



An ISO 9001
Company

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

| | |
|----------------|---|
| ENQUIRY | Phone: +91 431 257 75 75 Fax : +91 431 252 07 19 Email : rmanohar@bheltry.co.in Web : www.bhel.com |
|----------------|---|

| | | | |
|--|------------------------|----------------------|--|
| | Enquiry Number: | Enquiry Date: | Due date for submission of quotation: |
| | 2620600039 | 28.06.2006 | 24.07.2006 |

Your are requested to quote the Enquiry number date and due date in all your correspondences. This is only a request for quotation and not an order

| Item | Description | Quantity | Delivery Schedule |
|------|---|----------|-------------------|
| 10 | Special Purpose Valve (Hydro) Test Station as per the technical specification & commercial conditions applicable (to be downloaded from web site www.bhel.com) | 1 No. | 05.06.2007 |

Note:

- (1) The detailed Technical Specification along with technical point-by-point confirmation, Commercial Terms & Conditions applicable for this Enquiry, Confirmation of acceptance for BHEL commercial terms & conditions and Price Bid formats have been posted in BHEL Corporate web site www.bhel.com under Enquiry reference “2620600039”. Your offer should be based on all the above documents.
- (2) Also, you are requested to fill in the Supplier Registration formats available in www.bhel.com (under Advancement – Supplier Registration) and send it along with your offer.

| | |
|--|---|
| 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 Dy. Genl. Manager / Capital Purchase / MM / Manufacturing |
|--|---|

PART A**QUALIFYING CRITERIA FOR THE SUPPLY OF VALVES HYDRO TEST STATION****SECTION – I**

The BIDDER / VENDOR has to necessarily provide the following details, for making an assessment of the firm's capability and competency:

[The BIDDER is expected to give complete details against each clause in the table given below and wherever necessary an additional sheet may be attached (giving clear reference number) to cover the required details]

| S. No. | PARTICULARS | VENDOR's RESPONSE |
|---------------|---|--------------------------|
| 1 | Number of Years of Experience of the BIDDER/ VENDOR in the field of design, manufacture and supply of ' VALVES HYDRO TEST STATION ' | |
| 2 | Number of similar size and type of Valves Hydro Test Station supplied, installed and commissioned till date. | |
| 3 | Number of Valves Hydro Test Stations supplied, installed and commissioned till date for the High Pressure Valve manufacturer. | |
| 4 | Details of Designing background of the PRINCIPAL Equipment manufacturer. | |
| 5 | Details of the International code followed for designing Valves Hydro Test Station shall be furnished. Copies of the relevant portions of the International code shall be annexed with the offer. | |
| 6 | Details of Quality Assurance System followed | |
| 7 | Details on SERVICE-after-SALES Set-Up in India including the addresses of Agents/Service Centres in India and Asia | |
| 8 | Any Additional Data to supplement the manufacturing capability of the BIDDER | |

SECTION – II

The BIDDER / VENDOR has to compulsorily meet the following requirements to get qualified for submitting an offer for the Valves Hydro Test Station.

| S. No. | REQUIREMENTS | VENDOR's COMMENTS |
|---------------|---|--------------------------|
| 9 | The BIDDER / VENDOR shall have a minimum of TEN Years of Continuous Experience in the Design, Manufacture & Supply of Valves Hydro Test Stations. Indicate the actual experience. | |
| 10 | Reference List of Customers and Performance Certificate from CUSTOMERS (minimum 2 Customers) with full contact details of CONTACT PERSON. | |
| 11 | Reference list of Customers who are Power Utility Boiler manufacturers. The contact details may be furnished. | |

SECTION – III

The BIDDER / VENDOR has to comply with the following, for accepting the Technical Offer for scrutiny by the Purchaser:

| S.No. | REQUIREMENTS | VENDOR's COMPLIANCE |
|--------------|--|----------------------------|
| 12 | The BIDDER / VENDOR shall submit the offer in TWO PARTS - Technical [with PART A & PART B] & Commercial and Price Bid. The Technical Offer shall be in line with the BHEL Technical Specifications and the Guidelines or Annexures mentioned, wherever applicable. | |
| 13 | The Offer shall contain a comparative statement of Technical Specifications given by BHEL and the Offer Details submitted by the Bidder, against each clause. A just 'CONFIRMED' or 'COMPLIES' or 'YES' or 'NO-DEVIATION' or similar words in the technical comparative statement may lead to disqualification of the Technical Offer. | |
| 14 | The BIDDER / VENDOR shall assure a continuous support for SPARES and SERVICE for TEN Years, from the date of commissioning of the equipment at BHEL Works. | |
| 15 | The Technical Offer shall be supported by Product Catalogue and Data Sheets in ORIGINAL and complete technical details of 'Bought-Out-Items' with copies of Product Catalogue and Selection Criteria | |
| 16 | The Commercial Offer (given with the Technical Offer) shall contain the Scope of Supply and the Un-Priced Part of the Price-Bid, for confirmation of Scope of Supply. | |
| 17 | The reference List of Customers shall be accompanied with the details (Phone Number / E-Mail ID) of the CONTACT PERSON for cross reference by BHEL | |

PART B**TECHNICAL SPECIFICATION FOR VALVES HYDRO TEST STATION**

| S. No | PARTICULARS | BHEL SPECIFICATIONS | BIDDER's OFFER [with Complete Technical Details] |
|-------|---------------------|--|---|
| 1 | Area of Application | The Hydro Test Station is intended to test Globe, Gate and Non return Valves of sizes ranging from 2½" to 20". For dimensional details refer Annexure-1. | |

2. Operating Parameters

| | | | |
|-----|---------------------|--|--|
| 2.1 | Valves to be tested | Sizes and dimensions of Valves to be tested in this Hydro test station are given in the Annexure-1. The Valves to be tested will have flat ends. | |
| 2.2 | Weight of the Valve | Maximum - 8000 Kg. | |
| 2.3 | Test Medium | 1) Water 2) Air | |
| 2.4 | Tests to be done | 1. With water as medium, the following tests shall be carried out: b. Shell c. Back Seat d. Seat 2. With Air as medium, the following test shall be carried out a) Seat | |
| 2.5 | Pressure | Maximum test pressure 1) Water : 1200 kg / cm ² 2) Air : 9 kg / cm ² | |

| S. No | PARTICULARS | BHEL SPECIFICATIONS | BIDDER's OFFER [with Complete Technical Details] |
|--------------|--------------------|--|---|
| 2.6 | Clamping Distance | Minimum / Maximum distance between the clamping tables shall be suitably decided by the Vendor to accommodate the entire range of valves given in this specification.(refer Annexure-1). Vendor to furnish details. | |
| 2.7 | Production rate | The Hydro Test Station is expected to have a production capacity of 15 Nos of Valves on an average of various sizes - in 8 hrs shift The Hydro test station will be operated in three shifts. | |

3. HYDRO TEST STATION REQUIREMENTS

| | | | |
|------------|---------------------------------------|---|--|
| 3.1 | CLAMPING SYSTEM | | |
| 3.1.1 | Valve orientation in the test station | The orientation of the clamping unit shall be designed for loading and testing the valve (test body) with its spindle in vertical position and flow axis in horizontal position. Loading of Valves on the test station shall be done by using BHEL's crane. | |
| 3.1.2 | Valve loading | The clamping unit shall be designed for loading the test body from the front side. For this, care should be taken to give clear space without any hindrances. | |
| 3.1.3 | Clamping flanges | The left side locating/clamping flange on the test bed shall be fixed. The right side clamping flange shall move to and fro by motorized mechanical means. The moving elements shall be suitably protected. | |
| 3.1.4 | Inlet / Outlet | The test body shall be pressurized from both the sides alternately for checking seat tightness on both sides of the seat in one setting. The clamping system shall be suitably designed for this feature. | |
| 3.1.5 | Utility of clamping flanges | The clamping flanges shall hold sealing heads and have outlet / inlet to venting, prefilling and pressurizing systems. | |

| S. No | PARTICULARS | BHEL SPECIFICATIONS | BIDDER's OFFER [with Complete Technical Details] |
|--------|--------------------------------|--|--|
| 3.1.6 | Clamping flange operation | Movable clamping flange shall be operated by means of push buttons located on the movable clamp body. | |
| 3.1.7 | Speed | The movable clamping flange shall have both low & rapid speed. The flange shall move as long as the push button is pressed. | |
| 3.1.8 | Interlock | Once the pressure inside the test body has reached 3 Kg/cm ² , the movable clamping flange shall not operate. | |
| 3.1.9 | Body end sealing | Suitable 'O' rings shall be used for sealing the body ends. | |
| 3.1.10 | O ring quality | Vendor shall specify material, size and shore hardness for each size of 'O' ring. | |
| 3.1.11 | Sealing Plugs | Vendor to provide suitable sealing plugs for the entire range of valves given in this specification. | |
| 3.1.12 | Sump | A Stainless Steel water sump shall be provided with filtering and re-circulation facility. Capacity of sump shall be minimum 500 litres. | |
| 3.1.13 | Clamping mechanism | The movable end shall be moved by motorized mechanical means and the necessary initial clamping shall be achieved. Further, as the pressure inside the test body rises, the clamping load shall increase proportionally in such a way that the final reaction force to the test body at any point of time shall not exceed 3% of the test load. The mechanism used for this shall be of self sealing type. No pressure sensing, feedback mechanism and hydraulic clamping shall be used. The vendor shall mention the initial clamping force and give details of the mechanism deployed to achieve proportional clamping. | |
| 3.1.14 | Facility for visual inspection | Provision shall be made at the fixed end for visual inspection of seat tightness of valves. The details of the arrangement shall be given by the vendor in the offer. | |

| S. No | PARTICULARS | BHEL SPECIFICATIONS | BIDDER's OFFER [with Complete Technical Details] |
|------------|--------------------------------|--|--|
| 3.1.15 | Safety | Suitable safety device shall be provided to protect the clamping system from overloading. Vendor to furnish details. | |
| 3.2 | AIR VENTING SYSTEM | | |
| 3.2.1 | Air evacuation | Air venting system shall evacuate the air from inside the test body before filling water. | |
| 3.2.2 | Vacuum pump | A vacuum pump has to be provided for evacuating the air from the test body. | |
| 3.3 | WATER PREFILLING SYSTEM | | |
| 3.3.1 | Pump for prefilling | A centrifugal pump shall be provided for rapid prefilling of the test body with water. | |
| 3.3.2 | Pump capacity | Centrifugal pump discharge should be greater than 125 litres per minute | |
| 3.3.3 | Interlock | The prefilling system shall operate only after the designed vacuum level is achieved in the test body. Suitable interlocks shall be provided. | |
| 3.3.4 | Pump cut-off limit | The prefilling pump shall switch off automatically once the designed prefilling pressure is achieved. Vendor to specify the prefilling pressure details. | |
| 3.4 | PRESSURIZING SYSTEM | | |
| 3.4.1 | Test Medium selector | Necessary mechanism for selection of test medium (air / water) shall be provided. | |
| 3.4.2 | Direction selector | Direction selector mechanism shall be provided to enable pressurizing test body from any side. | |

| S. No | PARTICULARS | BHEL SPECIFICATIONS | BIDDER's OFFER [with Complete Technical Details] |
|--------------|---------------------------|---|--|
| 3.4.3 | Testing with Water | | |
| A | Multiple stage pump | The water pressurizing system shall consist of Multiple stages of Air operated pump to achieve a maximum test pressure of 1200 kg / cm ² . The line pressure of compressed air at BHEL will be 4 kg / cm ² . Vendor to specify make, number of stages and the discharge details. | |
| B | Pump operation | The various stages of pumps shall be operated independently and in any combination. Suitable controls shall be provided. | |
| C | Rate of pressurizing | Suitable controls shall be provided for controlling the rate of pressurizing. | |
| D | Isolating valve | The pressurizing system shall have suitable isolating valves to isolate the pumps from the test body. | |
| E | Pump On/Off control | ON/OFF controls for operating the pumps shall be provided | |
| 3.4.4 | Testing with Air | | |
| A | Pressure booster | The line pressure of compressed air at BHEL will be 4 kg / cm ² . Vendor shall provide necessary pressure booster for testing valves with air at 9 kg/cm ² . | |
| B | Air pressure regulators | Necessary regulator arrangement shall be provided to regulate the pressure of air inside the test body. | |
| 3.4.5 | Pressure tapping points | Tapping points to be provided to read pressure inside the test body, on both clamping sides. The pressure shall be tapped from both sides of the test body for pressure measurement purpose. The gauge mounting shall be M20 with necessary isolating valves. Totally six pressure gauge mounting points shall be provided (3 for each side) | |

| S. No | PARTICULARS | BHEL SPECIFICATIONS | BIDDER's OFFER [with Complete Technical Details] |
|------------|-------------------------|--|--|
| 3.4.6 | Pressure gauges | One set of Pressure gauges as given below shall be supplied along with the equipment. 0-12 kg / cm ² (for air) - 2 Nos 0-1000 kg / cm ² (for water) - 2 Nos 0-1600 kg / cm ² (for water) - 2 Nos | |
| 3.4.7 | Accumulators | Suitable accumulators shall be provided to even out pressure surges in the hydro / pneumatic circuit. | |
| 3.4.8 | Holding pressure | The pressure inside the test body will be held till the inspection is completed. Pressure holding time: Maximum 45 minutes | |
| 3.5 | LEAK MEASUREMENT | | |
| 3.5.1 | For Water | Suitable system shall be provided for assessing the quantum of leak during seat test with water. | |
| 3.5.2 | For Air | Bubble counter shall be provided for checking air leak during seat test with air. | |
| 3.6 | DEPRESSURIZING | | |
| 3.6.1 | Depressurizing | After valve testing is completed, the pressure inside the test body shall be relieved slowly by means of suitable drain valve. Provision to be made for draining the water into the sump. | |

| S. No | PARTICULARS | BHEL SPECIFICATIONS | BIDDER's OFFER [with Complete Technical Details] |
|------------|---|--|--|
| 3.7 | OPERATOR CONTROL PANEL | | |
| 3.7.1 | Controls | The control panel shall have the following minimum essential controls: 1. Medium selector 2. Direction selector 3. Venting system controls 4. Prefilling system controls 5. Pressurizing system controls 6. Draining system valves 7. Pressure gauge mountings 8. Test load indicator 9. Leak measurement devices for both air and water. | |
| 3.7.2 | Other controls | Vendor to specify the details of any other controls on the operator control panel. | |
| 3.8 | Foundation for the machine | | |
| 3.8.1 | Foundation of the machine shall be designed suitably. Vendor to provide details of foundation. | | |
| 4 | SPECIMEN TEST BODY | | |
| 4.1 | Vendor shall supply a suitable specimen test body to meet the commissioning requirements. Vendor to provide details. The specimen test body shall be able to withstand the maximum simulated test load conditions. | | |
| 5 | SAFETY | | |
| 5.1 | Safety features shall be built -into the system. The supplier shall indicate all the safety interlocks that are provided in the equipment. Vendor to furnish details of Safety interlocks for Critical Operations. | | |

| S. No | BHEL SPECIFICATIONS | BIDDER's OFFER [with Complete Technical Details] |
|----------|--|--|
| 5.2 | All the high pressure equipments including pressure vessels if any are to be provided with safety relief valve. | |
| 5.3 | Sliding safety doors fitted with transparent bullet-proof glass window on the clamping system shall be provided, for visual inspection of the test body under pressure. Vendor to submit details on this arrangement. | |
| 5.4 | All moving mechanical components are to be suitably guarded for safe operation. | |
| 6 | GENERAL | |
| 6.1 | Provision to be made for testing valves independently, outside the clamping system. All the venting, water prefilling, pressurizing and depressurizing systems of the Hydro test station shall be used for testing the valve. Suitable hoses and needed accessories shall be quoted item wise. | |
| 6.2 | The general arrangement drawing of the Hydro test station, Electrical circuit, Pneumatic circuit, Water circuit and hydraulic circuit (if any) shall be submitted along with the offer. Rating of individual Valves and other items shall be shown in the general arrangement drawing. | |
| 6.3 | All hoses and cables from operator control panel to various systems of the hydro test station shall be neatly routed and suitably protected. | |
| 6.4 | All pressure gauges shall be glycerin filled. | |
| 6.5 | The noise level from the Hydro test station shall not exceed 80dBA | |
| 6.6 | The machine configuration and machine elements arrangement should have easy accessibility and high rigidity. Self-aligning /fitting, locking & piloting arrangement shall be incorporated in the components and modules to ensure 'maintenance free' concept. | |
| 6.7 | Vendor to furnish the following with the offer a. GA Drawing of the Hydro test station. b. GA Drawing of Individual Mechanisms. c. Approximate weight details of individual components shall be furnished. | |

| S. No | PARTICULARS | BHEL SPECIFICATIONS | BIDDER's OFFER [with Complete Technical Details] |
|----------|----------------------------------|---|--|
| 7 | ACCESSORIES | | |
| 7.1 | Standard Accessories | The offer shall clearly indicate the list of standard accessories that will be supplied along with the machine. | |
| 7.2 | Sealing Plugs | Pairs of sealing plugs with 'O' rings for all the Valve sizes mentioned in the specification shall be supplied. | |
| 7.3 | Optional Accessories | Stand by Air compressor suitable for the application mentioned in the specification. | |
| 7.4 | Special Accessories | Any other special accessories shall be quoted separately as optional items | |
| 7.5 | REPAIR KIT | <p>'O' ring repair kit with complete accessories are to be supplied with machine. - 2 Sets</p> <p>Tool kit consists of all hand tools, spanner sets, screw drivers, Allen key set both in metric and inches. - 2 Sets</p> | |
| 8 | SPARES | | |
| 8.1 | Operating and Maintenance Spares | All spare parts item wise shall be quoted by the supplier for two years of trouble free operation. The list shall include all valves such as DC valves, NRV, Flow regulating valves, Needle valves in the pressure line with seal kits, End fittings and Ferrules. | |
| 8.2 | Essential Spares | <p>1. Pressure gauges</p> <p>0-12 kg / cm² (for air) - 2 Nos</p> <p>0-1000 kg / cm² (for water) - 2 Nos</p> <p>0-1600 kg / cm² (for water) - 2 Nos</p> <p>2. All 'O' rings for all sealing plugs - 50 sets in each size.</p> <p>3. Seal kit for air operated pumps - 10 sets</p> <p>4. All high pressure hoses - 1 Set</p> | |

| S. No | BHEL SPECIFICATIONS | BIDDER's OFFER [with Complete Technical Details] |
|----------|---|--|
| 9 | ELECTRICAL POINTS | |
| 9.1 | The electrical input power supply shall be $415 \pm 10\%$ V, $50 \pm 2\%$ Hz, 3 Phase AC supply through a 3 Wire System. No neutral conductor. | |
| 9.2 | BHEL will provide input power supply at one point only and the supplier has to take care of all other electrical distribution network required for the Station. | |
| 9.3 | All electrical motors, limit switches etc, on the machine shall be wired using PVC sheathed cable, running in conduits and converging to common terminal block | |
| 9.4 | External wiring from / to control panel, control desk, external motors etc shall be by means of screened multi-core cables. | |
| 9.5 | Control Voltage for all Solenoid Valves shall be 24V. | |
| 9.6 | Electrical Control panel shall have built in 230V, 5 amps, 3 pin plug. | |
| 9.7 | Electrical control panel shall be adequately illuminated for maintenance purpose. | |
| 9.8 | Machine is to be fitted with suitable lighting and provision for 24 V hand lamp 2 Nos in the front and rear side of the equipments. | |
| 9.9 | All components/devices/terminals are identified with numbered ferrules | |
| 9.10 | IP54 protection for all electrics. Totally enclosed Motors shall be used. | |
| 9.11 | All Electric Motors shall be of any of the following makes : SIEMENS / ABB / makes conforming to IEC Standards | |
| 9.12 | All electrical devices like contactors, relays, limit switches, push buttons etc are from SEW / Siemens/ Cutler hammer / Telemecanique / ROCKWELL-Allen Bradley / Delta | |
| 9.13 | The centrifugal pump and the air pump shall be of reputed make. | |

| S. No | BHEL SPECIFICATIONS | BIDDER's OFFER [with Complete Technical Details] |
|-----------|---|--|
| 10 | PNEUMATICS | |
| 10.1 | Pneumatics forming part of the machine and associated equipment shall be connected by nylon reinforced synthetic rubber hoses and / or steel tubes. | |
| 10.2 | A single compressed air inlet to the Hydro test station shall be provided with Filter / Regulator /Lubricator Unit. | |
| 11 | HYDRAULICS | |
| 11.1 | Vendor to furnish details of any hydraulic circuits if deployed. | |
| 11.2 | Such Hydraulic circuits shall be designed with minimum number of control valves and to suit oil of ISO VG 46 or 68 grade only. | |
| 11.3 | Vendor to provide details of Oil chiller used, Hydraulic Tank Capacity, Hydraulic power pack. | |
| 11.4 | All hydraulic pipelines to be neatly laid out | |
| 11.5 | All Hydraulic elements shall be of Vickers / Rexroth make. | |
| 11.6 | All hydraulic hoses shall be preferably of GATES make | |
| 12 | LUBRICATION | |
| 12.1 | Automatic timer controlled lubrication system is to be provided for sliding surfaces and all mechanical drives. | |
| 13 | AMBIENT ATMOSPHERIC CONDITION | |
| 13.1 | The Hydro test station with all Sub-Systems shall be suitable for operation in an ambient temperature of +50°C and with a Relative Humidity of 90%, both values do not occur simultaneously The entire equipment shall be Tropicalized in Design and construction. | |
| 14 | PAINTING | |
| 14.1 | Painting colour scheme shall be as per BHEL specification to be finalized at the time of placing order. | |

| S. No | BHEL SPECIFICATIONS | BIDDER's OFFER [with Complete Technical Details] |
|-----------|--|--|
| 15 | INSPECTION | |
| 15.1 | At Supplier's Works: The Machine shall be offered for inspection and performance trials to test the design features and capacity of the test station, by BHEL Engineers before dispatch, at Supplier's works. The tests shall be conducted using specimen test body. | |
| 16 | ERECTION & COMMISSIONING | |
| 16.1 | The supplier shall depute his engineer(s) for supervising the erection and commissioning of the machine at BHEL and prove-out trials. | |
| 17 | PERFORMANCE PROVE-OUT Supplier shall Prove-out the performance of Hydro test station for the following points: | |
| 17.1 | The vendor shall prove out the working of the test load safety device, at the maximum test load, by pressurizing the specimen test body with water. | |
| 17.2 | The vendor shall prove-out the leak tightness of the entire test station by holding pressure at 1200 kg/cm ² (water) for a duration of 1 hour at a stretch. Leak tightness shall be proved out for 10 such cycles. During each cycle the specimen test body will be unloaded and loaded into the clamping system. Any visual leak and pressure drop indicated on the pressure gauges will not be permitted. | |
| 17.3 | The vendor shall prove-out the leak tightness of the entire test station by holding pressure at 9 kg/cm ² (Air) for a duration of 30 min at a stretch. Leak tightness shall be proved out for 5 such cycles. During each cycle the specimen test body will be unloaded and loaded into the clamping system. Any pressure drop indicated on the pressure gauges will not be permitted. | |

| S. No | BHEL SPECIFICATIONS | BIDDER's OFFER [with Complete Technical Details] |
|-----------|---|--|
| 18 | TRAINING | |
| 18.1 | The Supplier shall train four of BHEL Engineers in the Operation, Trouble Shooting and Maintenance of the Hydro test station at the Supplier's Works for a minimum period of 5 working Days, after the inspection of the Equipment. | |
| 18.2 | The Supplier's Service Engineer / Application Engineer shall train BHEL Engineers in the Operation, Trouble Shooting and Maintenance of the Hydro test station for a minimum period of 10 Working Days, after commissioning of the Equipment at BHEL Works. | |
| 18.3 | The training shall include the following: a) Safety b) Operation of the machine c) Trouble-Shooting d) All special features of the machine e) Electrical / Mechanical / Electronics systems | |
| 18.4 | Vendor shall co-ordinate for a visit of BHEL Personnel to an industry having similar/identical machine & system, in case of order realisation, for system acquaintance & performance feedback. | |
| 19 | DOCUMENTS AND MANUALS | |
| 19.1 | <p>a) Operation & Maintenance Manuals:</p> <p><u>Operation manual</u> shall include all operations of the machines and its accessories with full details and safety instructions. All the features of the machine and how to operate them shall be explained in detail.</p> <p><u>Maintenance manual</u> shall include all machine construction drawing, Component drawings, assembly drawings, explanation and details about the sequence of operations of Electrical, Electronic & Hydraulic circuits.</p> <p style="text-align: right;">Hard copy : 3 Nos CD Media: 1 No</p> | |

| S. No | BHEL SPECIFICATIONS | BIDDER's OFFER [with Complete Technical Details] |
|-----------|--|--|
| 19.2 | b) Detailed spare parts specification for the electrical, electronics, mechanical, hydraulics (and pneumatic if any) to be furnished for items made by the supplier and for the items bought out and assembled by the supplier. <div>Hard Copy : 3 Nos.</div> | |
| 19.3 | c) Electrical Wiring Drawings – Power & Control Circuits. Pneumatic/Hydraulic Circuit Diagrams. Specifications/Ratings of All Bought-Out-Items. Trouble Shooting Chart for Main and all Sub-Systems. <div>Hard copy : 3 Nos.</div> | |
| 19.4 | d) Equipment data / Commissioning data to be provided | |
| 20 | PERFORMANCE GUARANTEE | |
| 20.1 | Equipment has to be guaranteed for its performance, for a minimum of 24 months from the date of commissioning. | |

Enclosure:

a) Annexure - 1

ALL DIMENSIONS ARE IN MILLIMETRES. FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER RELEVANT QCP / QP.

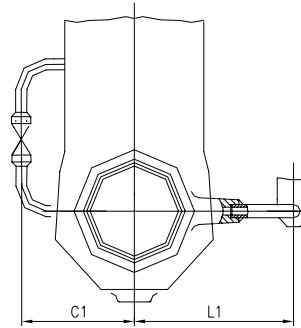
GATE VALVE

| 1500 CLASS | | | | | | |
|------------|------------|------|-----|-----|-----|-----|
| SL. No. | VALVE SIZE | L | Ød | ØD | L1 | C1 |
| 01 | 65 | 254 | 47 | 97 | — | — |
| 02 | 80 | 305 | 60 | 116 | — | — |
| 03 | 100 | 406 | 78 | 136 | — | — |
| 04 | 125 | 483 | 98 | 161 | — | — |
| 05 | 150 | 559 | 125 | 190 | 600 | 270 |
| 06 | 200 | 711 | 165 | 244 | 630 | 275 |
| 07 | 250 | 864 | 205 | 302 | 660 | 300 |
| 08 | 300 | 991 | 245 | 359 | 690 | 365 |
| 09 | 350 | 1067 | 280 | 381 | 706 | 375 |
| 10 | 400 | 1194 | 320 | 446 | 736 | 425 |
| 11 | 450 | 1346 | 360 | 501 | 781 | 475 |

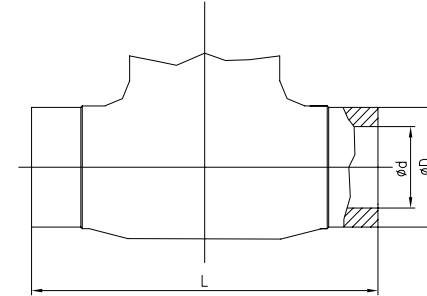
| 2000 CLASS | | | | | | |
|------------|------------|------|-----|-----|----|----|
| SL. No. | VALVE SIZE | L | Ød | ØD | L1 | C1 |
| 01 | 350 | 1118 | 260 | 401 | — | — |
| 02 | 450 | 1400 | 340 | 556 | — | — |

| 2500 CLASS | | | | | | |
|------------|------------|------|-----|-----|-----|-----|
| SL. No. | VALVE SIZE | L | Ød | ØD | L1 | C1 |
| 01 | 65 | 330 | 42 | 117 | — | — |
| 02 | 80 | 368 | 51 | 136 | — | — |
| 03 | 100 | 457 | 65 | 125 | 581 | — |
| 04 | 125 | 533 | 80 | 156 | 591 | — |
| 05 | 150 | 610 | 100 | 186 | 605 | 315 |
| 06 | 200 | 762 | 140 | 242 | 666 | 325 |
| 07 | 250 | 914 | 165 | 304 | 685 | 375 |
| 08 | 300 | 1041 | 210 | 359 | 735 | 415 |
| 09 | 350 | 1118 | 250 | 464 | 785 | 445 |
| 10 | 400 | 1245 | 265 | 452 | 785 | 445 |
| 11 | 450 | 1397 | 260 | 509 | 840 | 475 |

| 2850 CLASS/3000 CLASS/3500 CLASS | | | | | | |
|----------------------------------|-------------------|------|-----|-----|-----|-----|
| SL. No. | VALVE SIZE/RATING | L | Ød | ØD | L1 | C1 |
| 01 | 500/2850 | 1960 | 305 | 561 | 660 | 515 |
| 02 | 80/3000 | 368 | 50 | 115 | — | — |
| 03 | 350/3500 | 1118 | 190 | 385 | 775 | 425 |



Annexure - 1



NON RETURN VALVE

| 1500 CLASS | | | | | 2500 CLASS | | | | |
|------------|------------|------|-----|-----|------------|------------|------|-----|-----|
| SL. No. | VALVE SIZE | L | Ød | ØD | SL. No. | VALVE SIZE | L | Ød | ØD |
| 01 | 65 | 254 | 47 | 101 | 01 | 65 | 330 | 50 | 115 |
| 02 | 80 | 305 | 60 | 111 | 02 | 80 | 368 | 55 | 126 |
| 03 | 100 | 406 | 78 | 141 | 03 | 100 | 457 | 70 | 151 |
| 04 | 125 | 483 | 96 | 166 | 04 | 125 | 533 | 80 | 166 |
| 05 | 150 | 559 | 118 | 191 | 05 | 150 | 610 | 105 | 186 |
| 06 | 200 | 711 | 165 | 236 | 06 | 200 | 762 | 140 | 241 |
| 07 | 250 | 864 | 205 | 291 | 07 | 250 | 914 | 165 | 284 |
| 08 | 300 | 991 | 245 | 338 | 08 | 300 | 1041 | 210 | 353 |
| 09 | 350 | 1067 | 280 | 391 | 09 | 350 | 1118 | 250 | 417 |
| | | | | | 10 | 400 | 1245 | 270 | 461 |
| | | | | | 11 | 450 | 1397 | 300 | 511 |

GLOBE VALVE

| 1500 CLASS | | | | | 2500 CLASS | | | | |
|------------|------------|-----|----|-----|------------|------------|-----|-----|-----|
| SL. No. | VALVE SIZE | L | Ød | ØD | SL. No. | VALVE SIZE | L | Ød | ØD |
| 01 | 65 | 340 | 50 | 91 | 01 | 65 | 420 | 48 | 101 |
| 02 | 80 | 390 | 60 | 105 | 02 | 80 | 470 | 55 | 115 |
| 03 | 100 | 480 | 78 | 135 | 03 | 100 | 570 | 70 | 136 |
| 04 | 125 | 580 | 98 | 161 | 04 | 150 | 760 | 100 | 203 |

All dimensions are in mm

Drg No. CABS-1-27-01
BHEL, Tiruchirappalli