

**TELANGANA STATE POWER GENERATION
CORPORATION LIMITED (TSGENCO)**

**4X270 MW BHADRADRI
THERMAL POWER PROJECT**

VOLUME – II B

**TECHNICAL SPECIFICATION
FOR
SEWAGE TREATMENT PLANT**

SPECIFICATION NO. PE-TS-411-673-A001, R0



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, INDIA**



TITLE:
4 X 270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-673-A001

**TECHNICAL SPECIFICATION FOR
SEWAGE TREATMENT PLANT**

REV. NO. 00

DATE : 29/05/2017

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PROJECT INFORMATION

4x270 MW Bhadradi TPS is being set up by Telangana State Electricity Corporation Limited (TSGENCO) at Manuguru in the district of Khammam, Telangana, India.

The Bidder shall acquaint himself by a visit to the site, if felt necessary, with the conditions prevailing at site before submission of the bid. The information given here in under is for general guidance and shall not be contractually binding on BHEL/Owner. All relevant site data /information as may be necessary shall have to be obtained /collected by the Bidder.

APPROACH TO SITE

The distance from Manuguru to Major cities in state:

City	Km
Hyderabad	345
Warangal	180
Bhadrachalam	38
Kothagudem	70
Khammam	130
Vijayawada	195

District : **KHAMMAM**
State : **TELANGANA**

Nearest Airport: **The nearest airport is Vijayawada Airport but the most used airport is the Hyderabad International Airport.**

Nearest Railway Station: **Manuguru railway station is 10KM from nearby town. However, Warangal/ Vijaywada railway Station is major railway station near to Manuguru.**

1. Owner : TSGENCO
2. Project Title : 4X270 MW Bhadradi TPS
3. Location : 16 Km from Manuguru Railway station
4. Nearest Railway Stn. : Manuguru
5. Temperature
 - a. Mean daily minimum ambient temperature during oldest month of the year: 11.5 Deg.C
 - b. Mean daily minimum ambient temperature during hottest month of the year: 45.1 Deg.C
6. Rainfall: Intensity of rainfall @ 50 mm/hr considering heaviest fall in 24 hrs
7. Wind Data: Basic wind speed at 10m height : 44 m/sec
8. Wind pressure: As per IS: 875 Part III- 1987
9. Seismic Zone: Zone III as defined in IS:1893 (part-1)-2002 according to Indian Standard Seismic Zoning Map

10	Power Supply : The power supplies for distribution and auxiliaries shall be as under:	
	a) In plant generation	16.5kV $\pm 5\%$, 3ph, 50Hz $\pm 5\%$, high resistance earthed.



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b) MV distribution	6.6kV $\pm 6\%$, 3ph, 3w, 50 Hz, + 5 % to – 5%, Non-effectively earthed
c) LT distribution	415V $\pm 10\%$, 3ph, 4W, 50Hz + 5% to –5%, Effectively earthed
d) Motor rated above 160kW	6.6kV $\pm 6\%$, 3 ph 50Hz +5% to -5%.
e) Motor rated 160kW and below all motorized actuators.	415V $\pm 10\%$, 3 ph, 50Hz +5% to -5%.
f) For motors equal and below 30kW winding heating	24V AC $\pm 10\%$, 50 Hz %, [to be generated in 415V switchgear by vendor]
g) DC Motors	220V DC + 10% to - 15%, 2 wire ungrounded system
h) Control supply for relay panel/ 6.6kV breakers/415V breakers and DC emergency lighting.	220V DC + 10% to - 15%, 2 wire ungrounded system
i) UPS for instrumentation & Control system	240V AC $\pm 1\%$, 1 ph ,50Hz $\pm 0.5\%$ 2 Wire AC system
j) Control supply for 415V Motor contactors/AC Control circuits [to be generated in MCC /panel by vendor]	110V AC $\pm 10\%$, 50Hz + 5% to –5%.
k) Diesel Generator emergency supply	415V $\pm 10\%$, 3ph,3W, 50Hz +5%to –5%.
Fault levels	
a) 400kV	40kA rms for 1 sec
b) 6.6kV	40 kA rms for 1 sec.
c) 415V	50 kA rms for 1 sec.
d) DC Supply	25 kA



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SECTION – I

SPECIFIC TECHNICAL REQUIREMENTS

SUB-SECTION IA - SPECIFIC TECHNICAL REQUIREMENTS (MECHANICAL)

SUB-SECTION IB - SPECIFIC TECHNICAL REQUIREMENTS (ELECTRICAL)

SUB-SECTION IC - SPECIFIC TECHNICAL REQUIREMENTS (CONTROL & INSTRUMENTATION)



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SUB-SECTION IA

SPECIFIC TECHNICAL REQUIREMENTS (MECHANICAL)



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1.0 GENERAL

This specification is intended to cover design, engineering, manufacturing, inspection and testing at manufacturer's works of all equipments and foundations, packing, shipment and delivery to power station site, unloading, storage, handling at site, site testing, erection and commissioning, trial run, demonstration test and handing over plant to customer complete with all accessories including start up, commissioning and mandatory spares as required for Sewage Treatment Plant as per technical specification number **PE-TS-411-673-A001 for 4X270 MW BHADRADRI TPS.**

2.0 SCOPE OF SUPPLY

2.1 SCOPE OF SUPPLY FOR MECHANICAL (REFER P & ID OF SEWAGE TREATMENT PLANT)

- 2.1.1 Two (2) Nos. (1W+1S) submersible grinding type sewage transfer pumps for sewage sump (S1) complete with all instrumentation, valves, piping etc.
- 2.1.2 Two (2) Nos. (1W+1S) submersible grinding type sewage transfer pumps for sewage sump (S2) complete with all instrumentation, valves, piping etc.
- 2.1.3 Two (2) Nos. (1W+1S) submersible grinding type sewage transfer pumps for sewage sump (S3) complete with all instrumentation, valves, piping etc.
- 2.1.4 Two (2) Nos. (1W+1S) submersible grinding type sewage transfer pumps for sewage sump (S4) complete with all instrumentation, valves, piping etc.
- 2.1.5 Two (2) Nos. (1W+1S) submersible grinding type sewage transfer pumps for sewage sump (S5) complete with all instrumentation, valves, piping etc.
- 2.1.6 Two (2) Nos. (1W+1S) submersible grinding type sewage transfer pumps for sewage sump (S6) complete with all instrumentation, valves, piping etc.
- 2.1.7 Two (2) Nos. (1W+1S) submersible grinding type sewage transfer pumps for sewage sump (S7) complete with all instrumentation, valves, piping etc.
- 2.1.8 Two (2) Nos. (1W+1S) submersible grinding type sewage transfer pumps for sewage sump (S8) complete with all instrumentation, valves, piping etc.
- 2.1.9 Two (2) Nos. (1W+1S) submersible grinding type sewage transfer pumps for sewage sump (S9) complete with all instrumentation, valves, piping etc.
- 2.1.10 Two (2) Nos. (1W+1S) submersible grinding type sewage transfer pumps for sewage sump (S10) complete with all instrumentation, valves, piping etc.
- 2.1.11 Two (2) Nos. (1W+1S) submersible grinding type sewage transfer pumps for Common sewage collection sump complete with all instrumentation, valves, piping etc.
- 2.1.12 All instrumentation and accessories in sewage sump S1 (RCC work in BHEL scope).
- 2.1.13 All instrumentation and accessories in sewage sump S2 (RCC work in BHEL scope).
- 2.1.14 All instrumentation and accessories in sewage sump S3 (RCC work in BHEL scope).
- 2.1.15 All instrumentation and accessories in sewage sump S4 (RCC work in BHEL scope).
- 2.1.16 All instrumentation and accessories in sewage sump S5 (RCC work in BHEL scope).
- 2.1.17 All instrumentation and accessories in sewage sump S6 (RCC work in BHEL scope).
- 2.1.18 All instrumentation and accessories in sewage sump S7 (RCC work in BHEL scope).
- 2.1.19 All instrumentation and accessories in sewage sump S8 (RCC work in BHEL scope).
- 2.1.20 All instrumentation and accessories in sewage sump S9 (RCC work in BHEL scope).
- 2.1.21 All instrumentation and accessories in sewage sump S10 (RCC work in BHEL scope).
- 2.1.22 All instrumentation and accessories in Common sewage collection sump (RCC work in BHEL scope) located in STP area.
- 2.1.23 One no. above ground aeration tank of RCC construction (RCC work in BHEL scope) of minimum retention time of 16 hours.
- 2.1.24 One no. above ground RCC hopper bottom secondary clarifier (RCC work in BHEL scope) along with RCC flocculation tank (RCC in BHEL scope) with minimum capacity of 60 m3/day with an average flow of 6 m3/hr. Clarifier internals is in bidder's scope.
- 2.1.25 One no. agitator of SS 316 construction in flocculation tank.
- 2.1.26 One no. RCC clear water collection tank (RCC work in BHEL scope) complete with all instrumentation and accessories.
- 2.1.27 Two (2) nos. horizontal centrifugal pump for clear water transfer with 100 m hose pipe.



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- 2.1.28 One no. filter press having recovery of water for recycle to common sewage collection sump.
- 2.1.29 Two (2) Nos. (1W+1S) sludge recycle pumps complete with instrumentation and accessories to recycle the sewage of hopper bottom secondary clarifier to aeration tank and flocculation tank.
- 2.1.30 Two (2) nos. (1W + 1S) oil free type air blowers with electric motor drives for supplying air required for aeration tank and common sewage collection sump. Each blower shall be complete with motor, V-belt drive with belt guard, inlet filter/silencer, flexible couplings and discharge snubber, all mounted on a single base. Relief valve(s) shall be provided as required. Acoustic hood for air blowers shall also be provided by the bidder.
- 2.1.31 One (1) no. sodium hypochlorite dosing tank of minimum 24-hour storage capacity for dosing chemical to clear water tank complete with instrumentation, dissolving basket and slow speed agitator of SS 316 construction. MOC of dissolving basket will be SS 316.
- 2.1.32 Two nos. sodium hypochlorite dosing pumps along with instrumentation and accessories.
- 2.1.33 Necessary piping, valves, fitting, instruments etc. as per P&ID for sewage treatment plant enclosed with this technical specification.
- 2.1.34 The scope of supply and erection shall include all interconnecting piping, fittings, supports, valves, instruments etc.
- 2.1.35 One no. PLC based control system along with accessories.
- 2.1.36 One no. common RIO panel is in bidder's scope for all sewage lifting sumps located outside boundary of STP area.
- 2.1.37 4.0 km fiber optical cable are in bidder's scope for communication between RIO panel and PLC located in STP area.
- 2.1.38 Bidder to take care the length of piping as included elsewhere in specification of Sewage Treatment plant. Pipe routing shall be decided during detailed engineering, however bidder will consider 10 m static head + 10% margin during pump selection for outside STP area and clear water Transfer Pumps.
- 2.1.39 The pipe shall run on pipe pedestals. All auxiliary steel structures (U-clamps, nuts, bolts, channels etc.) for fixing the pipe on the pedestal or trestles shall be in the scope of bidder. If buried piping is required, Wrapping, coating and protection of all the buried pipe is also in bidder's scope & shall be as per IS 10221.
- 2.1.40 All steel inserts plates with lugs, rungs, ladder, puddle pipes, bolts, edge angle in desired shape, nuts, sleeves, and all other embedding components etc as required to grout in BHEL civil works and to support/hold the equipments being supplied under this specification shall be in bidder's scope.
- 2.1.41 Any statutory clearance required for the system from MOEF or local pollution control board in bidder's scope.
- 2.1.42 Initial charge of all lubricants & grease in bidder's scope.
- 2.1.43 The pipe sizes indicated in the tender specification/ P & I diagram are minimum. Wherever pipe sizes are not indicated, the same shall be selected based on the specification requirement and shall be subject to BHEL / customer approval during detailing engineering. All pipes shall be carbon steel unless exclusively mentioned.
- 2.1.44 All necessary drains, vents and sampling points with valves as specified and as required are in bidder's scope.
- 2.1.45 Monitoring gadgets, instruments and equipments required for maintenance (till PG test & plant handover).
- 2.1.46 Associated piping, instrumentation and valves required for the system.
- 2.1.47 All necessary instruments and controls required for easy and safe operation of the system.
- 2.1.48 Wherever terminal points between BHEL and bidder indicated, bidder shall provide pipes with counter flange.
- 2.1.49 All pipes, fittings etc. required for hand railing, platforms, and ladders shall be in the scope of bidder. All ladders shall be non-civil work. All insert plates, nuts and bolts, counter flanges wherever applicable shall be in the scope of bidder. Supply and erection of Hand railing as desired for safety purpose will be in bidder's scope.
- 2.1.50 All the sumps, tanks, reservoirs and other water retaining structures shall be provided with access ladders/rungs from operating platforms/ground level as the case may be and de-watering pits one for each section (civil work by BHEL).
- 2.1.51 Instrumentation, valves etc. indicated in P & ID of sewage treatment plant are bare minimum requirement, however bidder has to provide complete system for trouble free operation meeting technical specification requirement.
- 2.1.52 Sewage sumps S1, S2, S3, S4, S5, S6, S7, S8, S9 and S10 shall be located outside STP area however rest facilities indicated in P & ID of STP shall be located inside STP area provided in plot plan included in this specification.



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2.1.53 All blank flanges/counter flanges, isolations valves, tees etc. to interconnect the pipes at all terminal points.

2.1.54 Chain Pulley blocks for sewage sumps.

2.1.55 Media for aeration tank and sludge holding tank, if any.

2.1.56 PIPING

- a) Complete piping indicated in P & ID of Sewage treatment plant is in bidder's scope of supply and erection. In addition, any additional piping required to make the system complete inside STP area shall be in bidder's scope. Pipe length inside STP area has to be considered by bidder in their scope as per approved equipment layout and piping layout during detailed engineering.
- b) Pipe distances from sumps outside STP area upto STP area are given below:

SL. NO.	FROM	TO	DISTANCE (In meters)
1.	Sewage sump (S1)	STP area	640
2.	Sewage sump (S2)	Sewage sump (S1)	365
3.	Sewage sump (S3)	Sewage sump (S2)	150
4.	Sewage sump (S4)	Sewage sump (S1)	425
5.	Sewage sump (S5)	Sewage sump (S4)	310
6.	Sewage sump (S6)	Sewage sump (S5)	335
7.	Sewage sump (S7)	Sewage sump (S8)	215
8.	Sewage sump (S8)	Sewage sump (S6)	550
9.	Sewage sump (S9)	STP area	510
10.	Sewage sump (S10)	STP area	360

Bidder to note that no commercial settlement / adjustment shall be entertained for variation upto +/- 15% of pipe lengths tabulated above during detailed engineering.

Bidder to note that above piping distances are in bidder's scope. Distances given above are from one area to other area only, however inside piping in respective area shall be in bidder's scope which is not included in above distances.

2.1.57 100-meter hose pipe from clear water disposal pumps shall be provided by bidder for horticulture purpose.

2.1.58 Mandatory spares as per list attached in ANNEXURE VI.

2.1.59 Special tools and tackles as required for the system.

2.1.60 All special tools necessary for proper maintenance or adjustment of the equipment packaged in permanent box. Finish paints for touch-up painting of equipment after erection at site in sealed container.

2.1.61 Start-up and commissioning spares as required.

2.1.62 All the first fill and one Year's topping requirements of consumable such as greases, oil, lubricants, servo fluids/control fluids, gases and etc. which will be required to put the equipment covered under the scope of specifications, into successful commissioning / initial operation and to establish completion of facilities shall be furnished by the bidder. Suitable standard lubricants as available in India are desired. Efforts should be made to limit the variety of lubricants to minimum.

2.1.63 One no. (1X100%) Filter press shall be provided by bidder.

2.1.64 Two (2) nos. (2X100%) horizontal filter press feed screw pumps shall be provided by bidder.

2.1.65 One no. Sludge Holding tank (RCC work in BHEL scope) in two compartment each of 24 m3 capacity.

2.1.66 Grouting material is in bidder's scope.

2.2 SCOPE OF SUPPLY (ELECTRICAL)

Complete electrical as per specification / details indicated in Sub Section IB and IIB.

2.3 SCOPE OF SUPPLY (C&I)

Complete C&I as per specification / details indicated in Sub Section IC and IIC.

2.4 SCOPE OF SUPPLY (CIVIL)



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Total Civil is in BHEL Scope of work, however Civil Input drawing shall be provided by bidder.

3.0 SCOPE OF SERVICE

The bidder's scope also includes following services for scope under this specification:

- a. Unloading, Storage, handling and transportation at site.
- b. Minor civil work like chipping of foundation, grouting below base plate for all structures, equipment, grouting of anchor bolts wherever these are not placed in the foundation during casting of foundation itself, excavation & filling of earth for buried pipes if and as required. To the extent possible, vendor shall ensure to supply all foundation bolts timely so as to facilitate placement of these bolts while casting the foundation. Wrapping, coating and protection of all the buried pipe shall be as per IS 10221.
- c. Pre- Commissioning work such as flushing, hydraulic testing etc. Necessary consumables and instrumentation as required for inspection and testing at works as well as at site including pre-commissioning activities shall be arranged by the successful bidder at their own cost.
- d. Erection and Commissioning of entire Sewage Treatment Plant.
- e. Arrangement of all lubricants, instruments, reagents for carrying out trial run, commissioning and demonstration test.
- f. Monitoring gadgets, instruments and equipment required for maintenance (till demonstration test & Plant Hand over).
- g. All personnel required during commissioning, trial run and demonstration Test.
- h. Trial run for requisite period.
- i. Performance testing.
- j. Training of plant Owner's personnel, O&M operators' personnel on plant operation and maintenance.
- k. All other facilities/ services as described in section on site services in specification and related to sewage Treatment Plant scope of work.
- l. Relevant requirements as per GTR, GCC, ECC & SCC.
- m. Any other service required for making the installation complete in all respect within battery limits and for satisfactory erection & commissioning of the system as well as to meet any statutory requirement relevant to the package, unless specifically excluded from scope of services.
- n. Painting as per enclosed painting schedule ANNEXURE V. However, any variation in the painting schedule as finally approved by customer / BHEL shall be taken care by bidder without any commercial and delivery implication. Colour-coding scheme shall be intimated to vendor during detailed engineering.

4.0 TERMINAL POINTS

- a. Service water line (50 NB) will be provided by BHEL at 5 m distance from STP area. Further distribution inside STP area will be in bidder's scope. Bidder to note that pressure available at terminal point for service water will be 2 kg/cm² approx (max.); hence bidder will take care for their pump lubrication / cooling accordingly.
- b. All drains of STP plant shall be connected to common sewage collection sump inside STP area.
- c. Hard Sludge generated in filter press will be manually disposed by customer.

5.0 EXCLUSIONS

- 5.1 All civil works including foundation of equipment, excavation & back filling. However complete grouting for equipment, fixing and any concreting inside vessels and lining shall be in the scope of the bidder. Civil works including operating / maintenance platforms and interconnection platforms (if any) with ladders / stairs & handrails, structural supports and hangers for pipes / ducts, all embedments and inserts with lugs including anchor fasteners, bolts etc., dressing of foundations, grouting of pockets and underpinning of base plates for equipment / structures and fixing supports, filling and finishing of openings in walls, floors, cladding, roof and trenches shall be in Bidder's scope.
- 5.2 Main pipe trestles.
- 5.3 Air conditioning, ventilation & firefighting facilities.
- 5.4 Other exclusions are mentioned in the electrical & C&I parts of this specification.
- 5.5 Service water up to terminal points.
- 5.6 Chemicals.



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6.0 QP AND SUBVENDOR APPROVAL:

- 6.1 Minimum QP requirements are specified as C1 D. However, any additional comments as given by BHEL/Customer shall be adhered by the bidder without any commercial & delivery implication to BHEL.
- 6.2 The sub vendor list (Annexure- II) enclosed is indicative only and is subject to BHEL and Customer approval during detailed engineering stage without any commercial & delivery implication to BHEL.
- 6.3 Bidder to propose sub vendor list with following back up documents within 4 weeks of placement of LOI/LOA. Thereafter no request for additional sub-vendor shall be entertained. The sub vendor list shall subject to BHEL and Customer approval during detailed engineering stage without any commercial & delivery implication to BHEL.
- 6.4 Bidder to assess the capability of their proposed sub-vendors in terms of preparation of drawings, calculations, documents, quality assurance, supply of material etc. as per project schedule before placing the order on them.
- 6.5 Dealers are not acceptable for any item of the package. Bidder shall procure all items including plates, structural, flanges; counter flanges etc. from approved sub vendor only.
- 6.6 Bidder to refer Annexure I for quality requirements

7.0 DESIGN /CONSTRUCTION

In addition to the requirements of Section I & II the following shall also be complied under scope of this specification.

The P&I diagram is enclosed herein in this section for bidder's compliance.

The material of construction specified in data sheet-A are minimum requirements and material of construction for other components not specified shall be similarly selected by the bidder for intended duty which shall be subject to BHEL / Customer approval during detail engineering without any commercial & delivery implication to BHEL.

8.0 PAINTING

Painting shall be C1 E of technical specification. Internal painting of the equipments shall be suitable for withstanding effect of sewage. Outer painting shall be as per technical specifications. Supporting documents shall be furnished in support of suitability of the lining offered for the duty conditions by bidder during detailed engineering.

9.0 INFLUENT QUALITY AND OUTLET GUARANTEE PARAMETERS:

9.1 INFLUENT QUALITY:

- Persons Envisaged : 1200
- Flow Rate : 60 M³/day (Max).
- BOD₅ : 300 mg/l.
- COD : 600 mg/l.
- TSS : 450 mg/l.
- pH : 7 – 8.
- Temperature : Ambient.

9.2 OUTLET GUARANTEE PARAMETERS:

- BOD₅ : 20 mg/l
- COD : 100 mg/l
- TSS : 30 mg/l
- pH : 7 – 8
- Temperature : Ambient

Bidder to refer Annexure III Functional / performance / demonstration guarantee requirements.



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10.0 DRAWING/DOCUMENTS REQUIREMENT

- 10.1 For the Drawings/Documents distribution Procedure, please refer attached Annexure-IV. Bidder has to submit the revised drawing/document along with the compliance sheet indicating enumerate reply to all BHEL and customer comments or observations. Without compliance sheet the submission of the drawings/documents will not be considered and the delay on this account will be solely on bidder's side only. The numbers of soft copies & hard copies of drawing/documents to be submitted by the bidder shall be as per enclosed Annexure-IV.
- 10.2 After award of LOI/LOA, drawing/documents to be submitted by the bidder for BHEL/Customer approval has been indicated in Annexure VII. However, any additional drawing/document if found necessary for completion of the engineering, the same shall be submitted by bidder without any commercial & delivery implication to BHEL.
- 10.3 Bidder to note that the successful bidder, during detail engineering, will submit the drg/doc through web based Document Management System in addition to hard copies to be submitted as per the Annexure IV of this specification. Bidder would be provided access to the DMS for drg/doc approval and adequate training for the same. Detailed methodology would be finalized during the kick-off meeting. Bidder to ensure following at their end:
- Internet explorer version – Minimum Internet Explorer 7
 - Internet speed – 2 mbps (Minimum preferred)
 - Pop ups from our external DMS IP (124.124.36.198) should not be blocked
 - Vendor's Internal proxy setting should not block DMS application's link (<http://124.124.36.198/wrenchwebaccess/login.aspx>)
 - DMS user manuals to be used by BHEL PEM vendors for uploading, viewing, revising, commenting and tracking documents on PEM's DMS have been uploaded on PEM internet website (www.bhelpem.com) under the Vendor session.
 - For quick access bidder may refer the link <http://bhelpem.com/DMSManuals/DMSManuals.html>

11.0 SPARES

The Bidder shall include in his scope of supply all the necessary Mandatory spares, start up and commissioning spares as indicated in the relevant sections of specifications. The general requirements pertaining to the supply of these spares is given below: -

11.1 MANDATORY SPARES

- a. The list of mandatory spares which is to be considered by bidder in their scope are indicated in Annexure VI.
- b. All mandatory spares shall be delivered at site at least two months before scheduled date of initial operation of the first unit. However, spares shall not be dispatched before dispatch of corresponding main equipments.
- c. Wherever quantity is specified both as a percentage and a value, the Bidder has to supply the higher quantity until and unless specified otherwise.
- d.
- e. Inspection of mandatory spares shall be in line with the approved quality plans for the respective items/equipments. The inspection categorization of mandatory spares shall also be in line with the approved Categorization plan for the respective items/equipment.

11.2 START-UP & COMMISSIONING SPARES



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- a. Start-up and commissioning spares are those spares which are required during the start-up and commissioning of the equipment/system. All spares used till the plant is handed over to the BHEL/Customer shall come under this category. The Bidder shall provide for an adequate stock of such start up and commissioning spares to be brought by him to the site for the plant erection and commissioning. They must be available at site before the equipments are energized. The unused spares, if any, should be removed from there only after the issue of Taking Over certificate. All start up spares which remain unused at the time shall remain the property of the Bidder.
- b. The Bidder shall indicate the service expectancy period for the spares under normal operating conditions before replacement is necessary.
- c. All spares supplied under this contract shall be strictly inter changeable with the parts for which they are intended for replacements. The spares shall be treated and packed for long storage under the climatic conditions prevailing at the site e.g. small items shall be packed in sealed transparent plastic with desecrator packs as necessary.
- d. All the spares (mandatory) shall be manufactured along with the main equipment components as a continuous operation as per same specification and quality plan.
- e. Each spares part shall be clearly marked or labelled on the outside of the packing with its description. When more than one spares part is packed in a single case, a general description of the content shall be shown on the outside of such case and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purposes of identification.
- f. All cases, containers or other packages are to be opened for such examination as may be considered necessary by BHEL / Customer.
- g. The Bidder will provide the BHEL/Customer with all the addresses and particulars of his sub suppliers while placing the order on vendors for items/components/equipments covered under the contract and will further ensure with his vendors that the BHEL/Customer, if so desires, will have the right to place order for spares directly on them on mutually agreed terms based on offers of such vendors.
- h. The Bidder shall warrant that all spares supplied will be new and in accordance with the contract Documents and will be free from defects in design, material and workmanship.
- i. The bidder to provide datasheets/assembly drawings of the manufacturer/ any other relevant document showing Bill of Material(s), Make, Model Number, Part Number etc. through which the mandatory spares to be supplied can be uniquely identified.

12.0 ADDITIONAL REQUIREMENT

- Chemical dosing system shall be housed in the shed inside STP area, Control panel shall be located in RCC building. RCC building shall have toilet blocks for ladies and gents.
- Bidder to submit BBU during detailed engineering after approval of Basic documents. BBU shall be equal to BOQ for the package and there shall be no price and delivery implication is applicable to BHEL / customer for the same. None of the items supplied for the project as non-billable. Incomplete BBU shall not be review by BHEL.

Bidder to submit BBU during detailed engineering after approval of Basic documents. BBU shall be equal to BOQ for the package and there shall be no price and delivery implication is applicable to BHEL / customer for the same. None of the items supplied for the project as non-billable. Incomplete BBU shall not be review by BHEL. Further during detail engineering breakup of supply prices of Sewage treatment plant in the Billing break up schedule shall be prepared as per below mentioned details:



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1.0	THE BREAK UP (%) OF SUPPLY PRICES OF SEWAGE TREATMENT PLANT IN THE BBU SHALL BE IN LINE WITH THE BELOW PROVIDED DETAILS:	
1.2	Lump sum firm price for supply of Valves inclusive of all taxes, duties and other levies as applicable.	8% of Total Supply Price.
1.3	Lump sum firm price for supply of Pumps & Blowers with motor inclusive of all taxes, duties and other levies as applicable.	21% of Total Supply Price.
1.4	Lump sum firm price for supply of Piping & Fittings inclusive of all taxes, duties and other levies as applicable.	33% of Total Supply Price.
1.5	Lump sum firm price for supply of Agitators and strainers inclusive of all taxes, duties and other levies as applicable.	2% of Total Supply Price.
1.6	Lump sum firm price for supply of Instruments & analysers inclusive of all taxes, duties and other levies as applicable.	10% of Total Supply Price.
1.7	Lump sum firm price for supply of PLC system ,UPS with battery & battery charger, ACDB & BHMS (as applicable) inclusive of all taxes, duties and other levies as applicable.	12% of Total Supply Price.
1.8	Lump sum firm price for supply of Balance Miscellaneous items inclusive of all taxes, duties and other levies as applicable.	14% of Total Supply Price.

- Any statutory requirement / clearance required for the package from government / local body shall be in bidder's scope.
- All interconnecting piping, valves, fittings including dosing piping, drain piping from tanks to nearby drain, flushing lines from nearest available water source, valves, fittings and accessories is also in bidder's scope.
- Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval shall be taken from BHEL. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to customer for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.
- KKS numbering if required, as per BHEL/Customer requirement shall be provided by the Bidder during detailed engineering stage without any commercial/delivery implication to BHEL.
- Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the works for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The bidder without any extra charge shall provide the same.
- Buried piping shall be protected as under (as per IS-10221).
 - Surface cleaning by wire brush, power tool cleaning etc.
 - Apply one coat of coaltar/primer/enamel.
 - Apply one layer of tape comprising of coaltar. Application of tape shall conform to AWWA C- 203/IS 10221 (appendix-B) with Minimum thickness of tape as 4MM +10%
- All drawings/documents shall be approved by BHEL/Customer during detailed engineering stage. Successful Bidder shall comply with the comment of the customer/BHEL without price & delivery implication.
- Successful bidder shall furnish detailed erection manual for each of the equipment as well as complete system supplied under this contract at least 3 months before the scheduled erection of the concerned equipment / component or along with supply of concerned equipment / component whichever is earlier.
- Final Electrical Load list will be submitted by the successful bidder as per agreed drawing/ doc submission schedule. Thereafter any change in the electrical load list shall be entertained only subject to its feasibility, and BHEL reserves the right to debit the vendor cost of any changes necessitated in the switch gear /MCC on account of changed loads.
- Wherever CIVIL works is excluded from the bidder's scope, successful bidder shall furnish civil



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assignment / scope drawings. The corresponding CIVIL drawing prepared by BHEL / CIVIL agency, based on civil assignment drawing of bidder will be furnished to the successful bidder for concurrence. In case any modification is required in the civil work already carried out based on final civil inputs given by bidder, BHEL reserves the right to debit cost of such rework to bidder.

- In case vendor submits revised drawing after approval of the corresponding drawing, any delay in approval of revised drawing shall be to vendor's account and shall not be used as a reason for extension in contract completion.
- Bidders shall make Site visit in order to familiarize themselves with existing condition of site before submitting the bid in order to make their offer complete. During detail engineering also, the successful bidder shall be responsible for the correctness of details w.r.t. existing facility at site. Customer approval on any drawing having details of existing facility shall not be cited by the successful bidder a valid reason for any shortcoming in the work by them. BHEL shall also not entertain any cost implication for any lack of input data with regard to site during detail engineering.
- Bidder to adhere Format of operation and maintenance manual requirement as per Annexure IX during detailed engineering.
- Bidder to adhere site storage and preservation requirement as per Annexure X during detailed engineering.
- Bidder to adhere site General technical requirement as per Annexure XI during detailed engineering.
- Bidder to refer Plot plan attached with this section. Location of sewage sumps is located in plot plan along with tentative buried routing for bidder's information. All sewage transfer piping from sewage lifting sumps upto Sewage treatment plant shall be buried.

13.0 PLANT OPERATION AND CONTROL

Sewage treatment plant shall be controlled from PLC based control system.

The control philosophy of various systems is described below. However, for all the systems, following basic process related interlocks, alarms /pre-warning signals shall be implemented in the control system as per system requirement.

- a) Among the equipments, it shall be possible to select a specific pump or tank or sump for working/standby/ maintenance etc through control system.
- b) Permissive & Interlocks:
 - (i) Starting & tripping of pumps with respect to liquid level in the respective sump/tanks or liquid pressure in the suction lines.
 - (ii) Starting & tripping of agitators with respect to liquid level in the respective sump/tanks.
 - (iii) Starting & tripping of pumps (which are provided with forced water lubrication) with respect to lubricating water flow (through low pressure/ low flow signal as the case may be).
 - (iv) Tripping of pumps when the discharge pressure is very high to avoid operation of the pump under shutoff head.
 - (v) Stopping/ tripping of equipments due to abnormal parameters related to safety of equipments like high vibration, very high bearing lubrication water (and /or oil) temperature to the drive/pumps, very high bearing temperature of the of pump/drive etc as applicable based on the recommendations of Equipment Supplier.
 - (vi) Automatic opening of the re-circulation valve to pre-set percentage, in case of failure of opening of pump(s) discharge valve to ensure minimum flow through the pump, as per the recommendation of manufacturer.
 - (vii) Automatic starting of standby pumps upon failure of starting of selected pump or tripping of running pump as the case may be.
 - (viii) Capacity of the metering pump shall be controllable from 10-100% continuously by adjusting the stroke length manually by a micro meter dial calibrated for 0–100% of pump capacity integral with the pump.



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- (ix) Various annunciations related to low level of the chemical tanks & sumps shall be provided.
- (x) Alarms /Signals
- (xi) Abnormal parameters such as low & high level in tanks/sumps, high pressure at pump discharge, low header pressure, low lubrication water flow to pumps (provided with forced water lubrication system) etc.
- (xii) Failure of starting of equipments such as pumps, blowers etc. upon start command.
- (xiii) Tripping of equipments due to protection logic.

In addition, the control system shall facilitate the operator to know the status of various equipments (Whether equipment is running or stopped or tripped etc, whether the equipment is selected for operation/standby duty /maintenance mode etc as the case may be).

MATERIAL HANDLING EQUIPMENTS

1.0 ELECTRIC HOIST (EOT) AND MANUAL HOIST (CHAIN PULLEY BLOCK)

Required number of electric hoist / manual hoist of adequate capacity, to meet the erection and maintenance requirements are to be provided for the various areas where handling weight is more than 500 kg.

Manual hoists (hand operated) shall be designed to duty class 2 as per IS 3832 and electric wire rope hoist shall be designed as per IS: 3938 (latest).

The stipulations of all statutory codes like Indian Electricity Act, Indian Electricity Rules, Factory Acts, Local Municipality act etc. shall however prevail over the specification requirements, in case any conflict arises between this specification and the statutory codes.

Maintenance tools and tackles shall be as per data sheet attached.

DESIGN CRITERIA

For the hoists with more than 2.0 tonne lifting capacity and/ or more than 10.0 M lift i.e. either capacity or lift is more than 2T or 10 m, Electrical hoist shall be provided. Less than or equal to 2T and lift ≤ 10 m hoist blocks shall be of hand operated type for both travel and lift.

However, all monorails coming out of the building shall be provided with electric hoist block, irrespective of load and lift.

Capacity of electric and manual (Chain pulley block) hoists shall be decided keeping 25% margin over heaviest equipment to be handled.

For hand operated hoists, the hoists shall be suitable for operation from floor level. Hand chain shall be provided for long travel of trolley and the Hoisting mechanism. For electric hoist, operator shall be able to control the movement of the electrical hoist with the help of floor operated pendant

Note;

1. Area, type, capacity mentioned are minimum requirement and shall be finalized during detail engineering without any commercial implication
2. Travel and Lift are layout dependent and shall be finalized during detail engineering without any commercial implication
3. Additional electric/manual hoist required during detail engineering shall be provided as per design criteria given above without any commercial implication.

2.0 SCOPE OF SUPPLIES



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Equipment and services to be furnished by the bidder for the ELECTRIC HOIST/ MANUAL HOIST with accessories as per the details given in the technical specification and data sheet A. Any equipment / accessories not specified in the specification but required to make the ELECTRIC HOIST/ MANUAL HOIST complete and efficient operation shall also be under the bidder's scope of work.

Compliance with this specification shall not relieve the bidder of the responsibility of furnishing material and workmanship to meet the specified working/duty conditions.

2.1.0 ELECTRIC HOIST

Electric hoist shall include but not be limited to the following: -

- a. Hoisting and CT drive arrangement
- b. All electrical equipment including trailing cables and panels.
- c. PVC insulated shrouded bus bar DSL
- d. Earthing arrangement.
- e. Fill of lubricant till commissioning / handling over to customer.
- f. Painting of electric hoist and accessories.
- g. Maintenance tools & Tackles
- h. Erection & Commissioning spares
- i. Isolating switch in enclosure at operating floor for disconnecting supply to DSL while maintaining the electric hoist.
- j. Mandatory spares

2.2.0 MANUAL HOIST (CHAIN PULLEY BLOCK)

Manual hoist shall include but not be limited to the following:

- a. Chain pulley blocks with/without traveling trolleys
- b. Maintenance Tools and Tackles
- c. Mandatory spares

2.3.0 Erection and Commissioning spares (ELECTRIC HOIST)

The Bidder shall also supply erection & commissioning spares along with his main equipment as per his experience, for replacement of damaged or unserviceable parts during the execution of the project at site, to avoid delay in the project schedule. This shall form part of the main equipment supply. The Purchaser shall retain the unutilized commissioning spares. The initial fill of lubricants, oil etc. shall also be supplied by the bidder.

2.4.0 Services to be provided by the bidder

Packing, forwarding and transportation to site, storage and handling at site.

2.5.0 Erection and Commissioning

2.6.0 Functional test (Overload testing, load testing at rated speed, travel and hoisting motion checks as per relevant Indian standards)

2.7.0 Obtaining clearance and acceptance certificate from the concerned competent authority after site test as applicable. Necessary fees/expenditure as required shall be borne by the supplier.

3.0 INSPECTION AND TESTING

Inspection and testing shall be carried out as per enclosed standard quality plan approved QAP and as per IS 3938 (latest revision). Prime inspection agency shall be NBPPL/End Customer. Equipment supplied shall be strictly in accordance with nomenclature & technical specification. Any additional testing requirement/ CHP (Customer Hold Point) at any stage of inspection deemed necessary by Customer/NBPPL during detailed engineering shall be carried out without any commercial or technical implication.

4.0 WORKS EXCLUDED

Supply of ISMB monorail.

5.0 PAINTING SPECIFICATION

As per painting details specified elsewhere in specification.

ELECTRIC HOIST COLOR SHADE:

Color shade: Structure: Golden Yellow, RAL 1004



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Panel: Opaline green for exterior and semi glossy white for interior.

MANUAL HOIST COLOR SHADE:

Trolley: Lemmon yellow (Shade 355 as per IS 5)

Hook: Light grey (Shade 631 as per IS 5)

6.0 PACKING

As per packing details specified elsewhere in specification.

7.0 DEMONSTRATION TEST

Hoist along with its drives, controls and other accessories shall be demonstrated for the rated capacity against the rated speed of motions and for the service conditions specified as specified in QAP and as per IS 3938 for electric hoist and IS 3832 for manual hoist.

The bidder shall have the full responsibility for the safe and efficient operation of the hoist with associated accessories as a single unit.

If the shop/site performance tests indicate the failure of any of the components to achieve the guaranteed performance, the deficiency shall be made good at bidder's cost.

Demonstration tests shall be carried out each time after the rectification /modification is carried out.

8.0 MAKE OF SUB - VENDOR ITEMS

Makes of bought out items will be as per list specified in the specification. No other make will be acceptable, until and unless specifically got it approved by the purchaser/ end client.

9.0 TESTING AT SITE

A) ELECTRIC HOIST:

As required for statutory clearance for operating at site i.e., overload test, load test and other tests as per IS 3938.

Test for Operation -After the supply has been connected, tests shall be carried out to prove the following:

- a) The satisfactory operation of each controller, switch, contactor, relay and other control devices and in particular the correct operation of all limit switches under the most unfavorable conditions;
- b) The correctness of all circuits and interlocks and sequence of operation; and
- c) The satisfactory operation of all protective devices.

Overload Test -After test but before the hoist is put into service, it shall be tested with overload relays appropriately set, to lift and sustain a test load of 125 percent of the working load. During the overload test, the hoist shall sustain the load under full control. The specified speeds need not be attained but the hoist shall show itself capable of dealing with the overload without difficulty.

B) MANUAL HOIST:

As required for statutory clearance for operating at site with following minimum test i.e., overload and load test.

10.0 Maintenance Tools and Tackles

One (1) complete unused new set of special purpose tools, tackles and accessories along with detailed instructions and maintenance manual shall be supplied for each EH/CPB. Tools shall be of suitable sizes for maintenance of electric hoist of each type and capacity. Each tool shall be stamped so as to be identified easy for its use. The tools shall be supplied in steel toolbox. The items supplied shall be of the best quality, specially protected against rusting. The following shall be provided as minimum requirement:

S-No.	Description	Qty.
1	Complete set of ring spanners (Indicate the sizes offered)	1 Set



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2.	Complete set of screwdrivers (Indicate the sizes)	1 Set
3.	Adjustable Spanner	1 No.
4.	Insulated plier	1 No.
5.	Grease gun	1 No.
6.	Oil gun	1 No.
7.	Line tester	1 No.

Note:- Bidder shall ensure that the tools & tackles mentioned in above list are sufficient to handle all sizes/capacities of hoists & in case any other /additional tool is required for handling/maintenance any size/capacity of hoist the same shall be included in this list.

11.0 DRAWING/DOCUMENT SUBMISSION

The successful bidder shall submit the following drawings / documents during detail engineering for customer's approval /information:

A) ELECTRIC HOIST

SI. No.	BHEL DRG.NO	DRAWING TITLE
1	PE-V0-411-563-A100	Manufacturing Quality Plan with Sub vendor list
2	PE-V0-411-563-A101	GA Drawing for Electric Hoist, DSL arrangement and painting details
3	PE-V0-411-563-A102	Schematic Circuit Diagram
4	PE-V0-411-563-A103	Mechanism Sizing Calculation
5	PE-V0-411-563-A104	Detailed BOM/BOQ for EH
6	PE-V0-411-563-A105	O & M Manual including Erection procedure
7	PE-V0-411-563-A106	Mandatory spare parts list

B) MANUAL HOIST (CHAIN PULLEY BLOCK):

SI. No.	BHEL DRG.NO	DRAWING TITLE
1	PE-V0-411-563-A200	Manufacturing Quality Plan
2	PE-V0-411-563-A201	GA Drawing for Chain Pulley Block with detail BOM with painting details
3	PE-V0-411-563-A202	O & M Manual including Erection procedure

Notes;

- The above drawing list is tentative and shall be finalized with the successful bidder after placement of order.
- Drawings shall be prepared in Auto-Cad latest edition. Required no. of hard and soft copies (editable) of the drawings shall be furnished as per requirement specified elsewhere in the specification.
- All the drawings and documents including general arrangement drawing, data sheet, calculation etc. to be furnished to the customer during detailed engineering stage shall include / indicate the following details for clarity w.r.t. Inspection, construction, erection and maintenance etc.: -
 - All drawings and documents shall indicate the list of all reference drawings including general arrangement.
 - All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow - up view; all major self-manufactured and bought out items shall be labeled and included in BOQ / BOM in tabular form.



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- c) Painting schedule shall also be made as a part of general arrangement drawing of each equipment / items indicating at least 3 trade names.
- d) All the drawings required to be furnished to customer during detailed engineering stage shall include technical parameters, details of paints and lubrication, hardness and BOQ / BOM in tabular form indicating all major components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc.
- e) Drawings/ documents to be submitted for purchasers review/ approval shall be under Revision A, B, C... etc. while drawings /documents to be submitted thereafter for customer's approval after purchaser's approval shall be under R-0, 1, 2, 3etc.

12.0 MAKES:

MAKES OF ELECTRIC HOIST AND CHAIN PULLEY BLOCK AS PER LIST BELOW:

Package Name	Vendor Name
ELECTRIC HOIST	Alpha Services
	CONSOLIDATED HOISTS PVT LTD
	CENTURY CRANE ENGINEERS PVT. LTD.
	EDDY CRANES PVT. LTD.
	Grip Engineers Pvt. Ltd.,
	GLOBAL TECHNOLOGIES
	HERCULES HOISTS LTD.
	LIFTING EQUIPMENTS and ACCESSORIES
	Mangla Hoists Pvt Ltd
	REVA INDUSTRIES LTD.
	ROCKWELL HOISTO CRANES PVT. LTD.
	SAFEX ENERGY PVT. LTD.
	TUOBRO FURGUSON (INDIA) PVT LTD
CHAIN PULLEY BLOCK	ARMSEL MHE PVT. LTD
	HERCULES HOISTS LTD.
	LIFTING EQUIPMENTS and ACCESSORIES
	TUOBRO FURGUSON (INDIA) PVT LTD
	TRACTEL TIRFOR INDIA PVT. LTD.

Note: No other make will be acceptable, until and unless specifically got approved by BHEL/Customer / Customer's consultant during detail engineering only. Acceptance/non-acceptance of same shall not have any impact on manufacturing, delivery schedule and on cost of the Electric hoists

MAKES OF SUB VENDORS ITEMS AS APPLICABLE TO ELECTRIC HOIST:

STANDARD LIST OF MAKES OF SUB-VENDOR ITEMS FOR ELECTRIC HOISTS			
S.NO.	ITEM	STANDARD MAKES	REMARKS
1	STEEL	SAIL /TISCO / JINDAL/ ESSAR	
2	HOOKS	Steel Forging & Engg. Co., Kolkata/ SIMRITI FORGING/ Karachiwala (up to 25T)	
3	GEAR COUPLINGS	ALLIANCE / FLEX-TRANS (formerly known as HICLIFF) / OEM / NUTECH/ SAHARA	
4	WIRE ROPE	USHA MARTIN / FORT WILLIAMS/ Bharat Wire Ropes.	
5	BEARINGS	SKF/ FAG/ TATA / NBC	



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6	MOTORS	SIEMENS / NGEF (up to 15KW) / CROMPTON / KIRLOSKAR / BHARAT BIJLI / MARATHON/ ABB/LHP	
7	BRAKES	ELECTROMAG /SPEED-O- CONTROL / BCH (for DCEM Brakes only) / Kakku	
8	CONTACTOR	SIEMENS / L&T /SCHNEIDER (Earlier TELE MECHANIQUE) / BCH	
9	OVER LOAD RELAYS	SIEMENS / L&T / ABB / SCHNEIDER (Earlier TELE MACHANIQUE)	
10	HRC FUSES	SIEMENS / L&T/ ENGLISH ELECTRIC / GE Power / Eaton (Bussmann)/ABB	
11	ISOLATING SWITCH	SIEMENS/ L&T/ CONTROL & SWITCH GEAR/ABB	
12	SWITCH FUSE UNITS	SIEMENS/ L&T/ CONTROL & SWITCH GEAR/ ABB	
13	TIME DELAY RELAYS	SIEMENS/ L&T/ ABB/ BCH/ SCHNEIDER (Earlier TELE MACHANIQUE)	
14	TRANSFORMERS	INDCOIL / LOGICSTAT/ KAPPA / AUTOMATIC ELECTRIC / PRECISE ELECTRICALS / SILKAAN ELECTRIC MFG. CO. LTD. / SOUTHERN ELECTRIC/NEC	
15	CABLE LUGS (HEAVY DUTY)	DOWELLS / UML ENGINEERS, KOLKATA / JAINSON	
16	CABLES		
a)	PVC Power Cables	APAR INDUSTRIES LTD., CORDS CABLE INDUSTRIES LTD., Diamond Power Infrastructure Ltd, GOYOLENE FIBRES (INDIA) PVT.LTD, GOVIND CABLE INDUSTRIES, GUPTA POWER INFRASTRUCTURE LIMITED,, Havells India Limited, KEI INDUSTRIES LTD., KRISHNA ELECTRICAL INDUSTRIES LTD., KEC INTERNATIONAL LIMITED, MANSFIELD CABLES COMPANY LTD., NICCO CORPORATION LTD., PARAMOUNT COMMUNICATIONS LTD., POLYCAB WIRES PVT. LTD., RADIANT CORPORATION PRIVATE LIMITED, RAVIN CABLES LIMITED, SUYOG ELECTRICALS LTD., SRIRAM CABLES PVT. LTD., Scot Innovation Wires and Cables Pvt. Ltd., Sam Cables & Conductors (P) Ltd., THERMO CABLES LTD.,	



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b)	PVC Control cables	Advance Cable Technologies (P) Ltd., APAR INDUSTRIES LTD., CMI LTD., CORDS CABLE INDUSTRIES LTD., CRYSTAL CABLE INDUSTRIES LTD, DELTON CABLES LTD, Diamond Power Infrastructure Ltd, ELKAY TELELINKS LTD, GEMSCAB INDUSTRIES LTD., GOVIND CABLE INDUSTRIES, GUPTA POWER INFRASTRUCTURE LIMITED,, Havells India Limited, Incom Cables (P) Ltd.,KEI INDUSTRIES LTD., KRISHNA ELECTRICAL INDUSTRIES LTD., KEC INTERNATIONAL LIMITED, MANSFIELD CABLES COMPANY LTD., NICCO CORPORATION LTD., PARAMOUNT COMMUNICATIONS LTD., POLYCAB WIRES PVT. LTD., RAVIN CABLES LIMITED, SUYOG ELECTRICALS LTD., SPECIAL CABLES PVT. LTD, Scot Innovation Wires and Cables Pvt. Ltd., Sam Cables & Conductors (P) Ltd., SPM POWER & TELECOM PVT. LTD,TORRENT CABLES LTD., THERMO CABLES LTD., TIRUPATI PLASTOMATICS PVT. LTD., UNIVERSAL CABLES LTD.	
c)	Trailing Cables	Nicco / Universal / Incab / ICL / KEI/ APAR INDUSTRIES LTD/ CMI LTD/ KEI INDUSTRIES LTD./ SUYOG ELECTRICALS LTD.	
d)	XLPE Power Cables	APAR INDUSTRIES LTD., CORDS CABLE INDUSTRIES LTD., CRYSTAL CABLE INDUSTRIES LTD, Diamond Power Infrastructure Ltd, GEMSCAB INDUSTRIES LTD., GOVIND CABLE INDUSTRIES, GUPTA POWER INFRASTRUCTURE LIMITED,, Havells India Limited, KEI INDUSTRIES LTD., KRISHNA ELECTRICAL INDUSTRIES LTD., KEC INTERNATIONAL LIMITED, MANSFIELD CABLES COMPANY LTD., PARAMOUNT COMMUNICATIONS LTD., POLYCAB WIRES PVT. LTD., RAVIN CABLES LIMITED, SUYOG ELECTRICALS LTD., SPECIAL CABLES PVT. LTD, Scot Innovation Wires and Cables Pvt. Ltd., SRIRAM CABLES PVT. LTD.,TORRENT CABLES LTD., THERMO CABLES LTD., TIRUPATI PLASTOMATICS PVT. LTD.,	
e)	XLPE Control cables	APAR INDUSTRIES LTD., CABLE CORPORATION OF INDIA LTD., CRYSTAL CABLE INDUSTRIES LTD., Diamond Power Infrastructure Ltd, GEMSCAB INDUSTRIES LTD., Havells India Limited, KEI INDUSTRIES LTD., KRISHNA ELECTRICAL INDUSTRIES LTD., KEC INTERNATIONAL LIMITED, PARAMOUNT COMMUNICATIONS LTD., POLYCAB WIRES PVT. LTD., RADIANT CORPORATION PRIVATE LIMITED, RAVIN CABLES LIMITED, SUYOG ELECTRICALS LTD., SRIRAM CABLES PVT. LTD., TORRENT CABLES LTD., UNIVERSAL CABLES LTD.	
17	Cable gland	COMMET / SUNIL&CO./ ARUP ENGINEERING / JAINSON / DOWELL	
18	PUSH BUTTONS	SIEMENS / L&T / BCH / Schneider	
19	Limit Switches	Speed-o-control / Electromag	



TITLE:

4 X 270 MW BHADRADRI TPS

SPECIFICATION NO. PE-TS-411-673-A001

**TECHNICAL SPECIFICATION FOR
SEWAGE TREATMENT PLANT**

REV. NO. 00

DATE : 29/05/2017

20	Pendent Push button station	OEM	
21	Indicating Lamps	Tecknic / BCH / Siemens / Standard	
22	MCB	MDS / Indo Copp / Standard / Siemens / L&T/ ABB/ Schneider	
23	Panels	OEM / RITTAL / PYROTECH	
24	Resistance boxes	Enapros / OEM	
25	VVVF	YASKAWA/ ABB / SIEMENS/ SCHNIEDER/ FUJI ELECTRIC/ MITSUBISHI ELECTRIC	
26	Shrouded DSL	Susheel/ Stromag	
27	LOAD CELL	IPA, Sartorius	
28	GEAR BOX	OEM/ ELECON ENGINEERS/ SHANTI GEARS/ PBL*/ NAW*/ NORD*/ SEW*/ BONGFILIOLI*	* = Applicable for Geared Motors only
29	RAIL	JSPL / SAIL	

Note:

- 1 All the trailing cables shall be sourced from only one sub-vendor from the list.
- 2 No other make will be acceptable, until and unless specifically got approved by BHEL/Customer / Customer's consultant during detail engineering only. Acceptance/non-acceptance of same shall not have any impact on manufacturing, delivery schedule and on cost of the Electric hoists/ CPB.



TITLE: 4 X 270 MW BHADRADRI TPS	SPECIFICATION NO. PE-TS-411-673-A001	
	TECHNICAL SPECIFICATION FOR SEWAGE TREATMENT PLANT	REV. NO. 00 DATE : 29/05/2017

ANNEXURE I
QUALITY PLAN

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QUALITY ASSURANCE

Tests/Check Items / Components	Material Test	WPS/PQR/Welder Qualification	DPT/MPi	Assembly Fit up	Dimension	RT	Hydraulic / Water Fill	Performance Test	Test as per relevant Std/ Appd.	Data Sheets	Other Tests	Remarks
11. Rubber lining	Y ^a				Y				Y	Y ⁹	Y ⁹	Y ⁷ Heat Treatment of the Tank/Vessel shall be done per fabrication code requirement. Welded dished ends shall be stress relieved. Dished ends manufactured by cold working shall be stress relieved as per the requirement of code.
12. Reactor Clarifier	Y ^a	Y	Y ⁰	Y	Y				Y	Y ¹⁰	Y ¹⁰	Y ⁸ RT as per fabrication code requirements. However, dished ends welds, if manufactured by using welded plates shall be subjected to 100% RT.
13. Clariflocculator/ Plate or Tube Settler	Y ^a			Y	Y				Y			Y ⁹ Rubber Lining Mix shall be subjected to Bleed Resistance Test on mould sample. Adhesion Test, Spark Test and Hardness Test for the Rubber lined jobs shall also be conducted.
14. Hoists & Cranes	Y ^a	Y	Y ⁰	Y	Y	Y ⁸		Y	Y			Y ¹⁰ Gear Boxes shall be checked for smooth No Load Operation at shop to verify noise and vibration levels. Gear Ratio and Kerosene Leak Test shall also be conducted.
15. Chlorine Tonner	Y ^a	Y	Y ⁰	Y	Y	Y ⁸	Y					Y ¹¹ One Fan of each type & size shall be routine performance tested as per corresponding code for air flow, static pressure, total pressure, speed, efficiency, power consumption, noise & temperature rise. Also all Fans shall be subjected to run test of 4 hours during which noise, vibration, temperature rise and current drawn shall be measured.
16. Chlorine Evaporator	Y ^a	Y	Y	Y	Y	Y	Y	Y				Y ¹² Blue Matching, reduced pressure test for check valves shall be conducted per relevant standards. Dry cycle test on valve spring for 100000 cycles shall be carried out as type test, if not carried out earlier, for the similar MOC, size and type of spring.
17. Chlorinator & injector	Y ^a			Y	Y			Y		Y ¹⁰		
18. Agitators /Flash Mixer/ Flocculator	Y ^a	Y	Y ⁰	Y	Y			Y				
19. Pipes	Y ^a	Y		Y	Y		Y		Y			
20. Ventilation/Exhaust Fan	Y ^a		Y ⁰	Y	Y			Y ¹¹	Y	Y ^{0c}	Y ^{0c}	
After erection, the complete Piping system along with valves & fittings shall be hydraulically tested.												

NOTE:- Category of inspection for items / equipment shall be decided by BHEL only during detailed engineering. All the inspection shall be carried out by BHEL or its designated agency only. And further no customer / consultant inspection is envisaged.

THIS IS A PART OF TECHNICAL SPECIFICATION NO. PE-TS-411-673-A001

MANUFACTURER'S NAME & ADDRESS :		PROJECT :	
MANUFACTURING QUALITY PLAN		PACKAGE : CHAIN PULLEY BLOCKS	
ITEM : Chain Pulley Block		VOL IIB, SEC C	
QP No.: PE-TS-XXX-XXX-A001			
REV.:0, Date:., PAGE: 1 OF 4			

Sr. No.	COMPONENT / OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9.	M C N 10.	11.

1	RAW MATERIAL & B/OUT ITEMS:									
1.1	HOOKS	DIMENSIONS,	MA		One sample	IS: 15560	IS: 15560	MTC	✓	UT FOR SHANK DIA 50MM AND ABOVE
		CHEMICAL COMPOSITION, MECHANICAL, PHYSICAL PROPERTIES	MA	LAB ANALYSIS	PER LOT	Material specification as per approved drawings		T.C.	✓	
		IDENTIFICATION & COMPLIANCE WITH TC.	MA	VISUAL	100%	HOOK TC FROM COMPETENT AUTHORITY		IR	✓	
		INTERNAL DEFECTS	MA	UT	100%	ASTM A-388 (REFER NOTE 1)		TC	✓	
		PROOF LOAD TEST	MA	REVIEW	100%	IS 15560		TC	✓	
		NDT AFTER PROOF LOAD	MA	DPT	100%	ASTM E-165		TC	✓	
1.2	LOAD CHAIN	- DIMENSIONS - BREAKING STRENGTH - PROOF LOAD - HEAT TREATMENT - GRADE	MA MA MA MA MA	MEASUREMENT -TENSILE TEST -TENSILE TEST REVIEW REVIEW	100 % 1/LOT 100% 100% 1/BATCH	IS: 6216 & APPD. DRGS.	IS: 6216 & APPD. DRGS.	IR MTC MTC HT CHA RT MTC	✓ ✓ ✓ ✓ ✓ ✓ ✓	
1.3	RAW MATL. FOR GEAR/ RATCHET PAWL / RATCHET WHEEL	CHEMICAL COMPOSITION, MECHANICAL PROPERTIES	MA	LAB ANALYSIS	ONE SAMPLE PER LOT	MATERIAL SPECIFICATION AS PER	MATERIAL SPECIFICATION AS PER	MTC	✓	TC or inspection report for components

		LEGEND: ** M : MANUFACTURER / SUB-CONTRACTOR C : BHEL / NOMINATED INSPECTION AGENCY. N : CUSTOMER INDICATE "p" PERFORM "w" WITNESS AND "V" VERIFICATION	FOR CUSTOMER USE	
MANUFACTURER / CONTRACTOR				
SUB-CONTRACTOR				
SIGNATURE			REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY & SEAL

THIS IS A PART OF TECHNICAL SPECIFICATION NO. PE-TS-411-673-A001

MANUFACTURER'S NAME & ADDRESS :		PROJECT :	
MANUFACTURING QUALITY PLAN		PACKAGE : CHAIN PULLEY BLOCKS	
ITEM : Chain Pulley Block		VOL IIB, SEC C	
QP No.: PE-TS-XXX-XXX-A001			
REV.:0, Date.:, PAGE: 2 OF 4			

Sr. No.	COMPONENT / OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9.	M C N 10.	11.

		INTERNAL DEFECTS	MA	UT	10%	APPROVED DRAWING	APPROVED DRAWING	IR	P	shall be given.
1.4.	LOAD CHAIN WHEELS	- CHEMICAL COMPOSITION MECHANICAL PROPERTIES	MA	CHEMICAL MECHANICAL PROPERTIES	ONE SAMPLE PER LOT	APPD. DRG.	APPD. DRG.	MTC	P	
1.5	BEARINGS	MAKE, TYPE, CATALOGUE NO.	MA	VISUAL	RANDOM	APP DRG / MFR'S CATALOGUE	APP DRG / MFR'S CATALOGUE	IR	P	
1.6	HAND CHAIN WHEEL	CHEMICAL MECHANICAL PROPERTIES	MA	CHEMICAL MECHANICAL PROPERTIES	ONE SAMPLE PER LOT	AS PER DRAWING	AS PER DRAWING	MTC	P	
1.7	HAND CHAIN	GRADE/ DIMENSION	MA	GRADE DIMENSION	100 %	AS PER DRAWING	AS PER DRAWING	MTC	P	
1.8	TROLLEY GEARS, PINION, WHEELS, AXLE	CHEMICAL & MECHANICAL	MA	LAB ANALYSIS,	100%	APPVD DRGS	APPVD DRGS	IR/T C	P	
2	IN PROCESS									
2.1	RATCHET PAWL / RATCHET WHEEL	-HARDNESS	MA	HARDNESS	100%	IS:3832 / APPD DRG.	IS:3832 / APPD. DRG.	IR	P	

		LEGEND: ** M : MANUFACTURER / SUB-CONTRACTOR C : BHEL / NOMINATED INSPECTION AGENCY. N : CUSTOMER INDICATE "P" PERFORM "W" WITNESS AND "V" VERIFICATION	FOR CUSTOMER USE	
MANUFACTURER / CONTRACTOR				
SUB-CONTRACTOR SIGNATURE			REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY & SEAL

THIS IS A PART OF TECHNICAL SPECIFICATION NO. PE-TS-411-673-A001

MANUFACTURER'S NAME & ADDRESS :		PROJECT :	
ITEM : Chain Pulley Block		PACKAGE : CHAIN PULLEY BLOCKS	
QP No.: PE-TS-XXX-XXX-A001		VOL IIB, SEC C	
REV.:0, Date.:, PAGE: 3 OF 4			

Sr. No.	COMPONENT / OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY		REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9.	M	C N	11.
									10.		

		-SURFACE CRACK	MA	DPT	100 %	ASTM E165	NO DEFECT	IR	✓	P	V	V
2.2	GEARS AND PINIONS AFTER MACHINING	SURFACE HARDNESS HEAT TREATMENT, SURFACE CRACK, CASE DEPTH	MA	HARDNESS HT CHART, DPT FOR SURFACE CRACK	RANDOM ASTM E 165 FOR DPT	MFG STANDARD NO DEFECT	MFG STANDARD	IR	✓	P	V	V
3.0	FINAL INSPECTION											
3.1	COMPLETE ASSEMBLY	OVERALL DIMENSION	MA	MEASUREMENT	100 %	IS:3832 /APPD DRG	IS:3832 /APPD DRG	IR	✓	P	W	V
		PROOF LOAD TEST	CR	LOAD TEST	100%	-DO-	No cracks, flaws & other defects	IR	✓	P	W	V
		LIGHT LOAD TEST	MA	LOAD TEST	100%	IS 3832	IS 3832	IR	✓	P	W	V
		HEIGHT OF LIFT	MA	MEASUREME NT	100%	-DO-	-DO -	IR	✓	P	W	V
		SWIVELING OF HOOK	MA	VISUAL	100 %	-DO-	-DO-	IR	✓	P	W	V
		EFFORT	MA	PULL ON CHAIN	100%	-DO-	-DO-	IR	✓	P	W	V
3.2	PAINTING	-CLEANING	MA	VISUAL	AT RANDOM	APPROVED	APPROVED	IR		P	--	--
		- SHADE & DFT OF PAINT (Blue / Black)	MI	VISUAL	AT RANDOM	DRAWING/ SPECIFICATION	DRAWING/ SPECIFICATION	IR		P	W	-

LEGEND:		FOR CUSTOMER USE	
MANUFACTURER / CONTRACTOR	** M : MANUFACTURER / SUB-CONTRACTOR C : BHEL / NOMINATED INSPECTION AGENCY. N : CUSTOMER		
SUB-CONTRACTOR	INDICATE "P" PERFORM "W" WITNESS AND "V" VERIFICATION		
SIGNATURE	REVIEWED BY		NAME & SIGN OF APPROVING AUTHORITY & SEAL

THIS IS A PART OF TECHNICAL SPECIFICATION NO. PE-TS-411-673-A001

MANUFACTURER'S NAME & ADDRESS :		PROJECT :	
MANUFACTURING QUALITY PLAN		PACKAGE : CHAIN PULLEY BLOCKS	
ITEM : Chain Pulley Block		VOL IIB, SEC C	
QP No.: PE-TS-XXX-XXX-A001			
REV.:0, Date.:, PAGE: 4 OF 4			

Sr. No.	COMPONENT / OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTU M OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9.	M C N	11.
									10.	

3.3	NAME PLATE	VERIFICATION	MA	VISUAL	100%			IR	P V --	
3.4	PACKING	-VERIFICATION	MI	VISUAL	100%	SPECS.	SPECS.	IR	P -- -	
3.5	REVIEW OF QA DOCUMENTATION	VERIFICATION	MA	VISUAL	100%	APPD. QP	APPD. QP	✓	V V V	

CR – CRITICAL, MA – MAJOR , MI – MINOR

NOTE 1: BACK WALL ECHO SHALL BE ADJUSTED TO 100% OF FULL SCREEN HEIGHT IN SOUND (DEFECT FREE) AREA. DEFECT ECHO HEIGHT MORE THAN 20% OF SCREEN HEIGHT SHALL BE TREATED AS UNACCEPTABLE. BACK WALL ECHO SHALL NOT BE LESS THAN 80% OF SCREEN HEIGHT IN ANY CASE.

NOTE 2: RECORDS IDENTIFIED WITH TICK SHALL BE ESSENTIALLY INCLUDED IN QA DOCUMENTATION.

LEGEND:		FOR CUSTOMER USE	
MANUFACTURER / CONTRACTOR	** M : MANUFACTURER / SUB-CONTRACTOR C : BHEL / NOMINATED INSPECTION AGENCY. N : CUSTOMER		
SUB-CONTRACTOR SIGNATURE	INDICATE "P" PERFORM "W" WITNESS AND "V" VERIFICATION		
	REVIEWED BY	NAME & SIGN OF APPROVING AUTHORITY & SEAL	

THIS IS A PART OF TECHNICAL SPECIFICATION NO. PE-TS-411-673-A001

गोपनीय दस्तावेज़		MANUFACTURERS NAME & ADDRESS				STANDARD QUALITY PLAN				PROJECT			
		AS PER APPROVED VENDOR LIST				ITEM:	ELECTRIC		QIP NO	PACKAGE		WIRE ROPE ELECTRIC HOIST	
							WIRE	REV	0		CONTRACT No		
							ROPE	DATE			CONTRACTOR		
								PAGE	1 of 4		BHEL		
Sl.No	COMPONENT & OPERATIONS	CHARACTERISTICS	CATEGORY	TYPE OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS			
1	2	3	4	5	6	7	8	9	D*	M	C N		
1.0	RAW-MATERIALS												
1.1	a) STRUCTURAL MATERIAL b) RAW MATERIAL FOR HOIST AND GEAR BOX HOUSING, TROLLEY PLATE (AS APPLICABLE)	MECH. , CHEM. PROPS	MA	CHEMICAL COMPOSITION AND TENSILE STRENGTH	1 / lot	APPD. DRG. / DATA SHEET	APPD. DRG./ DATA SHEET	Mill.s TC	✓	V	V		
1.2	GEARS, SHAFT/AXLES, WHEELS	MECH. , CHEM. PROPS	MA	CHEMICAL COMPOSITION, HARDNESS (DURING IN-PROCESS)	1 / LOT	APPD. DRG. / DATA SHEET	APPD. DRG. / DATA SHEET / IS:3938	LAB. REPORT / MANUFACTURERS TEST CERTIFICATE	✓	P	V		
		U.T FOR DIA/THK > 50mm	CR	NDT	100%	ASTM A 388	NOTE 4	INSPN. REPORT	✓	P	V		
1.3	WIRE ROPE	Dimensional CHECK	MI	Dia.	100%	APPD. DRG. / DATA SHEET	APPD. DRG./ DATA SHEET	MFRS'TEST CERT.	✓	P	V		
		BREAKING LOAD CAPACITY	CR	BREAKING LOAD	100%	APPROVED DRG/DATA SHEET / IS:3938 / IS: 2266	APPROVED DRG/DATA SHEET AND / IS:3938 /	MFRS'TEST CERT.	✓	P	V		
1.4	HOOKS	PHYS./ MECH. , CHEM. PROPS.	MA	CHEMICAL COMPOSITION, HARDNESS	1 / LOT	APPROVED DRG/DATA SHEET / IS:3938 / IS:15560	APPROVED DRG/DATA SHEET / IS:3938 / IS:15560	MFRS'TEST CERT.	✓	P	V		
		U.T IF SHANK DIA > 50mm	CR	NDT	100%	ASTM A 388	NOTE 1	INSPN. REPORT	✓	P	W V		
		PROOF LOAD CAPACITY	CR	PROOF LOAD TEST	100%	APPROVED DRG/DATA SHEET / IS:3938 / IS:15560	APPROVED DRG/DATA SHEET ± IS:3938 / IS:15560	INSPN. REPORT	✓	P	W V		
		DP AFTER PROOF LOAD	CR	NDT	100%	ASTM E-165	NO CRACKS	INSPN. REPORT	✓	P	V/W V		
2.0	IN-PROCESS												
2.1*	WELDING PROCEDURE SPECIFICATION	CORRECTNESS	MA	SCRUTINY	100%	IS:7307 / ASME SEC IX	IS:7307 / ASME SEC IX	FORMAT OF IS IX	P	V	V		
2.2*	PROCEDURE & WELDER QUALIFICATION	WEDLING PARAMETRES	MA	PHYS. TESTS/RT	100%	IS:7310 / ASME SEC IX	IS:7310 / ASME SEC IX	AS PER ASME SEC IX	✓	P	W		
											IN CASE OF LLOYDS / EIL / TPL QUALIFIED WELDERS AVAILABLE, REQUALIFICATION OF WELDER IS NOT REQUIRED		
				LEGDS									
				* RECORDS IDENTIFIED WITH 'TICK' (✓) SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION									
				** M: MANUFACTURER/SUBCONTRACTOR									
	MANUFACTURER/ SUB CONTRACTOR	CONTRACTOR		INDICATE 'P' PERFORM 'W' WITNESS AND 'V' VERIFICATION AS APPROPRIATE " CHP" CUSTOMER SHALL IDENTIFY IN COLUMN "N"									
	SIGNATURE			REVIEWED BY								NAME & SIGN OF APPROVING AUTHORITY &SEAL	

THIS IS A PART OF TECHNICAL SPECIFICATION NO. PE-TS-411-673-A001

भारतीय विद्युत निगम 		MANUFACTURERS NAME & ADDRESS			STANDARD QUALITY PLAN				PROJECT								
		AS PER APPROVED VENDOR LIST			ELECTRIC				PACKAGE								
		ITEM:			WIRE ROPE				CONTRACT No								
					DATE				BHEL								
COMPONENT & OPERATIONS		CATEGORY	TYPE OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD			AGENCY			REMARKS				
Sl.No																	
1	2	3	4	5	6	7	8	9	D*	M	C	N					
2.3*	WELD SET UPS	DIMENSIONS	MA	MEAS. , VISUAL	100%	WPS, APPD. DRG.	WPS, APPD. DRG.	INSPN. REPORT	P	V							11
2.4*	WELDMENTS –FINAL RUN	SURFACE DEFECTS	MA	PT	100%	IS:3658 / ASTM E:165	ASME SEC. VIII DIV. I	INSPN. REPORT	✓	P	V	V					
2.5	TRUNION / TROLLEY WHEELS, GEARS PINION	SURFACE & INTERNAL FLAWS (FOR DIA. / THICKNESS >50MM)	MA	PT / UT	100%	ASTM E:165	NO LINEAR DEFECTS / NOTE 4	INSPN. REPORT	✓	P	W	V					
2.6	NDT OF LOAD BEARING BUTT WELDS (IF ANY)	WELD QUALITY OF a)Butt weld on tension 100% RT and 100% DPT b)Butt weld on compression 10% RT and 100% DPT c)Butt weld on rope drum 100% RT and 100% DPT d) Fillet weld - Random 10% DPT	CR	PT & RT	100%	ASME SEC. VIII DIV. I	ASME SEC. VIII DIV. 4 . CLUW-51 FOR RT APPENDIX -8 FOR PT	INSPN. REPORT ND FILM	✓	P	V	V					FILMS TO BE REVIEWED BY BHEL & Customer. DPT SHALL BE CHP FOR Customer & BHEL
2.7	GEAR BOXES	OVERALL DIMENSIONS	MA	MEAS.	100%	MFG. DRG.	MFG. DRG.	INSPN. REPORT	✓	P							
	COMPLETE ASSEMBLY	CHECK FOR OIL LEAKAGE, VIBRATION, NOISE TEMP. RISE	MA	NO LOAD RUNNING FOR TWO HOURS	100%	MFG. DRG.	MFG. STD.	INSPN. REPORT	✓	P	V	V					
2.8	ELECTRICALS																
1	MOTORS	TYPE TESTS (INCLUDING DEGREE OF PROTECTION)	MA	TYPE TESTS	1 / TYPE, 100%	IS:3938	IS:3938	MFRS' TEST CERT. , INSPN REPORT	✓	P	V	V					
2	RESISTANCES (IF APPLICABLE)	ROUTINE TESTS	MA	ROUTINE TESTS	100%	IS:325	IS:325	DO	✓	P	V	V					
3	CONTROLLER, LIMIT SWITCHES (IF APPLICABLE)	TEMPERATURE RISE	MA	VERIFICATION OF MNFRS' TEST CERT.	100%	IS:3938, RELV. ISS	IS:3938, RELV. ISS	MFRS' TEST CERT.	✓	P	V	V					
4	BRAKES	ROUTINE TESTS	MA	ROUTINE TEST	100%	IS:6975/TECH. SPEC.,	IS:6875/TECH. SPEC.,	MFRS' TEST CERT.	✓	P	V	V					Rating and make to be verified.
5	BRAKE DRUM (IF APPLICABLE)	ROUTINE TESTS	MA	ROUTINE TEST	100%	TECH. SPEC. / IS:15560	IS:3938/TECH. SPEC.	MFRS' TEST CERT.	✓	P	V	V					
6	CONTRACTOR	ROUTINE TESTS	MA	VISUAL, HARDNESS TEST	100%	APPD. DRGS./TECH. SPC.	APPD. DRGS./TECH. SPEC.	HT. CHART /INS PN. REPORT	✓	P	V	V					
7	CONTROL PANEL, PENDANT SWITCH	ROUTINE TESTS	MA	ROUTINE TEST	100%	IS:2959 AND TECH. SPEC., IS:6547 / IS:3938	IS:2959 AND TECH. SPEC., IS:6547 / IS:3938	INSPN. REPORT	✓	P	V	V					Rating and make to be verified.
		* FIXING OF COMPONENTS WIRING MARKING CONTINUITY * FUNCTIONAL TEST * IR & H.V. TEST * IP - PROTECTION TEST * PAINT SHADE, THICKNESS, SHEET THICKNESS	MA	VISUAL	100%	APPD.DRG. WIRING DIAGRAM,	APPD. DRG. WIRING DIAGRAM,	INSPN. REPORT	✓	P	V	V					BOUGHT OUT ITEMS AS PER BHEL / CUSTOMER APPROVAL LIST
		LEGENDS															
		* RECORDS IDENTIFIED WITH TICK(✓) SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION															
		** M: MANUFACTURER/SUBCONTRACTOR															
		C: CONTRACTOR NOMINATED INSPECTION AGENCY(BHEL) N: CUSTOME															
		INDICATE "P" PERFORM "W" WITNESS AND "V" VERIFICATION AS APPROPRIATE * CHP* CUSTOMER SHALL IDENTIFY IN COLUMN"N"															
	MANUFACTURER/ SUB CONTRACTOR	CONTRACTOR															
	SIGNATURE																

THIS IS A PART OF TECHNICAL SPECIFICATION NO. PE-TS-411-673-A001

[illegible]



TITLE: 4 X 270 MW BHADRADRI TPS	SPECIFICATION NO. PE-TS-411-673-A001	
	TECHNICAL SPECIFICATION FOR SEWAGE TREATMENT PLANT	REV. NO. 00 DATE : 29/05/2017

ANNEXURE II

SUB VENDORS LIST

The sub vendor list below is indicative only and is subject to BHEL and customer approval during detailed engineering stage without any commercial & delivery implication to BHEL. Bidder to propose sub vendor within 4 weeks of placement of LOI. thereafter no request for additional sub-vendor shall be entertained. Dealers are not acceptable for any item of the package. bidder shall procure all items including plates, structural, flanges; counter flanges etc. from approved sub vendor only. The inspection category will be intimated after award of contract by BHEL/customer. however, the same will be adhered by the bidder without any commercial and delivery implication to BHEL/ customer.

SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
1.	PRESSURE VESSELS	GLOBAL STRUCTURES & COMPOSITE LTD	-	
		JASMINO POLYMERTECH	TALOJA	
		SYSCON ENGINEERS	AMBERNATH	
		S.V. FABRICATORS	NAVI MUMBAI	
		SPARK FABRICATORS / STEELCON	-	
		ANUP ENGINEERING	AHMEDABAD	
		MURTHAL TANKS & VESSELS	SONEPAT	
		TITAN ENGG.	DURGAPUR	
		RISHI INDUSTRIES	BAHALGARH	
		UNIVERSAL HEAT EXCHANGERS	-	
		ATS CHEM	SALEM/HOSUR	
		CHEM PROCESS SYSTEM	SANAND	
		PROGEN	CHENNAI	
		CRYSTAL ENGINEERING	HOSUR	
		ISHAN EQUIPMENTS	VADODARA	
2.	ATMOSPHERIC/ STORAGE TANKS	GLOBAL STRUCTURES & COMPOSITE LTD	-	
		JASMINO POLYMERTECH	TALOJA	
		SYSCON ENGINEERS	AMBERNATH	
		S.V. FABRICATORS	NAVI MUMBAI	
		SPARK FABRICATORS / STEELCON	-	
		ANUP ENGINEERING	AHMEDABAD	
		MURTHAL TANKS & VESSELS	SONEPAT	
		TITAN ENGG.	DURGAPUR	
		RISHI INDUSTRIES	BAHALGARH	
		UNIVERSAL HEAT EXCHANGERS	-	
		ATS CHEM	SALEM/HOSUR	
		CHEM PROCESS SYSTEM	SANAND	
		PROGEN	CHENNAI	
		CRYSTAL ENGINEERING	HOSUR	
		ISHAN EQUIPMENTS	VADODARA	
3.	RUBBER LINING (AT SHOP)	TEMSEC	KOLKATA	
		RISHI INDUSTRIES	SONEPAT	



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SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		CORI ENGINEERS	CHENNAI	
		POLY RUBBER	MUMBAI	
		INDUSTRIAL LINING	VADODARA	
		ARUL RUBBERS	CHENNAI	
		JASMINO POLYMERTECH	TALOJA	
		WESTERN RUBBER	NAVI MUMBAI	
		ELASTOMER LINNING	AMBERNATH	
		EMKAY RUBBER	MUMBAI	
4.	AIR BLOWERS (TWIN LOBE TYPE)	SWAN PNEUMATIC	NOIDA	
		EVEREST TRANSMISSION	NEW DELHI	
		KAY INTERNATIONAL	NEW DELHI / SONEPAT	
		EVEREST BLOWER	BAHADURGARH	
		KULKARNI POWER TOOLS	KOLHAPUR/ PUNE	
5.	METERING PUMPS	VK PUMPS	NASIK	
		MILTON ROY INDIA	CHENNAI	
		SWELLORE	AHMEDABAD	
		POSITIVE METERING PUMPS	NASIK	
		METACHEM	MUMBAI	
6.	AGITATOR	REMI PEOCESS PLANT & M/C	MUMBAI	
		FIBRE & FIBRE	MUMBAI / SILVASA	
		CEECONS	CHENNAI	
		STANDARD ENGINEERS	MUMBAI	
7.	HORIZONTAL CENTRIFUGAL PUMPS	BEST AND CROMPTON ENGG LTD.	CHENNAI	
		BHARAT PUMPS & COMPRESSORS LTD	ALLAHABAD	
		FLOWMORE LTD.	GURGAON	
		JYOTI LTD.	VADODARA	
		KIRLOSKAR BROTHERS LTD	PUNE	
		WILO MATHER & PLATT PUMPS PVT. LTD.	PUNE	
		V-FLO PUMPS & SYSTEMS CO. LTD.,	BEIJING-CHINA	
		SINTECH PRECISION PRODUCT LTD.		
8.	VERTICAL CENTRIFUGAL PUMPS	WPII LIMITED	KOLKATA	
		BHARAT PUMPS & COMPRESSORS LTD	ALLAHABAD	
		FLOWMORE LTD.	GURGAON	
		JYOTI LTD.	VADODARA	
		WILO MATHER & PLATT PUMPS PVT. LTD.	PUNE	
		SINTECH PRECISION PRODUCT LTD.		
		SULZER PUMPS INDIA LTD.	THANE	
9.	SCREW PUMP	UT PUMP		
		ROTO PUMPS		



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		TUSHACO		
10.	SUBMERSIBLE PUMP	JASCO PUMP PVT. LTD.		
11.	HORIZONTAL CENTRIFUGAL PUMPS (RUBBER LINED)	KISHORE PUMPS	PUNE	
		SU MOTORS	MUMBAI	
12.	NON METALLIC (PP/FRP) HORIZONTAL CENTRIFUGAL PUMPS	ENGINEERS COMBINE	THANE	
		ANTICORROSIVE	VALSAD	
		LEAK PROOF PUMPS PVT. LTD. (RAJEDIA)	-	
13.	MISC. PUMP VERTICAL TURBINE TYPE	KBL	PUNE	
		M&P	PUNE	
		WPIL	GHAZIABAD	
		KISHORE PUMPS	PUNE	
		FLOWMORE	SAHIBABAD	
14.	BATTERY CHARGER FOR PLC	AMARA RAJA POWER SYSTEMS LIMITED	TRIPUTI	
		CHHABI ELECTRICALS PVT.LTD.	JALGAON	
		CHLORIDE POWER SYSTEMS & SOLUTIONS LIMITED	KOLKATA	
		DUBAS ENGG PVT LTD	BANGALORE	
		HBL POWER SYSTEMS LTD	HYDERABAD	
		JEMA ENERGY	SPAIN	FOR STATIC SCR TYPE FULL WAVE FULLY CONTROL TYPE
		MASS-TECH CONTROLS PVT.LTD.	MUMBAI	
		STATCON POWER CONTROLS LTD	NOIDA	
15.	UNDER BED NOZZLE	JONSONS SCREEN	AUSTRALIA/ IRELAND	
16.	COATING & WRAPPING MATERIAL TAPE	IWL LTD.	CHENNAI	
		MP TAR PRODUCT	BHILAI	
		PORWAL INDUSTRIES	RAIPUR	
		RUSTECH	KOLKATA	
		STP	JAMSHEDPUR	
17.	HEATER	ESCORTS	FARIDABAD	
		RACOLDS	FARIDABAD	
18.	CLARIFIER/ THICKENER MECHANISM	CLEAR WATER	DELHI	
		TRIVENI	NOIDA	
		PBJ ASSOCIATE	PUNE	
19.	CENTRIFUGE	HUMBOLT	-	
		HILLER	-	
20.	CAST IRON GATE/GLV/NRV/SRV	A.V. VALVES LTD	AGRA	
		ATAM VALVES PVT. LTD.	JALANDHAR	



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		FLUIDLINE VALVES COMPANY PVT.LTD.	GHAZIABAD	
		G.M. DALUI AND SONS PVT.LTD.	HOWRAH	
		H.SARKER AND COMPANY	HOWRAH	
		LEADER VALVES LTD.	JALANDHAR	
		VENUS PUMPS AND ENGG. WORKS	KOLKATA	
21.	BALL VALVE CLASS 150	A.V. VALVES LTD	AGRA	
		AKAY INDUSTRIES PVT.LTD.	DHARWAD	
		BELGAUM AQUA VALVES PVT. LTD.	BELGAUN	
		ASIAN INDUSTRIAL VALVES & INSTRUMENTS.	CHENNAI	
		ATAM VALVES PVT. LTD.	JALANDHAR	
		DEMBLA VALVES LTD.	THANE	
		M/S GM ENGINEERING	RAJKOT	
		HAWA VALVES (INDIA) PVT. LTD.	NAVI MUMBAI	
		INTERVALVE (INDIA) LTD.	PUNE	
		LEADER VALVES LTD.	JALANDHAR	
		MICROFINISH VALVES PVT LTD.	HUBLI	
		NILON VALVES PRIVATE LIMITED	AHMEDABAD	
		SURYA VALVES AND INSTRUMENTS MFG CO.	CHENNAI	
		MEVADA ENGG. WORKS PVT. LTD		
		UNIFLOW	CHENNAI	
		VALTECH INDUSTRIES	MUMBAI	
		VAAS AUTOMATION PVT. LTD.	NEW DELHI	
		WEIR BDK VALVES- A UNIT OF WEIR INDIA PVT. LTD.	NEW DELHI	
22.	ELECTRIC MOTOR	CROMPTON GREAVES	AHMEDNAGAR	
		LAXMI HYDRAULICS PVT. LTD	BANGALORE / HUBLI	
		RAJINDRA ELECT INDUSTRIES	FARIDABAD / BANGALORE	
		GE-POWER		
		BHARAT BIJLEE	MUMBAI	
		SIEMENS	MUMBAI	
		NGEF	BANGALORE	
		KIRLOSKAR ELECTRIC CO LTD.		
		ASEA BROWN BOVERI		
23.	BUTTER-FLY VALVE	MARATHON	KOLKATA	
		ADVANCE VALVES PVT. LTD.	NOIDA	
		FLUIDLINE VALVES COMPANY PVT.LTD.	GHAZIABAD	
		INSTRUMENTATION LTD.	PALAKKAD	
		INTERVALVE (INDIA) LTD.	PUNE	
		R AND D MULTIPLES (METAL CAST) PVT LTD	MUMBAI	
		SURYA VALVES AND INSTRUMENTS MFG	CHENNAI	



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SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		CO.		
		PENTAIR VALVES AND CONTROLS INDIA PRIVATE LIMITED	NAVI MUMBAI	
		UPADHAYA VALVES MANUFACTURERS PRIVATE LIMITED,	KOLKATA	
		VENUS PUMPS AND ENGG. WORKS	KOLKATA	
		WEIR BDK VALVES- A UNIT OF WEIR INDIA PVT. LTD.	NEW DELHI	
24.	DIAPHRAGM VALVE (MANUAL / PNEUMATIC) CLASS 150	WEIR BDK	HUBLI	
		CRANE FLOW PROCESS	SATARA	
		PROCON	MUMBAI	
		MAJESTIC VALVES (LABLINE)	-	
		HAWA ENGINEERS	AHMEDABAD	
25.	DUAL PLATE CHECK VALVES	ADVANCE VALVES PVT. LTD.	NOIDA	
		FLUIDLINE VALVES COMPANY PVT.LTD.	GHAZIABAD	1. DUAL PLATE CHECK VALVE CI - CLASS 150 & UP TO 600NB, 2. DUAL PLATE CHECK VALVE CCS - CLASS 150 & UP TO 500NB
		R AND D MULTIPLES (METAL CAST) PVT LTD	MUMBAI	
		VENUS PUMPS AND ENGG. WORKS	KOLKATA	CI ,CCS & STAINLESS STEEL SPRING ASSISTED DUAL PLATE CHECK VALVES UPTO 700 NB AND 150 CLASS RATING.
26.	Y-TYPE STRAINER / STRAINER (WATER SERVICE)	OTOKLIN GLOBAL BUSINESS LIMITED	MUMBAI	
		GRAND PRIX	NEW DELHI	
		JAYPEE	NEW DELHI	
		GREAVES COTTON	MUMBAI	
		MULTITEX FILTRATION ENGINEERS LIMITED,	NEW DELHI / NOIDA	
		FILTRATION ENGINEERS (I) PVT. LTD	MUMBAI	
		BOMBAY CHEMICAL EQUIPMENT'S		
		FLUIDNYE	-	
		SUNGOV ENGINEERING PVT. LTD.	DELHI	
		GRAND PRIX	FARIDABAD	



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		JAYPEE INDUSTRIES PVT. LTD.	DELHI	
		BHATIA ENGINEERING CO.	DELHI	
27.	RUBBER FLAP TYPE CHECK VALVES	ASHVIK VALVES	-	
		FLOW WAY VALVES	-	
		BDK	-	
		MAJESTIC VALVES (LABLINE INST)	-	
		ADVANCE VALVES	-	
28.	SOLENOID VALVES	ROTEX	-	
		AVCON	-	
29.	PRESSURE GAUGE/ DIFFERENTIAL PRESSURE GAUGE	A.N. INSTRUMENTS PVT. LTD.	KOLKATA	
		ASHCROFT INDIA PVT LTD.	GUJARAT	
		BOSE PANDA INSTRUMENTS PVT.LTD.	KOLKATA	
		FORBES MARSHALL (HYD) LTD.	HYDERABAD	
		GAUGE BOURDON INDIA PVT. LTD.	MUMBAI	
		H.GURU INDUSTRIES	KOLKATA	
		H.GURU INSTRUMENTS (SOUTH INDIA) P. LTD	BANGALORE	
		BAUMER TECHNOLOGIES INDIA PVT. LTD.	MUMBAI	
30.	CHAIN PULLEY BLOCK	ARMSEL MHE PVT. LTD	BANGALORE	
		CENTURY CRANE ENGINEERS PVT. LTD.	FARIDABAD	
		HERCULES HOISTS LTD.	RAIGAD	
		LIFTING EQUIPMENTS AND ACCESSORIES	DELHI	
		TUOBRO FURGUSON (INDIA) PVT LTD	KOLKATA	UPTO 10 TONNE.
		TRACTEL TIRFOR INDIA PVT. LTD.	FARIDABAD	
		TECHNO INDUSTRIES	AHMEDABAD	
		ARMSEL MHE PVT. LTD	BANGALORE	
		ALPHA SERVICES	BHIWADI	
		CONSOLIDATED HOISTS PVT LTD	PUNE	UPTO 20 TONNES
		CENTURY CRANE ENGINEERS PVT. LTD.	FARIDABAD	
		EDDY CRANES PVT. LTD.	MUMBAI	CAPACITY UPTO 10 TONS. BOIS BHEL APP.SUB-VENDORS.
		GRIP ENGINEERS PVT. LTD.,	FARIDABAD,	
		GLOBAL TECHNOLOGIES	HYDERABAD	
		HERCULES HOISTS LTD.	RAIGAD	
		LIFTING EQUIPMENTS AND ACCESSORIES	DELHI	
		MANGLA HOISTS PVT LTD	NEW DELHI	
		MEEKA MACHINERY PVT. LTD.	AHMEDABAD	



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31.	ELECTRIC HOIST	REVA INDUSTRIES LTD.	FARIDABAD	UPTO 25.0 T CAPACITY.
		ROCKWELL HOISTO CRANES PVT. LTD.	BAHADURGARH	
		SAFEX ENERGY PVT. LTD.	AHMEDABAD	
		TUOBRO FURGUSON (INDIA) PVT LTD	KOLKATA	UPTO 15 TONNES.
		TECHNO INDUSTRIES	AHMEDABAD	
		ARMSEL MHE PVT. LTD	BANGALORE	
		ALPHA SERVICES	BHIWADI	
		CONSOLIDATED HOISTS PVT LTD	PUNE	UPTO 20 TONNES
		CENTURY CRANE ENGINEERS PVT. LTD.	FARIDABAD	
		EDDY CRANES PVT. LTD.	MUMBAI	CAPACITY UPTO 10 TONS. BOIS BHEL APP.SUB-VENDORS.
		GRIP ENGINEERS PVT. LTD.,	FARIDABAD,	
		GLOBAL TECHNOLOGIES	HYDERABAD	
		HERCULES HOISTS LTD.	RAIGAD	
		LIFTING EQUIPMENTS AND ACCESSORIES	DELHI	
		MANGLA HOISTS PVT LTD	NEW DELHI	
32.	CONTROL VALVE	MEEKA MACHINERY PVT. LTD.	AHMEDABAD	
		REVA INDUSTRIES LTD.	FARIDABAD	UPTO 25.0 T CAPACITY.
		ROCKWELL HOISTO CRANES PVT. LTD.	BAHADURGARH	
		SAFEX ENERGY PVT. LTD.	AHMEDABAD	
		TUOBRO FURGUSON (INDIA) PVT LTD	KOLKATA	UPTO 15 TONNES.
		TECHNO INDUSTRIES	AHMEDABAD	
		SPX CORPORATION, USA	AHMEDABAD	
		CONTROL COMPONENT INC.	CALIFORNIA	
		DRESSER VALVE INDIA PVT. LTD	COIMBATORE	
		DAUME REGELARMATUREN GMBH,	GERMANY	
		EMERSON PROCESS MANAGEMENT CHENNAI LIMITED	CHENNAI	
		WEIR VALVES & CONTROLS UK LTD.	U.K	
		HOLTER REGELARMATUREN GMBH & CO.KG	GERMANY	
		INSTRUMENTATION LTD.	KERALA	
		KOSO INDIA PRIVATE LIMITED,	NASHIK	
		LESLIE CONTROLS, INC	USA	
		MIL CONTROLS LTD.	KERALA	
		METSO SINGAPORE PTE. LTD.,	SINGAPORE	



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SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		PARCOL S.P.A	ITALY	
		R.K.CONTROL INSTRUMENTS PVT. LTD.	THANE	
		RINGO VALVULAS S.L,	SPAIN	
		SHENJIANG VALVE CO. LTD.	CHINA	
		VALVITALIA S.P.A. ,	ITALY	
		WALDEMAR PRUSS ARMATURENFABRIK GMBH	GERMANY	
33.	PRESSURE/DP/VACUUM SWITCH	INDFOSS	GHAZIABAD	
		SOR	USA	
		DRESSOR	USA	
		DELTA CONTROL	UK	
		TRAFAG	RANIPET	
		GIC(GAUGES BOURDON)	PANVEL	
		ASHCROFT INDIA PVT LTD.	USA/GERMANY	
		SWITZER	CHENNAI	
34.	TEMPERATURE GAUGE	A.N. INSTRUMENTS PVT. LTD.	KOLKATA	
		ASHCROFT INDIA PVT LTD.	GUJARAT	
		BUDENBERG GUAGE CO.LTD.	UK	
		FORBES MARSHALL (HYD) LTD.	HYDERABAD	
		GOA INSTRUMENTS INDUSTRIES PVT.LTD.,	GOA	
		GOA THERMOSTATIC INSTRUMENTS PVT.LTD.		
		GAUGE BOURDON INDIA PVT. LTD.	MUMBAI	
		H.GURU INDUSTRIES	KOLKATA	
		H.GURU INSTRUMENTS (SOUTH INDIA) P. LTD	BANGALORE	
		BAUMER TECHNOLOGIES INDIA PVT. LTD.	MUMBAI	
35.	LEVEL GAUGE (F&B, TUBULAR, REFLEX)	SBEM		
		CHEMTROL		
		PUNE TECHTROL		
		SIGMA		
		V AUTOMAT		
		GENERAL INSTRUMENTS		
36.	ROTAMETER	EUREKA INDUSTRIAL EQUIPMENTS PVT.LTD.	PUNE	
		FLOW STAR ENGINEERING PVT. LTD.,	FARIDABAD	
		FLOWTECH INSTRUMENTS SERVICRS	VADODARA	
		INSTRUMENTATION ENGINEERS PVT LTD	TELANGANA	
		SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	NAVI MUMBAI	
37.	LEVEL SWITCH- CONDUCTIVITY TYPE	BLISS ANAND PVT. LTD.	GURGAON	
		FLOWTECH INSTRUMENTS SERVICRS	VADODARA	



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SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		HI-TECH SYSTEMS & SERVICES LTD.	KOLKATA-	VENDOR SHALL SOURCE IMPORT CONTENTS OF LEVEL SWITCH (CONDUCTIVITY TYPE) FROM LEVELSTATE SYSTEMS LTD., UNITED KINGDOM.
		LEVCON INSTRUMENTS PVT. LTD.	KOLKATA	
		RAMAN INSTRUMENTS PVT.LTD.	MUMBAI	VENDOR SHALL SOURCE IMPORT CONTENTS OF LEVEL SWITCH (CONDUCTIVITY TYPE) FROM MOBREY MEASUREMENT , AN OPERATING UNIT OF MORBEY LTD., SLOUGH, BERKSHIRE, UNITED KINGDOM.
		SIGMA INSTRUMENTS CO.	MUMBAI	
		SOR INC.	USA	
		SAPCON INSTRUMENT PVT LTD.	INDORE	
		V. AUTOMAT & INSTRUMENTS (P) LTD.	NEW DELHI	
38.	LEVEL SWITCH (ALL TYPES)	LEVCON		
		CHEMTROLS SAMIL (INDIA) PVT LTD.		
		SWITZER		
		WAAREE (BAUMER INSTRUMENTS)		
		V AUTOMAT		
		PUNE TECHTROL		
39.	MAGNETIC FLOW METER	ABB	-	
		WAAREE (BAUMER INSTRUMENTS)	-	
		EUREKA	-	
		EMERSON	-	
		YOKOGAWA	-	
		HACH (POTENSE)	-	
		KROHNE MARSHALL	-	
40.	FLOW ELEMENT - NOZZLE	HYDROPNEUMATICS PVT. LTD.	GOA	
		INSTRUMENTATION LTD.	PALAKKAD	



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SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
41.	FLOW ELEMENT - ORIFICE	MICRO PRECISION PRODUCTS PVT. LTD.	FARIDABAD	
		MINCO (INDIA) FLOW ELEMENTS PVT. LTD.	GOA	
		STAR-MECH CONTROLS (I) PVT.LTD.	PUNE	
		SEIKO FLOW CONTROL GMBH	AUSTRIA	
		FLOW STAR ENGINEERING PVT. LTD.,	FARIDABAD	
		HYDROPNEUMATICS PVT. LTD.	GOA	
		INSTRUMENTATION LTD.	PALAKKAD	
42.	FLOW TRANSMITTERS (ALL TYPES)	INSTRUMENTATION ENGINEERS PVT LTD	HYDERABAD	
		MICRO PRECISION PRODUCTS PVT. LTD.	FARIDABAD	
		MINCO (INDIA) PRIVATE LIMITED	GOA	
		STAR-MECH CONTROLS (I) PVT.LTD.	PUNE	
		E & H	-	
		KHRONE MARSHALL	-	
		EMERSON	-	
43.	LEVEL TRANSMITTERS (ALL TYPES)	ABB	-	
		HONEYWELL	-	
		YOKOGAWA	-	
		EMERSON	-	
		E & H	-	
		ABB	-	
		HONEYWELL	-	
44.	PRESSURE TRANSMITTERS (ALL TYPES)	V AUTOMAT	-	
		YOKOGAWA	-	
		SIEMENS	-	
		KROHNE MARSHALL	-	
		EMERSON	USA/PAWANE	
		LAXONS AUTOMATION	DAMAN	
		YIL	BANGALORE	
45.	TEMPERATURE TRANSMITTERS	SIEMENS	THANE	
		FUJI	CHINA	
		YOKOGAWA	JAPAN	
		HONEYWELL	USA/PUNE	
		EMERSON	-	
		E & H	-	
		ABB	-	
46.	PH TRANSMITTERS	HONEYWELL	-	
		V AUTOMAT	-	
		YOKOGAWA	-	
		SIEMENS	-	
		FORBES MARSHALL	-	
		EMERSON	-	



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SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		YOKOGAWA	-	
		HONEYWELL	-	
		ABB	-	
		HACH	-	
		FORBES MARSHALL	-	
47.	ANALYSERS (ALL TYPES)	ABB	-	
		EMERSON	-	
		YOKOGAWA	-	
		HONEYWELL	-	
		HACH POLYMETRON	-	
		SIEMENS	-	
		FORBES MARSHALL	-	
48.	PROGRAMMABLE LOGIC CONTROLLER	GE INTELLIGENT PLATFORMS PRIVATE LIMITED	BANGALORE	
		HONEYWELL AUTOMATION INDIA LIMITED ,	PUNE	
		ROCKWELL AUTOMATION INDIA LTD	SAHIBABAD	
		SIEMENS LIMITED	MUMBAI	
		SCHNEIDER ELECTRIC INDIA PVT.LTD.	NEW DELHI	
49.	UPS	HITACHI-HIREL	GANDHINAGAR	
		APC	BANGALORE	
		DELTA	GURGAON	
		EMERSON	MUMBAI	
		DB POWER	PUNE	
		APLAB	MUMBAI	
50.	INSTRUMENT FITTINGS	AURA INCORPORATED	NEW DELHI	
		ASTEC VALVES & FITTINGS PVT. LTD.,	MUMBAI	
		ARYA CRAFTS & ENGINEERING PVT. LTD.	MUMBAI	
		COMFIT & VALVE PVT. LTD.	GUJARAT	
		FLUIDFIT ENGINEERS PVT. LTD.	MUMBAI	
		FLUID CONTROLS PVT. LTD.	MUMBAI	
		HP VALVES & FITTINGS INDIA PVT. LTD.	CHENNAI	
		PRECISION ENGINEERING INDUSTRIES	MUMBAI	
		PANAM ENGINEERS,	MUMBAI	
		PERFECT INSTRUMENTATION CONTROL (INDIA) PVT. LTD.	MUMBAI	
		VIKAS INDUSTRIAL PRODUCTS	NOIDA	
51.	JUNCTION BOX	AJMERA INDUSTRIAL & ENGINEERING WORKS	MUMBAI	
		FLEXPRO ELECTRICALS PVT. LTD.	GUJARAT	METAL TYPE JUNCTION BOX ONLY



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		K.S.INSTRUMENTS PVT.LTD.	BANGALORE	
		SUCHITRA INDUSTRIES	BANGALORE	
		SHRENIK & COMPANY,	AHMEDABAD	
52.	CABLE GLAND	COMET	-	
		DOWELL	-	
		CHETNA	-	
53.	CABLE LUGS	ELECTRO BILLETS	-	
		COMET	-	
		DOWELL	-	
		CHETNA	-	
54.	MS PLATES	SAIL		
		ESSAR STEEL		
		TISCO		
		RINL		
		JINDAL		
		LLOYD		
		ISPAT		
		INDIAN IRON & STEEL CO. LTD		
55.	CS PIPE (ASTM A 106 GR. B)	INDIAN SEAMLESS METAL TUBES	AHMEDABAD	UPTO 150 NB
		MAHARASHTRA SEAMLESS	RAIGAD	UPTO 350 NB
56.	MS PIPES (IS: 1239 & 3589)	SAIL	ROURKELA	
		JINDAL	GHAZIBAD/HISSAR	
		SURYA ROSHNI	BAHADUR GARH	
		TATA TUBE	JAMSHEDPUR	
		PSL	CHENNAI/VIZAG/KUTCH/DAMAN	
		LALIT PROFILE	THANE	
		SAMSHI PIPES INDUSTRIES	VADODARA	
		MUKUT PIPES	RAJPURA	
		INDUS TUBES	G B NAGAR	
		MANN IND	INDORE	
		SURENDRA ENGG	RAJPURA	
		PRATIBHA PIPES & STRUCTURE PVT LTD	THANE	
		JCO GAS PIPE	CHINDWARA	
		NUKAT TANKS AND VESSELS	TARAPUR	
		DADU PIPES	SIKRANDRABAD	
		GOOD LUCK TUBES	SIKANDRABAD	
		ADVANCE STEEL TUBES	SAHIBABAD	
		BIHAR TUBES	SIKANDRABAD	
		HI TECH PIPES	SIKANDRABAD	



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SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		RATNAMANI	KUTCH/AHMEDABAD/CHHATRAL	
		MAHARASHTRA SEAMLESS	RAIGAD	
		WELSPUN	ANJAR/BHARUCH	
57.	SS PIPES / TUBES	APEX TUBES	BEHROR (ALWAR)	
		RATNAMANI	CHATTRAL	
		REMI	TARAPUR	
		PRAKASH STEELAGE	-	
58.	POWER/CONTROL/INSTRUMENT CABLE	CORDS CABLE	BHIWADI	
		RADIANT CABLES	HYDERABAD	
		POLYCAB	DAMAN	
		KEI	BHIWADI	
		NICCO	KOLKATA	
		RAVIN CABLES	PUNE	
		INCAB	PUNE	
		HVPL	FARIDABAD	
		TORRENT CABLE	NADIAD	
		HAVELLS	ALWAR	
		PARAMOUNT	KHUSHKHERA	
		SRI RAM CABLES	BHIWADI	
		THERMOCABLES	HYDERABAD	
		TORRENT CABLE	NADIAD	
		UNIVERSAL CABLES	SATNA	
		GEMSCAB	BHIWADI	
		DELTON	FARIDABAD	
59.	SAFETY SHOWER	UNICARE	-	
		MOHAN INDUSTRIES	-	
		SUPER SAFETY SERVICES	-	
60.	FRP TANKS & FITTINGS	GLOBAL COMPOSITE	-	
		EPP	-	
		DEEPA COMPOSITE	-	
		COROSEAL INDUSTRIES	-	
		CHEMICAL PROCESS & EQUIPMENT PVT LTD	-	
		J.R FIBRE INDUSTRIES PVT LTD	-	
		POLYPLAST	-	
61.	EJECTOR	ESSEM TECHNOLOGIES	-	
		RATNA PRASAD	-	
62.	LOCAL CONTROL PANEL	INDUSTRIAL SWITCHGEAR & CONTROL	-	
		POSITRONICS	-	
		DELTA CONTROL	-	



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SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		L & T	-	
		GE POWER	-	
		PYROTECH	-	
		C& S	-	
63.	TANK (FRP)	INDUSTRIAL SERVICE	KOLKATA	
		SUNRISE	BARODA	
		GANDHI & ASSOCIATES	AHMEDABAD	
		MODERN EQUIPMENTS	CHENNAI	
		EAGLE PLAST	PUNE	
		OMEGA PLAST	MUMBAI	
64.	STROKE CONTROLLER	V K PUMPS	NASIK	
		METACHEM	MUMBAI	
		SWELORE	AHMEDABAD	
		MILTON ROY INDIA	CHENNAI	
65.	SAFETY VALVES/RELIEF VALVES	METACHEM	MUMBAI	
		KEYSTONE	BARODA	
		V K PUMPS	NASIK	
		MILTON ROY	CHENNAI	
66.	DUPLEX STRAINER	JAYPEE INDUSTRIES PVT. LTD.	NEW DELHI	
		MULTITEX FILTRATION ENGINEERS LIMITED,	NEW DELHI	
		OTOKLIN GLOBAL BUSINESS LIMITED	MUMBAI	
		GRAND PRIX	FARIDABAD	
		BOMBAY CHEMICAL EQUIPMENT'S		
		SUNGOV ENGINEERING PVT. LTD.	CHENNAI	
67.	ORIFICE PLATE	MICRO PRECISION	FARIDABAD	
		INSTRUMENTAION LTD	PALGHAT	
		CARLO DYNAMICS	HYDERABAD	
68.	STEEL GATE/GLOBE/NR VALVES	A.V. VALVES LTD	AGRA	
		ATAM VALVES PVT. LTD.	JALANDHAR	(1) CARBON STEEL GATE VALVES & NON RETURN VALVES: 15 NB TO 50 NB (#800) & 65 NB TO 300 NB (#150) (2) CARBON STEEL GLOBE VALVES: 15 NB TO 50 NB (#800) & 65 NB TO 200 NB (#150)



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SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		FLUIDLINE VALVES COMPANY PVT.LTD.	KAUSHAMBI	
		M/S GM ENGINEERING	RAJKOT	
		INTERVALVE (INDIA) LTD.	PUNE	A) STEEL GATE VALVES: UPTO 50NB, #800 AND 65NB TO 150NB, #150 B) STEEL GLOBE VALVES: UPTO 50NB, #800 AND 65NB TO 100NB, #150 C) SUPPLIER NOT REGISTERED FOR NR VALVES
		LEADER VALVES LTD.	JALANDHAR	
		NITON VALVE INDUSTRIES PVT LTD	MUMBAI	
		NSSL LIMITED.	NAGPUR	
		STEEL STRONG VALVES (I) PVT.LTD.,	NAVI MUMBAI	LIMITED TO RANGES & CLASSES AS AVAILABE IN VD FILE.
		VENUS PUMPS AND ENGG. WORKS	KOLKATA	CC/CSS-GATE-BBT- UPTO600NB CL UPTO300,GATE-PSBT UPTO250NB CL 1500,GLV-BBT- UPTO300NB CL UPTO600,SCNR V-BBT- UPTO600NB CL UPTO150,SCNR V-BBT- UPTO300NB CL 300,SCNRV-PSBT- UPTO150NB CL UPTO900
		VALTECH INDUSTRIES	MUMBAI	CAST CARBON & ALLOY STEEL - VALVE/RATING /SIZE- GV/150/900,GV



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SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
				/300/400, GV/600/300 , GV/GLV/NRV/9 00/250 , GLV/300/300,G LV/150/350/ , SCNRV/150/70 0, SCNRV/300/35 0, SCNRV/600/25 0.
		HAWA VALVES (INDIA) PVT. LTD.		
		OSWAL INDUSTRIES LIMITED		
		V.K. VALVES PVT. LTD.,	JALANDHAR	
		WEIR BDK VALVES- A UNIT OF WEIR INDIA PVT. LTD.	NEW DELHI	
69.	SLUICE GATE	H SARKAR	KOLKATA	
		JASH ENGINEERING	-	
		YASHWANT INDUSTRIES	-	
70.	3 WAY VALVE	HI TECH	AHMEDABAD	
		ADVANCE VALVES PVT.LTD	NOIDA	
		BDK	HUBLI	
		FOURESS ENGG.INDIA LTD.	MUMBAI	
		FLUIDLINEVALVES COMPANY PRIVATE LTD.,	MUMBAI	
		INSTRUMENTATION LTD.	PALAKAD	
		KIRLOSKAR BROTHERS LTD.	PUNE	
		VENUS PUMP & ENGG. WORKS	KOLKATA	
		SURYA VALVES AND INSTRUMENTS MANUFACTURING COMPANY	CHENNAI	
		STAFFORD CONTROLS LIMITED	PUNE	
		MICON VALVES (INDIA) PVT.LTD	MUMBAI	
71.	PLUG VALVE(MANUAL)	BDK	HUBLI	
		HAWA ENGINEERS / MARCK & CARE	-	
		MICON VALVES	-	
		MICON VALVES (INDIA) PVT.LTD	MUMBAI	
72.	FITTINGS (CS/SS)	M.S. FITTINGS	KOLKATA	
		METAL LLOYDS	MUMBAI	
		TRUE FORGE	FARIDABAD	
		TUBE PRODUCTS	BARODA	
		NL HAZRA	KOLKATA	
		GUJRAT INFRA PIPES	BARODA	
		EDWARDS	USA	



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SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		PIPEFIT ENGINEERS	BARODA	
		SIDDARTH & GAUTAM	FARIDABAD	
		EBY	MUMBAI	
73.	FLANGES (SS/CS)	PRADEEP METALS LTD	MUMBAI	
		TUBE PRODUCT INCORPORATION	BARODA	
		MS FITTINGS	KOLKATA	
		HAWA ENGINEERING	-	
		ALIANCE PIPE & PLANGES	KOLKATA	
		JAI AMBE	MUMBAI	
74.	PIPE & FILLTING (PP,HDPE,PVC & CPVC)	GEROGE FISHCHER	DELHI	
		ASTROL PLYTECHINC LTD	AHMEDABAD	
		JAIN IRRIGATION	-	
		ORIPLAST	-	
75.	VALVES (GATE/GLOBE/NRV/BALL)- (PP,HDPE,PVC & CPVC)	GEROGE FISHCHER IPING SYSTEMS PVT LTD	DELHI	
		ASTROL PLYTECHINC LTD	AHMEDABAD	
		JAIN IRRIGATION	-	
		ORIPLAST	-	
76.	AIR FILTER REGULATOR	SHAVO NORGEN	-	
		PLACKA INSTRUMENTS	-	
77.	FILTER MEDIA	GLOBAL ABSORBENT	KOLKATA	
		BHARAT MINERALS		
78.	DC LEAD ACID / NI-CD BATTERIES	AMCO SAFT INDIA LTD	BANGALORE	NI-CD BATTERIES ONLY
		EXIDE INDUSTRIES LTD	NEW DELHI	LEAD ACID BATTERIES ONLY.
		HBL POWER SYSTEMS LTD	HYDERABAD	NI/CD AND TUBULAR TYPE FOR LEAD ACID
		HOPPECKE BATTERIEN GMBH & CO.KG,	GERMANY	
79.	DC LEAD ACID BATTERIES	EXIDE INDUSTRIES LTD	NEW DELHI	
		HBL POWER SYSTEMS LTD	HYDERABAD	TUBULAR TYPE
		HOPPECKE BATTERIEN GMBH & CO.KG,	GERMANY	
80.	DC NI CD BATTERIES	AMCO SAFT INDIA LTD	BANGALORE	
		HBL POWER SYSTEMS LTD	HYDERABAD	
		HOPPECKE BATTERIEN GMBH & CO.KG,	GERMANY	
81.	SIGHT FLOW INDICATORS	B.K.EQUIPMENTS PVT.LTD.	CHENNAI	
		BLISS ANAND PVT. LTD.	GURGAON	
		FLOWTECH INSTRUMENTS SERVICRS	VADODARA	
		INSTRUMENTATION ENGINEERS PVT LTD	TELANGANA	



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SR. NO.	ITEM	SUPPLIERS	PLACE	REMARKS
		SIGMA INSTRUMENTS CO.	MUMBAI	
		SCIENTIFIC DEVICES (BOMBAY) PVT LTD,	NAVI MUMBAI	
		TELACE EQUIPMENT PVT.LTD.	CHENNAI	
82.	PAINT	ASIAN PAINTS (I) LTD.		
		BERGER PAINTS INDIA LTD		
		GOODLASS NEROLAC		
		JENSON & NICHOLSON (I) LTD		
		CDC CARBOLINE (I) LTD.		
		SHALIMAR PAINTS LTD.		
		ADDISON PAINTS LTD		
		GRAND POLYCOAT		
		BOMBAY PAINTS		
		HEMPLE PAINTS (SINGAPORE)		
		JOTUN PAINTS		
83.	PNEUMATIC ACTUATOR	PROCON ENGINEERS	-	
		TYCO	-	
		CRANE PROCESS	-	
		BDK	-	
		INTERVALVE	-	
		BRAY CONTROL	-	
84.	MOTORISED ACTUATOR	ROTARK	-	
		AUMA	-	
		LIMITORK	-	