature within 2-3 hrs with heaters and with in 7-8 hrs without heaters*
- 4. Check of flushing water flow rate and temperature during flushing.*
- 5. Retention of mechanical particles.*
- 6. Provision of periodically checking cleanliness of filters (100 microns or finer white lint free cloth) at the outlet of the equipment.*
- 7. Flushing water sampling for checking of pH, chloride ion concentration, mass concentration of dense residue and salt content*
- 8. Measurement of pressure drop across equipment after acceptance of cleanliness*
- 9. Complete venting and draining of the system*

The flushing system will be acceptable only after it has undergone hot flushing in the same manner as the equipment, using flushing water of the same specification and meeting the same acceptance criteria for cleanliness. Cleanliness and preservation of all elements of the flushing system at the components stage and after final assembly therefore needs to be checked and ensured by the supplier as per approved quality plan.

2. Description of the flushing system

The equipment, after complete fabrication, is required to be flushed by circulating through it clean hot DM water at 90 °C temperature and at prescribed flow rates, so as to remove the impurities that might have got in during intermediate stages of manufacturing. Required cleanliness of the vessel is to be achieved by maintaining the

circulation of water for sufficiently long time *with flow reversal as required*. After completing the flushing cycle the system will be used to measure the differential pressure across the steam generator to ensure that the interior surfaces are free from blockages. For the above purpose a separate flushing stand is planned which consists of the following equipments. Detailed specification of the individual equipments is separately provided.

3. Scope of Supply / Work

- Design review and validation of the system for meeting the performance parameters.
- Supply of the complete system as per Scheme and drawing No. SK-1-D040-006 / 02 as a single Unit mounted on a common platform 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.
- Supply of recommended commissioning spares and 5 years operational spares. Item wise price shall be quoted separately.
- MCC along with complete cabling for motors and instrumentation items.
- 2.5 meters long stainless steel flexible hoses, two numbers in each of sizes 200 NB and 80 NB along with swivel type connecting flange fittings and gaskets on both ends as per ANSI 16.5
- 2 meters long stainless steel pipes, two numbers in each of sizes 200 NB and 80 NB with connecting flanges and gaskets on both ends as per ANSI 16.5. 200 NB pipes must have stubs welded on one end of the pipes for connecting the DP indicator.
- 20 numbers of 90 Degree elbows in each of sizes 200 NB and 80 NB
- 5 meters long stainless steel pipes, two numbers in each of sizes 200 NB and 80 NB as loose items
- 200 numbers of additional filter cloths for return line filters
- Preparation and submission of Lay out drawing in line with the schematic drawing with minor modifications (if required) limiting the overall dimension to approximately to 6.0 M x 6.0 M x 5 M.

- Erection and commissioning of the system at our works including trial run. BHEL will provide only power and water at single points and also any civil work if required.
- Training of Operation and Maintenance personnels at BHEL works
- Necessary tools and tackles for erection work shall be arranged by supplier.
- The supplier must offer the components to BHEL inspection at appropriate stages which will be identified by the component supplier in the quality plan and approved by BHEL.

4. Documents / details to be submitted along with the technical Bid.

- Lay out drawing indicating the overall dimensions of the system.
- List of recommended spares for erection and commissioning and for 5 years operation.
- Bill of materials covering the total scope.
- Catalogues and data sheets of pumps, motors, Cooler, Strainers, flow measurement devices and other instrumentation items.
- Filters being a very critical component, the constructional features of filters and fixing details of filter elements, which will illustrate the method of removal and replacement of filter elements shall be furnished
- Total power requirement for the system
- Detailed quality plan for the total system as well as the individual items like pumps, valves, filters, coolers and instruments.
- Details of cooling tower and the quantity of cooling water required for the secondary side.
- Pressure drop in the primary and secondary side loops and across individual strainers

5. Documents to be submitted after placement of order

- Thermal calculation for the cooler and pressure drop calculation for the total system.

- The orifice calculation for DP and calibration certificate for the transmitter to match with DP
- **Three sets** of Operation & Maintenance manual giving the following details to be provided in **hard and soft copies (CDs)**
- Complete step-by-step operating procedure including safety precautions.
- Maintenance procedures & trouble shooting hints for the system and individual components including preventive maintenance check points.
- Complete set of assembly & sub-assembly drawings with dimensions & bill of materials and manufacturing part drawings for wearing components.
- Complete specification and original catalogues of all the bought out items.
- Complete list of spares with purchase specifications, part numbers, make, etc.

6. List of equipments :

1. Storage tank.
2. Set of pumps selected to meet the discharge and head requirement.
3. *Heaters with individual on off control to ensure required water temperature in 2-3 hrs.*
4. A cooler to control the water temperature.
5. Set of strainers to remove impurities . All filters shall be provided with DP Gauge with alarm along with annunciation for the max allowed DP.
6. A cooling tower system for the cooling water for Cooler Secondary Side. Quantity and Head of cooling water required on the secondary side shall be indicated by the supplier.
7. Interconnecting pipes, valves and fittings.
8. Control and Instrumentation items.
9. Proper lighting arrangement for the total system
10. A common circuit breaker for isolating the total system

Supplier of all bought out items shall be identified in the offer and approved by BHEL before placing PO.

7. Design requirements :

All the components of the flushing stand except for the storage tank, shall be rated for a maximum pressure of 15 kg/cm^2 and maximum operating temperature of 100°C . Storage tank shall be rated for a pressure of 5 kg/cm^2 and temperature 100°C .

Design and construction of the system shall be as per ASME Section VIII Division -1 and the material of construction of all the items (e.g. *internals of pump, strainers, valves, piping etc.*) that come in direct contact with the flushing medium shall be Stainless Steel of Grade 304.

As the required temperature of water is proposed to be *maintained* by using the heat generated by the pump, the heat loss has to be kept minimum and hence the equipments and the piping of the flushing stand shall be provided with thermal insulation. Thickness of insulation shall be suitable for maintaining a surface temperature not more than 50°C

8. Materials :

Pipes, pipe fittings, valves and flanges shall conform to the following ANSI Standards

- | | | |
|------|----------------------------------|--------------|
| i) | Pipes | ANSI B 36.10 |
| ii) | Pipe fittings with BW Ends | ANSI B 16.9 |
| iii) | Pipe fittings with SW Ends | ANSI B 16.11 |
| iv) | Pipe Fittings with Threaded Ends | ANSI B 16 |
| v) | Flanges | ANSI B 16.5 |
| vi) | Valves | ANSI B 16.34 |

Material of construction for Pipes, pipe fittings, valves, flanges and fasteners and gaskets for flanges shall be as per the following ASTM Standards.

- | | | |
|------|---------------|--|
| i) | Pipes | ASTM A -312 TP 304 |
| ii) | Pipe fittings | ASTM A -182 F- 304 |
| iii) | Flanges | ASTM A -182 F- 304 |
| iv) | Valves | ASTM A -182 F- 304 For forged bodies
ASTM A-351 CF 8 for Cast bodies |
| v) | Fasteners | ASTM SA 193 B7/ SA 194 2H |
| vi) | Gaskets | To be selected by the system supplier for the intended service condition |

All pipe fittings of sizes upto 40 NB shall be socket welded ends and fittings of larger sizes shall be of butt welded types and shall be rated for a design pressure of 15 Kg/cm² and maximum working temperature of 100 ° C.

8. Technical points :

1. The details provided in this specification and the enclosed data sheets of the individual equipments 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.
2. *The flushing system shall not have stagnant zones, long corrugated piping, crevices etc. allowing accumulation/concentration of impurities and contamination.*
3. Specification, *drawings and suppliers* of individual items like pump, motor, filters (100 microns or finer white lint free cloth) and valves shall be submitted for approval before ordering.
4. Where ever possible, pump motors shall be low speed motor (1450 rpm)
5. Pumps shall be provided with stainless steel metallic bellows at the inlets and outlets.
6. Electrical connections from the panel to individual motors shall be by copper cables.
7. Contactors and FSU units shall be SIEMENS / L&T make.
8. 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.
9. Also, the material for packing gland in the valves shall be suitable for the intended application without disintegration during service.

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10. Material for gaskets between flanges shall also be selected so that there is no degradation of the gaskets during service. Gaskets shall be properly cut without any projection into the flow path.
11. Proper surface finish shall be ensured between filter basket seating surface and the bucket so as to avoid flow bypass.
12. All the instruments shall be properly calibrated and the calibration procedure for flow meters may be submitted for approval.
13. Thorough cleaning / pickling and passivation shall be done and cleanliness 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.

9. Performance parameters to be proven at supplier's works and subsequently at BHEL's works after installation and commissioning

The flushing system will be accepted for dispatch from supplier's works only after it has undergone hot flushing as during actual flushing of component and the following parameters are demonstrated in the presence of BHEL inspectors.

1. *Flushing water(DM water) chemistry shall be as follows :*

<i>Total mass concentration of salts</i>	<i>1 mg/dm³ or less</i>
<i>Or</i>	
<i>Specific electric conductivity</i>	<i>2.0 μ Cm/cm</i>
<i>mass concentration of dense residue</i>	<i>2 mg/dm³ or less</i>
<i>mass concentration of chloride ions</i>	<i>0.05 mg/dm³ or less</i>
<i>pH</i>	<i>6.5 - 7</i>

2. Minimum flow rate of 400 T / hr for the primary line and 40 T / hr for the secondary line at the system discharge points.
3. Pressure losses in the system to be limited to 5 kg/sq.cm. DP measurement gauge accuracy shall be within 1%.
4. Rise of water temperature from room temperature to 90 °C within 2-3 hrs
5. Control of water temperature at outlet between 80-90°C. Temperature measuring instruments accuracy shall be within 1%
6. Check for cleanliness of the system before dispatch from Supplier's works and also before getting connected to the equipment shall be carried out as per the following broad procedure guidelines :

- i) Prepare the system pipelines, flushing adapters, filters etc. for flushing by closed circuit water circulation. Check their cleanliness and clean them, if required. Visible contamination on filters is prohibited.
- ii) Take DM water sample just before filling the system to check chemistry
- iii) Fill the flushing system with DM water as specified above. Suitable venting during filling shall be ensured.
- iv) Flush the system at 400 T/hr with flow reversal as required after every 30 minutes. Flushing of system shall be done for min. 8 hrs.
- v) Periodicity of outlet filter inspection for cleanliness is 2-4 hrs.
- vi) Replace filtering elements (100 microns or finer white lint free cloth) as they are contaminated, but not later than 8 hrs. of washing.
- vii) 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.
- viii) At the end of flushing cycle, flushing water sample shall be taken for water quality analysis.
- ix) Outlet filter shall be inspected after washing cycle end. Acceptance as mentioned below.
- x) Flushing quality is satisfactory, if in three samples consequently 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) There are no mechanical particles, corrosion and other contamination on outlet filter element (100 microns or finer white lint free cloth).
 - d) Absence of oil products, rainbow on water surface and oil spot on white filter paper. Alternative methods which do not affect washing quality control may also be employed
 - e) There are no visible mechanical particles and contamination on accessible inner surfaces of adapters, piping etc.

xi) *Complete draining of the system shall be ensured after completion of flushing.*

10. Working of the system :

There are two flow paths inside the vessel, inner path and outer path, which need to be flushed. Pump P1 is used for flushing the inner path during when the flow in the system is to be maintained at 400 M³/hr. Pumps P2 & P3 are used to for flushing the outer path when the flow is to be maintained at 40 M³/hr. Required head is achieved by operating the pumps P2 and P3 in series. While flushing the inner path, the flow direction has to periodically reversed. For this purpose a separate set of Valves are provided as shown in the scheme.

The pumps P1, P2, and P3 take suction from the storage tank and discharge the water into the vessel through a set of discharge strainers. After flushing, the water is circulated back to the storage tank through another set of filters as shown in the Scheme. The strainers in the pump discharge lines and the strainers in the return lines are meant to remove suspended particles of sizes more than 100 microns. Strainers in return lines are provided with lint free white cloth (~100 microns mesh) wrapped over the mesh with necessary backing mesh to continuously monitor the quality of flushing medium and thereby ascertain the completion of flushing operation. In order to facilitate easy removal / assembly, the strainers shall have flanged end connection with isolation valves at both inlet and outlet. *Design of the strainers shall allow easy replacement of the white lint free cloth when required and it shall ensure that the lint free cloth does not get torn in the high flow rate.*

Impurities not being retained by the return line filters will settle in the storage tank to be periodically blowed down through the drain valve.

In order to avoid temperature raising beyond 90° C and maintain the flushing medium temperature at the desired level, a cooler is also provided in a separate loop circuit with independent pump (P4) and provision for regulating the flow through the cooler.

Before starting the flushing cycle, the entire system has to be thoroughly cleaned by continuous recirculation of hot water. During flushing operation the strainers in the return

lines shall be monitored for their normal working. In case of choking, the stand by strainers shall be brought on line and the choked strainers shall be taken up for maintenance and kept ready for replacement whenever required. Required flow at the required head through the vessel is to be achieved by manipulating the by pass valve in the by pass line and throttling valve in the pump discharge lines.

11. Equipment Layout and Piping

All equipments and piping of the flushing stand shall be neatly arranged. Pump will be provided with sufficient space all around for accessing and maintaining them, when ever required, handles of manually operated valves shall be positioned at suitable elevation for easy operation, sufficient space for removal of cartridges / strainer baskets shall be provided. Local control panel for operation of pumps and mounting of instruments and gauges shall be appropriately located so that operation of the system can be monitored from the panel location

Required sizes of pipes are indicated in the scheme and a complete list of valves required for the system is furnished separately. Quantity and type of various pipe fittings and length of pipes will be decided based on the piping layout.

12. Instrumentation and Control

The following instruments and gauges are provided in the system to monitor the working of flushing cycle.

1. Pressure indicator (Glycerine filled) for Storage tank pressure.
2. Level indicator for Storage tank level
3. Pressure Indicator (Glycerine filled) for Discharge pressure of Pumps P1, P2, P3 and P4
4. Flow indicator for flow rate in the pump (P1) discharge lines
5. Flow indicator for flow rate in the pump (P2 & P3) discharge lines
6. Temperature of water at the inlet to the Vessel
7. Temperature of water at the outlet from the vessel
8. Temperature of water at cooler out let.
9. Differential Pressure Indicator across the equipment

The type of instruments for the different parameters, suggested ranges for the instruments is separately provided. Only calibrated instruments shall be used. All gauges, transmitters and other instrument components shall be of reputed make. All instruments, gauges that are required to be mounted on the local control panel shall be neatly laid out at appropriate levels for ease of operation and maintenance. Proper venting provision shall be made for complete venting. Starters for the pumps motor shall be available on the panel and shall be mounted in segregated area of panel if combined with other instrument panel.

Specification for Pump 1

01	Type	Horizontal type single stage centrifugal pump with end suction and vertical discharge, electrically driven mounted on a common base plate
02	Medium	Demineralised water
03	Medium pressure	15 Kg/cm ²
04	Medium Temperature	100 ° C
05	Flow rate	400m ³ / hr
06	Head	100 M
07	Quantity	1 No
08	Discharge Nozzle size	200 NB
09	Suction Nozzle size	250 NB
10	End connections	With corresponding size flanges
11	Material of Construction (All wetted parts)	Stainless steel (Grade 304)
12	Motor rating	To be furnished by vendor Recommended Suppliers for motors : M/s SIEMENS, M/s KIRLOSKAR, M/s BILLEE BHARAT, M/s NGEF, M/s CROMPTON

Specification for Pump P2 & P3

01	Type	Horizontal type single stage centrifugal pump with end suction and vertical discharge, electrically driven mounted on a common base plate
02	Medium	Demineralised water
03	Medium pressure	15 Kg/cm ²
04	Medium Temperature	100 ° C
05	Flow rate	40m ³ / hr
06	Head	75 M
07	Quantity	2 Nos
08	Discharge Nozzle size	80 NB
09	Suction Nozzle size	100 NB
10	End connections	With corresponding size flanges
11	Material of Construction (All wetted parts)	Stainless steel (Grade 304)
12	Motor rating	To be furnished by vendor Recommended Suppliers for motors : M/s SIEMENS, M/s KIRLOSKAR, M/s BIJLEE BHARAT, M/s NGEF, M/s CROMPTON

Specification for Pump 4

01	Type	Horizontal type single stage centrifugal pump with end suction and vertical discharge.
02	Medium	Demineralised water
03	Medium pressure	15 Kg/cm ²
04	Medium Temperature	100 ° C
05	Flow rate	6 m ³ / hr
06	Head	75 M
07	Quantity	1 No
08	Discharge Nozzle size	25 NB
09	Suction Nozzle size	40 NB
10	End connections	With corresponding size flanges
11	Material of Construction (All wetted parts)	Stainless steel (Grade 304)
12	Motor rating	To be furnished by vendor Recommended Suppliers for motors : M/s SIEMENS, M/s KIRLOSKAR, M/s BIJLEE BHARAT, M/s NGEF, M/s CROMPTON

Specification of Strainers in the return Line

01	Flow medium	Demineralised water
02	Medium pressure	15 Kg/cm ²
03	Medium Temperature	100 ° C
04	Flow rate	100 m ³ / hr
05	Quantity	6 Nos
06	Mode of operation	4 Nos in operation , 2 nos standby
07	Type	In line basket type to be provided with lint free white cloth wrapped over the steel mesh with necessary backing steel mesh. The steel mesh shall be reusable.
08	Pressure drop	To be as minimum as possible (To be indicated for the type and size proposed)
09	Inlet	150 NB with flanged end
10	Outlet	150 NB with flanged end
11	Rating / mesh size	100 microns
12	Material of construction	
	Housing	SS 304
	Basket	SS 304
	Filter mesh	SS 304 / Lint free cloth which should not get torn during operation.

Specification of Strainers in the Pump Discharge (Supply) lines

01	Flow medium	Demineralised water
02	Medium pressure	15 Kg/cm ²
03	Medium Temperature	100 ° C
04	Flow rate	200 m ³ / hr
05	Quantity	2 Nos
06	Type	In line basket type with reusable mesh. .
07	Pressure drop	As minimum as possible(To be indicated for the type and size proposed)
08	Inlet	150 NB with flanged end
09	Outlet	150 NB with flanged end
10	Rating / mesh size	200 microns
11	Material of construction	
	Housing	SS 304
	Basket	SS 304
	Wire mesh	SS 304

Specification for Storage Tank

S.No.		
1	Quantity	1 No.
2	Type	Cylindrical tank with dished ends at both the ends & supported on saddles
3	Capacity	15 Cum
4	Inside Diameter	2230 mm
5	Wall Thickness	12 mm
6	Type of end enclosure	Torispherical
8	Knuckle Coner radius	140 mm
9	Thickness of closure	16 mm
10	End to End Length	4130 mm
11	Operating Pressure	Atmosphere
12	Operating Temperature	75 deg C
13	Design Pressure	5 Kg/sq. cm
14	Design Temperature	100 deg C
15	Design Code	ASME Section VIII, Div. 1
16	Material of construction	Stainless Steel - Grade 304
17	Material Specification No.	
	i). Shell and Closures	ASTM A-240 Type 304
	ii). Nozzles	ASTM A-312 Type 304
	iii). Flanges	ASTM A-182 Type 304
	iv). Manhole	ASTM A-240 Type 304
	v). Supports	Carbon steel (support welding to tank with SS poison plate of ASTM A-240 Type 304)
18	Support type & Nos.	Saddle type -2 Nos. with one end free.

Nozzle Schedule			
S. No.	Description	Size	Qty.
1	Pump P-1 suction	250 NB Sch 40	1 No.
2	Pump P-4 suction	40 NB Sch 40	1 No.
3	Filling	40 NB Sch 40	1 No.
4	Vent	40 NB Sch 40	1 No.
5	Drain	40 NB Sch 40	1 No.
6	Water Level measurement	20 NB Sch 40	2 Nos.
7	From Strainers	150 NB Sch 40	6 Nos.
8	From Sampling Strainer	25 NB Sch 40	1 No.
9	From Cooler	25 NB Sch 40	1 No.
10	Pump, P-1 discharge bypass	150 NB Sch 40	1 No.
11	Manhole	600 mm ID	1 No.

Valves Schedule

Serial No.	Valve No.	Size	Type	Function & Location
1	V-1	200 NB	Gate	Pump, P-1 discharge line
2	V-2,3,4,5	150 NB	Gate	Isolation valves for pump strainers, STR-1 & 2
3	V-6	200 NB	Globe	High flow pump discharge line
4	V-7	200 NB	Gate	High flow return line
5	V-8,9,10,11,12,13,14,15,16,17,18,19	150 NB	Gate	Inlet and Outlet lines of line Strainers STR-3,4,5,6,7&8
6	V-20	80 NB	Globe	Pump P3 by pass line
7	V-22	150 NB	Globe	Pump, P-1 bypass line
8	V-23	40 NB	Gate	P-4, Suction line
9	V-24	25 NB	Globe	Cooler inlet
10	V-25	25 NB	Globe	Cooler outlet
11	V-26	80 NB	Gate	Pump, P-2 discharge line
12	V-27	100 NB	Gate	Pump, P-3 Suction line
13	V-28	80 NB	Gate	Pump, P-3 discharge
14	V-29	80 NB	Globe	Pump, P-3 bypass
15	V-30	80 NB	Globe	Low flow pump discharge line
16	V-31,32,33,34	200 NB	Gate	Valves for Reversing Flow direction
17	V-35,36	80 NB	Gate	Bypass line across pump discharge and return lines
18	V-37	80 NB	Gate	Low flow return line
19	V-38	25 NB	Globe	Pump, P-4 bypass

20	V-39	20 NB	Globe	Impulse line process valve for pump discharge pressure
21	V-40	20NB	Globe	Impulse line process valve for pump discharge pressure (P2)
22	V-41	20NB	Globe	Impulse line process valve for pump discharge pressure (P3)
24	V-42,43	20 NB	Globe	Impulse line process valves across FE-1
25	V-44,45	20NB	Globe	Impulse line process valves across FE-2
28	V-46	25 NB	Globe	Pump, P-4 discharge line
29	V-47	20 NB	Needle	Sampling
30	V-48	40 NB	Globe	Storage tank DM water fillig
31	V-49	40 NB	Globe	Storage tank Vent
32	V-50	40 NB	Gate	Storage tank drain
33	V-51,52	20NB	Globe	Impulse line process valves for Storage tank level
34	V-53	20NB	Globe	Impulse line process valve for Pump, P-4 pressure

Schedule of Instrumentation and Control

Serial No.	Tag NO.	Process Parameter	Location	Units	Values		Accuracy	Identification Local/ Inst Panel	Alarm/ Interlocks	Remarks
					Nominal	Range				
1	PI-1	Pump P-1 Discharge Pressure	Pump, P-1 Discharge Line	Kg/cm ²	10	0-16	±1%	Local	No	Bourdon Gauge
2	PI-2	Pump P-2 Discharge Pressure	Pump, P-2 Discharge Line	Kg/cm ²	7.5	0-16	±1%	Local	No	Bourdon Gauge
3	PI-3	Pump P-3 Discharge Pressure	Pump, P-3 Discharge Line	Kg/cm ²	7.5	0-16	±1%	Local	No	Bourdon Gauge
4	PI-4	Pump P-4 Discharge Pressure	Pump, P-4 Discharge Line	Kg/cm ²	7.5	0-16	±1%	Local	No	Bourdon Gauge
5	LI-1	Storage Tank Level	Storage Tank	mm	2000	0-3000	±1%	Local	No	Level Indicator
6	DPISH-1	Differential Pressure across Vessel	Across inlet to the vessel and outlet from the vessel	Kg/cm ²	2.5	0-5	±1%	Local	No	DP gauge
7	FI-1	Flow through Primary side (Inner path)	Discharge line(200NB)	Cum/hr	400	0-500	±1%	Local	No	Orifice plate with flow transmitter
8	FI-2	Flow through Secondary Side (Outer path)	Discharge line(65NB)	Cum/hr	8-40	0-50	±1%	Local	No	Orifice plate with flow transmitter
9	TI-1	Temperature of medium at Vessel inlet	Discharge line	° C	75	0-100	±1%	Inst. Panel	No	RTD
10	TI-2	Temperature of medium in the return line	Return line at Strainer inlet	° C	70	0-100	±1%	Inst. Panel	No	RTD

11	TI-3	Temperature of medium at the Cooler inlet	Cooler inlet line	° C	95	0-100	±1%	Inst. Panel	No	RTD
12	TI-4	Temperature of medium at the Cooler outlet	Cooler outlet line	° C	40	0-100	±1%	Inst. Panel	No	RTD
13	TI-5	Temperature of medium in Pump, P-1 bypass line	Pump, P-1 bypass line	° C	40	0-100	±1%	Inst. Panel	No	RTD

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CAPITAL PURCHASE

(To be filled and submitted alongwith Technical Bid)

S.No	BHEL Commercial Terms and Conditions for Import Supplies	Vendor's acceptance
1	Prices shall be quoted item wise only. Unpriced copy shall be submitted with Technical bid.	
2	Prices shall be quoted only on F.O.B (Sea/Air port) basis.	
3	Prices shall be quoted on "FIRM PRICE" basis only.	
4	Validity of offer shall be for a minimum period of 120 days from the date of Tender opening	
5	Delivery period from the date of Letter of Intent shall be clearly mentioned in the offer.	
6	Liquidated damages @ ½% per week subject to a maximum of 15% of the order value shall be applicable for delay in deliveries.	
7	Following Risk Purchase clause shall be applicable: The Purchaser at his option will be entitled to terminate the contract and to purchase elsewhere at the risk and cost of the seller either the whole of the goods or any part which the supplier has failed to deliver or dispatch within the time stipulated or if the same were not available, the best and the nearest available substitute therefore. The supplier shall be liable for any loss which the Purchaser may sustain by reason of such risk purchases.	
8	Payment terms for Foreign vendor (Principal): 80% value of the goods will be paid through an irrevocable Letter of Credit established by our bankers. Balance 20% will be paid against acceptance / commissioning of goods for which supplementary invoice and PBG for 10% of total Purchase order value. All bank charges outside India are to vendor's account only.	
	Payment terms for Indian Agent: Indian Agency commission, if any, shall be clearly specified in the offer and the same will be paid in Indian Rupees against acceptance / commissioning of the equipment.	
	Payment terms for Erection / commissioning charges: 100% of the Erection / commissioning charges (in case contract involves erection/commissioning) shall be paid only on completion of such erection / commissioning at BHEL.	
9	Submission of Performance Bank Guarantee (PBG): Vendor should provide a performance bank guarantee(PBG) for 10% of the total Purchase order value valid for a period of 12 months from the date of commissioning (or) 18 months from the date of dispatch <u>whichever is later</u> with an additional claim period of 2 months. This PBG shall form part one of the documents for effecting payment.	
10	Offers should be submitted only in sealed cover super-scribing clearly the Enquiry reference and due date.	

Signature & Office seal of the vendor

(BHEL Commercial Terms and Conditions for Indigenous Supplies on the reverse)

CAPITAL PURCHASE
(To be filled and submitted alongwith Technical Bid)

S. N o	BHEL Commercial Terms and Conditions for Indigenous Supplies	Vendor's acceptance
1	Prices shall be quoted item wise only. An unpriced copy shall be submitted alongwith technical bid.	
2	Prices shall be quoted only on F.O.R / Despatching station basis including Packing & Forwarding charges, if any.	
3	Prices shall be quoted on "FIRM PRICE" basis only.	
4	% Of ED applicable shall be clearly mentioned in the offer. If ED is applicable, confirmation shall be given that ED Invoice will be provided.	
5	% of Taxes applicable including surcharge shall be clearly mentioned in the offer	
6	Validity of offer shall be for a minimum period of 120 days from the date of Tender opening	
7	Delivery period from the date of Letter of Intent shall be clearly mentioned in the offer.	
8	Liquidated damages @ ½% per week subject to a maximum of 15% of the order value shall be applicable for delay in deliveries.	
9	Following Risk Purchase clause shall be applicable: The purchaser at his option will be entitled to terminate the contract and to purchase elsewhere at the risk and cost of the seller either the whole of the goods or any part which the supplier has failed to deliver or dispatch within the time stipulated or if the same were not available, the best and the nearest available substitute therefore. The supplier shall be liable for any loss which the Purchaser may sustain by reason of such risk purchases.	
10	Payment terms: 100% payment will be made within 45 to 90 days after receipt and acceptance / commissioning of goods at BHEL and also against submission of PBG for 10% of the total Purchase order value. (or) 80% value of the goods will be paid within 45 to 90 days against dispatch documents negotiated through bank. Balance 20% will be paid against acceptance / commissioning of goods for which supplementary invoice and PBG for 10% of total Purchase order value are to be submitted. All bank charges are to vendor's account only. Payment terms for Erection / commissioning charges: 100% of the Erection / commissioning charges (in case contract involves erection/commissioning) shall be paid only on completion of such erection / commissioning at BHEL.	
11	Submission of Performance Bank Guarantee (PBG): Vendor should provide a performance bank guarantee(PBG) for 10% of the total Purchase order value valid for a period of 12 months from the date of commissioning (or) 18 months from the date of dispatch whichever is later with an additional claim period of 2 months. This PBG shall form one of the documents for effecting payment. The PBG shall be submitted in non-judicial stamp paper value of not less than Rs.80/- issued by any one of the following banks who is a member bank in our consortium of banks. 1) State Bank of India, 2) State Bank of Hyderabad, 3) State Bank of Travancore, 4) State Bank of Mysore, 5) Canara bank, 6) Bank of Baroda, 7) Punjab National bank, 8) Deutsche Bank, 9) HDFC Bank, 10) Standard Chartered Bank, 11) Citi Bank, 12) Standard Chartered Grindlays Bank 13) Bank of America and 14) Any one of the Nationalised banks.	
12	Offers should be submitted only in sealed cover super-scribing clearly the Enquiry reference and due date.	

Signature & Office seal of the vendor

BHEL ENQUIRY NO & DATE

VENDOR OFFER REF NO. &

MODEL PRICE BID FORMAT FOR FOREIGN VENDORS

S.No. Description of Item

Unit Qty Rate

Value

Ex-works Value

Packing & Forwarding Charges, if
any

FOB charges, if any

FOB Value

Approximate Freight charges

Approximate Transit Insurance
charges

Approximate Gross Weight, Nett

Weight & Dimensions of the

Consignment

Signature & Seal of Vendor

**NOTE: The Price bid should submitted strictly in line with the above FORMAT.
(Model Price Bid Format for Indigenous vendors on the reverse)**

BHEL ENQUIRY NO & DATE

VENDOR OFFER REF NO. &
DATE

MODEL PRICE BID FORMAT FOR INDIGENOUS VENDORS

S.No. Description of Item

Unit Qty Rate Rs Value Rs

Ex-works Value Rs
Packing & Forwarding Charges, if
any
FOR / Despatching Station value Rs
% of Excise Duty (extra or inclusive)
% of TAX (TNGST with FORM-17 or
CST with C-FORM)
% of TAX (TNGST without FORM-
17 or CST without C-FORM)
Surcharge on Tax
% of Any other Tax applicable other
than the above
Approximate Freight charges Rs
Approximate Transit Insurance
charges Rs
Approximate Gross Weight, Nett
Weight & Dimensions of the
Consignment

NOTE: The Price bid should be submitted strictly in line with the above FORMAT.

Signature & Seal of Vendor

CAPITAL PURCHASE : MM / FE

COMMERCIAL TERMS AND CONDITIONS

1.0 QUOTATIONS

The Bidders shall submit the offer in **TWO INNER ENVELOPES** as indicated below which shall be sealed in one outer envelope.

Envelope I This sealed envelope should contain all the copies of technical bid together with un-priced commercial bid. This envelope should be clearly marked **"Part I - Technical and commercial bid"**, indicating Enquiry No., Due Date and Address & Reference of the Bidder.

Envelope II This sealed envelope should contain **price details**. This envelope should be clearly marked **"Part II - Price bid"**, indicating Enquiry No., Due Date and Address & Reference of the Bidder.

Both the envelopes (Part I & II) shall be put in one cover, duly sealed, superscribing as Part I and Part II of Enquiry No., due date of opening and the address and reference of the Bidder.

The above offer should reach this office on or before the due date by 14.00 Hrs (IST). Late offers will not be considered.

Tender should not be addressed to any Individual's name but only by designation to:

**DGM / CAPITAL PURCHASE & SP/MM/FB
BHARAT HEAVY ELECTRICALS LIMITED
HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI - 620 014
TAMIL NADU, INDIA**

Contd 2/-

Tenders should be free from **CORRECTION AND ERASURES**, Corrections if any, must be attested. All amount shall be indicated both in words as well as in figures. Where there is difference between amount quoted in words and figures, amount quoted in words shall prevail.

Offers should be in **ENGLISH** and accompanied by detailed technical literature, catalogue and detailed dimensional drawings in **ENGLISH** or otherwise, the offers will not be considered.

2.0 **PART I (TECHNICAL & COMMERCIAL BID)**

2.1 **Technical**

This part shall include / indicate the following :

- 2.1.1. Offer should contain complete scope of supply with all technical details, specifications, delivery and other commercial terms and conditions.
- 2.1.2. Point by point confirmation for the Technical Specification enclosed to be provided. if there are any deviation, the same should be clearly specified. Offers received without confirmation to our specification will be rejected.
- 2.1.3. List of customers to whom same or similar equipment have been supplied along with performance certificates to be enclosed.
- 2.1.4. Relevant catalogues to be attached
- 2.1.5. List of spares parts (with part numbers) for two years operation and maintenance should be attached.
- 2.1.6. Information on shipping weight and cubage (length, width & height) to be provided.
- 2.1.7. Incase of foreign bidder offer, the Principal's technical offer should be enclosed.

2.2 **Commercial**

This part shall include / indicate the following :

- 2.2.1. Port of shipment / Station of despatch
- 2.2.2. Terms of payment
- 2.2.3. Taxes & duties applicable.
- 2.2.4. Delivery Schedule

Contd 3/-

- 2.2.5. Offer validity
- 2.2.6. Country of origin
- 2.2.7. Percentage of agency commission if any along with a copy of Agency agreement.
- 2.2.8. A copy of "Un-Priced Part II" i.e., a copy of the Price Bid without the price details to be enclosed.

3.0 PART II (PRICE- BID)

This part should contain the schedule of price particulars and to be co-related to the technical details provided in Part I.

4.0 OPENING OF TENDERS

The Part I - Technical & commercial bid alone would be opened on the Tender opening date.

The Part II - Price bid of Technically suitable Bidders alone would be opened. The Technically suitable Bidders would be informed about the tender opening date.

Clarifications if any required by BHEL for Technical evaluation would be sought from Bidders before opening of Part II - price bid.

5.0 GENERAL

- 5.1. Incomplete offers will not be considered.
- 5.2. **Fixed price:** Prices quoted by the bidder shall be fixed and not subject to any escalation whatsoever during the period of bid validity and execution of the Purchase Order. A bid submitted with an adjustable price will be treated as non - responsive and rejected. Prices shall be written in words and figures. In the event of difference, the price in words shall be valid and binding. Unit prices shall be considered correct in the event of any discrepancy with regard to total price.
- 5.3. **Bid currency:** Indian bidders should submit the prices only in Indian Rupees. Foreign bidders may submit their bid in their home currency.
- 5.4. **Terms of Delivery:** Bidders are required to quote their best delivery period. Foreign Bidders should submit their offer for net **FOB Nearest Sea / Air Port**. Indian Bidders should submit their offer for **FOR Despatching station**.

Contd 4/-

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5.5. **Taxes and Duties :** All Taxes and Duties payable as extra to the quoted price should be specifically stated in offers along with CST & TNGST No / Tariff No. etc., failing which the purchaser will not be liable for payment of such Taxes and Duties. Our T.N.G.S.T No. 356005 Dt. 04-04-1995, C.S.T. No. 239383 dt. 11-06-1991.

5.6. **Validity :** The offers for main equipment and spares shall be kept open for acceptance for 120 days (one hundred and twenty days) from the date of opening of the tender

(Part I).

5.7. **Terms of Payment :**

5.7.1. **Indian Bidders**

5.7.1.1. The preferred payment terms are indicated below :

5.7.1.2. 100% payment, within 45 to 90 days, after receipt / acceptance / commissioning of equipment at BHEL, Tiruchi, against submission of 10% Performance Bank Guarantee on total order value.

or

5.7.1.3. 80% payment against documents through bank within 45 to 90 days, (after pre-despatch inspection) and balance 20% payment after receipt / acceptance / commissioning of the equipment 45 to 90 days, 45 to 90 days against submission of 10% Performance Bank Guarantee on total order value.

5.7.2. **Foreign Bidders**

An Irrevocable Letter of Credit shall be established for 80% of the value of the goods. Balance 20% shall be paid on receipt / acceptance / commissioning of the goods at BHEL against submission of Performance Bank Guarantee for 10% on total order value. All bank charges outside India are to Vendor's account.

5.8. **Performance Bank Guarantee (PBG):** The Bidder, in the event of an order, should furnish a bank Guarantee from an Indian Bank approved by BHEL, at no extra cost in a proforma prescribed by BHEL, alongwith the order, for an amount equivalent to 10% (Ten percent) of the value of the contract. The PBG shall be valid for period of 18 months from the date of dispatch or 12 months from the date of receipt / acceptance / commissioning of the equipment at BHEL, Tiruchi which ever is later with additional claim period of 2 months.

Contd 5/-

The Performance Bank Guarantee shall be obtained from any one of the following banks who is a member bank in our consortium of banks.

- 1) State Bank of India, 2) State Bank of Hyderabad, 3) State Bank of Travancore, 4) State Bank of Mysore, 5) Canara Bank, 6) Bank of Baroda, 7) Punjab National Bank, 8) Deutsche Bank, 9) HDFC Bank, 10) Standard Chartered Bank, 11) Citi Bank, 12) Standard Chartered Grindlays Bank, & 13) Bank of America or any Nationalised Bank

- 5.9. **Liquidated damages :** It is clearly understood among the parties to the contract the " Time is the essence of the contract ". Therefore, the delivery of the goods specified in the purchase order should be made within the time prescribed. Where the seller supplies or despatches the goods, beyond the delivery period specified the purchaser will have no obligation to accept the goods. If accepted liquidated damages at the rate of 1/2% of the value of goods delayed for each week of delay subject to a maximum of 15% of the order value will be levied.
- 5.10. **Risk purchase :** Alternatively the purchaser at his option will be entitled to terminate the contract and to purchase elsewhere at the risk and cost of the seller either the whole of the goods or any part which the supplier has failed to deliver or despatch within the time stipulated as aforesaid or if the same were not available, the best and the nearest available substitute therefor. The supplier shall be liable for any loss which the Purchaser may sustain by reason of such risk purchases.
- 5.11. **Agency commission :** In case of Foreign Bidders, agency commission if any, payable to their Indian Agents, shall shown separately in the Offer. This will be paid by us in India, in Indian Rupees, on satisfactory completion of the Contract. Copies of current Agency Agreement / Authorization Letter in respect of Agency Commission shall be furnished alongwith offer. For calculation of Rupee equivalent of Agency Commission, exchange rate as prevailing on the date of offer will be taken.
- 5.12. **Test certificates / Operating and Maintenance manuals :** The Bidders shall clearly mention in their offer, that Test Certificates and Operating Maintenance Manuals, etc., as called for in the Technical Specification, in the required number of copies will be provided at no extra cost.

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- 5.13. **Modvat credit :** (for Indian Bidders only) If any Excise Duty is payable, the chapter head / sub-head reference and the rate of the duty should be quoted. If the tender is availing **MODVAT** credit for his input materials, the effect of proforma credit should be passed on to the purchaser.
- 5.14. **Packing and marking :** The Supplier shall arrange for securely protecting and packing the stores to avoid loss or damages during transit.
- 5.15. **BHEL** shall be at liberty to reject or accept any tender, part or in full, at their own discretion and any such action is not liable for any question or claim against **BHEL**.

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