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**JOB SPECIFICATION FOR 7.0 MLD SBR TECHNOLOGY
BASED SEWAGE TREATMENT PLANT**

Revisions:	Prepared by :	Checked by :	Approved by :	Date :
Refer to record of revisions	Pradeepa	AKS	MSSN	16.09.2017

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The detailed specification of the Sewage treatment plant may be referred in the document PY 51264 attached herewith.

The plant specific details are elaborated below (covered under sections 1.0 & 2.0):

1.0 **PROJECT DATA**

Project	:	1 x 7.0 MLD Sequential Batch reactor (SBR) based Sewage Treatment Plant (STP)
Customer	:	M/s. BHEL-Haridwar (BHEL In-house requirement)
Project Location	:	BHEL-Haridwar Township
Plant Capacity	:	7.0 MLD (average flow)
Peak Factor	:	1.2
Peak Flow	:	8.4 MLD

2.0 **DESIGN PARAMETERS**

Raw Sewage Quality

Sl. No.	Parameter	Unit of Measurement	Range
1	Biological Oxygen Demand	mg/l	40-100
2	Chemical Oxygen Demand	mg/l	100-200
3	Total Suspended Solids	mg/l	100-200
4	Phosphorous as PO ₄	mg/l	2- 4
5	Total kjeldahl Nitrogen as N	Mg/l	6-22

Guaranteed Treated Sewage Quality:

Sl. No.	Parameter	Unit of Measure	Value after tertiary treatment
1	pH	-	6.5 – 9.0
2	Biological Oxygen Demand	mg/l	10
3	Chemical Oxygen Demand	mg/l	50
4	Total Suspended Solids	mg/l	10
5	NH ₄ – N	mg/l	5
6	N – total	mg/l	10
7	Fecal Coliform	MPN / 100ml	< 230
8	PO ₄ – P	mg/l	2

Note: Bidder to design the plant as per the above parameters. In case of any observations on the above parameters, bidder may bring out during pre-bid stage for discussion and consideration accordingly.

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3.0 P&ID:

A typical P&ID of the system is also enclosed as Annexure –A. Bidder to design the STP in line with this P&ID and quote accordingly. In case bidder is not able to offer in line with the P&ID, the same are to be discussed and settled during pre-bid stage only.

4.0 CHECK LIST

Bidder to note that Check List shall be completely filled and the data required in-line with Check List shall be submitted along with their Offer to enable Purchaser to evaluate the offer submitted.

<u>S.No.</u>	<u>Description</u>	<u>Enclosed or [Yes/No]</u>	<u>Remarks/ Comments by Bidder</u>
1	Bidder to confirm compliance with spec. PY-AS-4-M098-8710-01 and its annexure without any deviations.		
2	Bidder has already raised pre-bid queries (if any) on Purchase specification.		
3	Bidder Shall submit completely filled following Annexures enclosed with Technical Purchase Specification PY 51264 along with their offer Annexure-I: Key Information Annexure-II: List of Recommended Spare Parts Annexure-III: Special Tools and Tackles Annexure-IV: Deviation from specification		
4	Tentative Electrical Load List is enclosed with offer.		
5	Bidder shall furnish the list of Erection and commissioning spares along with their offer.		
6	Bidder to fill Deviation list (Refer Annexure-IV of PY 51264). Only those deviation indicated in this list will be considered during technical evaluation of offer. Bidder to indicate the deviations which are impractical.		
7	All other requirements except the deviations brought out under deviation list, have been taken into consideration in the offer.		
8	Bidder has submitted unpriced "Price bid format" with "Quoted" mentioned against price for each line item of Price Bid Format		

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PRICE SCHEDULE

SL. NO.	DESCRIPTION	QTY.	UNIT PRICE (Rs)	TOTAL PRICE (Rs)
1.0	DESIGN, ENGINEERING, MANUFACTURE, SUPPLY, ERECTION SUPERVISION & COMMISSIONING			
1.1	Design, Engineering, Manufacture, Supply of the proprietary items of Biological treatment system of SBR.	1 set		
1.1.1	Decanter Assembly for SBR Basins			
1.1.2	Diffuser with air grid for SBR Basins			
1.1.3	Diffuser with air grid for Sludge sump			
1.1.4	PLC system for entire STP			
1.1.5	Special Tools & Tackles for Bidder supplied items as per the specification	1 set		
1.1.6	Commissioning and erection spares [Item wise list of commissioning and erection spares with unit rate and quantity for supply items listed under Sl. No. 1.1 above to be furnished by bidder)	1 set		
1.2	Engineering services for the design of the primary, secondary, tertiary and sludge handling system as per the specification.	1 Set		
1.3	Erection supervision and commissioning including performance guarantee of the plant as per the specification.	1 Set		
1.3.1	Per Diem rates per Service Engineer including Boarding, Lodging & Local Travel for the erection supervision and commissioning of all the three sets	8 days		
1.3.2	Travel expenses from vendor works to project site and back for Service Engineer/Technician (this shall include charges if any for travel time) for the Scope of Service defined in Technical Specification (Doc. No. PY-AS-4-M098-8710-01) and all its annexure	2		
	TOTAL (for Sl. No. 1)			
2.0	Recommended Spares (optional price)			
2.1	2 years recommended spares along with their quantities and unit rate for normal trouble free operation of the system described in Sl. No. 1.1 above based on bidders' experience. <i>Note: List for recommended spares and it's unit rate to be furnished by bidder.</i>	RO		

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NOTES:-

1. Bidder to quote strictly as per BHEL's NIT requirements.
2. Bidder to note that this is a LUMP SUM Turn-Key Order. Any additional claim after placement of order will not be entertained under any circumstances.
3. Bidder to quote the base rates only. All Applicable taxes and duties shall be indicated separately for the Supply Portion and Erection supervision & Commissioning Portion.
4. Bidder shall also submit unpriced copy of the Price-Bid Format with "Quoted" against each line item of the format along with the technical offer.
5. Bidder to quote strictly in the price bid format with line wise itemized price and quantity, failing which the bidder's offer shall be liable for rejection.
6. For the purpose of tender evaluation, a total of 8 man-days for 2 visits have been considered. However, either or both of the number of man days or no of visits may change on either side based on the actual site requirement.
7. Bidder to quote separately, in an identical format, 2 years operational spares compulsorily (for Bidder's supply items) item wise with recommended quantity and unit rate. However ordering of the same shall be at the sole discretion of BHEL.

Signature of Bidder's
Authorized representative

Date.....

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TENDER DRAWINGS/DOCUMENTS

Sl No.	Description	Drg. / Doc. No.	Rev. No.
1	Technical Purchase Specification for design of STP and supply of SBR components (Biological Treatment)	PY-51264	01
2	Technical Specification for Programmable Logic controllers (PLC)	PEIC-04269	00
3	Scheme of Sewage Treatment Plant		00
4	Typical QAP Format		00

NOTE: The bidder to comply with all the above specifications without any deviation.

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RECORD OF REVISIONS				
Rev. No.	Date	Revision Details	Revised By	Approved By
00	18.09.17	First Issue	AKS	MSSN

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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.	TECHNICAL PURCHASE SPECIFICATION FOR DESIGN OF STP AND SUPPLY OF SBR COMPONENTS (BIOLOGICAL TREATMENT)			

Revisions: Refer to record of revisions	Prepared by :	Checked by :	Approved by :	Date :
	Pradeepa	AKS	MSSN	18.09.17

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1.0 INTENT OF SPECIFICATION:

The intent of the specification is to cover the details of scope of design, supply and services for Sewage Treatment Plant based on SBR technology.

2.0 GENERAL DESCRIPTION:

2.1 Design of the STP shall conform to latest CPHEEO manual and applicable standards.

2.2 Supplies shall be rendered in conformity with proven design principles. The requirements specified in this document must be fulfilled in its entirety and with maximum reliability. All the components shall be so designed that repairs and overhauling is minimum and can be carried out easily in the shortest possible time.

2.3 All equipment/items supplied shall conform to the provisions of statutory & other regulations in force in India and the State/Province where the project is being executed.

2.4 The sewage treatment plant consists of the following systems:

- a) Raw Sewage pumping station
- b) Primary treatment
- c) Secondary treatment
- d) Tertiary treatment
- e) Sludge handling system

2.5 Treatment process

The sewage treatment process selected is Sequential Batch Reactor (SBR) technology. The treatment process should achieve the effluent water quality meeting the latest CPCB norms. Bidder shall design a complete, fully functional system for proper & easy operation meeting the stated performance requirements mentioned in Job specification. Bidder shall be responsible for the design of the complete system and performance of the plant.

3.0 SCOPE OF WORK:

The scope of work covered under this specification shall include:

Design, manufacture, testing, supply, erection supervision and commissioning of the key components of biological treatment system of SBR as specified in the scope of supply below.

Also Bidder's scope includes design and engineering services for the primary, secondary, tertiary and sludge handling systems as required for the safe and trouble-free operation of STP.

Please refer to the indicative scheme of the Sewage Treatment Plant enclosed along with the specification. Bidder's scope includes engineering of all the items / equipment indicated in the scheme.

3.1 Scope of Supply

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The scope of supply shall include the following items:

A. Decanter Assembly for each SBR basin:

Any one of decanter types i.e **Mechanical or Floating** type along with associated accessories as given below shall be supplied by the bidder:

A1. Mechanical actuated decanter, associated equipment and accessories as described herein for each basin (Bidder scope of supply includes all components required for trouble free operation of mechanical decanter and not limited to following):

- a) Each decanter shall consist of an integral flotation unit, gearbox, a 304/316 stainless steel movable weir assembly, scum guard, down comers and an electric motor-driven actuator with VFD to open and close the weir.
- b) The decanter shall have the ability to control the decant time between top water level and bottom water level. The travel of the decanter shall be limited and controlled by limit switches, which along with the motor shall be integrated with the process control system to prevent blower operation during decant phase of the cycle.
- c) All the down comers in each decanter should be of the same size
- d) Puddle pipe connecting the decanter outlet pipe from inside and outside of the basin, outlet pipe upto terminal point, including flange, counterflange, studwith 2 nuts, gaskets shall be in bidder scope. Bidder has to supply the puddle pipes well in advance matching the civil construction at site
- e) The decanter shall be designed with a scum guard mechanism to prevent the discharge of scum and floatables during decanter operation. During non-decant phase, the decanter shall be parked above design top water level, thereby eliminating any possibility of solids carryover.
- f) The decanter weir shall be positioned such that it is visible from the basin side wall for providing the operator with a visual check of the effluent quality.
- g) The decanter seals and bearings shall be constructed of maintenance free, synthetic materials for longest possible service life. All seals and bearings shall be shipped factory assembled, simplifying installation.
- h) All critical decanter components that may require inspection and maintenance shall be easily accessible from the access platform.

A2. Floating type of decanter, associated equipment and accessories as described herein for each basin (Bidder scope of supply includes all components required for trouble free operation of floating decanter and not limited to following):

- a) Each decanter shall consist of an integral floatation unit, a fiberglass reinforced plastic float and draw tube with 304/316 stainless steel spring loaded solids excluding valves, a heavy duty wire reinforced flexible hose, steel knee brace and elbow which connects the decanter
- b) Puddle pipe connecting the decanter outlet pipe from inside and outside of the basin, outlet pipe upto terminal point, motor operated on/off butterfly valve, including SS flange, CI / DI counterflange, studwith 2 nuts, gaskets shall be in bidder scope. Bidder has to supply the puddle pipes well in advance matching the civil construction at site
- c) The decanter shall have integrated scum control system to prevent any entrainment of surface scum, floating debris and foam consisting of air

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compressors assembly, associated piping, valves, piping components, accessories, instruments and its controls.

- d) Material of construction shall be of high quality, durable and corrosion resistant.
- e) The decanter weir shall be positioned such that it is visible from the basin side wall for providing the operator with a visual check of the effluent quality.

B. Diffusers with air grid

The diffusers with air grid for SBR Basins and sludge sump shall be supplied by the bidder. The diffusers shall have the following features:

- a) The diffusers for the SBR basin shall be of fine bubble type membrane / tubular. The diffusers for the sludge sump shall be of coarse bubble type membrane / tubular. The air grid manifold shall be fabricated of UPVC. The vertical piping of Stainless steel material (SS 304 /316) which connects to the air grid piping is also in the bidders scope and shall be terminated with a SS flange, MS counter flange along with stud with 2 nuts and gaskets at the top of the SBR basin and sludge sump respectively
- b) The air grid shall be provided with manifolds fabricated of UPVC with flanged connection to suit the feeder pipe and shall be with positive locking fixed threaded union joint connections or flange type joints for each air distribution header to prevent blow apart and rotation.
- c) 316 / 304 Stainless steel supports shall be provided for the manifold and distribution headers. Supports shall be designed so that they can be adjusted without removing the air distributor from the support.
- d) Membrane / Tubular diffusers shall be provided with a water tight seal to stop water ingress when not aerating.

C. PLC system:

Refer technical specification (PEIC-04269) for programmable logic controller (PLC) attached with this specification. Bidder shall provide PLC based SCADA system for the control of entire STP as per the latest technology with following minimum features / requirements:

- a) All field instruments and electro-mechanical equipment of total STP shall be operated, monitored and controlled through a single dedicated PLC system.
- b) The control system shall be complete with cabinets, processor modules, I/O modules, power supply modules, communication modules & networks and other associated hardware. PLC based automation system shall be designed using adequate redundancy features. Workstation + A4 laser Printer along with PLC panel & other peripherals shall be provided as a minimum.
- c) PLC system envisaged to operate in un-manned auto mode of operation. In case of PLC operation failure in auto, manual mode of operation should enable the operator to control and operate the plant.
- d) Bidder shall prepare diagrams / documents of the total plant viz., PLC architecture diagram / PLC panel layout / Digital logic diagrams / Analog closed loops / Dynamic graphics / cable schedules / Interconnection diagrams / alarm reports / log reports / event reports / process trends / history

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reports etc., being used for monitoring, operating and controlling of equipment and systems in the total STP plant.

- e) Bidder shall include & arrange for training of customer's personnel on automation and special instrumentation items.
- f) Bidder scope includes site visits of respective instrumentation and automation equipment manufacturer's competent representative as and when required, during erection & commissioning.
- g) Bidder shall submit and obtain approval from the purchaser during engineering stage, O & M manual of the plant in which all the finalized documents are enclosed.

D. Electrical items:

- a) Cable gland lugs for cable termination at the Bidder's side equipment shall be in bidder's scope of supply.
- b) Power supply feeder shall be provided to PLC at one point by BHEL. Further distribution to all associated equipment including HMI, Printer etc. shall be taken care by bidder.
- c) Glands shall be double compression type Nickel plated Brass(ET) shall be provided with back nut and PVC shroud (for all power and control cables)
- d) Lugs shall be tinned copper heavy-duty lug.

3.2 Scope of Services

The scope of services for the STP shall include:

- a) Engineering services for the design of primary, secondary, tertiary and sludge handling systems of STP. BHEL shall procure the equipment for Primary, Tertiary and Sludge handling systems based on the design data provided by the Bidder.
- b) Engineering services for the complete engineering of the STP shall include but not limited to preparation of engineering drawings/documents and submission in PDF and editable format such as Process design & calculations, Development of PFDs/P&IDs, Hydraulic diagrams, Terminal Point diagram with complete details, Equipment layout, Plot plan, Piping layout, Access platforms layout, Diffuser layout inside SBR basin and Sludge sump, GA drawings, datasheets and foundation details of equipment in bidders scope(Decanter, diffuser, PLC), datasheets & sizing criteria of all the equipment of the STP (Primary, Secondary, Tertiary & Sludge Handling), Equipment Installation drawings, Maintenance requirements of Equipment, Valves specifications, Painting Specification etc., and all necessary inputs required for complete engineering of the project.
- c) Bidder shall assist in obtaining the approvals of various engineering documents from customer.
- d) Bidder to furnish the required input details for the civil design of the STP.
- e) Bidder shall also provide the required input data (like load list, SLDs, instrument data sheets, instrument hook up diagrams for information purpose etc.) for the detailed design of associated electrical and instrumentation systems.
- f) Bidder to identify and furnish the list of equipment required for the complete STP.
- g) Provide service for the procurement engineering (specifications, data sheets, vendor list etc.).
- h) Erection supervision and commissioning of the biological treatment system and site support for integrating other systems like primary treatment, tertiary treatment, sludge disposal system etc.
- i) Visit of process design expert to meetings at intimated location and also at project site for support, as and when required, during execution of the project.



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- j) Performance guarantee Test of the overall plant.
- k) Training of Customer personnel in operation and maintenance of the plant.

3.3 A typical **services matrix** is listed below:

Sl. No.	Description	Basic Engineering	Detail Engineering	Supply	Execution
1	Raw Sewage Pumping station	Bidder	Bidder	BHEL	BHEL
2	Primary Treatment	Bidder	Bidder	BHEL	BHEL
3	Secondary Treatment	Bidder	Bidder	Bidder	BHEL under Supervision by Bidder
4	Tertiary Treatment	Bidder	Bidder	BHEL	BHEL
5	Sludge Handling system	Bidder	Bidder	BHEL	BHEL

Basic Engineering: means conceptual design, sizing criteria.

Detail Engineering: means Preparation of design documents, procurement specifications, technical offer scrutiny and vendor drawing approval.

Execution: means civil design, civil works and E&C. However, Bidder shall provide all the necessary civil inputs.

3.4 Consumables

Bidder shall furnish the list of consumables required for the commissioning, operation and maintenance of the system.

3.5 Lubricants

Bidder shall provide the flushing oil required, together with first fill of oil and/or grease for parts of equipment requiring lubrication under Bidder's scope. For all types of lubricants selected, equivalent grade of other makes shall be mentioned which can be sourced locally.

3.6 Erection & Commissioning Spares

The Bidder shall also supply erection & commissioning spares along with his main equipment as per his experience, for replacement of damaged or unserviceable ones during the execution of the project at site, to avoid delays in the project commissioning. This shall form part of the main equipment supply.

3.7 Special Maintenance Tools and Tackles

One set of special tools and tackles required for operation, maintenance, inspection and repair, neatly packed in steel boxes complete with operating instructions for Bidder's scope

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of equipment shall form part of the main equipment supply and a separate list for the same shall be furnished along with bid.

3.8 Recommended Spares

A minimum requirement of spare parts for the overall plant based on the experience of the Bidder sufficient for two (2) years of normal trouble free operation shall be recommended and quoted separately as optional item. Bidder shall furnish the description along with recommended quantity for each item in the offer.

3.9 Terminal Points

- (i) Bidder shall provide counter flanges alongwith stud nuts and gaskets for the diffuser pipes at terminal points of both SBR basins and sludge sump and also for the decanter outlet pipe. Material of the mating counter flanges shall be finalized and informed to bidder during detail engineering.
- (ii) Cable gland lugs for cable termination at the Bidder's side equipment shall be in bidder's scope of supply.
- (iii) Power supply feeder will be provided to PLC at one point by BHEL. Further distribution to all associated equipment including HMI, Printer etc. shall be taken care by bidder.

4.0 QUALITY & INSPECTION

4.1 Quality Assurance Program

To ensure that the equipment and services under the Scope of Contract whether manufactured or assembled within the Bidder's works or at his Sub-Vendor's premises or at the Owner's site or at any other place or work are in accordance with the specifications, Bidder shall adopt suitable quality assurance program to control such activities at all points, as necessary. Such program shall be outlined by the Bidder and shall be finally accepted by the Owner / Authorized representative after discussions before the award of Contract. The QA program shall be generally in line with ISO-9002/IS-14001. A quality assurance program of the Bidder shall generally cover the following:

System for shop manufacturing and site erection control including process controls, fabrication and assembly controls.

4.2 Quality Assurance Documents

The Bidder shall submit required no. of copies of the following Quality Assurance documents

- a) Material test reports on components as specified by the specification and approved Quality Plans.
- b) The inspection plan with verification, inspection plan check points, verification sketches, if used and method used to verify that the inspection and testing points in the inspection plan were performed satisfactorily.

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- c) Sketches and drawings used for indicating the method of traceability of the radiographs to the location on the equipment.
- d) Non-destructive examination results, reports including radiography interpretation reports.
- e) Factory tests results for testing required as per applicable codes and standards referred in the specification and approved Quality Plans.
- f) Inspection reports duly signed by QA personnel of the customer and Bidder for the agreed customer hold points.

The equipment shall be guaranteed to meet performance requirements required by this specification and rectification shall be carried out until satisfactory results are obtained. The Owner reserves the right to reject the equipment should the performance values fall short of those indicated in the schedule of Technical data sheets.

4.3 Quality Plan:

Bidder to furnish Quality Plan [Supply Quality plan] to BHEL along with offer in their standard format for general review by BHEL. During Detailed engineering, in addition to various tests indicated in this specification, Quality plan will be reviewed with respect to standard Inspection, standard Engineering practices, applicable standards, code etc. Accordingly, various tests required, stages of inspection and appropriate agencies for Inspection will be intimated. Bidder to abide by the same.

4.4 Tests & Inspection:

The manufacturer shall conduct all tests required to ensure that the equipment furnished shall conform to the requirements of this specification and in compliance with requirements of applicable codes and standards. The particulars of the proposed tests and the procedures for the tests shall be submitted to the Purchaser/Consultant for approval before conducting the tests.

4.5 Test at Manufacturer's work (as applicable):

4.6 Material Tests

4.7 Other Tests

4.8 Site Performance Test:

4.9 Inspection agency:

BHEL/Third Party appointed by BHEL/Customer

The various inspection stages will be witnessed by individual agencies (or) Group of Agencies as per above, in line with approved quality plan.

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5.0 PROTECTION FOR SHOP FABRICATED ITEMS:

- a) All coated surfaces shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portions shall be suitably protected with either a metallic or non-metallic protecting device. The parts which are likely to get rusted due to exposure to weather, should also be properly treated and protected in a suitable manner. All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coatings. All surfaces which will not be easily accessible after the shop assembly, shall beforehand be treated and protected for the life of the equipment. All surfaces shall be thoroughly cleaned of all mill scale, oxide and other coatings and prepared in the shop.
- b) The surfaces that are to be finish-painted after installation or require corrosion protection until installation, shall be shop painted with at least two coats of primer. The finished colors shall be as per manufacturer's standards.
- c) Shop primer for all steel surfaces which will be exposed to operating temperature below 95°C shall be selected by the Bidder after obtaining specific approval of the Purchaser regarding the quality of primer proposed to be applied.
- d) All other steel surfaces which are not to be painted shall be coated with suitable rust preventive compound subject to the approval of the Purchaser.
- e) All material shall be delivered in a clean and usable condition. Openings shall be securely covered against entry of foreign material where appropriate.

6.0 PACKING AND TRANSPORTATION:

All equipment shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. Bidder shall follow necessary road safety rules and shall obtain permission from highway authorities for goods movement. However, these aspects shall be taken into consideration in the design of the packing for the system.

7.0 NAME PLATES & TAG PLATES:

- A. Components whose identity is important for operation and maintenance of the plant shall be provided with permanently attached tag bearing the Purchaser's coding together with relevant text clearly inscribed.
- B. A corrosion-resistant nameplate shall be attached to each unit in a clearly visible, easily accessible location. The nameplate shall be stamped with the following information:
 - a) Manufacturer's name
 - b) Manufacturer's model number
 - c) Manufacturer's serial number
 - d) Purchaser's equipment tag number (item No.)
 - e) Service name
 - f) Weight (kg)
 - g) Hydrostatic test pressure, Bar. (g)
 - h) Other design information of the flow media like flow rate, temperature, pressure etc.

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- C. Nameplates shall be 3 mm (0.12") thick engraved plate of sufficient rigidity with lettering of a minimum height of 4 mm (0.16"). The method of implementation and labelling will be informed for all components after award of contract.
- D. Identification tags shall be provided and placed on all Bidder furnished items. Tags shall be corrosion resistance, having a larger than diameter of 3 cm, and shall have black identification figures stamped thereon. Figure height shall be larger than 0.5 cm. Tags shall bear the component system designation symbol shown on the Bidder's drawings.

8.0 **VENDOR DOCUMENTATION:**

8.1 The O&M manuals shall contain the following details as minimum in addition to those indicated in the above table:-

- Identification details of the equipment like BHEL PO NO., Vendor's SI. No., Vendors contact address with tel., fax details.
- Description of the equipment.
- Final Data sheets and Drawings of the equipment as per the list mentioned in this specification.
- Recommended 2 years operational spares.
- Test reports.

8.2 The erection documentation shall consist of

- All drawings/documents,
- All such drawings/documents, not submitted for review, but essential for erection/ commissioning, e.g. assembly drawings, etc.
- Master document list
- Site dispatchable B.O.M.

8.3 Vendor shall submit all drawings / documents as per the Document List given below:

SI.No	DRG/DOC. NAME	Date of Submission
MECHANICAL		
M.01	P&ID of SBR Sewage Treatment Plant	1 week from PO
M.02	System write-up of STP (Including Control Philosophy)	1 week from PO
M.03	Hydraulic flow diagram of Sewage Treatment Plant	1 week from PO
M.04	Hydraulic calculation of Sewage Treatment Plant	1 week from PO
M.05	Design Basis and Sizing Criteria of Sewage Treatment Plant including Process Calculations	1 week from PO
M.06	Equipment Layout and list	2 weeks from PO
M.07	Pipe Schedule	2 weeks from PO
M.08	Valve Schedule and valve specification	2 weeks from PO
M.09	List of Terminal Points	2 weeks from PO
M.10	STP Equipment Data sheet (Primary and Teritiary)	2 weeks from PO
M.11	GA of Primary treatment system (Stilling Chamber, Screens, Grit Chamber & Distribution Chamber)	3 weeks from PO
M.12	GA of SBR Basin	3 weeks from PO
M.13	Data sheet of Decanter with complete mechanism	3 weeks from PO



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M.14	GA of Decanter with complete mechanism	4 weeks from PO
M.15	Data sheet of Diffuser and air piping grid	3 weeks from PO
M.16	GA of Diffuser and air piping grid	4 weeks from PO
M.17	GA of Tertiary Treatment system (Chlorine contact tank, Sludge sump)	4 weeks from PO
M.18	GA of Sludge Treatment system	4 weeks from PO
M.19	Overall Layout of STP	2 weeks from PO
M.20	Painting Specification	4 weeks from PO
M.21	Piping layouts	4 weeks from PO
M.22	Diffuser layout inside SBR basin and sludge sump	4 weeks from PO
ELECTRICAL		
E.01	Electrical Load List with normal and emergency power requirement	1 week from PO
INSTRUMENTATION		
I.01	Instrument Index with BOQ, range, set points etc.,	2 weeks from PO
I.02	Instrument Hook up drawings	4 weeks from PO
I.03	Technical data sheet of Instruments	3 weeks from PO
I.04	PLC Configuration Diagram, GA & Wiring diagram	4 weeks from PO
I.05	PLC I/O List	5 weeks from PO
I.06	PLC Logic Diagram	5 weeks from PO
I.07	PLC Control Room Layout	5 weeks from PO
I.08	PLC Power Supply AC Inputs requirement	5 weeks from PO
I.09	PLC interconnection diagrams	5 weeks from PO
CIVIL		
C.01	Civil input drawings for all building	4 weeks from PO
C.02	Civil input drawings for all Tanks, pits and chambers etc.	4 weeks from PO
C.03	Foundation details of Diffuser, decanter & PLC	4 weeks from PO
MISCELLANEOUS		
MIS.01	Commissioning spares	5 weeks from PO
MIS.02	Recommended spares	5 weeks from PO
MIS.03	Consumable list (Chemicals, oil, grease etc.)	5 weeks from PO
MIS.04	O&M manual	5 weeks from PO
MIS.05	Performance Test Procedure	5 weeks from PO

Note: The date of first submission is indicated above. Bidder shall submit all subsequent revision within 5 working days of comments.

9.0 GUARANTEES

The guarantees shall form contract guarantees to be demonstrated through an approved performance test after the completion of the Plant. The schedule shall be finalized during the detail engineering stage.

10.0 DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER

- (i) Inlet quality for which the plant has been designed
- (ii) Guaranteed outlet quality
- (iii) Process description
- (iv) Detailed scope of supply
- (v) Filled in Annexures-I, II, III and IV of PY-51264.
- (vi) Un-priced Price bid format as given in Job specification.

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ANNEXURE – I

KEY INFORMATION

1.	Name of the Bidding Company	
2.	Registered in (mention the name of the Country)	
3.	Name, designation, telex & telephone number and postal address of responsible officer of Bidder to whom all reference shall be made for expeditious co-ordination.	
4.	Name, designation, telex & telephone number and postal address of responsible officer of Indian Agent.	
5.	Bidder's proposal number	
6.	Bidder's proposal date	
7.	Validity of offer, counted from the date of opening of bid	
8.	Guaranteed completion period, counted from date of issuance of LOI/TOI	
9.	Confirm that Scope of supply and services are exactly as per specification requirement	Yes/No
10.	Confirm Technical Compliance with Specification	Yes/No
11.	Confirm that Guarantees are as per Job Specification	Yes/No
12.	Confirm that List of Recommended Spares has been furnished as per Annexure-II	Yes/No
13.	Confirm that List of Special Tools & Tackles has been furnished as per Annexure-III	Yes/No
14.	Confirm that deviations ,if applicable, have been furnished as per Annexure-IV	Yes/No

Signature of Bidder's
Authorized representative

Date.....



Date.....

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ANNEXURE – III

LIST OF SPECIAL TOOLS AND TACKLES

Bidder shall tabulate in the proforma below list of all tools and tackles as recommended by the respective manufacturer for regular, reliable operation. In case the Bidder has to add any other relevant information, the same shall be indicated herein. Continuation sheets of like size and format may be used as per Bidder's requirements.

Sl.No.	Description	Quantity	Remarks
a			
b			
c			
d			

Signature of Bidder's
Authorized representative

Date.....

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ANNEXURE – IV

DEVIATION FROM SPECIFICATION

If the proposal submitted has got any deviation from the technical stipulations in the bidding document, the Bidder shall tabulate below the full particulars of such deviations and shall sign below. Additional sheets may be enclosed, if necessary. Deviation is to be furnished with mention of specific clause numbers. Technical and commercial deviations to scope of supply and services, shall be indicated separately. Bidders shall bring put only those deviations which are impractical to meet (or) not advisable

SI.N o.	CLAUSE NO.	DESCRIPTION AS PER SPECIFICATION	DEVIATION BY BIDDER

We confirm that all the deviations/exceptions to the Technical Specification PY51084, Job Specification and enclosures including reference documents attached are listed in this Annexure only. No other deviations or exceptions even if mentioned elsewhere shall be considered for any technical/ commercial evaluation or for ordering.

Signature of Bidder's
Authorized representative.....

Date

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VARIANT TABLE

Var. No.	Item	STP Capacity	Material Code	Ref. Drg./ Doc.
01	Sewage treatment Plant based on SBR Technology	4.5 MLD	PY9751264014	PEMC07133
02	STP Design & Supply of STP Proprietary items	7.0 MLD	PY9751264022	PY-AS-4-M098-8710-01

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RECORD OF REVISIONS				
Rev. No.	Date	Revision Details	Revised By	Approved By
00	08.07.17	First Issue	-----	MSSN
01	18.09..17	Variant added	AKS	MSSN

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			PEIC-04269		
			Rev. No.	00	
			Sheet 1 of 6		
TECHNICAL SPECIFICATION FOR PROGRAMMABLE LOGIC CONTROLLERS [PLC] USED IN SEWAGE TREATMENT PLANT [STP]					
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.	1. SCOPE This technical specification covers the Design, Engineering, Manufacturing, System integration, Assembly, testing at vendor works, inspection by purchaser, packing and transportation to site with necessary documentation like data sheets, statutory approvals, O&M manuals etc., as required and supervision of Erection, Commissioning till final handover of PLC system to End user.				
	2. PROVEN TRACK RECORD				
	2.1 The items offered as per specification should be operating satisfactorily in processing plants /Waste water treatment plant/Sewage water/Effluent Treatment plant under similar process conditions for at least 4000 Hours. The above criteria shall be applicable to main equipment, sub- components as well as bought out items if any.				
	2.2 The system should be supplied, engineered, integrated, tested etc. from a factory from where the system / sub-systems as offered / supplied have already been supplied, engineered, integrated, tested etc. and meet the criteria 2.1 above.				
	2.3 Vendor shall submit necessary supporting documents / past users confirmation supporting to above PTR requirements along with technical offer.				
	3. TECHNICAL REQUIREMENTS : Bidder shall provide PLC based SCADA system as per the latest technology with following minimum features, however vendor to ensure that offered control system should cater trouble free & satisfactory operation of entire STP :				
	3.1 All field instruments and electro-mechanical equipment shall be monitored and controlled locally as well as in the centralized control room. Automatic operation shall also be done as per PLC logic.				
	3.2 In case of PLC operation failure in auto, manual mode of operation should enable the operator to control and operate the plant.				
	3.3 A PLC shall be configured in redundant mode of operation as a minimum.				
	3.4 PLC shall be a microprocessor-based system, which shall be used to execute process plant control / sequence control / process and safety shutdown / interlock logic of the plant as specified in specification.				
	3.5 SCADA should have facility for dynamic graphics, alarm reports, process trends, history, etc., as in built feature.				
	3.6 The control system shall be complete with cabinets, processor modules, I/O modules, power supply modules, communication modules & networks and other associated hardware.				
	3.7 PLC based automation system shall be designed using adequate redundancy features.				
	3.8 HMIs along with PLC panel & other peripherals shall be provided.				
3.9 Bidder shall also prepare diagram for all the open / close loops as well as logics are being used for controlling of equipment and attach same with O & M manual of the plant.					
3.10 Bidder shall include & arrange for training of customer's personnel on PLC system in staged manner at site (2 stages).					
3.11 Bidder scope includes arranging visits by respective PLC OEM's competent representative at site as and when required, during erection & commissioning.					
3.12 The processor shall have capability to implement various control functions including relay logic, timer, counter, numerical calculations, PID control and data processing to implement the STP plant process					
Revisions: Refer to record of revisions		Prepared By: -sd- Nahid	Checked By : -sd- Sonalika	Approved : -sd- Kamal	Date : 14.08.17



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control / sequence logic, and / or process and safety shutdown logic.

- 3.13 The processor shall be provided with extensive error checking diagnostic functions such as total checking of memory, battery monitoring, parity checking, reference checking, I/O checking, short / open circuit checking etc.
- 3.14 Each processor shall be provided with separate power supply. Failure of one power supply shall not affect the system operation in case of Hot Back Up system.
- 3.15 Each input and output shall be optically isolated from external circuit.
- 3.16 Each I/O shall be protected against reversal of polarity of power voltage to the I/O.
- 3.17 Each output shall be short circuit proof and protected by fuse with a visual indication of blown fuse.

4. PLC DATA SHEET :

a)	PLC System loading	1) Loading for the controller shall not exceed 80% with installed spares 2) The system memory shall have sufficient capacity for 10% additional application programming & configuration in future.
b)	System redundancy	1) Controller – 1:1 2) Communication Bus/cards – 1:1 3) Power supply – 1:1
c)	No. of channels per I/O card	As per PLC OEM recommendations
d)	I/O count for PLC system	1) To be included all the field devices, electro-mechanical equipment's / drives / MOV's for operation, monitoring & controls of entire STP plant. 2) System level IO shall be considered for alarms and diagnostic purpose, 3) Third party interfacing equipment hardwired signals etc., (If applicable).
e)	Installed Spares	1) For I/O cards : 10% of base quantity 2) For system cards: 10% of total quantity to meet project requirement. 3) Marshalling: 10% [this includes isolators, terminals, cable glands, etc.] 4) Power supply: 20% for each variety [like feeders & other sub-components] All the installed spares shall be supplied with fully wired up for ready to charge.
f)	Quantity of Interposing relays (for DO's)	Base quantity + installed spares [These shall be suitable for interrogation voltages]
g)	Sequence of Events [SOE]	1) SOE shall be Integral to PLC 2) Number of SOE points: 256. 3) Sequence of event recording facility shall be provided with resolution same as PLC scan time. 4) At least 96 hours history for sequence of events should be available. The printout shall be from printer connected to PC.
h)	Spare space	1) I/O level: 10% [Internal wiring up to I/O terminals shall be completed with all necessary hardware. Installation of only I/O cards should make this spare space usable].
i)	OWS cum EWS along with printer.	1) 24" color TFT-LED tabletop mounted desktop type monitor with touch screen, key board & mouse. 2) To be loaded with necessary general software like Windows, MS office & Anti-virus software, etc., with latest versions. 3) To be loaded with License software used in PLC programming & graphic building for each OWS cum EWS. 4) Original CD's of license software to be provided for general as well as PLC programming software. 5) Software licenses shall be valid for lifetime. 6) Color laser Printer (A4 Size minimum)



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j)	Inter equipment / panel Cables like armor cables, LAN cables and their accessories by vendor.	1) All cables within package shall be vendor scope i.e., PLC panel to PC, PLC Panel to printer, PLC panel to network switch etc. 2) All cable accessories like cable glands, lugs, ferrules etc., are in vendor scope for all the incoming and outgoing cables from the PLC and its associated equipments. 3) Quantity of the cables as required [To be finalized during detailed engineering].
k)	Furniture / Work stations' s Tables	Industry standard computer table and printer table shall be provided as part of PLC package. The table shall be offered along with spike arrestor / distribution shall be required for connecting all the PC / Printer components. Industry standard revolving chairs of 2 numbers.
l)	Panel color	RAL 7035 (internal and external).
m)	Panel Cable entry	From Bottom.
n)	Removable gland plate at bottom	Required in two pieces.
o)	Panel door	Lockable
p)	Power Supply	1) 01 No. redundant (230 V AC) Power supply feeder will be provided nearer to PLC panel. Further power distribution to all associated PLC equipment's like PC, Printer etc., will be in bidder scope. 2) Vendor shall supply accessories (like cable glands, SS dummy plugs, ferrules, etc.) required for termination of purchaser's incoming cables as well as vendor power cables. Cable sizes will be intimated during detail engineering. 3) Normal power supply [non-UPS] for panel lighting & utility supply: 240V AC $\pm$ 10%, 1-phase, 50 Hz - 1 No non-redundant feeder to be provided by BHEL.
q)	PLC Earthing	PLC system earthing shall be in bidder scope. Earth points of all panels shall be looped together and shall be terminated to customer's earth raisers at single point provided by BHEL.

5. WARRANTY :

Warranty of the system shall be 18 months from the date of dispatch and 12 months from the commissioning activities whichever is earliest.

6. DOCUMENTATION

6.1 During drawing approval stage (within two weeks of PO Placement). Following documents are to be provided by bidder as a minimum for BHEL review / approval.

- PLC panel GA drawings & mounting arrangement details.
- System architecture
- Bill of material (Main supply & installed/mandatory spares in separate columns)
- PC & Printer technical details
- UPS & non-UPS power consumption details
- Power supply wiring diagrams and distribution
- I/O loop diagrams
- As configured logics
- Dynamic Graphics
- PLC termination details (After engineering is completed)



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- k) Furniture GA, make, model details
- l) Fat/Sat procedures
- m) As shipped documents (Along with PLC supply system)
- n) As built documents (after commissioning of PLC system)
- o) Any other documents are required, same will be finalized during kick of meeting after PO placement.

7. PLC SYSTEM SUPERVISIOIN OF ERECTION AND COMPLETE COMMISSIONING (IN VENDOR SCOPE)

7.1 System supervision of erection and complete commissioning shall include , but not limited to

- a. Loop checking for field to system in co-ordination with BHEL.
- b. System powering, checking healthiness of entire package.
- c. System boot up, on-line debugging.
- d. Commissioning of operator station, engineering, printer and function verification.
- e. Initial hardware/ software check & test
- f. Dynamic Graphics verification
- g. Operation of plant/ loop from PC
- h. Internal wiring and network verification
- i. Modifications in graphics, logics, loop, setting etc. as required for plant operation.
- j. Termination of cables within package, wiring modifications etc.

8. TESTING, INSTALLATION, COMMISSIONING & ACCEPTANCE

- 8.1 Final Inspection including document verification as per approved documents shall be carried out by CUSTOMER /CONSULTANT/ CUSTOMER's Third Inspection Agency & BHEL/BHEL's Third Party Inspection Agency at vendor works.
- 8.2 Inspection & Factory Acceptance Test at Vendor works – by BHEL + VENDOR as per approved FAT procedure
- 8.3 Site Acceptance Test at site - by BHEL + VENDOR as per approved SAT procedure

9. PLC VENDOR SERVICES SCOPE MATRIX

The following are the typical scope matrix for execution of the PLC system. In which, vendor means (PLC system supplier), Erection contractor means (BHEL or BHEL appointed agency))

SL No.	ACTIVITY	SCOPE OF AGENCY
1.	Transportation up to BHEL Stores	Vendor
2.	Unloading	Erection Contractor
3.	Supply Verification as per packing list, Transit damage inspection	Erection Contractor
4.	Panel Storage	Erection Contractor
5.	Custody of items in stores	Erection Contractor
6.	Issue of Items from Stores	Erection Contractor
7.	Shifting of panels/equipment's to Intended Location	Erection Contractor
8.	Provision of Crane for Shifting of the equipment's	Erection Contractor
9.	Unpacking of equipment's	Erection Contractor (Under Vendor supervision)
10.	Structural Steel (Channels / angles) below panel supply and installation	Erection Contractor
11.	Installation of equipment's at intended locations	Erection Contractor
12.	Inter equipment Cable supply	Vendor
13.	Inter equipment Cable laying	Erection Contractor
14.	Cable supply and laying up to PLC Panel from MCC / JB / instruments	Erection Contractor



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15.	Inter equipment earthing connectivity	Vendor
16.	Installation / termination of cable glands,	Vendor
17.	lugs, ferrules, dressing etc., required for termination of BHEL / vendor supplied cables in PLC system (Pair, LAN etc.,)	Vendor
18.	Loop Checking at Control Room from System to marshalling Terminals	Erection Contractor / vendor
19.	Loop Checking from field to marshalling Terminals	Erection Contractor
20.	Modifications / updation of logics, IO count etc., with in the PLC system	Vendor
21.	PLC Erection Supervision	Vendor
22.	PLC Commissioning	Vendor
23.	PLC Commissioning Supervision	Erection Contractor
24.	Erection & Commissioning co-ordination	Erection Contractor
25.	Provision of commissioning tools & tackles if any	Vendor
26.	PLC Commissioning spares, consumables	Vendor
27.	Training	Vendor
28.	Site Action Test	Vendor
29.	Trial run/Performance test & Handing over	Erection Contractor / vendor

Std. / Doc. Number

Rev. No.	00
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Rev. No.

Date _____

Revision Details

Revised By

Approved By

00

14.08.17

Original issue

Kamal

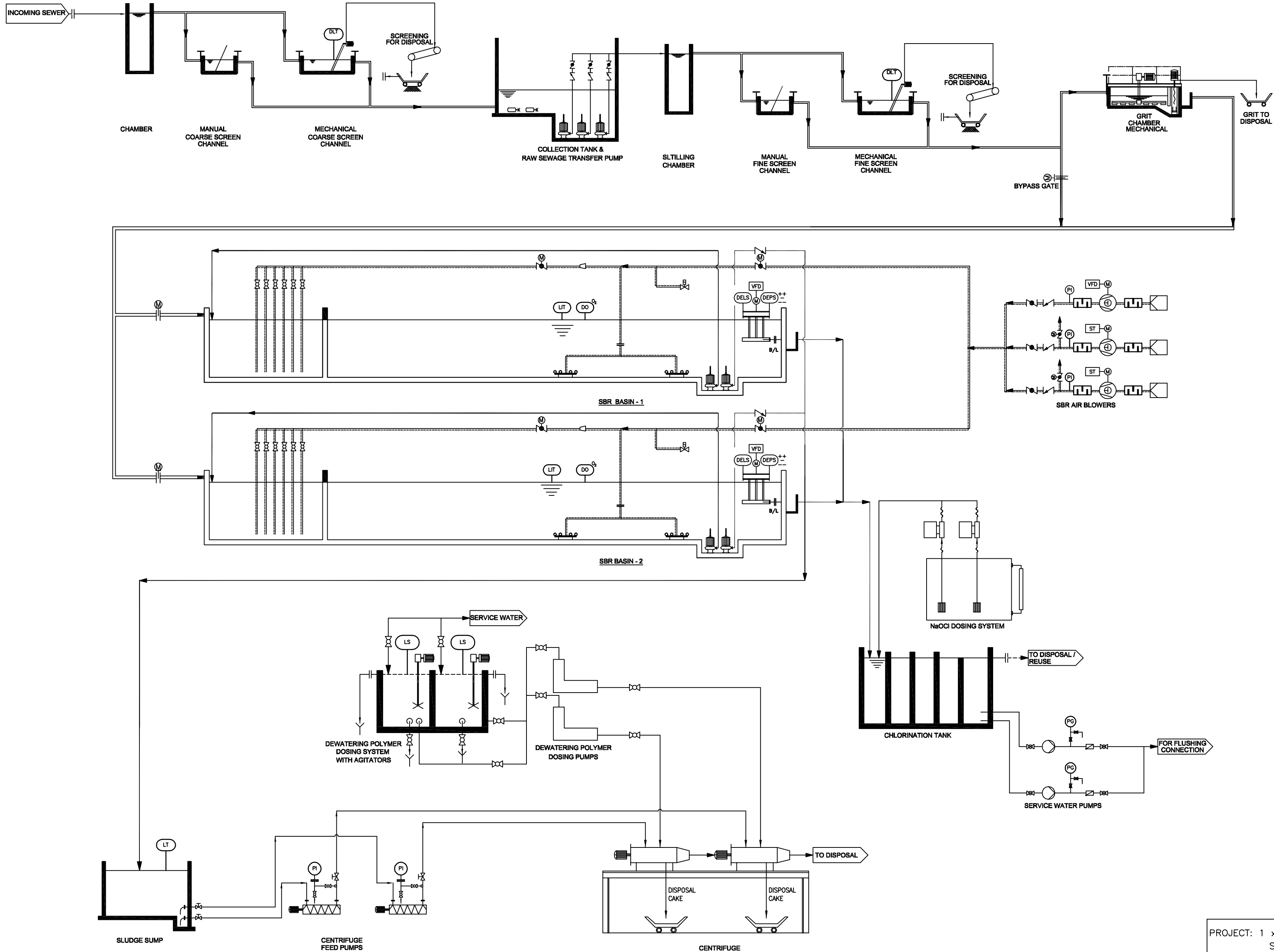
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INVENTORY NO. SIGN. AND DATE REF. DRG. NO. COMPUTER FILE NAME

ANNEXURE - A



PROJECT: 1 x 7.0 MLD, SEQUENTIAL BATCH REACTOR BASED
SEWAGE TREATMENT PLANT AT BHEL HARIDWAR

	BHARAT HEAVY ELECTRICALS LTD. HYDERABAD				NAME	SIGN.	DATE	NO.OF VAR.
	DRN.	AKS	--	29.08.17				
	CHD.	AKS	--	29.08.17				N.A.
	APPD.	M.S.S.N	--	29.08.17				
DEPT. PE&SD CODE 450	UNTOL. GR.	DIMS. C/W/F	SCALE NTS	WEIGHT (KG) -N.A.-	REF. TO ASSY. DRG. -N.A.-	ITEM NO. -N.A.-	NO.OF ITEMS -N.A.-	
TITLE SCHEME OF SEWAGE TREATMENT PLANT				CARD CODE	BHEL DRAWING NO.		REV.	
SHT. No 1				NO. OF SHT. 1				

TD-201 Rev No. 00 Form No.	 HYDERABAD	PRODUCT STANDARD PROJECT ENGINEERING & SYSTEMS DIVISION HYDERABAD	ANNEXURE
			Rev No. 00
			Page 1 of 3
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.	QAP GUIDELINES & FORMAT (ANNEXURE) The QAP format and guidelines for filling up the format shall be used by vendor for preparation and submission of QAP after order placement. Note : 1. Typical /Indicative /Standard QAP(s) for equipment /package attached is reference document and to use by successful bidder in future for preparation and submission of QAP for BHEL /CUSTOMER approval. 2. No deviation to reference document is acceptable.		

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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.	<u>GUIDELINES TO VENDORS FOR PREPARATION OF QUALITY ASSURANCE PLAN</u> - QAP shall be made in landscape mode on A4 size paper as per the format enclosed. Font size shall be minimum 10. - Each page of QAP shall contain the following information. - Vendor's name & address. - Customer: BHEL, Hyderabad. - Project. - BHEL Product Standard Number/revision number as referred in P.O. - BHEL Purchase Order Number & Date. - Product as per P.O. description. - QAP Number (unique and shall not repeat)/revision number/date. - Page number and number of pages - QAP shall contain four parts / stages as follows. - Raw materials and bought out items. - In process Control / Inspection. - Final assembly, Inspection & Testing. - Painting, preservation & packing. - Under 'Component', indicate name of the component (say casing, rotor, pressure gauge, etc). - Under 'Characteristics', indicate appropriately (say chemical analysis, mechanical properties, NDT (UT,DP etc.), hydrostatic test, calibration check etc.) - Under 'Class', indicate minor, major or critical depending on the importance of characteristic. - Under 'Type of check', indicate appropriately (say chemical, mechanical, UT, DP etc.) - Under 'Quantum of check', indicate appropriately (say 100%, 10%, sample, per melt, per heat, all pieces etc.) - Under 'Reference document' and 'Acceptance norms', appropriate National & International standards, BHEL standards, approved drawing references etc. should be indicated. It is not correct to mention as "Vendor's internal standards or Vendor's standard practice etc.". If vendors' internal standards are referred, same shall be in line with BHEL Spec. indicated in the P.O. These may require review & approval by our Engineering dept. - Under 'Format of record', indicate appropriately supplier's test certificate, calibration certificate, lab report, inspection report etc.		
	11. Please refer 'Agency' in QAP format. Under P: Perform, W: Witness, V: Verify Indicate against each characteristic 1: (BHEL CQS/Nominated inspection agency), OR 2: (Vendor / Sub vendor)		

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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.	Note: Performing agency is normally vendor or his sub vendor (Legend 2). Where witness points are indicated in specification, P.O., Drawing etc., for such operations, under Witness (W) column use 1. Under 'Verify' column, use code 1. 12. Under 'D' please put (Tick) against each characteristic where vendor proposes to submit test certificate/report etc. OR as required as per BHEL Specification. 13. Vendor's signature & stamp should be available on each page of QAP. 14. Vendor should read the BHEL Product Standard thoroughly and QAP should be made only inline and relevant to the Specification & Approved Drawings. 15. The following operations/characteristics/check points may be included (AS APPROPRIATE) a) Visual check b) Dimensional check c) Mechanical and Chemical properties. d) Surface preparation before painting (by chemical cleaning, sand blasting, shot blasting etc. as the case may be.) e) Painting check for shade, Dry Film Thickness (DFT), Adhesion/ peel off test etc. f) Check for correctness for all components mounted as per General arrangement Drawing, Bill Of Materials (BOM), etc. for range, rating, make, color, size, location as per GA, quantity, label description including tag nos., annunciator facia, loose components, accessories, spares etc. g) Verification of test certificate for protection class for the enclosures. h) Mechanical functioning of switches. i) Continuity of earthing and provision of earth points. j) Colour coding of wiring, size, tightness & dressing of wiring. k) Review of test certificates of assembled items, raw materials, internal test reports etc. l) Witness of functional checks, which may include mechanical run & electrical run, H.V.test, IR measurement, Electrical and Mechanical tests etc. m) PQR, WPS, Welder Qualification Record, welding records (fit up, DP) etc. n) Material identification (for punch marks of serial numbers, Heat No, Melt No, Inspector's stamp etc.) o) Hydraulic Pressure Test, Pneumatic Pressure Test, Liquid Penetration Examination and other Non Destructive Tests. p) Tests on Galvanised items (Visual, Hammer Test, Knife Test, Thickness, Pierce Test (Copper sulphate test), Hydrogen evaluation test, Stripping test (for Mass of Zinc coating) q) All tests as per BHEL Product Standard & approved drawings including Type tests and Routine tests on individual items and on System as a whole. r) Packing and Preservation. 16. QAP Format enclosed. 17. Typical Manufacturing QAP is attached.		
	Ref. Doc		

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

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

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