UPRVUNL
PANKI AUXILIARY BOILER 1x60 t/hr
TECHNICAL SPECIFICATION FOR BOILER FEED WATER PUMP

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1.0 SCOPE OF SUPPLY

1.1 2 Nos. of Boiler feed water pump set with drive motor and associated accessories.

1.2 The detailed scope of supply of the pump

1.2.1 2 Nos. of Boiler feed pumps. It shall be driven by electric motor.

1.2.2 2 Nos. of common base frame for pump & drive motor.

1.2.3 2 sets of foundation bolts and accessories.

1.2.4 2 sets of counter flanges of weld neck type matching with suction, discharge side of the pump, suction strainer, DPT across each strainer along with root valves and all other flanged terminal connections of the pumps complete with nuts, bolts and non-asbestos gaskets as required.

1.2.5 2 sets of complete instrumentation necessary (along with instrument tubing, fittings, isolation and drain valves) for the safe and reliable operation of the pump to be mounted on a local gauge rack fixed to the pump base of the unit (Refer clause 4.17 for the minimum instrumentation required to be supplied per pump). All the instrument contacts shall be terminated in a junction box.

1.2.6 2 Nos. of coupling with spacer and non-sparking coupling guard etc., between pump and driver as specified in clause 6.2 of this specification are to be supplied.

1.3 The pump shall be supplied with suction strainer with SS-316 internals. The strainer should be of removable type with free flow area of 4 times the flow area of pipe. Strainer size & rating shall be same as BHEL suction pipe size as indicated in General Datasheet.

1.4 Cooling water if required will be provided. The terminal point of vendor shall include counter flanges along with non-asbestos gasket on supply and return header pipes.

1.5 The warming up arrangement, if required, shall be provided by the bidder. The scope of supply shall include valves, orifices, piping etc.

1.6 Details of balance leak off line if required, shall be provided by bidder for connecting it to deaerator.

1.7 MANDATORY SPARES (Required per pump) – To be quoted separately

1. Pump bearings – 1 Set
2. Motor bearings - 1 Set

1.8 Loose Supply of 1 No. ARC valve (sizing suitable for selected pump requirement) with necessary counter flanges, gasket & fasteners for ready to install in the discharge pipe line

2.0 TECHNICAL REQUIREMENTS OF THE PUMP

2.1 SCOPE

This specification covers the design, material, construction features, manufacture, inspection, testing the performance at the VENDOR /SUB-VENDOR works.

2.2 CODES AND STANDARDS

The design, material, construction, manufacture, inspection and performance testing of Horizontal centrifugal pumps shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. Nothing in these specifications shall be construed to relieve the VENDOR of his responsibility. The equipment supplied shall comply with the latest applicable Indian, American, British standards. Other National Standards are acceptable, if they are established to be equal or superior to the Indian, American, British standards. Pumps used for fire protection services shall conform to the requirements of fire protection manual of Tariff Advisory Committee.

2.3 No deviation or exception from this specification shall be permitted without written approval from BHEL. Intended deviations shall be listed by the bidders separately and sent along with the bids and supported by reasons for the same, to be considered by BHEL for acceptability. Also bidder shall confirm categorically that their bid completely complies with the specification except for the deviation as listed.

3.0 DESIGN REQUIREMENTS.

3.1 Pumps of a particular category shall be identical and shall be suitable for parallel operation with equal load division. Components of identical pumps shall be interchangeable.

3.2 Pump shall run smooth without undue noise vibration. Noise level produced individually or collectively (pump and motor) shall not exceed 85dB (A) measured at distance of 1.5 meters from outline of equipment source in any direction. The magnitude of peak to peak vibration shall be as per hydraulic institute standards/IS 12075.

3.3 Pump of selected category shall be suitable for pumping hot water up to 120 Deg C.

3.4 Cooling water if required will be provided for cooling pump parts. Vendor shall specify cooling water requirement based on the conditions specified.

3.5 The pump must be made suitable for outdoor installation without a roof.

3.6 The pump shall be designed to have constant minimum re-circulation flow. This minimum flow requirement to avoid rapid temperature rise and re-circulation quantity shall be indicated.

3.7 Tolerance on performance values shall be as per HIS standard.

3.8 Both the feed water pumps shall be capable of running in parallel.

3.9 The temperature of the working fluid will vary from 105 deg C to ambient temperature without thermal stresses causing warping, buckling, misalignment, rubbing or other damaging effects. Pumps shall be capable of handling cold water.

3.10 Pump sets shall be capable of continuously delivering the rated output for the voltage variation of +/- 10% and frequency variation of +/- 5% occurring separately or combined voltage and frequency variation of +/- 10%.

3.11 Internal design clearances shall be adequate to account for pump shaft deflection.

3.12 The pumps shall be designed for intermittent duty and shall be designed to accommodate the quantity of starts & stops as recommended by the ANSI/NEMA MG-1.

3.13 The pumps shall be designed to operate satisfactorily up to and including 110% of design speed.

3.14 The pump shall be designed with a head capacity characteristic which rises steadily pump maximum (run out) capacity to minimum flow. The pump head at shutoff shall be a minimum of 110% of the design head capacity.

3.15 Motors shall be rated for 415V (10%), 3 phase, 50 Hz, AC supply and shall generally comply with the enclosed motor specification.

3.16 Characteristics curves:

3.16.1 The seller shall submit pump characteristic curves. Preliminary pump characteristic curves shall be submitted with seller's proposal. Curves shall indicate total head, efficiency, brake horsepower, and required net positive suction head, (basis 3% reduction in pump head) as ordinates, with capacity in cubic meters per hour as the abscissa. Final pump characteristic curves are required after award.

3.16.2 These curves shall be submitted for maximum and minimum impeller designs, which may be fitted to the pump casing and for the actual impeller design being provided.

3.16.3 Speed torque and motor performance curves shall also be submitted.

4.0 FEATURES OF CONSTRUCTION

4.1 Pumps shall be of horizontal, centrifugal, ring section type with required number of stages suitable for the service conditions.
Impellers shall be made in one piece and securely keyed to the shaft. Means shall be provided to prevent loosening during operation including rotation in reverse direction. Impeller fastening nuts (if provided) shall be of cap type and shall be tightened in the direction of normal rotation.

4.2 Fabricated impellers are not acceptable. Impellers for multistage pumps shall be individually secured against axial movement in either direction along shaft.

4.3 Wearing rings shall be of renewable type. Opposed wear surfaces of hardened material shall have a hardness difference of at least 50 BHN. The rotary components shall have higher Brinell hardness.

4.4 The design of the shaft shall also take into consideration the critical speed of the shaft, which shall be at least 20 percent above the operating speed.

4.5 Replaceable shaft sleeves shall be provided to protect the shaft where it passes through stuffing boxes.

4.6 Stuffing boxes shall be of such design that they can be housed without removing any part other than the gland and lantern ring. Packing shall be of mechanical seal.

4.7 Pump bearing shall be antifriction bearing.

4.8 The axial thrust of the pump shall be balanced by the balancing disc/drum. Balancing device consists of balancing disc / drum which is keyed to the shaft and bearing disc fitted to high pressure cover by means of tightening flange, studs nuts and washer. The axial sealing gap i.e., gap between bearing disc and balancing disc shall be approximately 0.1 mm. Balance leak off line shall be connected back to makeup water tank.

4.9 Bearings shall be easily accessible without disturbing the pump assembly. A drain plug shall be provided at the bottom of each bearing housing. Heavy-duty bearings shall be provided to take care of radial loads.

4.10 Pumps shall be furnished complete with an approved type of metallic flexible coupling. Couplings shall permit dis-assembling the pump without removing the pipe connections.

4.11 Suction and discharge connections shall be flanged as specified in section 1.2.4. If companion flanges are included in the scope of supply of the VENDOR, the suction and discharge connections shall be flanged and drilled as per MANUFACTURER's standard practice.

4.12 All accessories as called for in section-6 and any other accessory required for proper and safe operation shall be furnished with the pumps.

4.13 All incidentals piping (including valves) required for pump shall be furnished by the supplier.

4.14 Casing shall be provided with drain connection with nipple, threaded and seal welded and provided with a blind flange terminated at edge of base plate. For multi stage pumps with more than one drain point, block valves at each drain point shall be provided. The piping shall then be blind flange terminated at the edge of the base plate. Unless made self venting design, vent connections shall also be provided with a nipple threaded and seal welded and terminated with a blind flange.

4.15 The common base plate for pump and motor shall be in one piece and it shall be made of the material specified in the data sheet A. Suitable holes shall be provided for grouting and they shall be located so that the base can be grouted in place without disturbing the pump and motor. All pumps and motors shall be properly aligned, bolted and dowelled to the base plates by VENDOR. Adequate space shall be provided between pump drain connections and base plate for installation of minimum 15 mm drain piping.

4.16 Prime mover if electric driven shall conform to the enclosed specification for induction motor. Motor KW selection shall be at least 15% more than the required one at the design point.

4.17.1 Instrument rack with all indicating instruments mounted on it to be located on the base of the unit.

i) Pressure gauges: - Balance leak off pressure of BFP (if applicable)
ii) Temperature gauge - Suction temperature of BFP
- Discharge temperature of BFP

4.17.2 The following shall be wired up to junction box (JB) in instrument rack

i) RTD (Duplex) - For any one of the following bearings
DE Bearing of Pump
NDE Bearing of Pump
DE Bearing of Motor
NDE Bearing of Motor

ii) Differential Pressure Transmitter : 1 number across each suction strainer (24 V DC, 2 wire with HART Protocol, SMART type)

4.17.3 All instruments shall be completed with root valves, impulse lines, valve manifolds & other required mounting accessories.

5.0 DYNAMICS

5.1 Complete rotor assembly shall be dynamically balanced.

6.0 PUMP ACCESSORIES

All accessories shall be sourced from approved vendor list.

6.1 Driver

6.1.1 Motor shall be strictly in accordance with electric motor specification enclosed herewith. In motor nameplate, rating percentage of brake horsepower to be mentioned.

6.2 Coupling & guards

6.2.1 Coupling shall be forged steel and of non-lubricated, laminated disc type, with stainless steel / monel laminations. The selected coupling shall have a service factor not less than 1.5 over motor name plate rating. A spacer coupling (127 mm) minimum normal length, shall be used unless otherwise specified. The spacer length shall permit the removal of coupling, bearings, seal and/or rotor as applicable without disturbing the driver or the suction and discharge piping.

Pump vendor to obtain BHEL approval for the selected coupling, its make and rating.

6.2.2 Coupling shall be dynamically balanced.

6.3 Mounting plates

6.3.1 The length shall be at least equal to the overall length of the pump and motor assembly.

6.3.2 Unless otherwise specified, base plate for all sizes of pump shall be grouted.

6.3.3 A heavy duty grouted base plate shall be provided.

6.3.4 Levelling screws shall be provided.

6.3.5 The supports for the pump and engine shall be welded to structural members and not to flat plates.

7.0 QUALITY ASSURANCE, TESTING AND INSPECTION

As per BHEL approved quality plan. Vendor to furnish QP of pump & motor.

8.0 DRAWINGS / DATA TO BE FURNISHED ALONG WITH OFFER

8.1 Design characteristic curves showing flow vs head, power, efficiency and NPSH(R).

8.2 Filled in data sheet (given at Annexure-B of this specification).

8.3 Cross sectional drawing of pump.

8.4 General arrangement drawing giving overall dimensions, foundation details, loading and details of suction/ discharge nozzles.

8.5 Allowable forces and moments on suction & discharge nozzles.

8.6 Part list and material of construction.

8.7 Cooling water requirements with quantity and pressure if required.

8.8 Minimum re-circulation flow for the safe operation of Boiler Feed Pumps.

8.9 Speed Vs torque curve (Superimposed curves)

8.10 GD sq. value (moment of inertia)

8.11 Quality plan

8.12 List of special tools

8.13 Catalogues

8.14 Schematic diagram of the pump.

8.15 List of spare parts along with identification of the same on cross sectional drawing enclosed with offer.

8.16 List of instruments

8.17 Specific, point wise confirmation on all clauses of this specification. Deviations, if any, to be furnished

8.18 List of sub vendors of major items.

8.19 Drawings/data to be furnished after the award of the contract:

8.20 All the drawings / data as called for during offer.

8.21 Schematic diagram for cooling water and seal water lines if applicable.

8.22 Sequential interlocking write-up of feed water Pump set including recommended list of protections, annunciations and trips.

9.0 FINAL DOCUMENTATION

Sl No.	Item	No of copies	
1.	Drawings	12	| these documents shall be
2.	O&M manuals (CD)	12	| submitted one month before schedule
3.	Data sheets	12	| date of despatch
4.	Shop test certificates	12	| of the BFPs
5.	Guarantee certificates	12	

10.0 PERFORMANCE GUARANTEE

10.1 Guarantee shall be for a minimum period of one year of operation after commissioning. Any defects/problems arising during this period due to defective design, material of manufacture shall be attended by the vendor without any cost implications.

10.2 Guarantee shall be given for

a) Max capacity
b) Discharge pressure
c) Power consumption