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|------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------|--|--------------------|----|
| ESP-001 -<br>2A Rev.00 |  | <b>PROJECT ENGINEERING &amp; SYSTEMS<br/>DIVISION</b> |  | Std. / Doc. Number |    |
|                        |                                                                                   |                                                       |  | PY51326            |    |
|                        |                                                                                   |                                                       |  | Rev. No.           | 00 |
|                        |                                                                                   |                                                       |  | Sheet 1 of 13      |    |

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# TECHNICAL PURCHASE SPECIFICATION

## FOR

## SUBMERSIBLE PUMPS

|                 |                                        |
|-----------------|----------------------------------------|
| <b>PROJECT</b>  | <b>1X 7.0 MLD STP AT BHEL HARIDWAR</b> |
| <b>CUSTOMER</b> | <b>BHEL HARIDWAR</b>                   |

|                                                     |                      |                                                                                               |                                                                                                  |               |
|-----------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|---------------|
| <b>Revisions:00</b><br>Refer to record of revisions | <b>Prepared by :</b> | <b>Checked by :</b>                                                                           | <b>Approved by :</b>                                                                             | <b>Date :</b> |
|                                                     | RAJEEV JAIN          | <br>GIRISH | <br>M.S.P.B | 01.03.18      |

**DOCUMENTS TO BE SUBMITTED WITH THE BID:**

The bidder must submit the following documents along with their bid for each Pump, so as to enable BHEL to evaluate their offer.

- a) Duly filled in Pump-Motor datasheet
- b) Tentative GAD for Pump with Motor
- c) Performance curves for pump
- d) Un-priced copy of price in attached BHEL price bid formats indicating quoted/ not quoted against each row & column.
- e) Equipment qualification criteria / PTR / Reference Lists
- f) Checklist as per annexure-4
- g) Deviation list [if any] as per annexure-8

In case the above mentioned documents are not submitted with the offer, the offer of the bidder may be liable for technical rejection.

**1.0.0 INTENT OF SPECIFICATION:**

This specification specifies the requirement of Design, Engineering, Manufacturing, Assembling, Inspection, testing at manufacturer's works and Delivery of properly packed and painted for transport of Submersible Pump with drives and all accessories as specified in the scope of work and as required for the safe and trouble-free operation of equipment to be installed at site.

**2.0.0 SPECIAL NOTES TO BIDDERS:**

**2.0.1** This specification shall be read in conjunction with its enclosures. In case of any discrepancy arising between this specification & its enclosures, the most stringent of all shall be followed and shall over-ride others. Further, if a requirement in this specification or its enclosures, calls for decision of BHEL, it shall be bidder's sole responsibility to clearly bring out the same distinctively in his technical tender offer, so as to enable BHEL to furnish their decision. If such a requirement is not duly addressed by bidder during tender stage and same comes out during order execution stage, it shall be binding on the bidder to comply with the decision furnished by BHEL then, without any cost, delivery, or any other commercial implications.

- a) Bidders shall comply with various requirements of this specification. Bidders can bring out only those deviations which are impractical to meet, for our review.
- b) Bidders may please note that unless the deviations are specifically brought out under deviations clause, it will be considered that no deviations are taken, even if they are mentioned elsewhere directly/indirectly in the offer.

**2.0.2** Any additional equipment, material, etc., which are not specifically mentioned here, but are required to make the supplied equipment complete in all respect, in accordance with the intent of this technical specification, contractual agreement, statutory requirements, relevant/applicable codes/standards, good engineering practices, and for safe and trouble-free operation, shall be deemed to be covered under the scope of this specification.

**2.0.3** The Bidder shall accept full responsibility for the completeness and for the faultless working of all the equipment. These shall be executed on the basis of proven design principle and in accordance with the latest state of the art in such a manner that the purpose to be served by the Pump unit is fulfilled in every respect and a maximum of operational dependability and efficiency are assured. Standardization of equipment, materials etc. shall be employed in the design. Care shall be taken to ensure safe operation as well as simplicity of assembling and dismantling of all parts of the plant.

**2.0.4** Bidder shall quote strictly as per the scope of supply and requirements of this specification.

**2.0.5** Bidder offer shall be strictly as per these specification requirements. Unsolicited or Alternate offers from the bidders will not be entertained.

**2.0.6** In case bidder feels that it is necessary to exclude some components of scope of supply or some of the features of specification requirements due to any technical constraints, bidder shall bring the same to the notice of purchaser during pre-bid stage and take their prior approval before submission of their bid.

**2.0.7** In case Bidder is unable to offer due to any specific requirement of specification. Bidder shall bring out the same in their regret letter. Otherwise it will be considered that non participation by the bidder is attributable to reasons other than any specification requirements.

**3.0.0 APPLICATION OF SYSTEM:**

**Submersible Pumps are required for 1x7.0 MLD STP Project for Raipur Development Authority(RDA) and each STP require submersible pumps for various application.**

3 Nos. [2 Working+1 Standby] of Raw Sewage Lifting Pumps (Submersible Centrifugal) is envisaged for supplying Sewage from Raw Sewage Sump to Stilling Chamber.

3 Nos. [2 Working+1 Store Standby] of Return Activated Sludge Pump (Submersible Centrifugal) is envisaged for Lifting Sewage sludge from Sequential batch reactor-1 & 2 & transferring to Anoxic zone of SBR tank.



3 Nos. [2 Working+1Store standbyS] of Surplus Activated Sludge Pump (Submersible Centrifugal) is envisaged for Lifting Sewage sludge from Sequential batch reactor-1 & 2 & transferring to Sludge Sump.

#### 4.0.0 TECHNICAL DETAILS/REQUIREMENTS:

##### 4.1.0 Design Parameters and Technical Requirement of the Raw Sewage Lifting Pump:

| Sl. No. | Description                                 | Unit   | Rated Condition                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------|---------------------------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Liquid                                      |        | Raw Sewage                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 2       | Temperature Of Raw Sewage                   | Deg. C | Min. 20 Deg. C                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 3       | Specific Gravity                            |        | 1.05                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 4       | Solid Size                                  |        | 100 mm (Max.)                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 5       | Quantity                                    |        | <b>3 Nos.(2 W+1S)</b>                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 6       | Capacity Of each pump                       | m3/hr  | <b>175 m3/hr</b>                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 7       | Pump Differential Head(At Discharge Flange) | mwc    | <b>18 mwc</b>                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 8       | Drive(Pump Supplier Scope)                  |        | Motor                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 9       | Speed of Pump                               | rpm    | As per Manufacturing Standard                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 10      | Pump Type                                   |        | Submersible Type Non Clog Design(Centrifugal)                                                                                                                                                                                                                                                                                                                                                                                                       |
| 11      | Application                                 |        | Handling Sludge                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 12      | Duty                                        |        | Continuous                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 13      | Efficiency                                  |        | As per Manufacturing Standard                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 14      | Power Supply                                |        | 3 Ph,415 V,+/- 10% Voltage Variation, 50Hz,+/- 5% Frequency variation, Combined Variation: +/- 10%, DOL Starting                                                                                                                                                                                                                                                                                                                                    |
| 15      | Insulation/Protection/No. of Starts         |        | Class-F/IP68/Min 10 starts/stop per hour                                                                                                                                                                                                                                                                                                                                                                                                            |
| 16      | Material of Construction                    |        | Casing: Cast Iron IS 210 Gr. FG 260,<br>Impeller: Cast Iron IS 210 Gr. FG 260,<br>Shaft: AISI410,Cable Gland: Cast Iron IS 210 Gr. FG 260,<br>Motor body: Cast Iron IS 210 Gr. FG 260,<br>Seal Cover: Cast Iron IS 210 Gr. FG 260,<br>Sealing :SiC, Double Mechanical Seal<br>Automatic Coupling: CI,Duck Foot Bend: CI,<br>Guide Pipe: SS304,Lifting Chain: SS304,<br>Fasteners: MS with GI Coating.Other Components as per Manufacturer standard. |
| 17      | Noise Level                                 |        | Max. 85 DbA @ 1.5 m from pump drive                                                                                                                                                                                                                                                                                                                                                                                                                 |

##### 4.2.0 Design Parameters and Technical Requirement of the Return Activated Sludge Pump:

| Sl. No. | Description                                 | Unit   | Rated Condition                                  |
|---------|---------------------------------------------|--------|--------------------------------------------------|
| 1       | Liquid                                      |        | Return Activated Sludge [0.8% Solid Consistency] |
| 2       | Temperature Of Raw Sewage                   | Deg. C | Min. 20 Deg. C                                   |
| 3       | Specific Gravity                            |        | 1.05                                             |
| 4       | Solid Size                                  |        | 40 mm (Max.)                                     |
| 5       | Quantity                                    |        | <b>3 Nos.(2 W+1SS)</b>                           |
| 6       | Capacity Of each pump                       | m3/hr  | <b>75 m3/hr</b>                                  |
| 7       | Pump Differential Head(At Discharge Flange) | mwc    | <b>4.1 mwc</b>                                   |
| 8       | Drive(Pump Supplier Scope)                  |        | Motor                                            |
| 9       | Speed of Pump                               | rpm    | As per Manufacturing Standard                    |
| 10      | Pump Type                                   |        | Submersible Type Non Clog Design(Centrifugal)    |
| 11      | Application                                 |        | Handling Sludge                                  |



|    |                                     |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----|-------------------------------------|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12 | Duty                                |  | Continuous                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 13 | Efficiency                          |  | As per Manufacturing Standard                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 14 | Power Supply                        |  | 3 Ph,415 V,+/- 10% Voltage Variation, 50Hz,+/- 5% Frequency variation, Combined Variation: +/- 10%, DOL Starting                                                                                                                                                                                                                                                                                                                                    |
| 15 | Insulation/Protection/No. of Starts |  | Class-F/IP68/As per Manufacturing Standard,Min. 10 Starts/ Stops per hour                                                                                                                                                                                                                                                                                                                                                                           |
| 16 | Material of Construction            |  | Casing: Cast Iron IS 210 Gr. FG 260,<br>Impeller: Cast Iron IS 210 Gr. FG 260,<br>Shaft: AISI410,Cable Gland: Cast Iron IS 210 Gr. FG 260,<br>Motor body: Cast Iron IS 210 Gr. FG 260,<br>Seal Cover: Cast Iron IS 210 Gr. FG 260,<br>Sealing :SiC, Double Mechanical Seal<br>Automatic Coupling: CI,Duck Foot Bend: CI,<br>Guide Pipe: SS304,Lifting Chain: SS304,<br>Fasteners: MS with GI Coating.Other Components as per Manufacturer standard. |
| 17 | Noise Level                         |  | Max. 85 DbA @ 1.5 m from pump drive                                                                                                                                                                                                                                                                                                                                                                                                                 |

#### 4.3.0 Design Parameters and Technical Requirement of the Surplus Activated Sludge Pump:

| Sl. No. | Description                                 | Unit   | Rated Condition                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------|---------------------------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Liquid                                      |        | Surplus Activated Sludge [0.8% Solid Consistency]                                                                                                                                                                                                                                                                                                                                                                                                   |
| 2       | Temperature Of Raw Sewage                   | Deg. C | Min. 20 Deg. C                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 3       | Specific Gravity                            |        | 1.05                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 4       | Solid Size                                  |        | 40 mm (Max.)                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 5       | Quantity                                    |        | 3 Nos.(2 W+1SS)                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 6       | Capacity Of each pump                       | m3/hr  | 35 m3/hr                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 7       | Pump Differential Head(At Discharge Flange) | mwc    | 7.0 mwc                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 8       | Drive(Pump Supplier Scope)                  |        | Motor                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 9       | Speed of Pump                               | rpm    | As per Manufacturing Standard                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 10      | Pump Type                                   |        | Submersible Type Non Clog Design(Centrifugal)                                                                                                                                                                                                                                                                                                                                                                                                       |
| 11      | Application                                 |        | Handling Sludge                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 12      | Duty                                        |        | Continuous                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 13      | Efficiency                                  |        | As per Manufacturing Standard                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 14      | Power Supply                                |        | 3 Ph,415 V,+/- 10% Voltage Variation, 50Hz,+/- 5% Frequency variation, Combined Variation: +/- 10%, DOL Starting                                                                                                                                                                                                                                                                                                                                    |
| 15      | Insulation/Protection/No. of Starts         |        | Class-F/IP68/As per Manufacturing Standard,Min. 10 Starts/ Stops per hour                                                                                                                                                                                                                                                                                                                                                                           |
| 16      | Material of Construction                    |        | Casing: Cast Iron IS 210 Gr. FG 260,<br>Impeller: Cast Iron IS 210 Gr. FG 260,<br>Shaft: AISI410,Cable Gland: Cast Iron IS 210 Gr. FG 260,<br>Motor body: Cast Iron IS 210 Gr. FG 260,<br>Seal Cover: Cast Iron IS 210 Gr. FG 260,<br>Sealing :SiC, Double Mechanical Seal<br>Automatic Coupling: CI,Duck Foot Bend: CI,<br>Guide Pipe: SS304,Lifting Chain: SS304,<br>Fasteners: MS with GI Coating.Other Components as per Manufacturer standard. |
| 17      | Noise Level                                 |        | Max. 85 DbA @ 1.5 m from pump drive                                                                                                                                                                                                                                                                                                                                                                                                                 |

**5.0.0 SCOPE OF SUPPLY:**

The scope of supply for this enquiry is as given below:

Please refer to the enclosed Schematic for Submersible Pump (Annexure-1) for general clarity on scope of supply. The system shall be provided as per annexure-1 taking into all requirements including for testing, painting, documentation, sub vendor list, equipment specifications etc., specified in this specification and enclosures.

**Quantity of Pump & Drive Assembly for Each Project:** Submersible Pumps are required for STP Haridwar Project. For STP Project following are the quantities required:

- (i) 3 Nos. of Raw Sewage Sump Transfer Pumps (Submersible Centrifugal)
- (ii) 3 Nos. Return Activated Sludge Pumps (Submersible Centrifugal)
- (iii) 3 Nos. of Surplus Activated Sludge Pumps (Submersible Centrifugal)

The scope of supply for each pump & motor drive assembly is as given

**5.1.0 Pump:**

Submersible Centrifugal pump (Non Clog Type) complete with all accessories as per specification & required accessories for smooth running of pump assembly. Performance requirement, Design and construction of the pump shall be guided by the Manufacturer standard.

Pumps shall be submersible type of non-clog design. They shall be suitable for pumping soft solids normally present in raw sewage. In addition to this, the pumps shall be fitted with a special tearing system on the suction side for tearing soft solid material. The impeller shall be of a non-clog design with smooth passage and desired solid handling capability. Maintenance-free anti-friction bearing, deep grooved permanently greased filled ball bearings shall be provided to take care of all the axial and radial forces at any point of operation. The pump installation design shall be such as to facilitate automatic installation and removal of the pumps without having to enter into the sewage pit.

The pump design shall ensure that seal does not come directly in contact with the liquid being pumped as well as cooling / lubrication by oil is provided. The moisture sensor of the tripping unit shall be located inside the oil chamber.

The pump unit shall be supplied along with the special duck foot bend, flanged elbow, lifting chain with shackles, enough guide wire / pipe, sufficient tough rubber sheeted water proof cable, as well as stainless steel foundation bolts and nuts. Alternatively pump unit can be with SS wire rope guiding system and pedestal cart integrated with the discharge head.

**5.2.0 Motor:**

Motor Drive Rating shall be as per manufacturer standard practice. However the selected motor shall meet the maximum demand of the pump in the entire operating range of the pump. Design Standard of motor shall be as per Manufacturer standard practice.

The motor shall be squirrel cage type, suitable for three phase supply continuous duty with class 'F' insulation limited to Class B temp rise. Motor shall have integral cable parts and the cable entries shall be sealed. The cables must be leak tight with respect to liquids and firmly attached to the terminal block. The motor shall be designed for non-overloading characteristics. There shall be thermal protection against overheating of the motor winding.

The motor shall be integral part of the pump. The enclosure for motor shall be IP-68. Each phase of the motors shall be provided with thermostat. The motor winding shall be suitable for star delta/soft starter. The motor shall be designed for starts/stops as per Manufacturing Standard. However motor shall be suitable for minimum 10 starts/stops per hour, irrespective of whether it is DOL start or otherwise. The motor shall operate satisfactorily at all operating levels in wet well.



### 5.3.0 Pump Bearings:

Pump bearings shall be of the antifriction type. The bearings shall be able to take normal axial thrust loads due to unbalanced hydraulic loads on the impellers plus the weight of all rotating parts of the pumps. Pump bearings shall be designed with a minimum life of 40,000 hours. The bearings shall be grease lubricated for life and shall be maintenance free

### 5.4.0 Type of Sealing: Mechanical Seal

A double mechanical seal of approved type shall be provided to prevent pumped liquid entering into the motor winding. The seals shall be running in oil bath. The oil bath shall have moisture sensors to sense water leakage. The sensors shall be used for tripping the pump and also for alarm.

### 5.5.0 Pump Balance:

All rotating parts shall be accurately machined and shall be in rotational balance. Excessive vibration shall be sufficient cause for rejection of the equipment. The mass of the unit and its distribution shall be such that resonance at normal operating speeds is avoided. In any case the amplitude of vibration as measured at any point on the pumping unit shall not exceed the limits set forth in the latest edition of Indian Standards. At the operating speed, the ratio of relative speed to the critical speed of the unit or its components shall be less than 0.8 or more than 1.3.

#### Reverse Rotation

The pump shall be designed to operate safely in the reverse direction of rotation, due to wastewater returning through the pump.

### 5.6.0 Lifting chain:

Each pump shall be supplied with galvanized steel lifting chain of suitable capacity. One end of the chain shall be attached to the pump and the other end fixed near the upper bracket for guide rail / wire rope assembly, by means of GI D-shackle. The chain shall have GI rings fixed at an interval of about 1 meter for engaging the hook of the chain pulley block. M.S. Galvanized lifting chain as per manufacturer recommendation to be provided. However **while selecting minimum Chain length required for sump depth (Minimum length to be considered as sump depth as mentioned in Annexure-1) is to be considered.** The pumps will have automatic coupling arrangement at discharge end for removal and a guide pipe and chain in SS 304 will be provided for removal and lowering of pumps.

### 5.7.0 Submersible Cable:

Each pump shall be provided with submersible cables of equal length for power and control so that the pump positions can be interchanged with each other. The cable shall be terminated in a common weatherproof junction box. However **Minimum Power Cable and Signal Cable length is Sump Depth +5.0 m**

### 5.8.0 Moisture Sensor:

The moisture sensor shall be provided in the oil chamber to detect the failure of the mechanical seal

### 5.9.0 Inter connecting Piping & Instrumentation: For BHEL Pipe Size: Refer Annexure-1.

### 5.10.0 Necessary foundation bolts, nuts, shims/grouting pads etc.

### 5.11.0 Instrumentation: Bidder to consider required instrumentation (other than specified in specification), which are required for smooth & trouble free operation as per manufacturer recommendation.

### 5.12.0 Suitable Auto Coupling type Elbow on discharge side to be provided for removal of pump from pit without disturbing discharge pipe.



**5.13.0 Guide Rail :** Guide rail for Lowering the Pump inside pit is to be considered as Bidder's part of scope. *The min. length of Guide pipe to be considered as sump depth mentioned in Annexure-1.*

**5.14.0** All other items necessary for safe and smooth running of pump & Accessories required to make the supplied equipment complete in all respect.

**5.15.0** Glands and lugs for power cable, control cable, Space heater cable and earthing cable (if any) suitable at motor end has to be supplied along with the main equipment. Glands shall be weather proof (as per motor category) double compression type Nickel plated Brass (ET) shall be provided with back nut and PVC shroud. Lugs shall be tinned copper heavy duty lug Cable dimensions shall be furnished during detail engineering, accordingly glands, lugs shall be supplied.

**5.16.0 a) Following Protection as a minimum for Submersible Pump to be provided :**

i) Moisture Sensor ii) Motor Winding Temp. iii) Oil Temp sensor iv) Dry Running Protection.

All the signals to be terminated in PMU (Control Junction Box) having local indication as applicable. If any provision is not required bidder to bring out proper reasoning of non consideration.

b) Since all these pumps are submersible pumps a Junction Box shall be supplied by Pump supplier at which all the Power and control cables from Motor will be terminated. Hence each cable (from Motor to JB) of 10 meters length shall be considered in Supplier's scope. Separate cable for Power and Signal cable to be provided. Single cable carrying both power and control signal is not acceptable.

c) 1 No 415V Power supply feeder will be provided to each motor and 1 no. of 230V supply will be provided by BHEL upto Junction Box (supplied by Pump supplier).

d) The Electrical Power and C&I control cables from motor shall be brought upto a Junction box. Necessary cables and termination accessories for all the vendor supplied equipment shall be in Suppliers scope.

e) BHEL will terminate all the cables upto the above mentioned Junction BOX only.

f) All the process based permissive (contactors) shall be brought up to Junction Box which will further be taken upto PLC by BHEL.

**5.17.0 Commissioning Spares:**

A.1) For Raw Sewage Sump Transfer Pump (Submersible Centrifugal):

Three sets (One set for each pump & motor assembly) of commissioning spares for Raw Sewage Sump Transfer Pumps (Submersible Centrifugal) for each project shall be quoted and included in scope of supply as per manufacturer's recommendation.

A.2) For Return activated Sludge Pumps (Submersible Centrifugal):

Three sets (One set for each pump & motor assembly) of commissioning spares for Return activated Sewage Sludge Pumps (Submersible Centrifugal) for each project shall be quoted and included in scope of supply as per manufacturer's recommendation.

A.3) For Surplus activated Sludge Pumps (Submersible Centrifugal):

Three sets (One set for each pump & motor assembly) of commissioning spares for Surplus activated Sewage Sludge Pumps (Submersible Centrifugal) for each project shall be quoted and included in scope of supply as per manufacturer's recommendation.

**5.18.0 Mandatory Spares: Not Applicable.**



**5.19.0 Recommended Spares(Optional Item):** Optional prices along with list of items for recommended spares for 5 years operations to be furnished along with offer.

**5.20.0 Special Tools and Tackles:**

For Raw Sewage Sump Transfer Pumps (Submersible Centrifugal)/ Return Activated Sludge Pumps (Submersible Centrifugal)/ Surplus activated Sludge Pumps (Submersible Centrifugal):

The bidder shall furnish a complete 3 sets [1 set each for Each Variety of pump] for Each Project of all special tools, wrenches etc. with necessary tools boxes as required for operation and maintenance [disassemble, assemble, or maintaining the unit] as a part of scope of supply. Bidder shall furnish a list of such tools along with offer for the system. Prices for the special tools and tackles shall be part of main scope of supply.

**6.0.0 OPTIONAL PRICES:** Please Refer to Attached Price Bid Format.

Bidder to furnish the following as optional prices:

- 1) 5 year recommended spares for each pump

**7.0.0 EQUIPMENT QUALIFICATION CRITERIA (EQC)**

The bidder shall be an established manufacturer of Submersible Pump & having adequate engineering, manufacturing & testing facilities for Submersible Pump confirming to the relevant applicable codes and standards. The Submersible Pump model offered shall be from the existing regular manufacturing range of bidder.

The offered Submersible Pump model shall meet the minimum service & manufacturing experience specified as below:

Submersible Pump shall be identical or validly similar in terms of

- Type i.e. Submersible Centrifugal
- Capacity: Flow Rate/Differential Head
- Materials etc.
- Application.

as compared to at least 10 Units of the proposed model designed, manufactured, tested and supplied from the proposed manufacturing plant in the last 7(seven) years upto 28th Feb'2018 and at least Five of these units shall have supplied in last 3 years and successfully operated in the field for at least 8000 hours individually without any major problem as on the date of issue of enquiry in the last three years upto 28<sup>th</sup> Feb'2018. **As a proof for the same, Date of Supply/ Commissioning report/Customer Satisfaction report will be considered and same to be provided by vendor.**

Accordingly, Bidder to furnish reference list for the Submersible Pump consisting of year of supply, application, Customer Name, Quantity etc. as a minimum.

**8.0.0 QUALITY PLAN & INSPECTION AGENCY & TESTING:**

**Quality Plan: Please refer annexure-5 for typical quality plan:**

Based on Guidelines provided in Annexure-5, QAP to be furnished in line with manufacturer standard for BHEL review.

**Inspection agency:** As per manufacturer standard.

In case inspection is offered, Inspection shall be carried out by BHEL/Third Party appointed by BHEL.

The various review/witness/observation stages by Individual agencies (or) Group of Agencies as above will be in line with approved quality plan.

**Functional test:** Bidder to conduct functional test as a minimum.

**Material Test Report:** Material test report to be furnished for BHEL review.

**9.0.0 PAINTING:**

The pumps shall be epoxy painted. Bidder to furnish the painting procedure for approval after award of contract. One coat of zinc rich epoxy primer of DFT 75 micron shall be applied along with two coats of epoxy paint DFT 40 micron and DFT 30 micron respectively.

**10.0.0 PACKING AND FORWARDING:**

As per Manufacturer standard (Domestic/Seaworthy packing in case of import).

**11.0.0 SUB VENDORS:**

**Motor:** As per Pump Manufacturer standard.

**Signal Cable:**

a) Thermo Cables, b) KEC International, c) Middle East Specialized Cables co. d) Cords Cable Industries Ltd. e) CMI Ltd. f) KEI Industries g) Delton Cables Ltd. h) Paramount Communications i) Special Cables pvt. Ltd. j) T C Communications Pvt. Ltd. k) Polycab Wires l) Suyog Electricals Ltd. m) Elkat Telelinks n) Lapp India Pvt. Ltd. o) Advance Cables p) Associate Cables q) Leoni Cables r) Udey Pyrocables s) Pagoda Cables t) Gupta Powers.

**Cable Lugs & Glands:**

Automatic Electric, Chetna Engineering, Electromac, Forward Engineering Industries.

**LT Power Cable & Control Cable:**

Universal cables ltd/ Thermo cables limited/ KEC international limited/ Nicco corporation ltd hyd/ Cords cable industries ltd./ Cmi limited/ Kei industries limited/ Delton cables limited/ Special cables pvt. Ltd./ Sriram cables pvt. Ltd./ Gemscab industries ltd./ Polycab wires pvt.ltd/ Torrent power limited (cable unit)/ Suyog electricals ltd/ Apar industries limited/ Ravin cables ltd/ Gupta power infrastructure ltd./ Govind cable industries

Bidder shall follow approved sub vendors list. In case of any specific practical difficulty, bidder is requested to bring out the same with proper reason for not following vendor list. For other items for which sub vendors are not specified, bidder can follow their standard vendors. However, they have to ensure the Proven Track record of the sub vendors and Bidder to take prior approval of BHEL for the same.

**12.0.0 DOCUMENTATION:**

- a) Documentation shall be submitted by bidder during detailed engineering stage, as per the Master Document List to be mutually finalized during detailed engineering stage.
- b) No. of Copies to be furnished :

All the documents shall be submitted as given below:

| S.N | DESCRIPTION                                                                      | No. of copies to be Provided | WHEN TO SUBMIT                                           |
|-----|----------------------------------------------------------------------------------|------------------------------|----------------------------------------------------------|
| 1   | Initial drawings/documents under approval and information category.[Soft Copies] | 1                            | Within 2 weeks of placement of order                     |
| 2   | Revised drawings/documents incorporating BHEL's comments. .[Soft Copies]         | 1                            | Within 1 week of receipt of commented Drawings from BHEL |



|   |                                                                                  |   |                                              |
|---|----------------------------------------------------------------------------------|---|----------------------------------------------|
| 3 | Revised O & M Manuals with Test Certificates to be submitted to BHEL (Hyderabad) | 6 | Within one month after dispatch of equipment |
| 4 | Final O&M Manuals in a CD                                                        | 3 | Within one month after dispatch of equipment |

Drawings to be submitted for BHEL approval as per Document List (Annexure-6).

### 13.0.0 PRICE BID FORMAT:

Bidder to indicate his offer as per Price Bid format enclosed as Annexure-3.

All the items included in the price bid format shall be quoted as per tender specification and pre-bid clarifications as per annexure-7, if any. Responsibility of ensuring correctness & completeness of scope of supply as per specification requirement solely lies with bidder.

The equipment supplied shall be complete in all respects. The bidder shall not be eligible for any extra payment in respect of such mountings, fittings, fixtures and accessories if required for the safe and reliable operation of the equipment. Any additional equipment, material, etc., which are not specifically mentioned here, but are required to make the supplied equipment complete in all respect, in accordance with the intent of this technical specification, contractual agreement, statutory requirements, relevant/applicable codes/standards, good engineering practices, and for safe and trouble-free operation, shall be deemed to be in bidder scope Only.

Main offer consists of those items which will be part of main order after successful bidder is identified. Optional Items consists of those items which need to be quoted by bidder but may or may not be ordered by BHEL. Bidders are instructed to provide the pricing details listed under Main offer and Optional items as per the prescribed format. Prices quoted by the bidder shall remain firm till the successful handing over of the entire package to end customer. Any request for upward revision of price during any intermediate stage before handing over the plant to end customer will be summarily rejected by BHEL.

The Priced Bid shall be submitted in Original (without any copy) duly signed and stamped on each page in a separate sealed envelope super scribing "Price Bid –Do not Open" This shall not contain any condition whatsoever failing which the Bids shall be liable to be rejected. In case of any correction, the bidder shall put its signature and its stamp. Eraser fluid will not be allowed for making any correction.

Bidder shall confirm to the un-priced bid as part of their offer.

### 14.0.0 PRE-BID CLARIFICATIONS & DEVIATIONS:

14.1.0 Bidders shall comply with various requirements of this specification. It may please be noted that the requirements specified here in this specification are the standard practices being followed by the bidders. However, same things are presented in a structured form so that it can be ensured that the requirements of ultimate customer are complied with.

14.2.0 Bidders can bring out only those deviations which are impractical to meet, for our review in pre bid clarification only.

14.3.0 Bidders may also please note that the data sheets for, valves, instruments etc., submitted along with the offer will be considered as indicative only, as the requirements specified in the specification are standard in nature. These will not be reviewed by BHEL before award of contract. Same will be reviewed during order execution stage in line with the requirements of specification and agreed deviations.

14.4.0 All pre-bid clarifications & deviations shall be clear bring as per annexure- 7 & 8 Only.

14.5.0 In case bidder doesn't bring any clarification/deviation in prebid stage, the same shall be brought in their offer with following conditions:

a) Any deviations to Customer specifications, same are acceptable provided these deviations are also regularly accepted by Customer for their direct orders on bidders. During detailed engineering stage if it is found



that any deviation brought out by bidder is not a regular deviation accepted by Customer, the particular deviation brought out by bidder will not be considered as an acceptable deviation.

b) Bidders may please note that unless the deviations are specifically brought out under deviations clause, it will be considered that no deviations are taken, even if they are mentioned elsewhere directly/indirectly in the offer.

c) Price implication due to non-acceptance [by BHEL/Customer] of the deviations asked by bidder shall not be acceptable by BHEL.

#### 15.0.0 ANNEXURES:

Following input documents and specifications are enclosed to facilitate the bidder to furnish the offer and ensure compliance:

| Annexure No. | Description                                  |
|--------------|----------------------------------------------|
| 01           | Schematic For Pump-Drive Assembly            |
| 02           | Pump-Motor Data Sheet                        |
| 03           | Price Bid Format                             |
| 04           | Check List                                   |
| 05           | QAP guide Line & Formats                     |
| 06           | BOM Standard Format & Master DOC List Format |
| 07           | Pre-bid clarification format                 |
| 08           | Deviation format                             |

#### Variant Table

| Sl. No. | Variant No. | Item                                                | Material Code | Project                   |
|---------|-------------|-----------------------------------------------------|---------------|---------------------------|
| 1       | 1           | Raw Sewage Sump Transfer Pump                       | PY9751326010  | 1 x 7.0 MLD STP, Haridwar |
| 2       | 2           | Return Activated Sludge Pumps                       | PY9751326028  | 1 x 7.0 MLD STP, Haridwar |
| 3       | 3           | Surplus Activated Sludge Pumps                      | PY9751326036  | 1 x 7.0 MLD STP, Haridwar |
| 4       | 4           | Supervision of E&C of Raw Sewage Sump Transfer Pump | PY9851326046  | 1 x 7.0 MLD STP, Haridwar |
| 5       | 5           | Supervision of E&C of Return Activated Sludge Pump  | PY9851326054  | 1 x 7.0 MLD STP, Haridwar |
| 6       | 6           | Supervision of E&C of Surplus Activated Sludge Pump | PY9851326062  | 1 x 7.0 MLD STP, Haridwar |



## RECORD OF REVISIONS

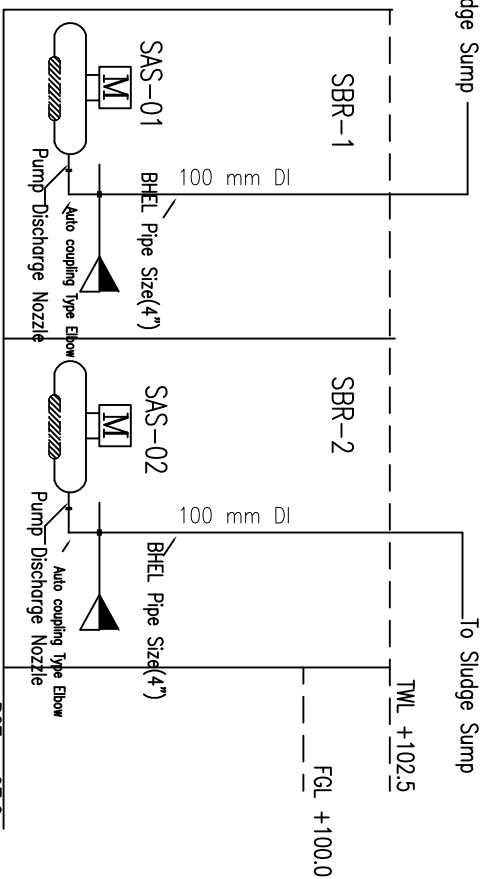
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|                      |                                                                                   |                                                   |                                |    |
|----------------------|-----------------------------------------------------------------------------------|---------------------------------------------------|--------------------------------|----|
| ESP-001-2A<br>Rev.00 |  | <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b> | Std. / Doc. Number             |    |
|                      |                                                                                   |                                                   | Annexure-1 to Doc. No. PY51326 |    |
|                      |                                                                                   |                                                   | Rev. No.                       | 00 |
|                      |                                                                                   |                                                   |                                |    |

|                                                                                                                                                                                                                                                |                                                             |  |  |  |
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| <p><b>COPYRIGHT AND CONFIDENTIAL</b></p> <p>The information on this document is the property of <b>BHARAT HEAVY ELECTRICALS LIMITED</b>, It must not be used directly or indirectly in any way detrimental to the interest of the company.</p> | <h1>Annexure-1</h1> <h2>SCHEMATIC FOR SUBMERSIBLE PUMP</h2> |  |  |  |
|                                                                                                                                                                                                                                                |                                                             |  |  |  |

|                                                   |                      |                     |                      |               |
|---------------------------------------------------|----------------------|---------------------|----------------------|---------------|
| <b>Revisions:</b><br>Refer to record of revisions | <b>Prepared by :</b> | <b>Checked by :</b> | <b>Approved by :</b> | <b>Date :</b> |
|                                                   | Rajeev Jain          | GIRISH              | Siva Prasad Babu     | 01.03.18      |

# ANNEXURE-1

BOT + 97.0

Note:

1. In order to Meet BHEL Pipe Size, Expander/Reducer after Elbow is in Bidders scope.
2. For other details pls refer specification (Doc. No. PY51326).

|             |           |                                |          |
|-------------|-----------|--------------------------------|----------|
| TITLE       |           | SCHEMATIC FOR SUBMERSIBLE PUMP |          |
| PROJECT:    |           | 1X7 MID STP, BHEL, HARDWAR     |          |
| DESIGNED BY | HYDERABAD | CHKD.                          | VER. NO. |
| DRAWN BY    |           | APPD.                          | DATE     |

|                      |                                                                                   |                                                   |                                |    |
|----------------------|-----------------------------------------------------------------------------------|---------------------------------------------------|--------------------------------|----|
| ESP-001-2A<br>Rev.00 |  | <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b> | Std. / Doc. Number             |    |
|                      |                                                                                   |                                                   | Annexure-2 to Doc. No. PY51326 |    |
|                      |                                                                                   |                                                   | Rev. No.                       | 00 |
|                      |                                                                                   |                                                   |                                |    |

|                                                                                                                                                                                                                                                |                                                                |  |  |  |
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|                                                                                                                                                                                                                                                |                                                                |  |  |  |

|                                                   |                      |                     |                      |               |
|---------------------------------------------------|----------------------|---------------------|----------------------|---------------|
| <b>Revisions:</b><br>Refer to record of revisions | <b>Prepared by :</b> | <b>Checked by :</b> | <b>Approved by :</b> | <b>Date :</b> |
|                                                   | Rajeev Jain          | GIRISH              | Siva Prasad Babu     | 01.03.18      |

**CUSTOMER: BHEL HARIDWAR**  
**PROJECT: 1X7.0 MLD STP, BHEL HARIDWAR**

| <b>DATA SHEET FOR RAW SEWAGE SUMP TRANSFER PUMP</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                               |                         |
|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|-------------------------|
| <b>Sl.no.</b>                                       | <b>Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>BHEL Requirement</b>                                                                                       | <b>BIDDER'S DETAILS</b> |
| <b>GENERAL DATA</b>                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                               |                         |
| 1                                                   | Service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Transferring Sewage from Raw Sewage Sump to Stilling Chamber.                                                 |                         |
| 2                                                   | Number of Pumps                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Total :3 Nos.[2 W+1S]                                                                                         |                         |
| 3                                                   | Location                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Outdoor                                                                                                       |                         |
| 4                                                   | Duty                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Continuous                                                                                                    |                         |
| 5                                                   | Drives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Motor                                                                                                         |                         |
| 6                                                   | Pumping fluid                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Raw Sewage Sludge                                                                                             |                         |
| 7                                                   | Fluid temp Deg C/Sludge Size/Specific Gravity                                                                                                                                                                                                                                                                                                                                                                                                                                                | Min 20 Deg.C/100 mm/1.05                                                                                      |                         |
| <b>PUMP PERFORMANCE &amp; OTHER DETAILS</b>         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                               |                         |
| 8                                                   | Pump Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Submersible type non-clog design(Centrifugal)                                                                 |                         |
| 9                                                   | Design Standard of pump                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | To be mentioned by Bidder                                                                                     |                         |
| 10                                                  | Rated Pump Parameters[Flow(In m3/hr)]                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 175 M3/hr                                                                                                     |                         |
| 11                                                  | Rated Differential Head (mlc)                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 18 mwc                                                                                                        |                         |
| 12                                                  | Pump Model No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | To be mentioned by Bidder                                                                                     |                         |
| 13                                                  | No. of Stages of pump                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | To be mentioned by Bidder                                                                                     |                         |
| 14                                                  | Parallel operation                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Yes                                                                                                           |                         |
| 15                                                  | Rated Speed of Pump (rpm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | As per Manufacturing Standard                                                                                 |                         |
| 16                                                  | Rated speed of Motor (rpm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | As per Manufacturing Standard                                                                                 |                         |
| 17                                                  | Pump Efficiency in %                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | As per Manufacturing Standard                                                                                 |                         |
| 18                                                  | Available Pressure at centre line of Suction nozzle of Pump mlc                                                                                                                                                                                                                                                                                                                                                                                                                              | Min. 1.0 kg/cm2                                                                                               |                         |
| 19                                                  | NPSH(A) at pump suction nozzle (mlc)                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.0 m                                                                                                        |                         |
| 20                                                  | NPSH(R) (mlc)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | To be mentioned by Bidder                                                                                     |                         |
| 21                                                  | NPSH(A) - NPSH(R)                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Minimum 1 m of margin between NPSH(A) & NPSH(R) to be maintained.                                             |                         |
| 22                                                  | Pump shut off head.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Flow vs Head curve shall be continuously rising towards shut-off head.                                        |                         |
| 23                                                  | Pump shut off head/rated head.                                                                                                                                                                                                                                                                                                                                                                                                                                                               | To be mentioned by Bidder                                                                                     |                         |
| 24                                                  | Minimum Submersible Level required for Pump                                                                                                                                                                                                                                                                                                                                                                                                                                                  | To be mentioned by Bidder                                                                                     |                         |
| 25                                                  | Impeller type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | The impeller should be of a non-clog design with smooth passage and solid handling capability of 100 mm size. |                         |
| 26                                                  | Pump rated impeller dia, mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | To be mentioned by Bidder                                                                                     |                         |
| 27                                                  | Pump max. impeller dia, mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | To be mentioned by Bidder                                                                                     |                         |
| 28                                                  | Pump minimum impeller dia., mm                                                                                                                                                                                                                                                                                                                                                                                                                                                               | To be mentioned by Bidder                                                                                     |                         |
| <b>PUMP CONSTRUCTION FEATURES</b>                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                               |                         |
| 29                                                  | Material of Construction*:<br>Casing: Cast Iron IS 210 Gr. FG 260,<br>Impeller: Cast Iron IS 210 Gr. FG 260,<br>Shaft: AISI410/340,<br>Cable Gland: Cast Iron IS 210 Gr. FG 260,<br>Motor body: Cast Iron IS 210 Gr. FG 260,<br>Seal Cover: Cast Iron IS 210 Gr. FG 260,<br>Sealing :SiC, Double Mechanical Seal<br>Automatic Coupling: CI,Duck Foot Bend: CI,<br>Guide Pipe: SS304,Lifting Chain: SS304,<br>Fasteners: MS with GI Coating.Other<br>Components as per Manufacturer standard. | To be Confirmed by Bidder                                                                                     |                         |

**CUSTOMER: BHEL HARIDWAR**  
**PROJECT: 1X7.0 MLD STP, BHEL HARIDWAR**

| Sl.no.                                     | Description                                                                                                                                                                                                                                                                                                                                          | BHEL Requirement                                                                                                                                                                                                                                                             | BIDDER'S DETAILS |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 30                                         | Sealing arrangement                                                                                                                                                                                                                                                                                                                                  | Double Mechanical Seal as per Manufacturer's Standard                                                                                                                                                                                                                        |                  |
| 31                                         | Type of bearings for pump                                                                                                                                                                                                                                                                                                                            | Antifriction                                                                                                                                                                                                                                                                 |                  |
| 32                                         | Bearings lubrication                                                                                                                                                                                                                                                                                                                                 | Pump bearings shall be designed with a minimum life of 40,000 hours. The bearings shall be grease lubricated for life and shall be maintenance free.                                                                                                                         |                  |
| 33                                         | Coupling used between Pump and Motor                                                                                                                                                                                                                                                                                                                 | To be mentioned by Bidder                                                                                                                                                                                                                                                    |                  |
| <b>PERFORMANCE TEST STANDARD FOR PUMPS</b> |                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                              |                  |
| 34                                         | Performance test standard                                                                                                                                                                                                                                                                                                                            | To be mentioned by Bidder                                                                                                                                                                                                                                                    |                  |
| 35                                         | Maximum Allowed Working Pressure (MAWP) in Kg/cm <sup>2</sup> g                                                                                                                                                                                                                                                                                      | To be mentioned by Bidder                                                                                                                                                                                                                                                    |                  |
| 36                                         | Hydraulic test pressure of casing Kg/cm <sup>2</sup> (g)                                                                                                                                                                                                                                                                                             | Hydraulic test pressure of casing shall be 1.5 times the MAWP. Test duration shall be minimum 30 min.                                                                                                                                                                        |                  |
| 37                                         | Noise level for Pump                                                                                                                                                                                                                                                                                                                                 | Max. 85 DbA @ 1.5 m from pump drive                                                                                                                                                                                                                                          |                  |
| 38                                         | Vibration for Pump                                                                                                                                                                                                                                                                                                                                   | As per BS 4675: Part-I to III, Subclass B or Better. At Motor Bearing, Pump Bearing Housing and Base Plate, Max. Vibration shall be limited to 2.8 mm/Sec. RMS within +/- 10% rated head, While the limit is 4.5 mm/s RMS for balanced portion from shutoff to Maximum flow. |                  |
| 39                                         | Pump Instruments                                                                                                                                                                                                                                                                                                                                     | As per Manufacturer recommendation duly taking care of Specification requirement.                                                                                                                                                                                            |                  |
| <b>MOTOR DETAILS</b>                       |                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                              |                  |
| 61                                         | Drive                                                                                                                                                                                                                                                                                                                                                | Motor                                                                                                                                                                                                                                                                        |                  |
| 62                                         | BKW at the rated point                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                              |                  |
| 63                                         | BKW at end of curve                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                              |                  |
| 64                                         | Selected drive rating in kW:<br>Motor Drive Rating shall be as per manufacturer standard practice. However the selected motor shall meet the following Criteria i.e<br>(i) 110 % of power required by the pump at the duty point<br>(ii) Maximum power required by the pump from zero discharge to the runoff point total head, Whichever is higher. | Bidder to mention motor kW rating for the motor duly taking care of the requirements.                                                                                                                                                                                        |                  |
| 65                                         | Design Standard of Motor                                                                                                                                                                                                                                                                                                                             | As per Manufacturer Standard                                                                                                                                                                                                                                                 |                  |
| 66                                         | Energy Efficient Class                                                                                                                                                                                                                                                                                                                               | As per Manufacturer Standard                                                                                                                                                                                                                                                 |                  |
| 67                                         | Manufacturer                                                                                                                                                                                                                                                                                                                                         | As per Manufacturer Standard                                                                                                                                                                                                                                                 |                  |
| 68                                         | Ambient Temperature                                                                                                                                                                                                                                                                                                                                  | 50 Deg C<br>All motors shall be designed to operate in humid atmosphere with a maximum ambient temperature of 50 Deg C.                                                                                                                                                      |                  |
| 69                                         | Area classification for motor                                                                                                                                                                                                                                                                                                                        | Safe Area                                                                                                                                                                                                                                                                    |                  |
| 70                                         | Rated Voltage & Frequency                                                                                                                                                                                                                                                                                                                            | 415 V & 50 Hz                                                                                                                                                                                                                                                                |                  |
| 71                                         | Permissible variations in Voltage/Frequency/Combined                                                                                                                                                                                                                                                                                                 | (+/-)/10%/(+/-)/5%/(+/-)/10%                                                                                                                                                                                                                                                 |                  |
| 72                                         | No of poles / synchronous speed                                                                                                                                                                                                                                                                                                                      | Based on Pump Speed                                                                                                                                                                                                                                                          |                  |
| 73                                         | Method of Starting                                                                                                                                                                                                                                                                                                                                   | Motor shall be capable of starting with DOL                                                                                                                                                                                                                                  |                  |
| 74                                         | Method of cooling                                                                                                                                                                                                                                                                                                                                    | To be Confirmed by Bidder                                                                                                                                                                                                                                                    |                  |
| 75                                         | Class of Insulation & Temp. rise                                                                                                                                                                                                                                                                                                                     | Class F with Temperature rise ltd. to class B                                                                                                                                                                                                                                |                  |
| 76                                         | Degree of protection                                                                                                                                                                                                                                                                                                                                 | As per Manufacturer Standard, Min. IP 68                                                                                                                                                                                                                                     |                  |
| 77                                         | TB Short time-Current & Short time-Time                                                                                                                                                                                                                                                                                                              | 40 kA , 0.25 Sec                                                                                                                                                                                                                                                             |                  |
| 78                                         | Cable, Cable glands & Lugs                                                                                                                                                                                                                                                                                                                           | Cable details shall be furnished during DDE. Accordingly suitable double compression Nickel plated brass cable glands with back nut and PVC shroud and Tinned copper lugs to be provided by the bidder.                                                                      |                  |
| 79                                         | No. of Starts                                                                                                                                                                                                                                                                                                                                        | As per Manufacturing Standard. However minimum 10 starts/stops per hour to be considered.                                                                                                                                                                                    |                  |
| 80                                         | Bearing RTDs, Winding RTDs & TGs                                                                                                                                                                                                                                                                                                                     | As per Manufacturer Recommendation duly taking care of Specification requirement.                                                                                                                                                                                            |                  |

**CUSTOMER: BHEL HARIDWAR**  
**PROJECT: 1X7.0 MLD STP, BHEL HARIDWAR**

| <b>DATA SHEET FOR RETURN SLUDGE ACTIVATED PUMPS</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                               |                         |
|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|-------------------------|
| <b>Sl.no.</b>                                       | <b>Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>BHEL Requirement</b>                                                                                       | <b>BIDDER'S DETAILS</b> |
| <b>GENERAL DATA</b>                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                               |                         |
| 1                                                   | Service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Transferring Sewage from Sequential batch reactor-1 & 2 & transferring to Anoxic zone of SBR tank.            |                         |
| 2                                                   | Number of Pumps                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Total :3 Nos.[2 W+1SS]                                                                                        |                         |
| 3                                                   | Location                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Outdoor                                                                                                       |                         |
| 4                                                   | Duty                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Continuous                                                                                                    |                         |
| 5                                                   | Drives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Motor                                                                                                         |                         |
| 6                                                   | Pumping fluid                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Biological Sludge of 0.8% Solid Consistency                                                                   |                         |
| 7                                                   | Fluid temp Deg C/Sludge Size/Specific Gravity                                                                                                                                                                                                                                                                                                                                                                                                                                                | Min 20 Deg.C/40 mm/1.05                                                                                       |                         |
| <b>PUMP PERFORMANCE &amp; OTHER DETAILS</b>         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                               |                         |
| 8                                                   | Pump Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Submersible type non-clog design(Centrifugal)                                                                 |                         |
| 9                                                   | Design Standard of pump                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | To be mentioned by Bidder                                                                                     |                         |
| 10                                                  | Rated Pump Parameters[Flow(In m3/hr)]                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 75 M3/hr                                                                                                      |                         |
| 11                                                  | Rated Differential Head (mlc)                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 4.1 mwc                                                                                                       |                         |
| 12                                                  | Pump Model No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | To be mentioned by Bidder                                                                                     |                         |
| 13                                                  | No. of Stages of pump                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | To be mentioned by Bidder                                                                                     |                         |
| 14                                                  | Parallel operation                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Yes                                                                                                           |                         |
| 15                                                  | Rated Speed of Pump (rpm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | As per Manufacturing Standard                                                                                 |                         |
| 16                                                  | Rated speed of Motor (rpm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | As per Manufacturing Standard                                                                                 |                         |
| 17                                                  | Pump Efficiency in %                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | As per Manufacturing Standard                                                                                 |                         |
| 18                                                  | Available Pressure at centre line of Suction nozzle of Pump mlc                                                                                                                                                                                                                                                                                                                                                                                                                              | Min. 1.0 kg/cm2                                                                                               |                         |
| 19                                                  | NPSH(A) at pump suction nozzle (mlc)                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.0 m                                                                                                        |                         |
| 20                                                  | NPSH(R) (mlc)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | To be mentioned by Bidder                                                                                     |                         |
| 21                                                  | NPSH(A) - NPSH(R)                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Minimum 1 m of margin between NPSH(A) & NPSH(R) to be maintained.                                             |                         |
| 22                                                  | Pump shut off head.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Flow vs Head curve shall be continuously rising towards shut-off head.                                        |                         |
| 23                                                  | Pump shut off head/rated head.                                                                                                                                                                                                                                                                                                                                                                                                                                                               | To be mentioned by Bidder                                                                                     |                         |
| 24                                                  | Minimum Submersible Level required for Pump                                                                                                                                                                                                                                                                                                                                                                                                                                                  | To be mentioned by Bidder                                                                                     |                         |
| 25                                                  | Impeller type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | The impeller should be of a non-clog design with smooth passage and solid handling capability of 100 mm size. |                         |
| 26                                                  | Pump rated impeller dia, mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | To be mentioned by Bidder                                                                                     |                         |
| 27                                                  | Pump max. impeller dia, mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | To be mentioned by Bidder                                                                                     |                         |
| 28                                                  | Pump minimum impeller dia., mm                                                                                                                                                                                                                                                                                                                                                                                                                                                               | To be mentioned by Bidder                                                                                     |                         |
| <b>PUMP CONSTRUCTION FEATURES</b>                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                               |                         |
| 29                                                  | Material of Construction*:<br>Casing: Cast Iron IS 210 Gr. FG 260,<br>Impeller: Cast Iron IS 210 Gr. FG 260,<br>Shaft: AISI410/340,<br>Cable Gland: Cast Iron IS 210 Gr. FG 260,<br>Motor body: Cast Iron IS 210 Gr. FG 260,<br>Seal Cover: Cast Iron IS 210 Gr. FG 260,<br>Sealing :SiC, Double Mechanical Seal<br>Automatic Coupling: CI,Duck Foot Bend: CI,<br>Guide Pipe: SS304,Lifting Chain: SS304,<br>Fasteners: MS with GI Coating.Other<br>Components as per Manufacturer standard. | To be Confirmed by Bidder                                                                                     |                         |

**CUSTOMER: BHEL HARIDWAR**  
**PROJECT: 1X7.0 MLD STP, BHEL HARIDWAR**

| Sl.no.                                     | Description                                                                                                                                                                                                                                                                                                                                          | BHEL Requirement                                                                                                                                                                                                                                                             | BIDDER'S DETAILS |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 30                                         | Sealing arrangement                                                                                                                                                                                                                                                                                                                                  | Double Mechanical Seal as per Manufacturer's Standard                                                                                                                                                                                                                        |                  |
| 31                                         | Type of bearings for pump                                                                                                                                                                                                                                                                                                                            | Antifriction                                                                                                                                                                                                                                                                 |                  |
| 32                                         | Bearings lubrication                                                                                                                                                                                                                                                                                                                                 | Pump bearings shall be designed with a minimum life of 40,000 hours. The bearings shall be grease lubricated for life and shall be maintenance free.                                                                                                                         |                  |
| 33                                         | Coupling used between Pump and Motor                                                                                                                                                                                                                                                                                                                 | To be mentioned by Bidder                                                                                                                                                                                                                                                    |                  |
| <b>PERFORMANCE TEST STANDARD FOR PUMPS</b> |                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                              |                  |
| 34                                         | Performance test standard                                                                                                                                                                                                                                                                                                                            | To be mentioned by Bidder                                                                                                                                                                                                                                                    |                  |
| 35                                         | Maximum Allowed Working Pressure (MAWP) in Kg/cm <sup>2</sup> g                                                                                                                                                                                                                                                                                      | To be mentioned by Bidder                                                                                                                                                                                                                                                    |                  |
| 36                                         | Hydraulic test pressure of casing Kg/cm <sup>2</sup> (g)                                                                                                                                                                                                                                                                                             | Hydraulic test pressure of casing shall be 1.5 times the MAWP. Test duration shall be minimum 30 min.                                                                                                                                                                        |                  |
| 37                                         | Noise level for Pump                                                                                                                                                                                                                                                                                                                                 | Max. 85 DbA @ 1.5 m from pump drive                                                                                                                                                                                                                                          |                  |
| 38                                         | Vibration for Pump                                                                                                                                                                                                                                                                                                                                   | As per BS 4675: Part-I to III, Subclass B or Better. At Motor Bearing, Pump Bearing Housing and Base Plate, Max. Vibration shall be limited to 2.8 mm/Sec. RMS within +/- 10% rated head, While the limit is 4.5 mm/s RMS for balanced portion from shutoff to Maximum flow. |                  |
| 39                                         | Pump Instruments                                                                                                                                                                                                                                                                                                                                     | As per Manufacturer recommendation duly taking care of Specification requirement.                                                                                                                                                                                            |                  |
| <b>MOTOR DETAILS</b>                       |                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                              |                  |
| 61                                         | Drive                                                                                                                                                                                                                                                                                                                                                | Motor                                                                                                                                                                                                                                                                        |                  |
| 62                                         | BKW at the rated point                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                              |                  |
| 63                                         | BKW at end of curve                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                              |                  |
| 64                                         | Selected drive rating in kW:<br>Motor Drive Rating shall be as per manufacturer standard practice. However the selected motor shall meet the following Criteria i.e<br>(i) 110 % of power required by the pump at the duty point<br>(ii) Maximum power required by the pump from zero discharge to the runoff point total head, Whichever is higher. | Bidder to mention motor kW rating for the motor duly taking care of the requirements.                                                                                                                                                                                        |                  |
| 65                                         | Design Standard of Motor                                                                                                                                                                                                                                                                                                                             | As per Manufacturer Standard                                                                                                                                                                                                                                                 |                  |
| 66                                         | Energy Efficient Class                                                                                                                                                                                                                                                                                                                               | As per Manufacturer Standard                                                                                                                                                                                                                                                 |                  |
| 67                                         | Manufacturer                                                                                                                                                                                                                                                                                                                                         | As per Manufacturer Standard                                                                                                                                                                                                                                                 |                  |
| 68                                         | Ambient Temperature                                                                                                                                                                                                                                                                                                                                  | 50 Deg C<br>All motors shall be designed to operate in humid atmosphere with a maximum ambient temperature of 50 Deg C.                                                                                                                                                      |                  |
| 69                                         | Area classification for motor                                                                                                                                                                                                                                                                                                                        | Safe Area                                                                                                                                                                                                                                                                    |                  |
| 70                                         | Rated Voltage & Frequency                                                                                                                                                                                                                                                                                                                            | 415 V & 50 Hz                                                                                                                                                                                                                                                                |                  |
| 71                                         | Permissible variations in Voltage/Frequency/Combined                                                                                                                                                                                                                                                                                                 | (+/-)/10%/(+/-)/5%/(+/-)/10%                                                                                                                                                                                                                                                 |                  |
| 72                                         | No of poles / synchronous speed                                                                                                                                                                                                                                                                                                                      | Based on Pump Speed                                                                                                                                                                                                                                                          |                  |
| 73                                         | Method of Starting                                                                                                                                                                                                                                                                                                                                   | Motor shall be capable of starting with DOL                                                                                                                                                                                                                                  |                  |
| 74                                         | Method of cooling                                                                                                                                                                                                                                                                                                                                    | To be Confirmed by Bidder                                                                                                                                                                                                                                                    |                  |
| 75                                         | Class of Insulation & Temp. rise                                                                                                                                                                                                                                                                                                                     | Class F with Temperature rise ltd. to class B                                                                                                                                                                                                                                |                  |
| 76                                         | Degree of protection                                                                                                                                                                                                                                                                                                                                 | As per Manufacturer Standard, Min. IP 68                                                                                                                                                                                                                                     |                  |
| 77                                         | TB Short time-Current & Short time-Time                                                                                                                                                                                                                                                                                                              | 40 kA , 0.25 Sec                                                                                                                                                                                                                                                             |                  |
| 78                                         | Cable, Cable glands & Lugs                                                                                                                                                                                                                                                                                                                           | Cable details shall be furnished during DDE. Accordingly suitable double compression Nickel plated brass cable glands with back nut and PVC shroud and Tinned copper lugs to be provided by the bidder.                                                                      |                  |
| 79                                         | No. of Starts                                                                                                                                                                                                                                                                                                                                        | As per Manufacturing Standard. However minimum 10 starts/stops per hour to be considered.                                                                                                                                                                                    |                  |
| 80                                         | Bearing RTDs, Winding RTDs & TGs                                                                                                                                                                                                                                                                                                                     | As per Manufacturer Recommendation duly taking care of Specification requirement.                                                                                                                                                                                            |                  |

**CUSTOMER: BHEL HARIDWAR**  
**PROJECT: 1X7.0 MLD STP, BHEL HARIDWAR**

| <b>DATA SHEET FOR SURPLUS SLUDGE ACTIVATED PUMPS</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                               |                         |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|-------------------------|
| <b>Sl.no.</b>                                        | <b>Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>BHEL Requirement</b>                                                                                       | <b>BIDDER'S DETAILS</b> |
| <b>GENERAL DATA</b>                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                               |                         |
| 1                                                    | Service                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Transferring Sewage from Sequential batch reactor-1 & 2 & transferring to Sludge Sump                         |                         |
| 2                                                    | Number of Pumps                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Total :3 Nos.[2 W+1SS]                                                                                        |                         |
| 3                                                    | Location                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Outdoor                                                                                                       |                         |
| 4                                                    | Duty                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Continuous                                                                                                    |                         |
| 5                                                    | Drives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Motor                                                                                                         |                         |
| 6                                                    | Pumping fluid                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Biological Sludge of 0.8% Solid Consistency                                                                   |                         |
| 7                                                    | Fluid temp Deg C/Sludge Size/Specific Gravity                                                                                                                                                                                                                                                                                                                                                                                                                                                | Min 20 Deg.C/40 mm/1.05                                                                                       |                         |
| <b>PUMP PERFORMANCE &amp; OTHER DETAILS</b>          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                               |                         |
| 8                                                    | Pump Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Submersible type non-clog design(Centrifugal)                                                                 |                         |
| 9                                                    | Design Standard of pump                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | To be mentioned by Bidder                                                                                     |                         |
| 10                                                   | Rated Pump Parameters[Flow(In m3/hr)]                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 75 M3/hr                                                                                                      |                         |
| 11                                                   | Rated Differential Head (mlc)                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 4.1 mwc                                                                                                       |                         |
| 12                                                   | Pump Model No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | To be mentioned by Bidder                                                                                     |                         |
| 13                                                   | No. of Stages of pump                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | To be mentioned by Bidder                                                                                     |                         |
| 14                                                   | Parallel operation                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Yes                                                                                                           |                         |
| 15                                                   | Rated Speed of Pump (rpm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | As per Manufacturing Standard                                                                                 |                         |
| 16                                                   | Rated speed of Motor (rpm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | As per Manufacturing Standard                                                                                 |                         |
| 17                                                   | Pump Efficiency in %                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | As per Manufacturing Standard                                                                                 |                         |
| 18                                                   | Available Pressure at centre line of Suction nozzle of Pump mlc                                                                                                                                                                                                                                                                                                                                                                                                                              | Min. 1.0 kg/cm2                                                                                               |                         |
| 19                                                   | NPSH(A) at pump suction nozzle (mlc)                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.0 m                                                                                                        |                         |
| 20                                                   | NPSH(R) (mlc)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | To be mentioned by Bidder                                                                                     |                         |
| 21                                                   | NPSH(A) - NPSH(R)                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Minimum 1 m of margin between NPSH(A) & NPSH(R) to be maintained.                                             |                         |
| 22                                                   | Pump shut off head.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Flow vs Head curve shall be continuously rising towards shut-off head.                                        |                         |
| 23                                                   | Pump shut off head/rated head.                                                                                                                                                                                                                                                                                                                                                                                                                                                               | To be mentioned by Bidder                                                                                     |                         |
| 24                                                   | Minimum Submersible Level required for Pump                                                                                                                                                                                                                                                                                                                                                                                                                                                  | To be mentioned by Bidder                                                                                     |                         |
| 25                                                   | Impler type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | The impeller should be of a non-clog design with smooth passage and solid handling capability of 100 mm size. |                         |
| 26                                                   | Pump rated impeller dia, mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | To be mentioned by Bidder                                                                                     |                         |
| 27                                                   | Pump max. impeller dia, mm                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | To be mentioned by Bidder                                                                                     |                         |
| 28                                                   | Pump minimum impeller dia., mm                                                                                                                                                                                                                                                                                                                                                                                                                                                               | To be mentioned by Bidder                                                                                     |                         |
| <b>PUMP CONSTRUCTION FEATURES</b>                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                               |                         |
| 29                                                   | Material of Construction*:<br>Casing: Cast Iron IS 210 Gr. FG 260,<br>Impeller: Cast Iron IS 210 Gr. FG 260,<br>Shaft: AISI410/340,<br>Cable Gland: Cast Iron IS 210 Gr. FG 260,<br>Motor body: Cast Iron IS 210 Gr. FG 260,<br>Seal Cover: Cast Iron IS 210 Gr. FG 260,<br>Sealing :SiC, Double Mechanical Seal<br>Automatic Coupling: CI,Duck Foot Bend: CI,<br>Guide Pipe: SS304,Lifting Chain: SS304,<br>Fasteners: MS with GI Coating.Other<br>Components as per Manufacturer standard. | To be Confirmed by Bidder                                                                                     |                         |

**CUSTOMER: BHEL HARIDWAR**  
**PROJECT: 1X7.0 MLD STP, BHEL HARIDWAR**

| Sl.no.                                     | Description                                                                                                                                                                                                                                                                                                                                          | BHEL Requirement                                                                                                                                                                                                                                                             | BIDDER'S DETAILS |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 30                                         | Sealing arrangement                                                                                                                                                                                                                                                                                                                                  | Double Mechanical Seal as per Manufacturer's Standard                                                                                                                                                                                                                        |                  |
| 31                                         | Type of bearings for pump                                                                                                                                                                                                                                                                                                                            | Antifriction                                                                                                                                                                                                                                                                 |                  |
| 32                                         | Bearings lubrication                                                                                                                                                                                                                                                                                                                                 | Pump bearings shall be designed with a minimum life of 40,000 hours. The bearings shall be grease lubricated for life and shall be maintenance free.                                                                                                                         |                  |
| 33                                         | Coupling used between Pump and Motor                                                                                                                                                                                                                                                                                                                 | To be mentioned by Bidder                                                                                                                                                                                                                                                    |                  |
| <b>PERFORMANCE TEST STANDARD FOR PUMPS</b> |                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                              |                  |
| 34                                         | Performance test standard                                                                                                                                                                                                                                                                                                                            | To be mentioned by Bidder                                                                                                                                                                                                                                                    |                  |
| 35                                         | Maximum Allowed Working Pressure (MAWP) in Kg/cm <sup>2</sup> g                                                                                                                                                                                                                                                                                      | To be mentioned by Bidder                                                                                                                                                                                                                                                    |                  |
| 36                                         | Hydraulic test pressure of casing Kg/cm <sup>2</sup> (g)                                                                                                                                                                                                                                                                                             | Hydraulic test pressure of casing shall be 1.5 times the MAWP. Test duration shall be minimum 30 min.                                                                                                                                                                        |                  |
| 37                                         | Noise level for Pump                                                                                                                                                                                                                                                                                                                                 | Max. 85 DbA @ 1.5 m from pump drive                                                                                                                                                                                                                                          |                  |
| 38                                         | Vibration for Pump                                                                                                                                                                                                                                                                                                                                   | As per BS 4675: Part-I to III, Subclass B or Better. At Motor Bearing, Pump Bearing Housing and Base Plate, Max. Vibration shall be limited to 2.8 mm/Sec. RMS within +/- 10% rated head, While the limit is 4.5 mm/s RMS for balanced portion from shutoff to Maximum flow. |                  |
| 39                                         | Pump Instruments                                                                                                                                                                                                                                                                                                                                     | As per Manufacturer recommendation duly taking care of Specification requirement.                                                                                                                                                                                            |                  |
| <b>MOTOR DETAILS</b>                       |                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                              |                  |
| 61                                         | Drive                                                                                                                                                                                                                                                                                                                                                | Motor                                                                                                                                                                                                                                                                        |                  |
| 62                                         | BKW at the rated point                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                              |                  |
| 63                                         | BKW at end of curve                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                              |                  |
| 64                                         | Selected drive rating in kW:<br>Motor Drive Rating shall be as per manufacturer standard practice. However the selected motor shall meet the following Criteria i.e<br>(i) 110 % of power required by the pump at the duty point<br>(ii) Maximum power required by the pump from zero discharge to the runoff point total head, Whichever is higher. | Bidder to mention motor kW rating for the motor duly taking care of the requirements.                                                                                                                                                                                        |                  |
| 65                                         | Design Standard of Motor                                                                                                                                                                                                                                                                                                                             | As per Manufacturer Standard                                                                                                                                                                                                                                                 |                  |
| 66                                         | Energy Efficient Class                                                                                                                                                                                                                                                                                                                               | As per Manufacturer Standard                                                                                                                                                                                                                                                 |                  |
| 67                                         | Manufacturer                                                                                                                                                                                                                                                                                                                                         | As per Manufacturer Standard                                                                                                                                                                                                                                                 |                  |
| 68                                         | Ambient Temperature                                                                                                                                                                                                                                                                                                                                  | 50 Deg C<br>All motors shall be designed to operate in humid atmosphere with a maximum ambient temperature of 50 Deg C.                                                                                                                                                      |                  |
| 69                                         | Area classification for motor                                                                                                                                                                                                                                                                                                                        | Safe Area                                                                                                                                                                                                                                                                    |                  |
| 70                                         | Rated Voltage & Frequency                                                                                                                                                                                                                                                                                                                            | 415 V & 50 Hz                                                                                                                                                                                                                                                                |                  |
| 71                                         | Permissible variations in Voltage/Frequency/Combined                                                                                                                                                                                                                                                                                                 | (+/-)/10%/(+/-)/5%/(+/-)/10%                                                                                                                                                                                                                                                 |                  |
| 72                                         | No of poles / synchronous speed                                                                                                                                                                                                                                                                                                                      | Based on Pump Speed                                                                                                                                                                                                                                                          |                  |
| 73                                         | Method of Starting                                                                                                                                                                                                                                                                                                                                   | Motor shall be capable of starting with DOL                                                                                                                                                                                                                                  |                  |
| 74                                         | Method of cooling                                                                                                                                                                                                                                                                                                                                    | To be Confirmed by Bidder                                                                                                                                                                                                                                                    |                  |
| 75                                         | Class of Insulation & Temp. rise                                                                                                                                                                                                                                                                                                                     | Class F with Temperature rise ltd. to class B                                                                                                                                                                                                                                |                  |
| 76                                         | Degree of protection                                                                                                                                                                                                                                                                                                                                 | As per Manufacturer Standard, Min. IP 68                                                                                                                                                                                                                                     |                  |
| 77                                         | TB Short time-Current & Short time-Time                                                                                                                                                                                                                                                                                                              | 40 kA , 0.25 Sec                                                                                                                                                                                                                                                             |                  |
| 78                                         | Cable, Cable glands & Lugs                                                                                                                                                                                                                                                                                                                           | Cable details shall be furnished during DDE. Accordingly suitable double compression Nickel plated brass cable glands with back nut and PVC shroud and Tinned copper lugs to be provided by the bidder.                                                                      |                  |
| 79                                         | No. of Starts                                                                                                                                                                                                                                                                                                                                        | As per Manufacturing Standard. However minimum 10 starts/stops per hour to be considered.                                                                                                                                                                                    |                  |
| 80                                         | Bearing RTDs, Winding RTDs & TGs                                                                                                                                                                                                                                                                                                                     | As per Manufacturer Recommendation duly taking care of Specification requirement.                                                                                                                                                                                            |                  |

|                      |                                                                                   |                                                   |                                |    |
|----------------------|-----------------------------------------------------------------------------------|---------------------------------------------------|--------------------------------|----|
| ESP-001-2A<br>Rev.00 |  | <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b> | Std. / Doc. Number             |    |
|                      |                                                                                   |                                                   | Annexure-3 to Doc. No. PY51326 |    |
|                      |                                                                                   |                                                   | Rev. No.                       | 00 |
|                      |                                                                                   |                                                   |                                |    |

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| <p style="text-align: center;"><b>COPYRIGHT AND CONFIDENTIAL</b></p> <p>The information on this document is the property of <b>BHARAT HEAVY ELECTRICALS LIMITED</b>,<br/>It must not be used directly or indirectly in any way detrimental to the interest of the company.</p> | <h1 style="margin: 0;">Annexure-3</h1><br><br><h2 style="margin: 0;">PRICE BID FORMAT FOR SUBMERSIBLE PUMP</h2> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|

|                                                   |                      |                     |                      |               |
|---------------------------------------------------|----------------------|---------------------|----------------------|---------------|
| <b>Revisions:</b><br>Refer to record of revisions | <b>Prepared by :</b> | <b>Checked by :</b> | <b>Approved by :</b> | <b>Date :</b> |
|                                                   | Rajeev Jain          | GIRISH              | Siva Prasad Babu     | 01.03.18      |

|                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                   |                                                                               |      |                 |             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|------|-----------------|-------------|
|                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                   | <b>BHARAT HEAVY ELECTRICALS LIMITED</b><br><b>R.C.PURAM, HYDERABAD-502032</b> |      |                 |             |
| <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                   |                                                                               |      |                 |             |
| <b>PRICE FORMAT (R00) FOR RAW SEWAGE SUMP TRANSFER PUMP (Submersible Centrifugal) with Drive Assembly</b><br><b>PROJECT : 1X7 MLD STP AT BHEL HARIDWAR</b>                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                   |                                                                               |      |                 |             |
| SL NO                                                                                                                                                                                                                                                                                                                                                                                              | ITEM DESCRIPTION                                                                                                                                                                                                                                                  | QTY                                                                           | UNIT | UNIT RATE (RS.) | TOTAL (RS.) |
| <b>Bidder's Name : &lt;Bidder to indicate&gt;</b><br><b>Bidder's Offer No. &amp; Dt. : &lt;Bidder to indicate&gt;</b><br><b>Bidder's Ref No. &amp; Dt. :&lt;Bidder to indicate&gt;</b><br><b>BHEL Enq. No. &amp; date :&lt;Bidder to indicate&gt;</b>                                                                                                                                              |                                                                                                                                                                                                                                                                   |                                                                               |      |                 |             |
| 1                                                                                                                                                                                                                                                                                                                                                                                                  | <b>MAIN OFFER</b>                                                                                                                                                                                                                                                 |                                                                               |      |                 |             |
| A                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Raw Sewage Sump Transfer Pumps (Submersible Centrifugal) with Drive Assembly:[175 m3/hr,18 mwc]</b>                                                                                                                                                            |                                                                               |      |                 |             |
| A.1.                                                                                                                                                                                                                                                                                                                                                                                               | <b>MATERIAL SUPPLY-Raw Sewage SumpTransfer Pumps (Submersible Centrifugal) with Drive Assembly</b>                                                                                                                                                                |                                                                               |      |                 |             |
|                                                                                                                                                                                                                                                                                                                                                                                                    | Raw Sewage Transfer Pumps (Submersible Centrifugal)[175 m3/hr,18 mwc] with Drive Assembly (weather proof) with required accessories inline with requirments mentioned in specification                                                                            | 3                                                                             | Set  |                 |             |
| A.2                                                                                                                                                                                                                                                                                                                                                                                                | <b>Commissioning spares</b>                                                                                                                                                                                                                                       |                                                                               |      |                 |             |
|                                                                                                                                                                                                                                                                                                                                                                                                    | One set of commissioning spares per pump shall be quoted as per manufacturer's recommendation. (Ref. Note-12)                                                                                                                                                     | 3                                                                             | Set  |                 |             |
| A.3                                                                                                                                                                                                                                                                                                                                                                                                | <b>Special Tools &amp; tackles</b>                                                                                                                                                                                                                                |                                                                               |      |                 |             |
|                                                                                                                                                                                                                                                                                                                                                                                                    | One set of Tools and tackles shall be quoted as per manufacturer's recommendation.                                                                                                                                                                                | 1                                                                             | Set  |                 |             |
| A.4                                                                                                                                                                                                                                                                                                                                                                                                | <b>Supervison charges for erection &amp; commissioning at site</b>                                                                                                                                                                                                |                                                                               |      |                 |             |
| a                                                                                                                                                                                                                                                                                                                                                                                                  | Travel expenses from vendor works to site and back per visit /person                                                                                                                                                                                              | --                                                                            |      |                 |             |
| b                                                                                                                                                                                                                                                                                                                                                                                                  | Per day charges per person for supervision of erection & commissioning at site including boarding, lodging, lcoal transportation etc., except for travel expenses as above.                                                                                       | --                                                                            |      |                 |             |
| 2                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Optional Items</b>                                                                                                                                                                                                                                             |                                                                               |      |                 |             |
| A.1                                                                                                                                                                                                                                                                                                                                                                                                | <b>5 Years Recommended Spares</b>                                                                                                                                                                                                                                 |                                                                               |      |                 |             |
|                                                                                                                                                                                                                                                                                                                                                                                                    | Recommended spares list for 5 Years normal operation along with unit price breakup for Pump, Drive & other accessories.(List with price break up to be enclosed)<br>(1 set stands for quantity required for the replacement of one pump, drive (or) accessories). | As per List                                                                   | Set  |                 |             |
| TOTAL                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                   |                                                                               |      |                 |             |
| Notes:                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                   |                                                                               |      |                 |             |
| 1) Bidder to quote strictly as per BHEL's NIT requirements.                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                   |                                                                               |      |                 |             |
| 2) Bidder to note that this is a LUMP SUM Turn-Key Order. However<br>(a) Changes to the tender specification during execution of the project for successful operation of the system need to be carried out by bidder and commercial implications if any will be settled suitably.<br>(b) Unit rates quoted by bidder shall be applicable for any changes in BOQ during detailed engineering stage. |                                                                                                                                                                                                                                                                   |                                                                               |      |                 |             |
| 3)Main offer consists of those items which will be part of main order after successful bidder is identified. Optional Items consists of those items which need to be quoted by bidder but may or may not be ordered by BHEL. Bidders are instructed to provide the pricing details listed under Main offer and Optional items as per the prescribed format.                                        |                                                                                                                                                                                                                                                                   |                                                                               |      |                 |             |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                       | <b>BHARAT HEAVY ELECTRICALS LIMITED</b><br><b>R.C.PURAM, HYDERABAD-502032</b>                                                                              |      |                 |             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                       | <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>                                                                                                          |      |                 |             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                       | <b>PRICE FORMAT (R00) FOR RAW SEWAGE SUMP TRANSFER PUMP (Submersible Centrifugal) with Drive Assembly</b><br><b>PROJECT : 1X7 MLD STP AT BHEL HARIDWAR</b> |      |                 |             |
| SL NO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ITEM DESCRIPTION                                                                                                                                                                                                                                      | QTY                                                                                                                                                        | UNIT | UNIT RATE (RS.) | TOTAL (RS.) |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Bidder's Name : &lt;Bidder to indicate&gt;</b><br><b>Bidder's Offer No. &amp; Dt. : &lt;Bidder to indicate&gt;</b><br><b>Bidder's Ref No. &amp; Dt. :&lt;Bidder to indicate&gt;</b><br><b>BHEL Enq. No. &amp; date :&lt;Bidder to indicate&gt;</b> |                                                                                                                                                            |      |                 |             |
| 4) Prices quoted by bidders for items under main offer : Sl. No.1(1.A.1+1.A.2+1.A.3+1.A.4) will be considered for evaluation of lowest bidder.<br>For the purpose of tender (L1 bidder evaluation).<br>For Supervision of E&C, total no of 2 Man days to be covered in 1 Visit have been considered. However, either or both of the number of man days or no of visits may change on either side based on the actual site requirement.However, BHEL reserves the right<br>(a) To include any of the optional items in scope of supply (as per customer contract requirements) and accordingly consider the same in evaluation. Any such scope increase and change in evaluation will be intimated to vendor during technical evaluation(before price bid opening).<br>(b) To place PO for any of the Optional items with in the contract period.<br>Hence bidders need to mandatorily quote reasonable prices for all optional items considering such requirement and keep the validity of the prices till the end of contract period. |                                                                                                                                                                                                                                                       |                                                                                                                                                            |      |                 |             |
| 5.a) For all items including Optional items, prices to be furnished in this prescribed price bid format only for each individual item. No combined prices, common prices or any other format will be accepted and such bids may be liable for rejection.<br>5.b) Bidder must not change the indicated item description, quantity & units in the price bid format. Bidder should only fill the unit rates & total price.<br>5.c) Bidder to quote for all the items as per price bid format. Incomplete/partial offer may be liable for rejection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                       |                                                                                                                                                            |      |                 |             |
| 6) Bidder to quote the base rates only. All other commercial charges for packing, freight, transportation, insurance, taxes & duties etc., shall be indicated separately.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                       |                                                                                                                                                            |      |                 |             |
| 7 a.) Commissioning spares are those spares which are required at the time of commissioning and shall be recommended(as per bidders experience) and quoted by bidder. However commissioning spares indicated in the price bid format shall be quoted as minimum.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                       |                                                                                                                                                            |      |                 |             |
| 8)With respect to Mandatory Spares;<br>A) If any of above items indicated by the specified name are not applicable, bidder to offer alternative item serving the same function as per equipment's design and indicate below the item being replaced.-<br>B) If bidder is not able to meet the above note, then bidder may mention "Not Applicable". However, if found applicable during detailed engg. stage or alternative item as per equipment design can serve the same function, bidder to supply the specified quantity with out any delivery and commercial implications to BHEL.                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                       |                                                                                                                                                            |      |                 |             |
| 9) Reference document: PY51326 R00 & annexures.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                       |                                                                                                                                                            |      |                 |             |
| 10) Unpriced price bid format indicating as quoted against each applicable item shall be submitted duly signed & stamped along with technical offer by bidder as a token of concurrence that prices are submitted in this format only. The offer shall be liable for rejection in case if un-priced price bid format is not submitted or any modification is carried out in price bid format.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                       |                                                                                                                                                            |      |                 |             |
| 11) <del>In case the systems are being supplied from outside India</del> , reputed Third Party Inspection like Llyods or equivalent has to be considered and the charges should be included in the Main offer. For those bidders who are supplying from India, such third party inspection charges need not be considered and same will be arranged by BHEL/BHEL nominated inspection agency.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                       |                                                                                                                                                            |      |                 |             |
| 12) Any commissioning spare consumed over and above the recommended commisioning spares, during commissioning shall be supplied free of cost by the equipment vendor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                       |                                                                                                                                                            |      |                 |             |

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|                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                   | <b>BHARAT HEAVY ELECTRICALS LIMITED</b><br><b>R.C.PURAM, HYDERABAD-502032</b> |      |                 |             |
| <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                   |                                                                               |      |                 |             |
| <b>PRICE FORMAT (R00) FOR Return Activated Sludge Pumps (Submersible Centrifugal) with Drive Assembly</b><br><b>PROJECT : 1X7 MLD STP AT BHEL HARIDWAR</b>                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                   |                                                                               |      |                 |             |
| SL NO                                                                                                                                                                                                                                                                                                                                                                                              | ITEM DESCRIPTION                                                                                                                                                                                                                                                  | QTY                                                                           | UNIT | UNIT RATE (RS.) | TOTAL (RS.) |
| <b>Bidder's Name : &lt;Bidder to indicate&gt;</b><br><b>Bidder's Offer No. &amp; Dt. : &lt;Bidder to indicate&gt;</b><br><b>Bidder's Ref No. &amp; Dt. :&lt;Bidder to indicate&gt;</b><br><b>BHEL Enq. No. &amp; date :&lt;Bidder to indicate&gt;</b>                                                                                                                                              |                                                                                                                                                                                                                                                                   |                                                                               |      |                 |             |
| 1                                                                                                                                                                                                                                                                                                                                                                                                  | <b>MAIN OFFER</b>                                                                                                                                                                                                                                                 |                                                                               |      |                 |             |
| A                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Return Activated Sludge Pumps (Submersible Centrifugal) with Drive Assembly:[75 m3/hr,4.1 mwc]</b>                                                                                                                                                             |                                                                               |      |                 |             |
| A.1.                                                                                                                                                                                                                                                                                                                                                                                               | <b>MATERIAL SUPPLY-Return Activated Sludge Pumps (Submersible Centrifugal) with Drive Assembly</b>                                                                                                                                                                |                                                                               |      |                 |             |
|                                                                                                                                                                                                                                                                                                                                                                                                    | Return Activated Sludge Pumps (Submersible Centrifugal)[75 m3/hr,4.1 mwc] with Drive Assembly (weather proof) with required accessories inline with requirments mentioned in specification                                                                        | 3                                                                             | Set  |                 |             |
| A.2                                                                                                                                                                                                                                                                                                                                                                                                | <b>Commissioning spares</b>                                                                                                                                                                                                                                       |                                                                               |      |                 |             |
|                                                                                                                                                                                                                                                                                                                                                                                                    | One set of commissioning spares per pump shall be quoted as per manufacturer's recommendation. (Ref. Note-12)                                                                                                                                                     | 3                                                                             | Set  |                 |             |
| A.3                                                                                                                                                                                                                                                                                                                                                                                                | <b>Special Tools &amp; tackles</b>                                                                                                                                                                                                                                |                                                                               |      |                 |             |
|                                                                                                                                                                                                                                                                                                                                                                                                    | One set of Tools and tackles shall be quoted as per manufacturer's recommendation.                                                                                                                                                                                | 1                                                                             | Set  |                 |             |
| A.4                                                                                                                                                                                                                                                                                                                                                                                                | <b>Supervison charges for erection &amp; commissioning at site</b>                                                                                                                                                                                                |                                                                               |      |                 |             |
| a                                                                                                                                                                                                                                                                                                                                                                                                  | Travel expenses from vendor works to site and back per visit /person                                                                                                                                                                                              | --                                                                            |      |                 |             |
| b                                                                                                                                                                                                                                                                                                                                                                                                  | Per day charges per person for supervision of erection & commissioning at site including boarding, lodging, lcoal transportation etc., except for travel expenses as above.                                                                                       | --                                                                            |      |                 |             |
| 2                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Optional Items</b>                                                                                                                                                                                                                                             |                                                                               |      |                 |             |
| A.1                                                                                                                                                                                                                                                                                                                                                                                                | <b>5 Years Recommended Spares</b>                                                                                                                                                                                                                                 |                                                                               |      |                 |             |
|                                                                                                                                                                                                                                                                                                                                                                                                    | Recommended spares list for 5 Years normal operation along with unit price breakup for Pump, Drive & other accessories.(List with price break up to be enclosed)<br>(1 set stands for quantity required for the replacement of one pump, drive (or) accessories). | As per List                                                                   | Set  |                 |             |
| TOTAL                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                   |                                                                               |      |                 |             |
| Notes:                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                   |                                                                               |      |                 |             |
| 1) Bidder to quote strictly as per BHEL's NIT requirements.                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                   |                                                                               |      |                 |             |
| 2) Bidder to note that this is a LUMP SUM Turn-Key Order. However<br>(a) Changes to the tender specification during execution of the project for successful operation of the system need to be carried out by bidder and commercial implications if any will be settled suitably.<br>(b) Unit rates quoted by bidder shall be applicable for any changes in BOQ during detailed engineering stage. |                                                                                                                                                                                                                                                                   |                                                                               |      |                 |             |
| 3)Main offer consists of those items which will be part of main order after successful bidder is identified. Optional Items consists of those items which need to be quoted by bidder but may or may not be ordered by BHEL. Bidders are instructed to provide the pricing details listed under Main offer and Optional items as per the prescribed format.                                        |                                                                                                                                                                                                                                                                   |                                                                               |      |                 |             |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                       | <b>BHARAT HEAVY ELECTRICALS LIMITED</b><br><b>R.C.PURAM, HYDERABAD-502032</b>                                                                              |      |                 |             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                       | <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>                                                                                                          |      |                 |             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                       | <b>PRICE FORMAT (R00) FOR Return Activated Sludge Pumps (Submersible Centrifugal) with Drive Assembly</b><br><b>PROJECT : 1X7 MLD STP AT BHEL HARIDWAR</b> |      |                 |             |
| SL NO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ITEM DESCRIPTION                                                                                                                                                                                                                                      | QTY                                                                                                                                                        | UNIT | UNIT RATE (RS.) | TOTAL (RS.) |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Bidder's Name : &lt;Bidder to indicate&gt;</b><br><b>Bidder's Offer No. &amp; Dt. : &lt;Bidder to indicate&gt;</b><br><b>Bidder's Ref No. &amp; Dt. :&lt;Bidder to indicate&gt;</b><br><b>BHEL Enq. No. &amp; date :&lt;Bidder to indicate&gt;</b> |                                                                                                                                                            |      |                 |             |
| 4) Prices quoted by bidders for items under main offer : Sl. No.1(1.A.1+1.A.2+1.A.3+1.A.4) will be considered for evaluation of lowest bidder.<br>For the purpose of tender (L1 bidder evaluation).<br>For Supervision of E&C, total no of 2 Man days to be covered in 1 Visit have been considered. However, either or both of the number of man days or no of visits may change on either side based on the actual site requirement.However, BHEL reserves the right<br>(a) To include any of the optional items in scope of supply (as per customer contract requirements) and accordingly consider the same in evaluation. Any such scope increase and change in evaluation will be intimated to vendor during technical evaluation(before price bid opening).<br>(b) To place PO for any of the Optional items with in the contract period.<br>Hence bidders need to mandatorily quote reasonable prices for all optional items considering such requirement and keep the validity of the prices till the end of contract period. |                                                                                                                                                                                                                                                       |                                                                                                                                                            |      |                 |             |
| 5.a) For all items including Optional items, prices to be furnished in this prescribed price bid format only for each individual item. No combined prices, common prices or any other format will be accepted and such bids may be liable for rejection.<br>5.b) Bidder must not change the indicated item description, quantity & units in the price bid format. Bidder should only fill the unit rates & total price.<br>5.c) Bidder to quote for all the items as per price bid format. Incomplete/partial offer may be liable for rejection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                       |                                                                                                                                                            |      |                 |             |
| 6) Bidder to quote the base rates only. All other commercial charges for packing, freight, transportation, insurance, taxes & duties etc., shall be indicated separately.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                       |                                                                                                                                                            |      |                 |             |
| 7 a.) Commissioning spares are those spares which are required at the time of commissioning and shall be recommended(as per bidders experience) and quoted by bidder. However commissioning spares indicated in the price bid format shall be quoted as minimum.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                       |                                                                                                                                                            |      |                 |             |
| 8)With respect to Mandatory Spares;<br>A) If any of above items indicated by the specified name are not applicable, bidder to offer alternative item serving the same function as per equipment's design and indicate below the item being replaced.-<br>B) If bidder is not able to meet the above note, then bidder may mention "Not Applicable". However, if found applicable during detailed engg. stage or alternative item as per equipment design can serve the same function, bidder to supply the specified quantity with out any delivery and commercial implications to BHEL.                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                       |                                                                                                                                                            |      |                 |             |
| 9) Reference document: PY51326 R00 & annexures.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                       |                                                                                                                                                            |      |                 |             |
| 10) Unpriced price bid format indicating as quoted against each applicable item shall be submitted duly signed & stamped along with technical offer by bidder as a token of concurrence that prices are submitted in this format only. The offer shall be liable for rejection in case if un-priced price bid format is not submitted or any modification is carried out in price bid format.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                       |                                                                                                                                                            |      |                 |             |
| 11) <del>In case the systems are being supplied from outside India</del> , reputed Third Party Inspection like Llyods or equivalent has to be considered and the charges should be included in the Main offer. For those bidders who are supplying from India, such third party inspection charges need not be considered and same will be arranged by BHEL/BHEL nominated inspection agency.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                       |                                                                                                                                                            |      |                 |             |
| 12) Any commissioning spare consumed over and above the recommended commissioning spares, during commissioning shall be supplied free of cost by the equipment vendor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                       |                                                                                                                                                            |      |                 |             |

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| <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                         |                                                                               |      |                 |             |
| <b>PRICE FORMAT (R00) FOR Surplus Activated Sludge Pumps (Submersible Centrifugal) with Drive Assembly</b><br><b>PROJECT : 1X7 MLD STP AT BHEL HARIDWAR</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                         |                                                                               |      |                 |             |
| SL NO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ITEM DESCRIPTION                                                                                                                                                                                                                                                        | QTY                                                                           | UNIT | UNIT RATE (RS.) | TOTAL (RS.) |
| <b>Bidder's Name : &lt;Bidder to indicate&gt;</b><br><b>Bidder's Offer No. &amp; Dt. : &lt;Bidder to indicate&gt;</b><br><b>Bidder's Ref No. &amp; Dt. :&lt;Bidder to indicate&gt;</b><br><b>BHEL Enq. No. &amp; date :&lt;Bidder to indicate&gt;</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                         |                                                                               |      |                 |             |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>MAIN OFFER</b>                                                                                                                                                                                                                                                       |                                                                               |      |                 |             |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Surplus Activated Sludge Pumps (Submersible Centrifugal) with Drive Assembly:[35 m3/hr,7.0 mwc]</b>                                                                                                                                                                  |                                                                               |      |                 |             |
| A.1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>MATERIAL SUPPLY-Surplus Activated Sludge Pumps (Submersible Centrifugal) with Drive Assembly</b>                                                                                                                                                                     |                                                                               |      |                 |             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Surplus Activated Sludge Pumps (Submersible Centrifugal)[35 m3/hr,7.0 mwc] with Drive Assembly (weather proof) with required accessories inline with requirments mentioned in specification                                                                             | 3                                                                             | Set  |                 |             |
| A.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Commissioning spares</b>                                                                                                                                                                                                                                             |                                                                               |      |                 |             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | One set of commissioning spares per pump shall be quoted as per manufacturer's recommendation. (Ref. Note-12)                                                                                                                                                           | 3                                                                             | Set  |                 |             |
| A.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Special Tools &amp; tackles</b>                                                                                                                                                                                                                                      |                                                                               |      |                 |             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | One set of Tools and tackles shall be quoted as per manufacturer's recommendation.                                                                                                                                                                                      | 1                                                                             | Set  |                 |             |
| A.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Supervison charges for erection &amp; commissioning at site</b>                                                                                                                                                                                                      | --                                                                            |      |                 |             |
| a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Travel expenses from vendor works to site and back per visit /person                                                                                                                                                                                                    | --                                                                            |      |                 |             |
| b                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Per day charges per person for supervision of erection & commissioning at site including boarding, lodging, lcoal transportation etc., except for travel expenses as above.                                                                                             | --                                                                            |      |                 |             |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Optional Items</b>                                                                                                                                                                                                                                                   |                                                                               |      |                 |             |
| A.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>5 Years Recommended Spares</b>                                                                                                                                                                                                                                       |                                                                               |      |                 |             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Recommended spares list for 5 Years normal operation along with unit price breakup for Pump, Drive & other accessories.( <b>List with price break up to be enclosed</b> ) (1 set stands for quantity required for the replacement of one pump, drive (or) accessories). | As per List                                                                   | Set  |                 |             |
| TOTAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                         |                                                                               |      |                 |             |
| <b>Notes:</b><br>1) Bidder to quote strictly as per BHEL's NIT requirements.<br>2) Bidder to note that this is a LUMP SUM Turn-Key Order. However<br>(a) Changes to the tender specification during execution of the project for successful operation of the system need to be carried out by bidder and commercial implications if any will be settled suitably.<br>(b) Unit rates quoted by bidder shall be applicable for any changes in BOQ during detailed engineering stage.<br>3)Main offer consists of those items which will be part of main order after successful bidder is identified. Optional Items consists of those items which need to be quoted by bidder but may or may not be ordered by BHEL. Bidders are instructed to provide the pricing details listed under Main offer and Optional items as per the prescribed format. |                                                                                                                                                                                                                                                                         |                                                                               |      |                 |             |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                       | <b>BHARAT HEAVY ELECTRICALS LIMITED</b><br><b>R.C.PURAM, HYDERABAD-502032</b>                                                                               |      |                 |             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                       | <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b>                                                                                                           |      |                 |             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                       | <b>PRICE FORMAT (R00) FOR Surplus Activated Sludge Pumps (Submersible Centrifugal) with Drive Assembly</b><br><b>PROJECT : 1X7 MLD STP AT BHEL HARIDWAR</b> |      |                 |             |
| SL NO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ITEM DESCRIPTION                                                                                                                                                                                                                                      | QTY                                                                                                                                                         | UNIT | UNIT RATE (RS.) | TOTAL (RS.) |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Bidder's Name : &lt;Bidder to indicate&gt;</b><br><b>Bidder's Offer No. &amp; Dt. : &lt;Bidder to indicate&gt;</b><br><b>Bidder's Ref No. &amp; Dt. :&lt;Bidder to indicate&gt;</b><br><b>BHEL Enq. No. &amp; date :&lt;Bidder to indicate&gt;</b> |                                                                                                                                                             |      |                 |             |
| 4) Prices quoted by bidders for items under main offer : Sl. No.1(1.A.1+1.A.2+1.A.3+1.A.4) will be considered for evaluation of lowest bidder.<br>For the purpose of tender (L1 bidder evaluation).<br>For Supervision of E&C, total no of 2 Man days to be covered in 1 Visit have been considered. However, either or both of the number of man days or no of visits may change on either side based on the actual site requirement.However, BHEL reserves the right<br>(a) To include any of the optional items in scope of supply (as per customer contract requirements) and accordingly consider the same in evaluation. Any such scope increase and change in evaluation will be intimated to vendor during technical evaluation(before price bid opening).<br>(b) To place PO for any of the Optional items with in the contract period.<br>Hence bidders need to mandatorily quote reasonable prices for all optional items considering such requirement and keep the validity of the prices till the end of contract period. |                                                                                                                                                                                                                                                       |                                                                                                                                                             |      |                 |             |
| 5.a) For all items including Optional items, prices to be furnished in this prescribed price bid format only for each individual item. No combined prices, common prices or any other format will be accepted and such bids may be liable for rejection.<br>5.b) Bidder must not change the indicated item description, quantity & units in the price bid format. Bidder should only fill the unit rates & total price.<br>5.c) Bidder to quote for all the items as per price bid format. Incomplete/partial offer may be liable for rejection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                       |                                                                                                                                                             |      |                 |             |
| 6) Bidder to quote the base rates only. All other commercial charges for packing, freight, transportation, insurance, taxes & duties etc., shall be indicated separately.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                       |                                                                                                                                                             |      |                 |             |
| 7 a.) Commissioning spares are those spares which are required at the time of commissioning and shall be recommended(as per bidders experience) and quoted by bidder. However commissioning spares indicated in the price bid format shall be quoted as minimum.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                       |                                                                                                                                                             |      |                 |             |
| 8)With respect to Mandatory Spares;<br>A) If any of above items indicated by the specified name are not applicable, bidder to offer alternative item serving the same function as per equipment's design and indicate below the item being replaced.-<br>B) If bidder is not able to meet the above note, then bidder may mention "Not Applicable". However, if found applicable during detailed engg. stage or alternative item as per equipment design can serve the same function, bidder to supply the specified quantity with out any delivery and commercial implications to BHEL.                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                       |                                                                                                                                                             |      |                 |             |
| 9) Reference document: PY51326 R00 & annexures.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                       |                                                                                                                                                             |      |                 |             |
| 10) Unpriced price bid format indicating as quoted against each applicable item shall be submitted duly signed & stamped along with technical offer by bidder as a token of concurrence that prices are submitted in this format only. The offer shall be liable for rejection in case if un-priced price bid format is not submitted or any modification is carried out in price bid format.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                       |                                                                                                                                                             |      |                 |             |
| 11) <del>In case the systems are being supplied from outside India</del> , reputed Third Party Inspection like Llyods or equivalent has to be considered and the charges should be included in the Main offer. For those bidders who are supplying from India, such third party inspection charges need not be considered and same will be arranged by BHEL/BHEL nominated inspection agency.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                       |                                                                                                                                                             |      |                 |             |
| 12) Any commissioning spare consumed over and above the recommended commisioning spares, during commissioning shall be supplied free of cost by the equipment vendor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                       |                                                                                                                                                             |      |                 |             |

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| ESP-001-2A<br>Rev.00 |  | <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b> | Std. / Doc. Number             |    |
|                      |                                                                                   |                                                   | Annexure-4 to Doc. No. PY51326 |    |
|                      |                                                                                   |                                                   | Rev. No.                       | 00 |
|                      |                                                                                   |                                                   |                                |    |

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|                                                   |                      |                     |                      |               |
|---------------------------------------------------|----------------------|---------------------|----------------------|---------------|
| <b>Revisions:</b><br>Refer to record of revisions | <b>Prepared by :</b> | <b>Checked by :</b> | <b>Approved by :</b> | <b>Date :</b> |
|                                                   | Rajeev Jain          | GIRISH              | Siva Prasad Babu     | 01.03.18      |

**ANNEXURE-4**  
**CHECKLIST FOR OFFER FOR SUBMERSIBLE PUMP WITH DRIVE ASSEMBLY**

| Description                                                                                                                                                                                                                             | Enclosed (Yes/No) |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Bidder to confirm to the scope of supply as per BHEL specs Doc. No. PY51326                                                                                                                                                             |                   |
| Bidder to furnish duly filled Pump-Motor datasheet as per Annexure-2. <b><u>Datasheets in other formats are strictly not accepted. Bidder to furnish filled in the Datasheets as per BHEL tender enquiry only.</u></b>                  |                   |
| Bidder to confirm that Auto Coupling type Elbow at pump discharge shall be in their scope in line with P&ID (Annexure-1).                                                                                                               |                   |
| Bidder to confirm that the Motor Efficiency class considered shall be as per Manufacturer standard.                                                                                                                                     |                   |
| Bidder to Confirm that seaworthy packing is considered in case of importing the pump.                                                                                                                                                   |                   |
| Bidder to confirm that the recommended spares as mentioned in Sl. No. A.4 of Price bid format (Annexure-3) is considered.                                                                                                               |                   |
| Bidder to furnish a list of commissioning spares (Refer Cl. No. 5.17 of Doc. No. PY51326).                                                                                                                                              |                   |
| Bidder to furnish a list of special tools & tackles (Refer Cl. No. 5.20 of Doc. No. PY51326).                                                                                                                                           |                   |
| Bidder's confirmation required for furnishing a list of 2 year recommended spares in their offer separately with optional price.                                                                                                        |                   |
| Bidder to furnish reference list for the offered pump as per Cl. No. 7.0.0 of BHEL tender specification (Doc. No. PY51326).                                                                                                             |                   |
| Bidder to furnish the filled in unpriced price bid format along with their offer as per Annexure-3.                                                                                                                                     |                   |
| Bidder to quote individual price for each item mentioned in the seal priced bid as per price bid format (Annexure-03 of BHEL specs Doc. No. PY51326). Bidder to confirm the same.                                                       |                   |
| Deviations to the BHEL tender specifications shall be clearly bought by bidder in a separate deviation list. Bidder to furnish deviation list, if any, as per Annexure-07 of BHEL specs Doc. No. PY51326                                |                   |
| All important documents such as unpriced price bid, reference list, pump performance curve, Pump & drive assembly GA drawings, CS drawings must necessarily to be furnished by bidder along with their offer.                           |                   |
| Bidder to raise Pre bid queries, if any, must be raised as per Attached format (Annexure-08) before submission of technical and commercial bid. Any deviation/ queries raised during technical bid submission shall not be entertained. |                   |

SIGNATURE:  
NAME:  
DESIGNATION:  
COMPANY:  
DATE:

|                      |                                                                                   |                                                   |                                   |
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| ESP-001-2A<br>Rev.00 |  | <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b> | Std. / Doc. Number                |
|                      |                                                                                   |                                                   | Annexure-5 to Doc.<br>No. PY51326 |
|                      |                                                                                   |                                                   | Rev. No.   00                     |
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|---------------------------------------------------|----------------------|---------------------|----------------------|---------------|
| <b>Revisions:</b><br>Refer to record of revisions | <b>Prepared by :</b> | <b>Checked by :</b> | <b>Approved by :</b> | <b>Date :</b> |
|                                                   | Rajeev Jain          | GIRISH              | Siva Prasad Babu     | 01.03.18      |

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| TD-201<br>Rev No. 00<br>Form No.                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>PRODUCT STANDARD</b><br>PROJECT ENGINEERING & SYSTEMS DIVISION<br>HYDERABAD | ANNEXURE    |
|                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                | Rev No. 00  |
|                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                | Page 1 of 3 |
| <b>COPYRIGHT AND CONFIDENTIAL</b><br><br>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED,<br>It must not be used directly or indirectly in any way detrimental to the interest of the company. | <div>QAP GUIDELINES &amp; FORMAT</div> <div>( ANNEXURE)</div> <p>The QAP format and guidelines for filling up the format shall be used by vendor for preparation and submission of QAP after order placement.</p> <p><b>Note :</b></p> <ol style="list-style-type: none"><li>1. Typical /Indicative /Standard QAP(s) for equipment /package attached is reference document and to use by successful bidder in future for preparation and submission of QAP for BHEL /CUSTOMER approval.</li><li>2. No deviation to reference document is acceptable.</li></ol> |                                                                                |             |

|          |                                                                                                                                                                                                                                                                            |                                                                                                                              |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                        |
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| Form No. | <br>HYDERABAD                                                                                                                                                                              | <p align="center"><b>PRODUCT STANDARD</b></p> <p align="center">PROJECT ENGINEERING &amp; SYSTEMS DIVISION<br/>HYDERABAD</p> | ANNEXURE<br>Rev No. 00<br>Page 2 of 3 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                        |
|          | <p align="center"><b>COPYRIGHT AND CONFIDENTIAL</b></p> <p align="center">The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED .<br/>It must not be used directly or indirectly in any way detrimental to the interest of the company.</p> |                                                                                                                              |                                       | <p align="center"><b><u>GUIDELINES TO VENDORS FOR<br/>PREPARATION OF QUALITY ASSURANCE PLAN</u></b></p> <ol style="list-style-type: none"> <li>QAP shall be made in landscape mode on A4 size paper as per the format enclosed.<br/>Font size shall be minimum 10.</li> <li>Each page of QAP shall contain the following information.           <ol style="list-style-type: none"> <li>Vendor's name &amp; address.</li> <li>Customer: BHEL, Hyderabad.</li> <li>Project.</li> <li>BHEL Product Standard Number/revision number as referred in P.O.</li> <li>BHEL Purchase Order Number &amp; Date.</li> <li>Product as per P.O. description.</li> <li>QAP Number (unique and shall not repeat)/revision number/date.</li> <li>Page number and number of pages</li> </ol> </li> <li>QAP shall contain four parts / stages as follows.           <ol style="list-style-type: none"> <li>Raw materials and bought out items.</li> <li>In process Control / Inspection.</li> <li>Final assembly, Inspection &amp; Testing.</li> <li>Painting, preservation &amp; packing.</li> </ol> </li> <li>Under 'Component', indicate name of the component (say casing, rotor, pressure gauge, etc).</li> <li>Under 'Characteristics', indicate appropriately (say chemical analysis, mechanical properties, NDT (UT,DP etc.), hydrostatic test, calibration check etc.)</li> <li>Under 'Class', indicate minor, major or critical depending on the importance of characteristic.</li> <li>Under 'Type of check', indicate appropriately (say chemical, mechanical, UT, DP etc.)</li> <li>Under 'Quantum of check', indicate appropriately (say 100%, 10%, sample, per melt, per heat, all pieces etc.)</li> <li>Under 'Reference document' and 'Acceptance norms', appropriate National &amp; International standards, BHEL standards, approved drawing references etc. should be indicated. It is not correct to mention as "Vendor's internal standards or Vendor's standard practice etc.". If vendors' internal standards are referred, same shall be in line with BHEL Spec. indicated in the P.O. These may require review &amp; approval by our Engineering dept.</li> <li>Under 'Format of record', indicate appropriately supplier's test certificate, calibration certificate, lab report, inspection report etc.</li> </ol> |                                                                                                                                                                                                                                                        |
|          |                                                                                                                                                                                                                                                                            |                                                                                                                              | Ref. Doc                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <ol style="list-style-type: none"> <li>Please refer 'Agency' in QAP format.<br/>Under P: Perform, W: Witness, V: Verify<br/>Indicate against each characteristic 1: (BHEL CQS/Nominated inspection agency), OR<br/>2: (Vendor / Sub vendor)</li> </ol> |

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| Form No.                                                                                                                                                                                                                                                                   | <br>HYDERABAD | <p align="center"><b>PRODUCT STANDARD</b></p> <p align="center">PROJECT ENGINEERING &amp; SYSTEMS DIVISION</p> <p align="center">HYDERABAD</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ANNEXURE |
|                                                                                                                                                                                                                                                                            | Rev No. 00                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |
|                                                                                                                                                                                                                                                                            | Page 3 of 3                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |          |
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|                                                                                                                                                                                                                                                                            |                                                                                               | Ref. Doc                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |

| VENDOR'S NAME & ADDRESS: |                                             |                 | <b>MANUFACTURING QUALITY PLAN</b> |               |                  |                         |                  |                  | QP. NO.: |                 |             |  |         |
|--------------------------|---------------------------------------------|-----------------|-----------------------------------|---------------|------------------|-------------------------|------------------|------------------|----------|-----------------|-------------|--|---------|
|                          |                                             |                 | CUSTOMER: BHEL, HYDERABAD – 32.   |               |                  | BHEL P.O.NO.:           |                  |                  | REV NO:  |                 | DATE:       |  |         |
|                          |                                             |                 | PROJECT:<br>PRODUCT:              |               |                  | P.O.DATE:<br>BHEL SPEC: |                  |                  | REV:     |                 | PAGE 1 OF 1 |  |         |
| SL NO                    | COMPONENTS                                  | CHARACTERISTICS | CLASS                             | TYPE OF CHECK | QUANTUM OF CHECK | REFERENCE DOCUMENT      | ACCEPTANCE NORMS | FORMAT OF RECORD | * D      | AGENCY<br>P W V |             |  | REMARKS |
| 1.0                      | <b>RAW MATERIALS &amp; BOUGHT OUT ITEMS</b> |                 |                                   |               |                  |                         |                  |                  |          |                 |             |  |         |
|                          |                                             |                 |                                   |               |                  |                         |                  |                  |          |                 |             |  |         |
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| 2.0                      | <b>INPROCESS INSPECTION</b>                 |                 |                                   |               |                  |                         |                  |                  |          |                 |             |  |         |
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| 3.0                      | <b>FINAL INSPECTION &amp; TESTING</b>       |                 |                                   |               |                  |                         |                  |                  |          |                 |             |  |         |
|                          |                                             |                 |                                   |               |                  |                         |                  |                  |          |                 |             |  |         |
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| 4.0                      | <b>PRESERVATION &amp; PACKING</b>           |                 |                                   |               |                  |                         |                  |                  |          |                 |             |  |         |
|                          |                                             |                 |                                   |               |                  |                         |                  |                  |          |                 |             |  |         |
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|                          |                                             |                 |                                   |               |                  |                         |                  |                  |          |                 |             |  |         |

**VENDOR TO NOTE:** THIS FORMAT IS IN MICROSOFT WORD. HEADER & FOOTER SHALL BE AVAILABLE IN EACH PAGE OF QP. QP SHALL BE IN LANDSCAPE & A4 SIZE ONLY. FONT SIZE SHALL BE MIN 10. VENDOR SHALL SIGN & STAMP IN EACH PAGE OF QP. LOI REF. & DATE ARE NOT ACCEPTABLE. P.O.NO. & DATE SHALL BE INDICATED. QP NO. SHOULD BE UNIQUE AND SHALL NOT REPEAT. ALL THE TESTS / CHECKS INDICATED IN THE BHEL SPEC. SHALL BE INDICATED IN THE QP.

|                                                                                                                                                                                                                                                                                                                             |                            |                           |                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------|------------------------------|
| LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS. | PREPARED BY                | APPROVED BY               | APPROVED BY                  |
|                                                                                                                                                                                                                                                                                                                             | VENDOR'S SIGNATURE & STAMP | BHEL QA SIGNATURE & STAMP | CUSTOMER'S SIGNATURE & STAMP |

|                                                  |                                                                                                           |                                                                                          |       |                                             |                                                          |                                                    |                  |                              |     |                 |   |   |                                      |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-------|---------------------------------------------|----------------------------------------------------------|----------------------------------------------------|------------------|------------------------------|-----|-----------------|---|---|--------------------------------------|
| <div><div>बी एच डी एल</div><div>BHEL</div></div> |                                                                                                           | TYPICAL MANUFACTURING QUALITY PLAN                                                       |       |                                             |                                                          |                                                    |                  | MQP. NO.:                    |     |                 |   |   |                                      |
|                                                  |                                                                                                           | PROJECT ENGINEERING & SYSTEMS<br>DIVISION BHEL,<br>RC PURAM, HYD-502032                  |       |                                             | PROJECT:<br>PACKAGE: CENTRIFUGAL PUMP<br>BHEL TECH SPEC: |                                                    |                  | REV NO:                      |     | DATE:           |   |   |                                      |
|                                                  |                                                                                                           |                                                                                          |       |                                             |                                                          |                                                    |                  | PAGE 1 OF 4                  |     |                 |   |   |                                      |
| SL NO                                            | COMPONENTS                                                                                                | CHARACTERISTICS                                                                          | CLASS | TYPE OF CHECK                               | QUANTUM OF CHECK                                         | REFERENCE DOCUMENT                                 | ACCEPTANCE NORMS | FORMAT OF RECORD             | * D | AGENCY<br>P W V |   |   | REMARKS                              |
| 1.0                                              | RAW MATERIALS & BOUGHT OUT ITEMS                                                                          |                                                                                          |       |                                             |                                                          |                                                    |                  |                              |     |                 |   |   |                                      |
| 1.1                                              | Casing                                                                                                    | Chemical & Mech. Properties                                                              | Major | Chemical & Mech. analysis                   | 1 per heat/lot                                           | Tech Spec/ Approved Datasheet/<br>Approved Drawing |                  | MTC                          | √   | 2               | 2 | 1 |                                      |
| 1.2                                              |                                                                                                           | Heat treatment *                                                                         | Major | Heat treatment                              | 100%                                                     |                                                    |                  | HT chart / TC                | √   | 2               | 2 | 1 | * for castings                       |
| 1.3                                              | Impeller, Diffuser, shaft                                                                                 | Chemical & Mech. Properties                                                              | Major | Chemical & Mech. analysis                   | 1 per heat/lot                                           |                                                    |                  | MTC                          | √   | 2               | 2 | 1 |                                      |
| 1.4                                              | Mechanical seal                                                                                           | Material and leakage check (Air test)                                                    | Major | OEM's certificate review                    | 100%                                                     |                                                    |                  | MTC / COC                    | √   | 2               | 2 | 1 |                                      |
| 1.5                                              | Bearing and bearing housing                                                                               | Make and Model                                                                           | Major | Visual                                      | 100%                                                     |                                                    |                  | MTC / COC                    | √   | 2               | 2 | 1 |                                      |
| 1.6                                              | Accessories *<br>(coupling and coupling guards, inter connecting piping, strainers, instruments, JB etc.) | Chemical & Mech. Properties                                                              | Major | Chemical & Mech. Analysis                   | 1 per heat/lot                                           |                                                    |                  | MTC                          | √   | 2               | 2 | 1 | * accessories as per scope of supply |
| 1.7                                              |                                                                                                           | MOC, hydro test reports, Calibration reports and Type test certificates for instruments. | Major | OEM's certificate review                    | 100%                                                     |                                                    |                  | OEM test certificates or COC | √   | 2               | 2 | 1 |                                      |
| 1.8                                              | Wear rings                                                                                                | Chemical & Mech. Properties and hardness                                                 | Major | Chemical & Mech. Analysis and hardness test | 1 per heat/lot                                           |                                                    |                  |                              |     | MTC             | √ | 2 | 2                                    |

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|                                       |                                                                      |                                                                         |          |                                                 |                                                          |                                                    |                  |                  |     |                 |   |    |          |
|---------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------|----------|-------------------------------------------------|----------------------------------------------------------|----------------------------------------------------|------------------|------------------|-----|-----------------|---|----|----------|
| <div>बी एच ई एल</div> <div>BHEL</div> |                                                                      | TYPICAL MANUFACTURING QUALITY PLAN                                      |          |                                                 |                                                          |                                                    |                  | MQP. NO.:        |     |                 |   |    |          |
|                                       |                                                                      | PROJECT ENGINEERING & SYSTEMS<br>DIVISION BHEL,<br>RC PURAM, HYD-502032 |          |                                                 | PROJECT:<br>PACKAGE: CENTRIFUGAL PUMP<br>BHEL TECH SPEC: |                                                    |                  | REV NO:          |     | DATE:           |   |    |          |
|                                       |                                                                      |                                                                         |          |                                                 |                                                          |                                                    |                  | PAGE 2 OF 4      |     |                 |   |    |          |
| SL NO                                 | COMPONENTS                                                           | CHARACTERISTICS                                                         | CLASS    | TYPE OF CHECK                                   | QUANTUM OF CHECK                                         | REFERENCE DOCUMENT                                 | ACCEPTANCE NORMS | FORMAT OF RECORD | * D | AGENCY<br>P W V |   |    | REMARKS  |
| 1.9                                   | Gaskets, Flanges, and Fasteners                                      | Chemical & Mech. Properties                                             | Minor    | Chemical & Mech. Analysis                       | 1 per heat/lot                                           |                                                    |                  | MTC              | √   | 2               | 2 | 1  |          |
| 2.0                                   | INPROCESS INSPECTION                                                 |                                                                         |          |                                                 |                                                          |                                                    |                  |                  |     |                 |   |    |          |
| 2.1                                   | Fabrication of casing and other components                           | WPS, PQR and WQR                                                        | Major    | Document verification                           | 100%                                                     | Tech Spec/ Approved Datasheet/<br>Approved Drawing |                  | WPS, PQR and WQR | --  | 2               | 2 | 1  |          |
| 2.2                                   | Fillet welds on pressure containing components *                     | NDE                                                                     | Major    | MPI or LPI (when MPI is not feasible)           | 100%                                                     |                                                    |                  | NDE reports      | √   | 2               | 2 | 1  | * if any |
| 2.3                                   | Nozzle weld and butt weld joints on pressure containing components * | NDE                                                                     | Major    | RT or UT (when RT is not feasible)              | 100%                                                     |                                                    |                  | NDE reports      | √   | 2               | 2 | 1  | * if any |
| 2.4                                   | Casing                                                               | Surface finish & NDE                                                    | Major    | Visual & DPT/MPI                                | 100%                                                     |                                                    |                  | NDE reports      | √   | 2               | 2 | 1  |          |
| 2.5                                   |                                                                      | Leakage                                                                 | Critical | Hydro test                                      | 100%                                                     |                                                    |                  | Test reports     | √   | 2               | 1 | -- |          |
| 2.6                                   | Impeller, Diffuser and Shaft (if shaft > 50 mm diameter)             | NDE                                                                     | Major    | For impeller/ diffuser DPT/MPI and for Shaft UT | 100%                                                     |                                                    |                  | NDE reports      | √   | 2               | 2 | 1  |          |

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|                                                                                   |                                 |                                                                         |          |                     |                  |                                                                 |                  |                  |     |                 |   |    |                                                                                           |
|-----------------------------------------------------------------------------------|---------------------------------|-------------------------------------------------------------------------|----------|---------------------|------------------|-----------------------------------------------------------------|------------------|------------------|-----|-----------------|---|----|-------------------------------------------------------------------------------------------|
|  |                                 | TYPICAL MANUFACTURING QUALITY PLAN                                      |          |                     |                  |                                                                 |                  | MQP. NO.:        |     |                 |   |    |                                                                                           |
|                                                                                   |                                 | PROJECT ENGINEERING & SYSTEMS<br>DIVISION BHEL,<br>RC PURAM, HYD-502032 |          |                     |                  | PROJECT:<br>PACKAGE: <b>CENTRIFUGAL PUMP</b><br>BHEL TECH SPEC: |                  | REV NO:          |     | DATE:           |   |    |                                                                                           |
|                                                                                   |                                 |                                                                         |          |                     |                  |                                                                 |                  | PAGE 3 OF 4      |     |                 |   |    |                                                                                           |
| SL NO                                                                             | COMPONENTS                      | CHARACTERISTICS                                                         | CLASS    | TYPE OF CHECK       | QUANTUM OF CHECK | REFERENCE DOCUMENT                                              | ACCEPTANCE NORMS | FORMAT OF RECORD | * D | AGENCY<br>P W V |   |    | REMARKS                                                                                   |
| 2.7                                                                               | Wear rings                      | NDE                                                                     | Major    | DPT                 | 100%             |                                                                 |                  | DP reports       | √   | 2               | 2 | 1  |                                                                                           |
| 2.8                                                                               | Impeller                        | Dynamic balancing                                                       | Critical | Balancing           | 100%             |                                                                 |                  | IR               | √   | 2               | 2 | 1  |                                                                                           |
| 3.0                                                                               | FINAL INSPECTION & TESTING      |                                                                         |          |                     |                  |                                                                 |                  |                  |     |                 |   |    |                                                                                           |
| 3.1                                                                               | Pump Assembly<br>with job motor | Performance test                                                        | Critical | Testing             | 100%             | Tech Spec/ Approved Datasheet/<br>Approved Drawing              |                  | TC               | √   | 2               | 1 | -- | Only 10% witness by BHEL / BHEL's TPIA, subjective to minimum 1 pump of each size & type. |
| 3.2                                                                               |                                 | NPSH (if applicable)                                                    | Major    | Testing             | 100%             |                                                                 |                  | TC               | √   | 2               | 1 | -- |                                                                                           |
| 3.3                                                                               |                                 | Mechanical run test                                                     | Critical | Testing             | 100%             |                                                                 |                  | TC               | √   | 2               | 1 | -- |                                                                                           |
| 3.4                                                                               |                                 | Strip Examination                                                       | Critical | Dismantling         | 100%             |                                                                 |                  | TC               | √   | 2               | 1 | -- |                                                                                           |
| 3.5                                                                               |                                 | Overall Dimensions                                                      | Major    | Measurement         | 100%             |                                                                 |                  | IR               | √   | 2               | 1 | -- |                                                                                           |
| 3.6                                                                               |                                 | String test / complete unit test                                        | Major    | Testing             | 100%             |                                                                 |                  | IR               | √   | 2               | 1 | -- |                                                                                           |
| 3.7                                                                               |                                 | Spares (if any)                                                         | Major    | BOM check           | 100%             |                                                                 |                  | IR               | √   | 2               | 1 | -- |                                                                                           |
| 4.0                                                                               | PRESERVATION & PACKING          |                                                                         |          |                     |                  |                                                                 |                  |                  |     |                 |   |    |                                                                                           |
| 4.1                                                                               | Pump and its components         | Direction of rotation, Stamping and Painting                            | Major    | Visual, Shade & DFT | Random           | Tech Spec/ Approved Datasheet/<br>Approved Drawing              |                  | IR               | √   | 2               | 1 | -- |                                                                                           |
| 4.2                                                                               |                                 | Packing #                                                               | Major    | Visual              | 100%             |                                                                 |                  | Packing List     | √   | 2               | 2 | 1  | # Seaworthy packing for export orders                                                     |

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|                                                                                   |            |                                                                         |       |               |                                                                 |                    |                  |                  |   |       |                     |  |  |         |
|-----------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------|-------|---------------|-----------------------------------------------------------------|--------------------|------------------|------------------|---|-------|---------------------|--|--|---------|
|  |            | <b>TYPICAL MANUFACTURING QUALITY PLAN</b>                               |       |               |                                                                 |                    |                  | MQP. NO.:        |   |       |                     |  |  |         |
|                                                                                   |            |                                                                         |       |               |                                                                 |                    |                  | REV NO:          |   | DATE: |                     |  |  |         |
|                                                                                   |            | PROJECT ENGINEERING & SYSTEMS<br>DIVISION BHEL,<br>RC PURAM, HYD-502032 |       |               | PROJECT:<br>PACKAGE: <b>CENTRIFUGAL PUMP</b><br>BHEL TECH SPEC: |                    |                  | PAGE 4 OF 4      |   |       |                     |  |  |         |
| SL NO                                                                             | COMPONENTS | CHARACTERISTICS                                                         | CLASS | TYPE OF CHECK | QUANTUM OF CHECK                                                | REFERENCE DOCUMENT | ACCEPTANCE NORMS | FORMAT OF RECORD | * | D     | AGENCY<br>P   W   V |  |  | REMARKS |

**Notes:-**

1. This MQP should be read along with specification ((Latest revisions to be considered as per PO), approved drawings & approved datasheet.
2. Specification/drawing/datasheet shall prevail over quality plan for contradiction if any.
3. Any project/customer specific requirements which shall be notified have to be fulfilled by the vendor at the time of execution of order.

**Abbreviations:-**

|     |   |                           |     |   |                             |     |   |                    |
|-----|---|---------------------------|-----|---|-----------------------------|-----|---|--------------------|
| MTC | – | Material Test certificate | COC | – | Certificate of Compliance   | DFT | – | Dry Film Thickness |
| TC  | – | Test Certificate          | NDE | – | Non Destructive Examination | IR  | – | Inspection Report  |
| DFT | – | Dry Film Thickness        | IBR | – | Indian Boiler Regulations   | IS  | – | Indian Standards   |

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|  |                                                              | TYPICAL MANUFACTURING QUALITY PLAN                                                                                                            |       |                                                 |                         |                                                                                                       |                  | MQP. NO.:                      |     |                 |         |   |  |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------------------------------|-------------------------|-------------------------------------------------------------------------------------------------------|------------------|--------------------------------|-----|-----------------|---------|---|--|
| PROJECT ENGINEERING & SYSTEMS<br>DIVISION BHEL,<br>RC PURAM, HYD-502032           |                                                              | PROJECT:<br>PACKAGE: <b>LT MOTOR</b><br>BHEL TECH SPEC:                                                                                       |       |                                                 |                         | REV NO:                                                                                               |                  | DATE:                          |     |                 |         |   |  |
| PAGE 1 OF 4                                                                       |                                                              |                                                                                                                                               |       |                                                 |                         |                                                                                                       |                  |                                |     |                 |         |   |  |
| SL NO                                                                             | COMPONENTS                                                   | CHARACTERISTICS                                                                                                                               | CLASS | TYPE OF CHECK                                   | QUANTUM OF CHECK        | REFERENCE DOCUMENT                                                                                    | ACCEPTANCE NORMS | FORMAT OF RECORD               | * D | AGENCY<br>P W V | REMARKS |   |  |
| <b>1.0 RAW MATERIALS &amp; BOUGHT OUT ITEMS</b>                                   |                                                              |                                                                                                                                               |       |                                                 |                         |                                                                                                       |                  |                                |     |                 |         |   |  |
| 1.1                                                                               | <u>COPPER WIRE</u><br>Enameled Copper Wire                   | Overall diameter, elongation, Mandrel winding test, Peel test, springiness, Abrasion test, Cut through test, Heat shock test, Continuity test | Major | Measurement and mechanical & electrical testing | One sample per heat/lot | National & international standard ( IS or IEC) / technical specification/ approved drawing/ datasheet |                  | IR / supplier test certificate | √   | 2               | 2       | 1 |  |
| 1.2                                                                               | <u>STEEL SHAFT</u><br>Straightened Steel bar in black Finish | Dimensions, surface finish, chemical composition                                                                                              | Major | Visual, measurement and chemical testing        | One sample per heat/lot |                                                                                                       |                  | supplier test certificate      | √   | 2               | 2       | 1 |  |
| 1.3                                                                               |                                                              | NDT                                                                                                                                           | Major | UT                                              | 100%                    |                                                                                                       |                  | supplier test certificate      | √   | 2               | 2       | 1 |  |
| 1.4                                                                               | <u>ALUMINIUM INGOTS</u>                                      | Chemical properties                                                                                                                           | Major | Chemical testing                                | One sample per heat/lot |                                                                                                       |                  | supplier test certificate      | √   | 2               | 2       | 1 |  |
| <b>2.0 INPROCESS INSPECTION</b>                                                   |                                                              |                                                                                                                                               |       |                                                 |                         |                                                                                                       |                  |                                |     |                 |         |   |  |
| 2.1                                                                               | ASSEMBLY                                                     | Completeness and correctness of assembly                                                                                                      | Major | Visual verification                             | 100%                    | MO and manufacturer's internal processes                                                              |                  | Log book                       | --  | 2               | 2       | 2 |  |

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|                                                 |                            |                                                                         |       |               |                                                         |                                                                           |                  |                  |     |        |   |    |         |
|-------------------------------------------------|----------------------------|-------------------------------------------------------------------------|-------|---------------|---------------------------------------------------------|---------------------------------------------------------------------------|------------------|------------------|-----|--------|---|----|---------|
| <div><div>बी एच ई एल</div><div>BHEL</div></div> |                            | TYPICAL MANUFACTURING QUALITY PLAN                                      |       |               |                                                         |                                                                           |                  | MQP. NO.:        |     |        |   |    |         |
|                                                 |                            | PROJECT ENGINEERING & SYSTEMS<br>DIVISION BHEL,<br>RC PURAM, HYD-502032 |       |               | PROJECT:<br>PACKAGE: <b>LT MOTOR</b><br>BHEL TECH SPEC: |                                                                           |                  | REV NO:          |     | DATE:  |   |    |         |
|                                                 |                            |                                                                         |       |               |                                                         |                                                                           |                  | PAGE 2 OF 4      |     |        |   |    |         |
| SL NO                                           | COMPONENTS                 | CHARACTERISTICS                                                         | CLASS | TYPE OF CHECK | QUANTUM OF CHECK                                        | REFERENCE DOCUMENT                                                        | ACCEPTANCE NORMS | FORMAT OF RECORD | * D | AGENCY |   |    | REMARKS |
|                                                 |                            |                                                                         |       |               |                                                         |                                                                           |                  |                  |     | P      | W | V  |         |
| 3.0                                             | FINAL INSPECTION & TESTING |                                                                         |       |               |                                                         |                                                                           |                  |                  |     |        |   |    |         |
| 3.1                                             | ROUTINE TESTING            | Measurement of winding resistance in cold condition                     | Major | Testing       | 100%                                                    | National & international standard ( IS or IEC ) / technical specification |                  | TC               | √   | 2      | 1 | -- |         |
| 3.2                                             |                            | SH heater resistance (if applicable)                                    | Major | Testing       | 100%                                                    |                                                                           |                  | TC               | √   | 2      | 1 | -- |         |
| 3.3                                             |                            | Insulation resistance (before and after HV test)                        | Major | Testing       | 100%                                                    |                                                                           |                  | TC               | √   | 2      | 1 | -- |         |
| 3.4                                             |                            | High voltage test at 1.8 KV for 1 minute and space heater HV test       | Major | Testing       | 100%                                                    |                                                                           |                  | TC               | √   | 2      | 1 | -- |         |
| 3.5                                             |                            | Direction of rotation                                                   | Major | Testing       | 100%                                                    |                                                                           |                  | TC               | √   | 2      | 1 | -- |         |
| 3.6                                             |                            | No load test (measurement of NL A, voltage, NL power and NL RPM)        | Major | Testing       | 100%                                                    |                                                                           |                  | TC               | √   | 2      | 1 | -- |         |
| 3.7                                             |                            | Reduced run up voltage test at ( rated volt√3)                          | Major | Testing       | 100%100%                                                |                                                                           |                  | TC               | √   | 2      | 1 | -- |         |
| 3.8                                             |                            | Locked rotor test at full load current                                  | Major | Testing       | 100%                                                    |                                                                           |                  | TC               | √   | 2      | 1 | -- |         |
| 3.9                                             |                            | Vibration measurement                                                   | Major | Testing       | 100%                                                    |                                                                           |                  | TC               | √   | 2      | 1 | -- |         |
| 3.10                                            |                            | Measurement of noise level                                              | Major | Testing       | 100%                                                    |                                                                           |                  | TC               | √   | 2      | 1 | -- |         |
| 3.11                                            |                            | 120% over speed test                                                    | Major | Testing       | 100%                                                    |                                                                           |                  | TC               | √   | 2      | 1 | -- |         |

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|-----------------------------------------------------------------------------------|------------|-----------------------------------------------------------------------------------------------|-------|---------------|---------------------------------------------------------|---------------------------------------------------------------------------|------------------|------------------|-----|-----------------|----|---|---------------------------------------------------------------------------------------------|
|  |            | TYPICAL MANUFACTURING QUALITY PLAN                                                            |       |               |                                                         |                                                                           |                  | MQP. NO.:        |     |                 |    |   |                                                                                             |
|                                                                                   |            | PROJECT ENGINEERING & SYSTEMS<br>DIVISION BHEL,<br>RC PURAM, HYD-502032                       |       |               | PROJECT:<br>PACKAGE: <b>LT MOTOR</b><br>BHEL TECH SPEC: |                                                                           |                  | REV NO:          |     | DATE:           |    |   |                                                                                             |
|                                                                                   |            |                                                                                               |       |               |                                                         |                                                                           |                  | PAGE 3 OF 4      |     |                 |    |   |                                                                                             |
| SL NO                                                                             | COMPONENTS | CHARACTERISTICS                                                                               | CLASS | TYPE OF CHECK | QUANTUM OF CHECK                                        | REFERENCE DOCUMENT                                                        | ACCEPTANCE NORMS | FORMAT OF RECORD | * D | AGENCY<br>P W V |    |   | REMARKS                                                                                     |
| 3.12                                                                              | TYPE TESTS | Measurement of winding resistance in cold condition                                           | Major | Testing       | One /rating                                             | National & international standard ( IS or IEC ) / technical specification |                  | TC               | √   | 2               | -- | 1 | Verification of Identical Type test Report of same Rating                                   |
| 3.13                                                                              |            | Temp. rise test at full load ( load point for 100%, 75% & 50% load ( full load, ¾ and ½ load) | Major | Testing       | One /rating                                             |                                                                           |                  | TC               | √   | 2               | -- | 1 |                                                                                             |
| 3.14                                                                              |            | 160% momentary overload test                                                                  | Major | Testing       | One /rating                                             |                                                                           |                  | TC               | √   | 2               | -- | 1 |                                                                                             |
| 3.15                                                                              |            | Locked rotor amp and torque test                                                              | Major | Testing       | One /rating                                             |                                                                           |                  | TC               | √   | 2               | -- | 1 |                                                                                             |
| 3.16                                                                              |            | No load test                                                                                  | Major | Testing       | One /rating                                             |                                                                           |                  | TC               | √   | 2               | -- | 1 | Identical type test reports for motor ratings (not more than 5 years old) will be provided. |
| 3.17                                                                              |            | Reduced voltage running up test                                                               | Major | Testing       | One /rating                                             |                                                                           |                  | TC               | √   | 2               | -- | 1 |                                                                                             |
| 3.18                                                                              |            | Insulation resistance test ( before and after HV test)                                        | Major | Testing       | One /rating                                             |                                                                           |                  | TC               | √   | 2               | -- | 1 |                                                                                             |
| 3.19                                                                              |            | HV test – 1.8 KV for winding and 1.5 KV for space heater                                      | Major | Testing       | One /rating                                             |                                                                           |                  | TC               | √   | 2               | -- | 1 |                                                                                             |
| 3.20                                                                              |            | Vibration test                                                                                | Major | Testing       | One /rating                                             |                                                                           |                  | TC               | √   | 2               | -- | 1 |                                                                                             |
| 3.21                                                                              |            | 120% over speed test                                                                          | Major | Testing       | One /rating                                             |                                                                           |                  | TC               | √   | 2               | -- | 1 |                                                                                             |

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|                                                                                   |                                   |                                                                         |       |               |                  |                                                        |                  |                                                         |   |       |                     |             |  |         |
|-----------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------|-------|---------------|------------------|--------------------------------------------------------|------------------|---------------------------------------------------------|---|-------|---------------------|-------------|--|---------|
|  |                                   | <b>TYPICAL MANUFACTURING QUALITY PLAN</b>                               |       |               |                  |                                                        |                  | MQP. NO.:                                               |   |       |                     |             |  |         |
|                                                                                   |                                   |                                                                         |       |               |                  |                                                        |                  | REV NO:                                                 |   | DATE: |                     |             |  |         |
|                                                                                   |                                   | PROJECT ENGINEERING & SYSTEMS<br>DIVISION BHEL,<br>RC PURAM, HYD-502032 |       |               |                  |                                                        |                  | PROJECT:<br>PACKAGE: <b>LT MOTOR</b><br>BHEL TECH SPEC: |   |       |                     | PAGE 4 OF 4 |  |         |
| SL NO                                                                             | COMPONENTS                        | CHARACTERISTICS                                                         | CLASS | TYPE OF CHECK | QUANTUM OF CHECK | REFERENCE DOCUMENT                                     | ACCEPTANCE NORMS | FORMAT OF RECORD                                        | * | D     | AGENCY<br>P   W   V |             |  | REMARKS |
| 4.0                                                                               | <b>PRESERVATION &amp; PACKING</b> |                                                                         |       |               |                  |                                                        |                  |                                                         |   |       |                     |             |  |         |
|                                                                                   |                                   | Painting*,<br>(Shade, DFT,) Marking                                     | Major | Visual, DFT   | Random           | Technical specification/<br>approved drawing/datasheet |                  | TC                                                      | √ | 2     | --                  | 1           |  |         |
|                                                                                   |                                   | Packing*                                                                | Major | Visual        | Random           |                                                        |                  | Packing List                                            | √ | 2     | --                  | --          |  |         |

**Notes:-**

- This MQP should be read along with specification ((Latest revisions to be considered as per PO), approved drawings & approved datasheet.
- Specification/drawing/datasheet shall prevail over quality plan for contradiction if any.
- Any project/customer specific requirements which shall be notified have to be fulfilled by the vendor at the time of execution of order.

**Abbreviations:-**

|     |   |                           |     |   |                             |     |   |                    |
|-----|---|---------------------------|-----|---|-----------------------------|-----|---|--------------------|
| MTC | – | Material Test certificate | COC | – | Certificate of Compliance   | DFT | – | Dry Film Thickness |
| TC  | – | Test Certificate          | NDE | – | Non Destructive Examination | IR  | – | Inspection Report  |
| DFT | – | Dry Film Thickness        | IBR | – | Indian Boiler Regulations   | IS  | – | Indian Standards   |

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# TYPICAL QAP

## MANUFACTURING QUALITY PLAN

QP. NO.: QAP/BHEL/411, 412, 413

CUSTOMER: M/s BHEL, BHOPAL  
LOI: BHEL/PE&SD/PUR/LOI-T7E1Q07358, DATED: 26.09.2017  
MODEL: 4SC-15I/100+ (15 HP) – 03 NOS.  
MODEL: 4SR-03G/40+ (3 HP) – 02 NOS.  
MODEL: 4SR-05H/25+ (5 HP) – 02 NOS.

REV NO: 00

DATE: 04.10.2017

PAGE 1 OF 2

| SL NO      | COMPONENTS                                                      | CHARACTERISTICS               | CLASS    | TYPE OF CHECK      | QUANTUM OF CHECK | REFERENCE DOCUMENT         | ACCEPTANCE NORMS           | FORMAT OF RECORD          | * D | AGENCY P | W | V | REMARKS |
|------------|-----------------------------------------------------------------|-------------------------------|----------|--------------------|------------------|----------------------------|----------------------------|---------------------------|-----|----------|---|---|---------|
| <b>1.0</b> | <b>RAW MATERIALS &amp; BOUGHT OUT ITEMS</b>                     |                               |          |                    |                  |                            |                            |                           |     |          |   |   |         |
| 1.1        | MOTOR BODY, BOTTOM END SHIELD, TOP END SHIELD, IMPELLER, CASING | CHEMICAL & MECHANICAL         | CRITICAL | CHEM & MECH        | PER LOT          | AS PER APPROVED CS DRAWING | AS PER APPROVED CS DRAWING | SUPPLIER TEST CERTIFICATE | √   | 2        | - | 1 |         |
| 1.2        | SHAFT                                                           | CHEMICAL & MECHANICAL         | CRITICAL | CHEM & MECH        | PER BATCH        | AS PER APPROVED CS DRAWING | AS PER APPROVED CS DRAWING | SUPPLIER TEST CERTIFICATE | √   | 2        | - | 1 |         |
| <b>2.0</b> | <b>INPROCESS INSPECTION</b>                                     |                               |          |                    |                  |                            |                            |                           |     |          |   |   |         |
| 2.1        | SHAFT                                                           | UT                            | MAJOR    | UT                 | 100%             | ASTMA 388                  | ASTMA 388                  | ASTMA 388                 | √   | 2        | - | 1 |         |
| 2.2        | SHAFT                                                           | DPT                           | MAJOR    | DPT                | 100%             | ASTME 165                  | ASTME 165                  | NO INDICATIONS            | √   | 2        | - | 1 |         |
| 2.3        | IMPELLER, ROTOR WITH SHAFT                                      | DYNAMIC BALANCING             | MAJOR    | BALAN - CING       | 100%             | ISO-1940 (Gr. 6.3)         | ISO-1940 (Gr. 6.3)         | INSPECTION REPORT         | √   | 2        | - | 1 |         |
| 2.4        | CASING                                                          | HYDROSTATIC PRESSURE TESTING  | MAJOR    | HYDRO TEST         | 100%             | IS-14220                   | IS-14220                   | INSPECTION REPORT         | √   | 2        | - | 1 |         |
| 2.5        | ROUTINE TEST OF MOTOR                                           | ROUTINE TEST                  | MAJOR    | ROUTINE TEST       | 100%             | IS-9283                    | IS-9283                    | TEST REPORT               | √   | 2        | - | 1 |         |
| <b>3.0</b> | <b>FINAL INSPECTION &amp; TESTING</b>                           |                               |          |                    |                  |                            |                            |                           |     |          |   |   |         |
| 3.1        | PERFORMANCE TEST                                                | Q v/s H<br>Q v/s P<br>Q v/s ṡ | CRITICAL | PERFORM- ANCE TEST | 1/TYPE           | IS-14220                   | IS-14220                   | TEST REPORT               | √   | 2        | 1 |   |         |

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PREPARED BY



MANUFACTURER'S SIGNATURE & STAMP

APPROVED BY

BHEL QA SIGNATURE & STAMP

| <b>MANUFACTURER'S NAME &amp; ADDRESS:</b><br>DARLING PUMPS PVT. LTD.<br>K NO. 340/2, TIGARIA BADSHAH,<br>AGARBATTI COMPLEX, SANWER ROAD<br>INDUSTRIAL AREA<br>INDORE-452015 |                                   |                              | <b>MANUFACTURING QUALITY PLAN</b><br>CUSTOMER: M/s BHEL, BHOPAL<br>LOI: BHEL/PE&SD/PUR/LOI-T7E1Q07358, DATED: 26.09.2017<br>MODEL: 4SC-15I/100+ (15 HP) – 03 NOS.<br>MODEL: 4SR-03G/40+ (3 HP) – 02 NOS.<br>MODEL: 4SR-05H/25+ (5 HP) – 02 NOS. |                            |                  |                            |                            | QP. NO.: QAP/BHEL/411, 412, 413 |     |        |   |   |  |         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------------|----------------------------|----------------------------|---------------------------------|-----|--------|---|---|--|---------|
| REV NO: 00                                                                                                                                                                  |                                   |                              |                                                                                                                                                                                                                                                 |                            | DATE: 04.10.2017 |                            |                            |                                 |     |        |   |   |  |         |
| PAGE 2 OF 2                                                                                                                                                                 |                                   |                              |                                                                                                                                                                                                                                                 |                            |                  |                            |                            |                                 |     |        |   |   |  |         |
| SL NO                                                                                                                                                                       | COMPONENTS                        | CHARACTERISTICS              | CLASS                                                                                                                                                                                                                                           | TYPE OF CHECK              | QUANTUM OF CHECK | REFERENCE DOCUMENT         | ACCEPTANCE NORMS           | FORMAT OF RECORD                | * D | AGENCY |   |   |  | REMARKS |
|                                                                                                                                                                             |                                   |                              |                                                                                                                                                                                                                                                 |                            |                  |                            |                            |                                 |     | P      | W | V |  |         |
| 3.2                                                                                                                                                                         | PUMPS WITH ALL ACCESSORIES        | VISUAL & DIMENSIONAL         | CRITICAL                                                                                                                                                                                                                                        | VISUAL & MEASUREMENT CHECK | 1/TYPE           | AS PER APPROVED GA DRAWING | AS PER APPROVED GA DRAWING | -                               | √   | 2      | 1 |   |  |         |
| 4.0                                                                                                                                                                         | <b>PRESERVATION &amp; PACKING</b> |                              |                                                                                                                                                                                                                                                 |                            |                  |                            |                            |                                 |     |        |   |   |  |         |
| 4.1                                                                                                                                                                         | COMPLETE PUMP                     | PAINTING, PACKING & DISPATCH | MAJOR                                                                                                                                                                                                                                           | VISUAL                     | 100%             | DPPL STD.                  | DPPL STD.                  | -                               | -   | 2      | - | - |  |         |

|                                                                                                                                                                                                                                                                                                                            |                                                                                                      |                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|---------------------------|
| LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY), 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS. | PREPARED BY<br> | APPROVED BY               |
|                                                                                                                                                                                                                                                                                                                            | MANUFACTURER'S SIGNATURE & STAMP                                                                     | BHEL QA SIGNATURE & STAMP |

|                      |                                                                                   |                                                   |                                |
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| ESP-001-2A<br>Rev.00 |  | <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b> | Std. / Doc. Number             |
|                      |                                                                                   |                                                   | Annexure-5 to Doc. No. PY51326 |
|                      |                                                                                   |                                                   | Rev. No.   00                  |
|                      |                                                                                   |                                                   |                                |

|                                                                                                                                                                                                                                                |                                                   |
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|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|

|                                                   |                      |                     |                      |               |
|---------------------------------------------------|----------------------|---------------------|----------------------|---------------|
| <b>Revisions:</b><br>Refer to record of revisions | <b>Prepared by :</b> | <b>Checked by :</b> | <b>Approved by :</b> | <b>Date :</b> |
|                                                   | Rajeev Jain          | GIRISH              | Siva Prasad Babu     | 01.03.18      |

[illegible]

| MASTER DOCUMENT LIST - Submersible pump |                                                                                                           |                                                                                                   |                 |         |                      |                                     |                            |                           |                    |                                                            |    |         |       |    |         |                   |              |         |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------|---------|----------------------|-------------------------------------|----------------------------|---------------------------|--------------------|------------------------------------------------------------|----|---------|-------|----|---------|-------------------|--------------|---------|
|                                         | Vendor Name:                                                                                              |                                                                                                   |                 |         | PROJECT:             |                                     |                            |                           |                    |                                                            |    |         |       |    |         | Supplier Doc- No: |              |         |
|                                         | Vendor Contact Person:                                                                                    |                                                                                                   |                 |         | BHEL PO No.          |                                     | PO date:                   |                           |                    | PO Dly. Date:                                              |    |         |       |    |         | Rev- No.          |              |         |
|                                         | Vendor contact No.                                                                                        |                                                                                                   |                 |         | Supplier's Job No.   |                                     |                            |                           |                    |                                                            |    |         |       |    |         | Date:             |              |         |
|                                         | SYSTEM/PACKAGE:                                                                                           | Raw Sewage Sump Transfer Pumps/<br>Return activated Sludge Pumps/<br>Waste activated Sludge Pumps |                 |         |                      | TODAY-DATE                          | 1/Mar/18                   |                           |                    |                                                            |    |         |       |    |         |                   |              |         |
| Sl.No                                   | DRG/DOC. NAME                                                                                             | DRG/<br>DOC NO.                                                                                   | NO. OF<br>SHTS. | CAT     | CRITICAL FOR<br>MFG? | REQD.FOR<br>CUSTOMER<br>SUBMISSION? | Plan date of<br>submission | Count of DUE<br>as on Dt. | STATUS             | Rev-0                                                      |    |         | Rev-1 |    |         | Rev-2             |              |         |
|                                         |                                                                                                           |                                                                                                   | NO.             | (A / I) | (Y/N)                | (Y/N)                               | dd-mmm-yyyy                |                           | " /PV/PB<br>/PC/AA | SD                                                         | AD | APP.CAT | SD    | AD | APP.CAT | SD                | AD           | APP.CAT |
| 10                                      | BILL OF MATERIAL                                                                                          |                                                                                                   |                 | A       | N                    | N                                   |                            |                           |                    |                                                            |    |         |       |    |         |                   |              |         |
| 11                                      | BILLING BREAKUP                                                                                           |                                                                                                   |                 | A       | N                    | N                                   |                            |                           |                    |                                                            |    |         |       |    |         |                   |              |         |
| 12                                      | QUALITY ASSURANCE PLAN                                                                                    |                                                                                                   |                 | A       | N                    | Y                                   |                            |                           |                    |                                                            |    |         |       |    |         |                   |              |         |
| 13                                      | SUB VENDOR LIST                                                                                           |                                                                                                   |                 | I       | N                    | N                                   |                            |                           |                    |                                                            |    |         |       |    |         |                   |              |         |
| 14                                      | COMMISSIONING SPARES LIST                                                                                 |                                                                                                   |                 | A       | N                    | N                                   |                            |                           |                    |                                                            |    |         |       |    |         |                   |              |         |
| 15                                      | Mandatory Spares List                                                                                     |                                                                                                   |                 | A       | N                    | N                                   |                            |                           |                    |                                                            |    |         |       |    |         |                   |              |         |
| 16                                      | LUBE OIL SCHEDULE                                                                                         |                                                                                                   |                 | I       | N                    | N                                   |                            |                           |                    |                                                            |    |         |       |    |         |                   |              |         |
| 17                                      | STARTUP PROCEDURE                                                                                         |                                                                                                   |                 | I       | N                    | N                                   |                            |                           |                    |                                                            |    |         |       |    |         |                   |              |         |
| 18                                      | ERECTION PROCEDURE & Comissioing<br>procedure                                                             |                                                                                                   |                 | I       | N                    | N                                   |                            |                           |                    |                                                            |    |         |       |    |         |                   |              |         |
| 19                                      | INSPECTION/TESTS<br>REPORTS/CERTIFICATE                                                                   |                                                                                                   |                 | I       | N                    | N                                   |                            |                           |                    |                                                            |    |         |       |    |         |                   |              |         |
| 20                                      | O& M Manuals(Soft Copies)                                                                                 |                                                                                                   |                 | A       | N                    | N                                   |                            |                           |                    |                                                            |    |         |       |    |         |                   |              |         |
| 21                                      | O& M Manuals(Hard Copies)**<br>** hard copy shall be furnished after getting<br>concurrence on soft copy. |                                                                                                   |                 | I       | N                    | N                                   |                            |                           |                    |                                                            |    |         |       |    |         |                   |              |         |
|                                         |                                                                                                           |                                                                                                   |                 |         |                      |                                     | TOTAL                      | 0                         |                    | ^APP.CAT                                                   |    |         |       |    |         |                   |              |         |
|                                         | A-Approval Category                                                                                       | PV-Commented and pending with vendor                                                              |                 |         |                      |                                     | TOTAL "PV"                 |                           | 0                  | A1-'Approved                                               |    |         |       |    |         |                   | Approved By: |         |
|                                         | I-Information Category                                                                                    | PB- Pending with BHEL                                                                             |                 |         |                      |                                     | TOTAL "PB"                 |                           | 0                  | A2-'Mfg. Clearance given subject incorporation of comments |    |         |       |    |         |                   | Sign :       |         |
|                                         |                                                                                                           | PC- Pending with Customer                                                                         |                 |         |                      |                                     | TOTAL "PC"                 |                           | 0                  | A3-Commented.Revision & resubmission required.             |    |         |       |    |         |                   |              |         |
|                                         |                                                                                                           | AA- Approved                                                                                      |                 |         |                      |                                     | TOTAL "AA"                 |                           | 0                  | A4- Retained for info.                                     |    |         |       |    |         |                   | Date :       |         |
|                                         |                                                                                                           | " " - Not yet Due.                                                                                |                 |         |                      |                                     |                            |                           |                    |                                                            |    |         |       |    |         |                   |              |         |
|                                         |                                                                                                           | OD-Overdue                                                                                        |                 |         |                      |                                     | TOTAL "OD"                 |                           | 0                  |                                                            |    |         |       |    |         |                   |              |         |
|                                         |                                                                                                           | " " - Not yet Due.                                                                                |                 |         |                      |                                     |                            |                           |                    |                                                            |    |         |       |    |         |                   |              |         |

| Vendor documentation status |                |                                         |                                      |                                |                                              |                         |                                     |                                |                    |  |
|-----------------------------|----------------|-----------------------------------------|--------------------------------------|--------------------------------|----------------------------------------------|-------------------------|-------------------------------------|--------------------------------|--------------------|--|
| Total No of Docs            | Due as on Date | Submitt<br>ed by<br>vendor as<br>on Dt. | Approv<br>ed by<br>BHEL as<br>on Dt. | Commented by<br>BHEL as on Dt. | Pending with<br>BHEL/CUSTOM<br>ER as on date | %age of Dos<br>Approved | %age of<br>critical Dos<br>Approved | Is Mfg.<br>Clearance<br>given? | Status/<br>Remarks |  |
| (Nos)                       | (Nos)          | (Nos)                                   | (Nos)                                | (Nos)                          | (Nos)                                        | % age                   | % age                               | (Y/N)./( If Y<br>) put Dt.     |                    |  |
| 0                           | 0              | 0                                       | 0                                    | 0                              | 0                                            | #DIV/0!                 | 0.00%                               | Y                              |                    |  |

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| ESP-001-2A<br>Rev.00 |  | <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b> | Std. / Doc. Number             |
|                      |                                                                                   |                                                   | Annexure-7 to Doc. No. PY51326 |
|                      |                                                                                   |                                                   | Rev. No.   00                  |
|                      |                                                                                   |                                                   |                                |

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|                                                   |                      |                     |                      |               |
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|                                                   | Rajeev Jain          | GIRISH              | Siva Prasad Babu     | 01.03.18      |

## DEVIATION SCHEDULE TECHNICAL

Bidder are requested to mark “✓” as applicable

☐ No Deviation required

☐ Deviation required

List of deviations (expectations and /or addition requested by Bidder) from specification, standards and /or drawing etc.

| Sl. No. | Section / Part/Subsection | Page No. | Clause No. | Bid Specification | Bidder's Query | Purchaser's Reply |
|---------|---------------------------|----------|------------|-------------------|----------------|-------------------|
|         |                           |          |            |                   |                |                   |
|         |                           |          |            |                   |                |                   |
|         |                           |          |            |                   |                |                   |
|         |                           |          |            |                   |                |                   |
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|         |                           |          |            |                   |                |                   |
|         |                           |          |            |                   |                |                   |

**Note:** Bidder to furnish this duly filled format along with SEAL & SIGN at pre-bid stage only and any deviations appearing elsewhere shall not be considered.

SIGNATURE : \_\_\_\_\_  
NAME : \_\_\_\_\_  
DESIGNATION : \_\_\_\_\_  
COMPANY : \_\_\_\_\_  
DATE : \_\_\_\_\_

COMPANY SEAL

|                      |                                                                                   |                                                   |                    |
|----------------------|-----------------------------------------------------------------------------------|---------------------------------------------------|--------------------|
| ESP-001-2A<br>Rev.00 |  | <b>PROJECT ENGINEERING &amp; SYSTEMS DIVISION</b> | Std. / Doc. Number |
|                      |                                                                                   |                                                   | Annexure-8 to Doc. |
|                      |                                                                                   |                                                   | No. PY51326        |
|                      |                                                                                   |                                                   | Rev. No.   00      |

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|                                                   |                      |                     |                      |               |
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|                                                   | Rajeev Jain          | GIRISH              | Siva Prasad Babu     | 01.03.18      |

## DEVIATION SCHEDULE TECHNICAL

Bidder are requested to mark “✓” as applicable

☐ No Deviation required

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List of deviations (expectations and /or addition requested by Bidder) from specification, standards and /or drawing etc.

| Sl. No. | Section / Part/Subsection | Page No. | Clause No. | Bid Specification | Bidder's Query | Purchaser's Reply |
|---------|---------------------------|----------|------------|-------------------|----------------|-------------------|
|         |                           |          |            |                   |                |                   |
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|         |                           |          |            |                   |                |                   |

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COMPANY : \_\_\_\_\_  
DATE : \_\_\_\_\_

COMPANY SEAL