

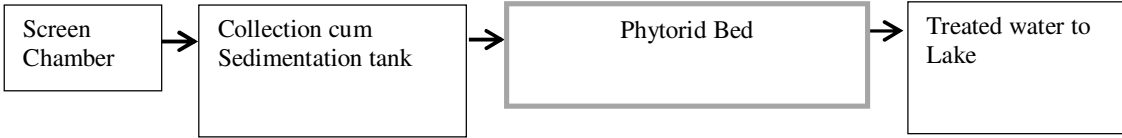
TD-201 Rev No. 00 Form No.		BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION		PY-AS-4-M107-8436-01	
				Rev No. 00	
				Page 1 of 30	
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.		Technical Specification :: Design, Supply, Insurance, E&C and O&M (5 years) works for Mechanical & Electrical package using phytorid technology Project:: Telibandha Lake purification :: Raipur Smart city ltd, Raipur Chhatisgarh			
Ref. Doc	Prepared : Pradeepa	Checked : AKS	Approved : MSSN	Date : 11.05.18	

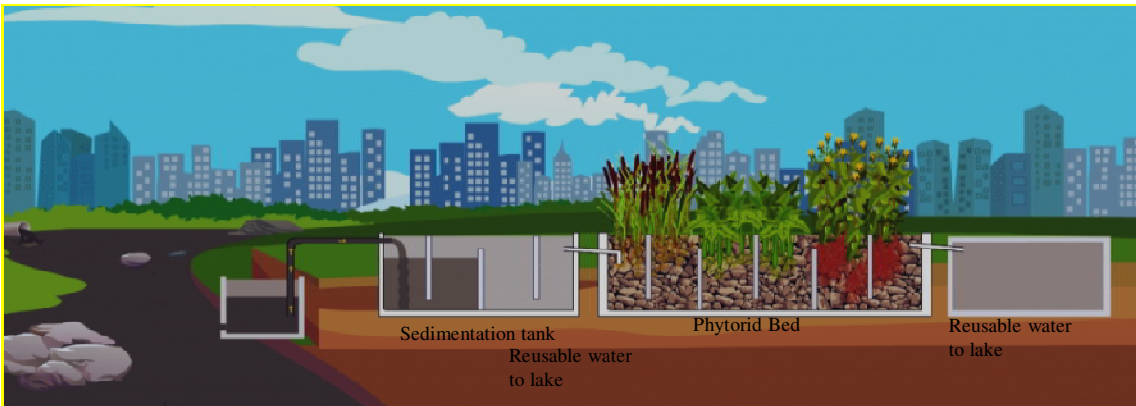
TD-201 Rev No. 00 Form No.		BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01																		
			Rev No. 00																		
			Page 2 of 30																		
<u>CONTENTS</u> <table border="1"> <thead> <tr> <th>Section No.</th> <th>Description</th> <th>Page No.</th> </tr> </thead> <tbody> <tr> <td>I</td> <td>GENERAL</td> <td>3-12</td> </tr> <tr> <td>II</td> <td>DETAILED TECHNICAL SPECIFICATION</td> <td>13-26</td> </tr> <tr> <td>III</td> <td>PRICE SCHEDULE</td> <td>27-28</td> </tr> <tr> <td>IV</td> <td>TENDER DRAWINGS/DOCUMENTS</td> <td>29</td> </tr> <tr> <td>V</td> <td>RECORD OF REVISION</td> <td>30</td> </tr> </tbody> </table>				Section No.	Description	Page No.	I	GENERAL	3-12	II	DETAILED TECHNICAL SPECIFICATION	13-26	III	PRICE SCHEDULE	27-28	IV	TENDER DRAWINGS/DOCUMENTS	29	V	RECORD OF REVISION	30
Section No.	Description	Page No.																			
I	GENERAL	3-12																			
II	DETAILED TECHNICAL SPECIFICATION	13-26																			
III	PRICE SCHEDULE	27-28																			
IV	TENDER DRAWINGS/DOCUMENTS	29																			
V	RECORD OF REVISION	30																			
Ref. Doc OPYRIGHT 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 .																					

TD-201 Rev No. 00	Form No.	 HYDERABAD	BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01 Rev No. 00 Page 3 of 30
OPYRIGHT 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>SECTION-I</u> <u>GENERAL</u> 1.0 BRIEF SYSTEM DESCRIPTION Raipur Smart City Limited, on the occasion of World water day, 22nd March, 2017, with a theme of water conservation and making use of waste water, decided to take up the pledge to transform a big lake of the city in to lively water bodies with restored aquatic ecology and saving the environment of the city. The project is purely focused upon the reinstating the natural ecosystem and making the water quality adequate to support life, with a clear and straightforward objective to remove all harmful aquatic weeds, increase the Dissolved Oxygen (DO) level, reduce Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD), significant reduction of nutrient elements (like Nitrogen and Phosphorus which are harmful for aqua life) <u>The lake shall NOT be dried in the process.</u> The Telibandha Lake is presently receiving untreated sewage from two sources from the eastern edge of the lake. The inlets are approximately 75m apart. The untreated sewage being let into the lake is polluting the natural water body and thereby the aquatic life of the lake. The technology to be used for the purification process shall be “Phytorid technology” developed by NEERI.		
Ref.	Doc			

TD-201 Rev No. 00	Form No.		BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01 Rev No. 00 Page 4 of 30
OPYRIGHT 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 .		2.0 TECHNOLOGY SOLUTION OFFERED: NEERI have developed a holistic lake cleaning methodology which is completely natural and sustainable. The major components of this technology include: Phytorid Beds: Based on principle of constructed wetland technology (patented by NEERI), these plant beds along the banks of the lake would achieve wastewater treatment by filtration, adsorption, nutrient uptake and decomposition. Floating rafters: modification of Phytorid beds which are applied on the water surface. The plant beds are constructed on material which can float on water and then anchored in the lake bed. Diffused Aerators: Fine diffused aerators are well established systems commonly applied in various lakes, STPs and aquariums to increase DO of water. These proposed systems are floating systems with adequate capacity to aerate the liquid below the floating raft with specialized plants. <u>PHYTORID TECHNOLOGY</u> <u>Efficient, Economical, Ecological Sewage Treatment System</u> Technical Description Phytorid Technology is a self-sustaining technology developed by National Environmental Engineering Research Institute (NEERI), CSIR that works on the principles of natural wetland. It has been developed and patented by CSIR-National Environmental Engineering Research Institute (CSIR-NEERI). The patent awarded is European Patent Office (EPO) Pub. No.: WO2004087584, Pub. Date: 14.10.2004, Australian Patent Office (APO) Pub. No.: AU2003223110, Pub. Date: 25.10.2004 and Indian Patent Office (IPO) 0010NF2003/IN Pub. No.: 241523, Pub. Date: 09/07/2010. This technology has also obtained authorization from the Council of Scientific and Industrial Research.		
Ref.	Doc			

TD-201 Rev No. 00		Form No.	बी एच ई एल  HYDERABAD BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION PY-AS-4-M107-8436-01 Rev No. 00 Page 5 of 30														
OPYRIGHT 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 .			PHYTORID systems are based on natural treatment methods and have distinct advantages over conventional treatment plants. In this technology, treatment occurs via natural methods such as filtration, sedimentation nutrient uptake by plants and microbial action in a constructed system which is filled with gravels. Specifically identified different species of plants which are known to have good nutrient uptake rates are planted in the gravel bed. <i>Table 1: Treatment efficiency of Phytorid system</i> <table><tr><th>Pollutant</th><th>Performance (% removal)</th></tr><tr><td>Total suspended solids</td><td>75-95</td></tr><tr><td>Biochemical oxygen demand (BOD)</td><td>80-93</td></tr><tr><td>Chemical oxygen demand</td><td>85-95</td></tr><tr><td>Total nitrogen</td><td>60-70</td></tr><tr><td>Phosphate</td><td>30-40</td></tr><tr><td>Faecal Coliform</td><td>90-95</td></tr></table> Phytorid unit is essentially a civil structure. It comprises of screen chambers, collection chamber, Phytorid bed, treated water tank. The system includes screen cum sedimentation chamber and modified Phytorid beds. Wastewater from screen cum sedimentation chamber flows into modified Phytorid beds by gravity. Solids are separated in the screen cum sedimentation chamber and broken down anaerobically. Wastewater from screen cum sedimentation chamber further flows into modified Phytorid bed by gravity. Phytorid bed is provided with different gradation of gravels/stone aggregate and hydrophytes (type of plants such as <i>Colocasia esculenta</i>, <i>Canna indica</i>, <i>Cyperus alternifolius</i>, etc.). The Phytorid bed is divided into compartments with baffles provided in such a way that the flow of wastewater is in sinusoidal manner. This unique design provides both the anaerobic and aerobic zones in the same Phytorid bed. Aerobic zone is near roots of the plants, as plants transports oxygen from air to the roots and in-turn into water for biochemical oxidation. The flow of wastewater is 6 inch below the top gravel layer and therefore no sewage is exposed thereby escaping mosquito problems. The plants in the Phytorid bed uptake nitrates and phosphates from the wastewater. Due to several passages through gravel beds with both aerobic and anaerobic zones faecal coliform is also reduced by more than 99%. Phytorid does not require any electricity and skilled operators for its operation (these are the major O&M cost in any STP) but still is able to achieve either better or nearly similar pollutant removal as compared to other STP processes.	Pollutant	Performance (% removal)	Total suspended solids	75-95	Biochemical oxygen demand (BOD)	80-93	Chemical oxygen demand	85-95	Total nitrogen	60-70	Phosphate	30-40	Faecal Coliform	90-95
			Pollutant	Performance (% removal)													
Total suspended solids	75-95																
Biochemical oxygen demand (BOD)	80-93																
Chemical oxygen demand	85-95																
Total nitrogen	60-70																
Phosphate	30-40																
Faecal Coliform	90-95																
Ref. Doc																	

TD-201 Rev No. 00	Form No.		BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01 Rev No. 00 Page 6 of 30
OPYRIGHT 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.		<i>Table 2: Benefits of implementing the Phytorid system</i> Benefits of implementing the Phytorid system • Negligible consumption of electric power. • The technology is very simple in design and operation therefore needs no skilled manpower for operation and maintenance. • The system has an aesthetic aura because of plants (ornamental as well as flowering) and subsurface flow of water • Negligible sludge production • No odour • No application of chemicals for treatment process • Lower costs of treating water • Happier nearby residents • Increased development and Preserved values of property proximal to STP • More diverse biota • Reduced toxins in water • Increased presence of birds and other fauna • Extra gardens and landscaping features not required for beautification • Carbon sequestration  <pre> graph LR A[Screen Chamber] --> B[Collection cum Sedimentation tank] B --> C[Phytorid Bed] C --> D[Treated water to Lake] </pre> <i>Figure 1: Phytorid wastewater treatment plant layout</i> Operation and Maintenance This technology being a natural system, operation is mostly passive and requires little operator intervention. Maintaining uniform flow across the wetland system through inlet and outlet adjustment is extremely important to achieve the expected treatment performance. Sampling of inlet and outlet will be carried out for a period of 3 months every fortnight after stabilization of the treatment systems. Operational aspects include harvesting of the roots once 6 months and loosening of the gravel after a year. Any accumulation of sludge due to non-removal at the first stage will need flushing for washing the gravel bed for further use.		
Ref. Doc				

TD-201 Rev No. 00		Form No.	बी एच ई एल  HYDERABAD	BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01																												
Rev No. 00																																	
Page 7 of 30																																	
OPYRIGHT 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 .																																	
		 Figure 2: Cross Sectional View of Phytorid Treatment System where influent is from Nallah Table 3: Removal mechanisms in Phytorid system <table><thead><tr><th>Constitution of wastewater</th><th>Removal mechanisms</th></tr></thead><tbody><tr><td>BOD (Biodegradable Organics)</td><td>Bioconversion by facultative and anaerobic bacteria on plant and debris surface</td></tr><tr><td>Suspended solids</td><td>Filtration, Sedimentation</td></tr><tr><td>Nitrogen</td><td>Nitrification/de-nitrification, plant uptake, volatilization</td></tr><tr><td>Phosphorous</td><td>Filtration, media sorption, precipitation take place plant uptake</td></tr><tr><td>Heavy Metals</td><td>Adsorption of plant and debris surface sedimentation</td></tr><tr><td>Trace organics</td><td>Adsorption, Biodegradation</td></tr><tr><td>Pathogens</td><td>Natural decay, perdition, sedimentation, exertion of antibiotics from roots of plants</td></tr></tbody></table> 3.0 PROJECT INFORMATION <table><tr><td>Project</td><td>: Lake Purification & Restoration with “Phytorid technology” in Telibandha lake including O&M for 5yrs at Raipur</td></tr><tr><td>Site Location</td><td></td></tr><tr><td>State</td><td>: Chattisgarh</td></tr><tr><td>Nearest town</td><td>: Raipur</td></tr><tr><td>Nearest Railway Station</td><td>: Raipur</td></tr><tr><td>Nearest Airport</td><td>: Raipur</td></tr></table>				Constitution of wastewater	Removal mechanisms	BOD (Biodegradable Organics)	Bioconversion by facultative and anaerobic bacteria on plant and debris surface	Suspended solids	Filtration, Sedimentation	Nitrogen	Nitrification/de-nitrification, plant uptake, volatilization	Phosphorous	Filtration, media sorption, precipitation take place plant uptake	Heavy Metals	Adsorption of plant and debris surface sedimentation	Trace organics	Adsorption, Biodegradation	Pathogens	Natural decay, perdition, sedimentation, exertion of antibiotics from roots of plants	Project	: Lake Purification & Restoration with “Phytorid technology” in Telibandha lake including O&M for 5yrs at Raipur	Site Location		State	: Chattisgarh	Nearest town	: Raipur	Nearest Railway Station	: Raipur	Nearest Airport	: Raipur
Constitution of wastewater	Removal mechanisms																																
BOD (Biodegradable Organics)	Bioconversion by facultative and anaerobic bacteria on plant and debris surface																																
Suspended solids	Filtration, Sedimentation																																
Nitrogen	Nitrification/de-nitrification, plant uptake, volatilization																																
Phosphorous	Filtration, media sorption, precipitation take place plant uptake																																
Heavy Metals	Adsorption of plant and debris surface sedimentation																																
Trace organics	Adsorption, Biodegradation																																
Pathogens	Natural decay, perdition, sedimentation, exertion of antibiotics from roots of plants																																
Project	: Lake Purification & Restoration with “Phytorid technology” in Telibandha lake including O&M for 5yrs at Raipur																																
Site Location																																	
State	: Chattisgarh																																
Nearest town	: Raipur																																
Nearest Railway Station	: Raipur																																
Nearest Airport	: Raipur																																
Ref. Doc																																	

TD-201 Rev No. 00	Form No.	 HYDERABAD	BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01 Rev No. 00 Page 8 of 30
OPYRIGHT 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 .		4.0 SCOPE OF WORK <u>DESCRIPTION</u> The scope of work shall include design, supply, erection, testing and commissioning, Minor civil works like grouting etc and operation & maintenance (for 5 years) including necessary Insurance for the total period of contract for Lake purification & restoration with Phytorid technology in TELIBANDHA LAKE, Raipur. The project is purely focused upon reinstating the natural ecosystem and making the water quality adequate to support life, with a clear and straight forward objective to remove all harmful aquatic weeds, increase the Dissolved Oxygen (DO) level, reduce Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), significant reduction of nutrient elements (like Nitrogen and Phosphorus which are harmful for aqua life) to balance the ecology and plantation for natural air purification and CO2 absorption using Phytorid technology. The bidder has to ensure physical cleaning of floating material/ weeds/ ceremonial Pooja material prior to the installation of this system. Scope of work is not just to clean water, but also restore the natural ecological balance of the water body; therefore the process of conservation & reverse eutrophication should be free from any kind of indulgence of machines / chemicals that could disturb the ecological balance of the aquatic life forms. The process adopted for remediation of the water body must be free from mechanical / chemical intervention in the water. It is important that the Quantitative estimate/assessment for removal of bottom sludge by biological operations over the contract period should be provided by the Bidder. The lake shall NOT be dried in the process. The influent sewage to the lake shall have screening, flow measurement and purification using Phytorid Technology. The lake should be treated incorporating bio oxygenation and bio-augmentation preferably by aerobic processes. The reverse eutrophication process shall be started within 15 days from the date of stabilization.		
Ref. Doc				

TD-201 Rev No. 00	Form No.	 HYDERABAD	BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01 Rev No. 00 Page 9 of 30
OPYRIGHT 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 .		The lake water quality desired as per the specification shall be achieved within 3 months of the start of the reverse eutrophication process. <u>SCOPE OF SUPPLY AND SERVICES:</u> <u>Mechanical</u> 1. Screening system including screen handling equipment. 2. Raw Sewage Pumps. 3. Flow measuring device. 4. Phytoid beds consisting of special type of plants, gravel and bio-culture to be cultured in the sedimentation tank for treating of the inlet sewage. 5. Floating sponge supports with fibre nets for supporting the wetland plants to be installed in the lake for maintaining the quality of the lake. 6. Lake remediation bio culture to be manually added in the lake. 7. Complete Air supply system consisting of blowers, distribution piping and diffuser grids to maintain the dissolved oxygen level in the lake for the aquatic life. 8. Hypo-chlorite dosing system. 9. Lime & Alum/PAC to be manually added in the lake. 10. Motorized Boat & boatman services for adding bio-culture, chemical dosing and maintaining the floating rafters. 11. Periodic cleaning of lake including initial cleaning of the lake. 12. Special tools and tackles (if any) 13. Bidder shall get the design documents reviewed and approved by NEERI. 14. Insurance during transit, storage, execution, erection & commissioning and O&M for the total plant including man & machinery etc. 15. Watch & ward of the plant during execution, testing, commissioning and O&M period. 16. All Chemicals and consumables required during execution, testing, commissioning and O&M period.		
Ref.	Doc			

TD-201 Rev No. 00	Form No.	 HYDERABAD	BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01 Rev No. 00 Page 10 of 30
OPYRIGHT 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 .		17. Bidder shall arrange the required water supply & power during the execution period. During O&M, RSCL will provide the same. 18. Supply & Erection of the entire equipment and commissioning of the system required for meeting the standards specified as per the specification. 19. Commissioning and O&M spares. 20. Maintain the screen chamber, sedimentation tank, Phytorid beds and floating rafters. 21. Operation and maintenance of the complete system for 5 years. 22. Water quality analysis shall be carried out once in three months (i.e., quarterly) by NABL accredited labs / government organization / agencies. 23. Carry out water sampling as per the instruction of Engineer-in-charge, RSCL to capture intra-day, horizontal and vertical variation in water quality. Samples to be collected in a transverse section (X configuration) with overlapping cross arms with total of 9 sampling points at lake surface (1 common point at the intersection) and at the common point 2 different depths (1 middle and 1 bottom of lake). Total 11 samples. 24. Bidder shall adhere to an inclusive planning and remediation technique to treat the contaminated water sources of the water body. 25. Carry out site assessment for the execution of the project. 26. Bidder to establish and maintain the site office during the period of contract. 27. Maintain record of the completed work as per requirement of the specification for the entire duration of maintenance period. 28. For the entire O&M period, Bidder shall be responsible for maintaining required water quality standards & watering relevant activities. <u>Electrical:</u> 1. 415V Power Distribution Board (PDB) 2. Local Starters 3. Power cables, for Bidder supplied equipment including incoming cable to distribution board from customer premises. 4. Cable lugs and glands for termination of cables at the electrical equipment.		
Ref.	Doc			

TD-201 Rev No. 00	Form No.		BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01 Rev No. 00 Page 11 of 30
OPYRIGHT 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.		5. Illumination system in the complete area (battery limit). 6. Earthing of all the Electrical equipment as per IS 3043. 7. Safety items like danger boards. 8. G.I conduits for cable laying. 9. Necessary canopies for all outdoor electrical equipment as per supply BOQ. 10. Bidder shall arrange construction power & water during execution & commissioning period(Till commencement of plant Operation & maintenance). During O&M, RSCL will provide the same. <u>Civil works</u> 1. Civil works to be carried out by others which consists of 1.5MLD Phytorid System with RCC tank - screen chamber, Sedimentation tank , Phytorid tank Blower & DB room. 2. Equipment grouting and minor civil works shall be part of this tender for completion of equipment erection(scope of this tender). 3. For smooth execution of site activities Bidder shall coordinate with Civil agencies. NOTE: Any other equipment / service required for meeting the guaranteed performance shall be provided by the Bidder without any time and cost implication. No mechanical means of de-silting is allowed. Bidders should note that scope of this work do not include any activities related to fish culture, fishing & relevant activities & successful bidder will not allow anybody to carry out such activities during tenure of the contract. All rights for fish culture, fishing & relevant activities are with RSCL. 5.0 Design Data Plant shall be sized for following flow capacities:		
Ref.	Doc			

TD-201 Rev No. 00 Form No.	 HYDERABAD	BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01
			Rev No. 00
			Page 12 of 30

OPYRIGHT 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.

Total : 1.5 MLD (To Telibandha Lake)

The raw sewage quality shall be tested by the Bidder for the design of the Phytorid STP.

6.0 Treatment Process

The implementation of restoring the natural water body quality and maintaining the aquatic life in the Telibandha Lake shall be executed in the following two steps:

1. Treating the inlet sewage flowing into the lake.
2. Maintaining the quality of the Lake

7.0 Performance Data / Key Parameters

The water quality to be achieved as per norms laid down by the Ministry of Environment and Forests, for inland surface water bodies:

The job/activity of work will not be completed unless the desired parameters are not achieved in the lake i.e., DO, BOD and COD levels.

SL. NO.	PARAMETERS FOR INLAND SURFACE WATER	UNIT	LIMITING STANDARDS
1	pH		6.5 to 8.5
2	Biochemical Oxygen Demand @ 27 deg C, 3 day,	mg/l	< 20
3	Chemical Oxygen Demand	mg/l	< 50
4	Total Suspended Solids (TSS)	mg/l	< 10
5	Ammonical Nitrogen (NH ₄ – N)	mg/l	< 5
6	Total Nitrogen, N-Total	mg/l	< 10
7	Feacal Colliforms	MPN/100ml	< 230
8	Total Phosphate	mg/l	< 2
9	Total Residue Chlorine	mg/l	1

TD-201 Rev No. 00	Form No.	 HYDERABAD	BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01 Rev No. 00 Page 13 of 30
OPYRIGHT 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>SECTION-II</u> <u>DETAILED TECHNICAL SPECIFICATION</u> 1.0 MECHANICAL 1.1 Treating the inlet sewage flowing into the lake. 1.2 Maintaining the quality of the Lake 1.1 Treating the inlet sewage flowing into the lake The following two streams are flowing in to the lake untreated: a. Inlet 1 : 1.0 MLD b. Inlet 2 : 0.5 MLD c. Total : 1.5 MLD (To Telibandha Lake) These streams flowing in to the lake are polluting the quality and ecology of the lake. Hence, the streams in combined form shall be treated before letting into the lake. A. Phytorid Technology The sewage treatment of the streams shall be based on the “Phytorid Technology”. Based on the principle of constructed wetland technology (patented by NEERI), these plant beds are to be installed for achieving the wastewater treatment by filtration, adsorption, nutrient uptake and decomposition. The Phytorid unit shall essentially consist of a civil structure comprising of screen chambers, sedimentation chamber, Phytorid bed chamber and treated water outlet. Wastewater from screen cum sedimentation chamber shall flow into the Phytorid beds by gravity. The solids shall be separated in the screen cum sedimentation chamber. Wastewater from screen cum sedimentation chamber shall further flow into Phytorid bed by gravity. Phytorid bed shall be provided with different gradation of gravels/stone aggregate and specialized plants.		
Ref.	Doc			

TD-201 Rev No. 00	Form No.		BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01 Rev No. 00 Page 14 of 30
OPYRIGHT 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 .		The Phytorid bed shall be divided into compartments with baffles provided in such a way that the flow of wastewater is in sinusoidal manner providing both the anaerobic and aerobic zones in the same Phytorid bed. The flow of wastewater shall be below the top gravel layer, thereby ensuring no sewage is exposed which shall create mosquito problems. The plants in the Phytorid bed shall uptake nitrates and phosphates from the wastewater. The civil tank with baffles shall be designed in such a way that several passages through gravel beds with both aerobic and anaerobic zones shall reduce the faecal coliform also. 1.2 Maintaining the quality of the Lake To continuously maintain the quality and ecology of the lake, after treatment of the influent sewage and discharge in to the lake, floating rafters shall be provided in the lake. A. <u>Floating Rafters</u> The water quality of the lake shall be maintained continuously by installing plant beds on the water surface. These plant beds shall be constructed on material which can float on water and they shall be anchored in the lake for stability. These wetland plant on the floating rafters shall treat the water through physical, chemical and biological process. The process shall utilize aquatic plants' developed roots to contact water for absorption, transformation and degradation of the water pollutants. The plants' roots secreting large amount of enzyme and organic acid shall accelerate the decomposition of the macromolecular pollutants in water. Meanwhile, plants' roots shall also provide microorganism with oxygen source and attachment place and enhance their metabolism to cut down water pollutants' content.		
Ref. Doc				

TD-201 Rev No. 00	Form No.		BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01 Rev No. 00 Page 15 of 30
OPYRIGHT 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.		The plants shall be trimmed, shifted out and separated them from water thereby purifying the lake water. 1.3 Screening System Supply, installation, testing & commissioning of two numbers Stainless Steel-316 Perforated Corrugated Screen of size 1000mm x 1125mm fabricated through 5mm thick plate having holes of 20 mm at a distance of 10 mm with suitable lifting arrangement. This is to slide in the fixed SS channels fixed on the side walls. These screens shall be provided in the screen cum pump chamber for initial filtering of bigger particles before pumping the raw sewage. Type : Perforated corrugated screen / Bar screen MOC : Stainless steel SS-316 Accessories : Fixing bolts, SS channels (if any) Screen cleaning : Manual cleaning rakes 1.4 Raw Sewage Pumps Two numbers (1W + 1S) raw sewage lifting pumps with motor shall be provided for pumping the sewage from the inlet point to the sedimentation tank for further treatment. Pump shall be provided with dry running protection. Type : Submersible MOC : Cast Iron Capacity : 65m3/hr Head : 15mwc Accessories : Foundation bolts / Anchor, Pressure gauge 1.5 Piping and Valves The piping, valves and piping components as required Location : Raw sewage suction & discharge Hypochlorite dosing piping Perforated pipe for Phytorid bed Treated sewage piping to the lake		
Ref. Doc				

TD-201 Rev No. 00	Form No.		BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01 Rev No. 00 Page 16 of 30
OPYRIGHT 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 .		Air blower piping Diffuser piping in the lake Note: The raw sewage pumps shall be provided with NRVs & isolation valves in the discharge pipe. Bypass line (as required) with manual isolation valve. 1.6 Flow measurement device with counter flanges Type : Electromagnetic/Orifice type Location : At raw sewage outlet 1.7 Diffuser system with complete Air supply system consisting of blowers, distribution piping and diffuser grids in the lake to maintain the dissolved oxygen level in the lake for the aquatic life. 1.8 Phytorid Bed - This bed shall consist of specifically identified different species of plants(patented by NEERI), gravel for the bed support etc. for meeting the required performance parameters. 1.9 Floating rafter assembly- The system shall consist of complete set of floating sponge foam of required thickness, Fiber net to hold the foam and support the plant, plant hooks and assembly materials. 1.10 Dosing system- To maintain the residual chlorine required dosing arrangement (tank of 100litres and associated piping)shall be provided at the outlet of the Pythorid bed. Dosing of Bio-culture, lime and alum/PAC shall be done through carboys/jerrycans directly in the lake. 1.11 Sludge handling The sludge generated in the sedimentation tank shall be disposed off with a portable pump to the satisfaction of customer.		
Ref. Doc				

TD-201 Rev No. 00		Form No.	बी एच ई एल  HYDERABAD	BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01
					Rev No. 00
					Page 17 of 30

OPYRIGHT 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 .

1.12 Miscellaneous items

The lifting arrangement for the screens, pumps and any other item required for meeting the required performance of the plant and maintaining it during the O&M

2.0 ELECTRICAL

2.1 415V Power Distribution Board (PDB)

1. The PDB shall be provided with voltmeter at the incomer side

2. The PDB shall be of 415V 3ph, 4 wire, 50Hz and fault level of the DB shall be 10kA/1 sec.

3. All the feeders shall be as per the below SLD.

4. The PDB shall be suitable for wall mounted / floor mounted.

5. Minimum degree of protection for floor mounted PDB shall be IP54 & wall mounted PDB shall be IP55.

TYPICAL-SLD

FROM CUSTOMER BULK FEEDER

3.5Cx 95 SQMM XLPE,AL, Armoured cable

WALL MOUNTED/FLOOR MOUNTED PDB

415V, 3Ph,4WIRE,63A,10kA/1SEC

VOLTMETER
0-415V AC

63A SFU

SFU/MCCB
16A**

SFU/MCCB
16A**

SFU/MCCB
16A**

SFU/MCCB
16A**

SFU/MCCB
16A**

SFU/MCCB
16A**

CONTACTOR

TIMER

BLCB

4Cx4SQMM CABLE

4Cx4SQMM CABLE

4Cx16 SQMM CABLE

4Cx16SQMM CABLE

4Cx4SQMM CABLE

4Cx4SQMM CABLE

4Cx4SQMM CABLE

RAW SEWAGE TRANSFER PUMP(3Ph)
(Qty-2Nos)

AIR BLOWERS-(3Ph)
(Qty-2Nos)

OUTDOOR LIGHTING-3PH
(Qty-1No)

INDOOR LIGHTING PANEL
(3PH)
(Qty-1No)

MAGNETIC FLOW METER(1PH)
(Qty-1No)

PORTABLE SLUDGE PUMP(1PH)
(Qty-1No)

SPARE(3PH)
(Qty-3No)

**--THE RATINGS OF MCCB/SFU MAY VARY BASED ON FINAL LOADLIST

Ref.

Doc

TD-201 Rev No. 00	Form No.	 HYDERABAD	BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01 Rev No. 00 Page 18 of 30
OPYRIGHT 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.		2.2 Local Starters:MK1 Local starters shall be provided to operate the Motor Loads locally and they shall be provided with required protections like Overload, single phasing , Level switch shall be integrated for dry run of Submersible pumps. 2.3 Power cable The Power cables shall be 1.1kV grade, XLPE, armoured cable. These cables shall conform to IS 7098 and all relevant test reports as per this IS shall be furnished.. All the necessary cabling between Customer bulk feeder to Bidder supplied DB and DB to Bidder supplied electrical installations like Electrical motors, Lights, fans etc. are in the scope of successful bidder. 2.4 Cable Lugs & Glands The cable termination accessories like Cable Lugs, Cable Glands shall be in Bidder's scope. Cable lugs shall be of Tinned copper heavy duty lugs & cable glands shall be of Double compression nickel coated Brass type. 2.5 Illumination system: Bidder shall provide illumination in all the process areas as per the supply BOQ. All the cabling and termination shall be carried by successful bidder for illumination purpose also and these lights shall be fed through lighting panel which will be fed from PDB mentioned above. 2.6 Earthing: Earthing system shall be provided as per the supply BOQ. Earthing of all equipment shall be carried out by successful bidder in line with IS3043 . Earth pits with GI electrodes shall be used for earthing of electrical loads and below ground inter connecting of all these electrodes shall be through GI flats. GI Flats shall be used for above ground earthing also. 3.0 CONTROL & INSTRUMENTATION 3.1 Level switch shall be provided in receiving chamber & shall be integrated for dry run of Submersible pumps in the local panel 3.2 Flow meter shall be provided in the outlet of pump discharge.		
Ref.	Doc			

TD-201 Rev No. 00	Form No.		BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01 Rev No. 00 Page 19 of 30
OPRYRIGHT 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 .		4.0 QUALITY PLAN & INSPECTION AGENCY & TESTING: Bidder to furnish Quality Plan to BHEL for approval after award of contract. Quality plan will be reviewed during detailed Engineering stage with respect to Inspection, standard Engineering practices & Specification. Requirements and various tests and stages of inspection and appropriate agencies for Inspection will be Intimated. Bidder to abide by the same. <u>Inspection agency:</u> BHEL/Third Party appointed by BHEL. The various review/witness/observation stages by Individual agencies (or) Group of Agencies as above will be in line with approved quality plan. 5.0 DELIVERY CONDITION & PACKING 5.1 Internal piping system cleanliness to be assured by flushing or equivalent method. All material shall be delivered in a clean and usable condition. Openings shall be securely covered against entry of foreign material where appropriate. 5.2 Packing shall be accomplished in accordance with acceptable commercial practice (seaworthy packages for foreign dispatches) unless otherwise indicated on BHEL purchase order or quotation request. The unit shall be neatly packed and fastened. Complete unit shall reach site in undamaged conditions. 5.3 The vendor shall make the dispatch consistent with the requirements of safe transit, available modes of transportation and routing. It shall be vendor's responsibility to determine that packing as done is adequate to assure that complete unit shall arrive at destination in an undamaged condition and ready for the intended use. 5.4 When more than one container is required, the vendor shall provide suitable container number marking for recognition of parts of one unit. Assembly instruction shall be included with each such dispatches. Container number shall be put on the BOM for ease of identification.		
Ref.	Doc			

TD-201 Rev No. 00 Form No.	 HYDERABAD	BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01									
			Rev No. 00									
			Page 20 of 30									
OPYRIGHT 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 .	6.0 ERECTION AND COMMISSIONING SPARES The Bidder shall 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 delay in the project schedule. 7.0 SPECIAL TOOLS AND TACKLES Required set of special tools and tackles (if any) required during execution, operation and maintenance period shall be supplied by the Bidder. 8.0 O&M SPARES As the scope of work includes O&M for a period of 5 years, the required spares during the O&M period shall be supplied by the Bidder. 9.0 SPECIAL CLEANING, PROTECTION & PAINTING Any special coating, protection or painting required for the sedimentation tank shall be carried out by the Bidder. 10.0 CHEMICALS AND CONSUMABLES All the chemicals and consumables required for the commissioning and O&M period, to maintain the plant performance, shall be supplied by the Bidder. 11.0 TERMINAL POINTS The terminal points are marked on the layout, refer the layout for the piping length from the terminal point to the equipment area. A. MECHANICAL <table border="1"> <thead> <tr> <th>Sl. No.</th> <th>Main Equipment / Systems</th> <th>Terminal Points</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Raw sewage inlet</td> <td>At the sewage inlet sump</td> </tr> <tr> <td>2.</td> <td>Service water</td> <td>At one point near the STP</td> </tr> </tbody> </table>			Sl. No.	Main Equipment / Systems	Terminal Points	1.	Raw sewage inlet	At the sewage inlet sump	2.	Service water	At one point near the STP
	Sl. No.	Main Equipment / Systems	Terminal Points									
1.	Raw sewage inlet	At the sewage inlet sump										
2.	Service water	At one point near the STP										
Ref. Doc												

TD-201 Rev No. 00 Form No.	 HYDERABAD	BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01						
			Rev No. 00						
			Page 21 of 30						
OPYRIGHT 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.									
B. ELECTRICAL <table border="1" data-bbox="472 453 1448 640"> <thead> <tr> <th>Sl. No.</th> <th>Main Equipment/Systems</th> <th>Terminal Points</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Electrical Power</td> <td>Contractor to arrange power from distribution company.</td> </tr> </tbody> </table> 12.0 DOCUMENTS TO BE FURNISHED a) Along with the offer Bidders is requested to fill and furnish the Checklist for the offer enclosed to specification and also submit the following: - P&ID / Scheme of the system - Filled in annexure - Duly filled in unpriced price bid format. b) After award of contract All the drawings and documents to be submitted as per the Master Document List enclosed with the specification. 13.0 PERFORMANCE TEST REQUIREMENTS & GUARANTEES In addition to compliance with the requirements of the specification, Bidder shall meet the specific guarantees of treated water quality as required and as stated in the performance data. All tests shall be carried out in accordance with the relevant international standards, unless otherwise specified or approved by Owner/Owner's representative. a) The complete system shall operate safely, reliably, and without undue maintenance or operator attention/intervention. Guarantees shall be such that, it can be met in everyday operation under all specified operating conditions. b) Supplier shall note that the provisions of the clauses on tests as outlined in the specification for "Inspection and Testing"				Sl. No.	Main Equipment/Systems	Terminal Points	1.	Electrical Power	Contractor to arrange power from distribution company.
Sl. No.	Main Equipment/Systems	Terminal Points							
1.	Electrical Power	Contractor to arrange power from distribution company.							
Ref. Doc									

TD-201 Rev No. 00	Form No.		BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01 Rev No. 00 Page 22 of 30
OPYRIGHT 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.		c) Performance test will be carried out within the appropriate time period as specified. 14.0 GUARANTEE TEST PROCEDURE In conducting the plant performance tests, the plant shall be operated by Owner/Owner's representative's staff under the direction and responsibility of Bidder's representative and to the mutual satisfaction of the parties concerned. 15.0 SUBMISSION OF TEST PROCEDURES The Supplier shall submit for approval at least one month prior to testing, detailed test procedures for equipment, sub-systems and complete systems covered under this order. 16.0 OPERATION AND MAINTENANCE OF PLANT 16.1 Plant is capable of treating 1.5MLD of sewage. Technical details of the Plant and the process layout with inland surface water limiting standards. 16.2 The contractor should engage required manpower to meet O&M requirements. The minimum Man power requirement is given for operation & treating the sewage to the norms specified and disposes the treated water in to the lake as directed by the Engineer-in-charge. 16.3 Contractor should ensure the screen rejects and process rejects regularly and helps generally to keep the plant & surrounding neat and clean in the every shift. Regular pruning of plants & necessary replacement of plants of Phytoid and floating rafters to be ensured by Contractor. Manual clean of lake with boatman to be performed periodically as per site requirement. Dosing to be ensured timely to maintain the water quality. Blowers/diffusers to be maintained to ensure proper functionality.		
Ref. Doc				

TD-201 Rev No. 00	Form No.		BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01 Rev No. 00 Page 23 of 30
OPYRIGHT 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 .		16.4 Operation and Maintenance is to be carried out in three shifts a day for all the activities of the plant maintaining pumps, blowers, valves, dosing systems etc of this tender. Daily log details have to be maintained for all equipment of the plant and their performance including energy / diesel consumption, water qualities as instructed Engineer in charge. All equipment & valves may have to be operated / controlled manually also. 16.5 If the system is not operated for more than one day due to break-down on account of other than Power Supply, non-availability of effluent., recovery will be made on pro rata basis as per the approved and awarded rate per month from the date of break down to the date of putting back the system to perform effectively. The work is to be executed on all days, (working days, public holidays and Sundays). However the levy of penalty shall be as per the discretion of the Engineer Incharge. 16.6 Carryout preventive maintenance of the equipment like pumps, blowers ,valves etc as per the instructions given in the O&M manual. Attend all Major/minor breakdowns. Contractor shall arrange all Materials/consumables/Chemicals etc ,if any required for repairs , maintenance of the equipment/plant & maintaining the water quality as specified. 16.7 The Operator / Supervisor shall report to the BHEL executive / supervisor in charge of the Lake purification plant, about the healthiness of the plant every day. 16.8 Contract supervisor shall be responsible for all official correspondences with BHEL. 16.9 The contractor shall depute alternate Supervisor / Mechanic / Operator if the shift Supervisor / Mechanic / Operator is on leave / absent / compensatory off.		
Ref.	Doc			

TD-201 Rev No. 00	Form No.		BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01 Rev No. 00 Page 24 of 30
OPYRIGHT 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 .		16.10 Required Power and water for the Operation of the system will be provided by RSCL free of charges. 16.11 Raw and treated water should be tested as per the schedule given in the Performance Data / Key Parameters. All test records and results should be maintained and produced to BHEL for its verification. Analysis should be conducted in approved lab for conducting the above said tests, within the quoted rates. 16.12 The contractor should maintain all monitoring records w.r.t plant operation and maintenance, Laboratory analysis reports, etc 16.13 The contractor shall ensure payment of Minimum wages, Bonus to the workmen employed by him at the rate at which shall not less than the minimum wage applicable under Law from time to time. 16.14 PF &ESI Act should cover the workmen as applicable and payment will be made only on verification of the documents for the remittance of ESI and PF for the personnel engaged in the work 16.15 The contractor should submit the list and quantity of consumables and spares used every month for the verification/Record by BHEL 16.16 The details of spares inventory required for all pumps/Blower/electrical/C&I system and other equipment shall be maintained by the contractor well in advance so as to keep ready to run the plant without any interruption, Replacing of defective spares is in the scope of tender. Records shall be maintained for the receipt and use of spares.		
Ref. Doc				

TD-201 Rev No. 00 Form No.	 HYDERABAD	BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01																																		
			Rev No. 00																																		
			Page 25 of 30																																		
OPYRIGHT 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 .		16.17 The workers should be provided with personal protective equipments such as Gloves, Goggles, safety shoes, Gum boots, face masks, life jackets, waste cloths, soaps, etc by the Contractor within the quoted rates. 16.18 The contractor should follow all procedures pertaining to safety and EMS in day to day running of the plant 16.19 The contractor should keep a First Aid Box with list of Aids and should be refilled as and when required. 16.20 During this period the contractor should take whole responsibility of the Plant operation including treatment efficiency. Any deviation from the specific performance requirement of any equipment or quality of treated effluent as per norms, the contractor shall immediately take steps to rectify the deficiency without any extra cost. 16.21 Before handing over the project to RSCL, after completion of 5 years O&M, the site shall be cleared of any surplus material, debris and temporary works. The plant shall be handed over in the working condition with all the equipment working satisfactorily. 16.22 Manpower Requirement(O&M) <table border="1"> <thead> <tr> <th colspan="7">MINIMUM MAN POWER DEPLOYMENT DURING O&M PERIOD</th> </tr> <tr> <th>Sl. No.</th> <th>DESCRIPTION</th> <th>Category</th> <th>Nos. Reqd.</th> <th>Shift(s)</th> <th>Total Nos./ day</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Shift Operator</td> <td>ITI/Skilled</td> <td>3</td> <td>A , B &C</td> <td>3</td> <td rowspan="3"></td> </tr> <tr> <td>2</td> <td>Boatman (for lake maintenance like cutting shrubs, removal of debris & solids, chemical addition etc)</td> <td>Semiskilled.</td> <td>2</td> <td>Gen</td> <td>2</td> </tr> <tr> <td>3</td> <td>Watchman</td> <td>Unskilled</td> <td>3</td> <td>A,B &C</td> <td>3</td> </tr> </tbody> </table>			MINIMUM MAN POWER DEPLOYMENT DURING O&M PERIOD							Sl. No.	DESCRIPTION	Category	Nos. Reqd.	Shift(s)	Total Nos./ day	Remarks	1	Shift Operator	ITI/Skilled	3	A , B &C	3		2	Boatman (for lake maintenance like cutting shrubs, removal of debris & solids, chemical addition etc)	Semiskilled.	2	Gen	2	3	Watchman	Unskilled	3	A,B &C	3
MINIMUM MAN POWER DEPLOYMENT DURING O&M PERIOD																																					
Sl. No.	DESCRIPTION	Category	Nos. Reqd.	Shift(s)	Total Nos./ day	Remarks																															
1	Shift Operator	ITI/Skilled	3	A , B &C	3																																
2	Boatman (for lake maintenance like cutting shrubs, removal of debris & solids, chemical addition etc)	Semiskilled.	2	Gen	2																																
3	Watchman	Unskilled	3	A,B &C	3																																
Ref. Doc																																					

TD-201 Rev No. 00 Form No.	 BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01
		Rev No. 00
		Page 26 of 30
OPYRIGHT 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 . 8.0 ORDER OF PRECEDENCE This specification shall be read in conjunction with all other specifications and documents enclosed to it. Any conflict between referenced documents shall be identified and indicated. When resolving conflicts the following order of precedence shall govern. (1) RAIPUR SMART CITY LIMITED (RSCL)/ BHEL specification (2) Schemes (3) Annexures (4) Standards and codes as applicable		
Ref. Doc		

TD-201 Rev No. 00 Form No.	 BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01
		Rev No. 00
		Page 27 of 30

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.

SECTION-III

PRICE SCHEDULES

SL. NO.	DESCRIPTION	QTY.	UNIT PRICE (Rs.)	TOTAL PRICE (Rs.)
	Design, Supply, Insurance, E&C and O&M (for 5years) works for Mechanical & Electrical package for Telibandha Lake purification for Raipur Smart city ltd, Raipur Chhatisgarh as per the technical specification.			
1	Equipment design, supply, transportation including spares **	1 lot		
2	Equipment receipt, handling, storage, preservation and erection, Commissioning & testing **	1 lot		
3	O&M **			
3.1	O&M for first year	1 lot		
3.2	O&M for Second year	1 lot		
3.3	O&M for Third year	1 lot		
3.4	O&M for Fourth year	1 lot		
3.5	O&M for Fifth year	1 lot		
	Total Price Sl. No. (1+ 2+3.1+3.2+3.3+3.4+3.5)			

** Shall be inclusive of Insurance

Bidder to quote the base rates only. All applicable taxes and duties shall be indicated separately for the Supply Portion and Erection & Commissioning Portion and O&M portion

NOTES:-

- Bidder to quote strictly as per BHEL's NIT requirements.
- 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.
- Offer will be evaluated based on total price for Supply, E&C and O&M (for 5years) works (i.e. Sl. Nos. 1.+2+3.1+3.2+3.3+3.4+3.5. of price format).

Ref. Doc

TD-201 Rev No. 00	Form No.		BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01 Rev No. 00 Page 28 of 30
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 .		4. For purpose of ordering of complete system by BHEL, the prices of all Supply, Insurance, E&C and O&M (for 5years) works shall be considered as follows: i) For design, supply, transportation including Spares: Shall be 28.94 % of the Total Price quoted by the bidder ii) For Erection & commissioning Services : Shall be 3.22% of the Total Prices quoted by the bidder for complete System iii) For O&M Service: For first year : Shall be 11.08% of the Total Price quoted by the bidder For Second year: Shall be 12.19% of the Total Price quoted by the bidder For Third year: Shall be 13.58% of the Total Price quoted by the bidder For fourth year: Shall be 14.75% of the Total Price quoted by the bidder For Fifth year : Shall be 16.23% of the Total Price quoted by the bidder 5. Two Separate Purchase Orders will be issued, One PO for Supply + E&C and One PO for O&M services of this project. 6. Bidder to note that all the Erection & commissioning spares and consumables including O&M spares and consumables are included in the quoted price. 7. Bidder to fill up the above total price (price for each line item wise will be considered as per the percentage furnished above) manually put his seal & signature and submit the same for price bid opening. BIDDER'S SIGNATURE: NAME: DATE COMPANY SEAL		
Ref. Doc				

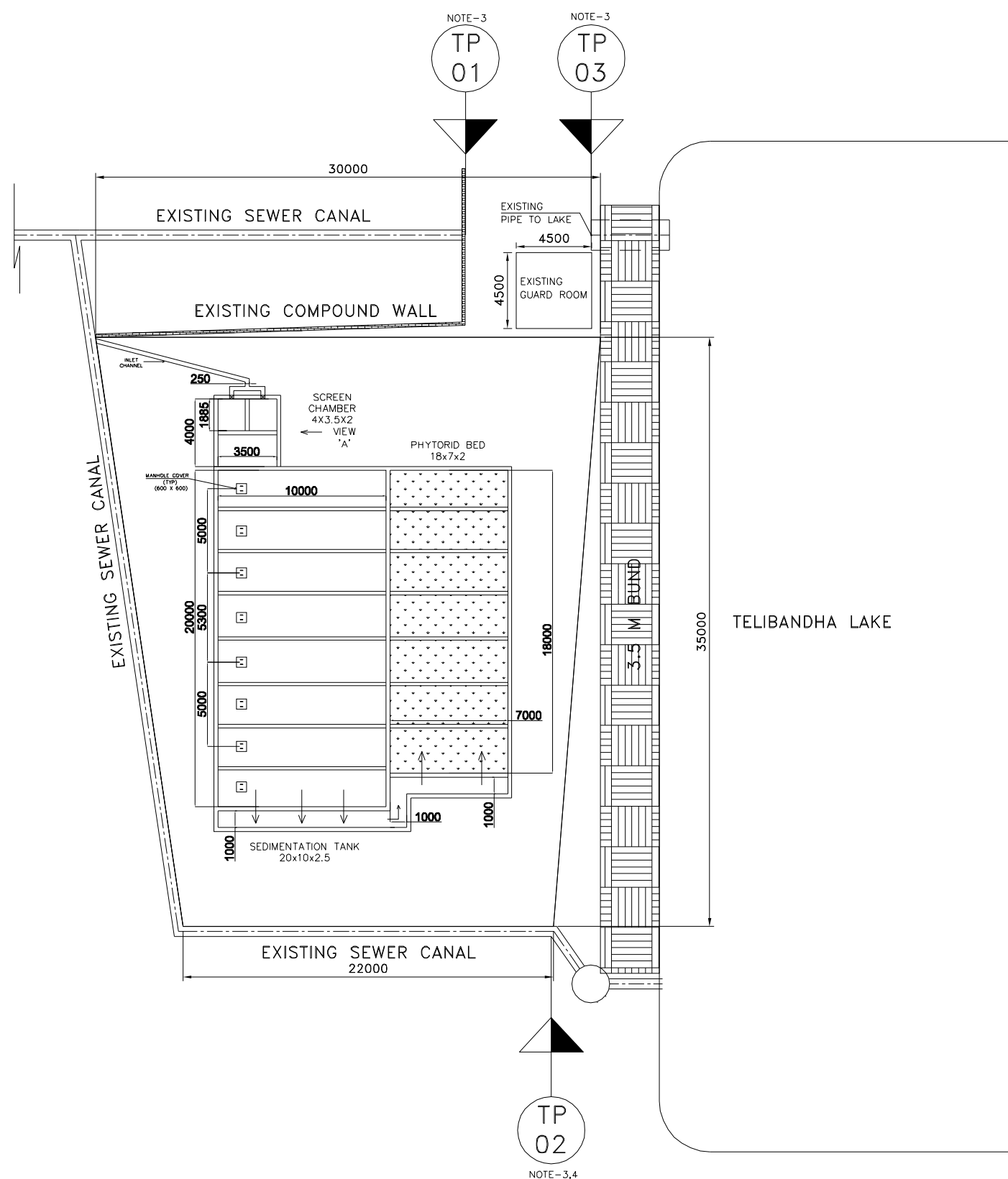
TD-201 Rev No. 00 Form No.	 HYDERABAD	BHARAT HEAVY ELECTRICALS LIMITED RC PURAM, HYDERABAD - 32 PROJECT ENGINEERING & SYSTEMS DIVISION	PY-AS-4-M107-8436-01
			Rev No. 00
			Page 29 of 30
SECTION -IV DRAWINGS AND DOCUMENTS FOR TENDER PURPOSE 1. PLOT PLAN 2. EQUIPMENT LAYOUT 3. CHECK LIST 4. ANNEXURE-1 : KEY INFORMATION 5. ANNEXURE-II :VENDOR DOCUMENTATION PROCEDURE 6. ANNEXURE-III :QAP FORMAT 7. ANNEXURE -IV :MASTER DOCUMENT LIST 8. INSTRUMENT DATA SHEET			
Ref. Doc			

OPYRIGHT 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 .

	Form No.		PRODUCT STANDARD PROJECT ENGINEERING HYDERABAD				PY-AS-4-M107-8436-01
							Rev No. 00
							Page 300 of 30
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.		RECORD OF REVISIONS					
	Rev. No.	Date	Revision Details	Prepared By	Checked By	Approved By	
	00	11.05.18	First issue	CHP	AKS	MSSN	
	Ref. Doc.						

INVENTORY NO.



1. ALL DIMENSIONS ARE IN MM.
2. THE DIMENSIONS ARE ONLY INDICATIVE. ACTUAL DIMENSIONS SHALL BE FURNISHED DURING DETAILED ENGINEERING.
3. RSCG TO CONFIRM THE EXACT CO-ORDINATES OF TERMINAL POINTS TP-01,02,03.
4. RSCG TO CONFIRM THE REQUIREMENT OF TP-02, AS PRESENTLY THERE IS NO SEWAGE FLOW THROUGH CHANNEL CONNECTED TO TP-02.

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD
ZONE			ZONE			ZONE			ZONE			ZONE			ZONE			ZONE		
	1			2			3			4			5						9	

CUSTOMER:

RAIPUR SMART CITY LIMITED (RSCL)

EPC CONTRACTOR:

BHARAT HEAVY ELECTRICALS LTD.

PE&SD, HYDERABAD

PROJECT:

LAKE PURIFICATION & RESTORATION IN
TELIBANDHA LAKE, RAIPUR

TECHNOLOGY PROVIDER

NEERI

NAME	SIGN.	DATE	NO. OF VAR.
DRN.	PRADEEPA	17.05.18	
CHD.	AMIT SINHA	17.05.18	N.A.
APP.	M.S.S.N	17.05.18	

DEPT.
PE&SD
CODE
450

UNTOL. DIMS.
OR.
g/m²/y

SCALE

NTS

WEIGHT (KG)

-N.A.-

REF. TO ASSY. DRG.

-N.A.-

ITEM NO.

-N.A.-

NO. OF
ITEMS
-N.A.-

TITLE

EQUIPMENT LAYOUT OF
THE PHYTORID SYSTEM

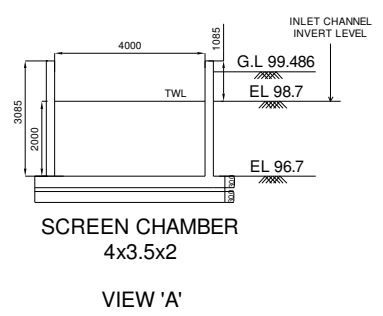
BHEL DRAWING NO.
PY-LQ-1-M107-2001-01

VENDOR DRAWING NO.

REV.
00

Size _____ SHT. No 1 _____ NO. OF SHT. _____

ENTORY NO.



CUSTOMER:										
		RAIPUR SMART CITY LIMITED (RSCL)								
EPC CONTRACTOR:		BHARAT HEAVY ELECTRICALS LTD.								
		PE&SD, HYDERABAD								
PROJECT:		LAKE PURIFICATION & RESTORATION IN TELIBANDHA LAKE, RAIPUR								
TECHNOLOGY PROVIDER						NAME		SIGN.	DATE	NO.OF VAR.
NEERI				DRN.		PRADEEPA			17.05.18	N.A.
				CHD.		AMIT SINHA			17.05.18	N.A.
				APPD.		M.S.S.N			17.05.18	N.A.
DEPT. PE&SD CODE 450	UNTOL. DIMS. GR. L/M/T		SCALE NTS	WEIGHT (KG) -N.A.-	REF. TO ASSY. DRG. -N.A.-			ITEM NO. -N.A.-	NO.OF ITEMS -N.A.-	
TITLE					BHEL DRAWING NO. PY-DG-1-M107-1040-01					
GA OF PHYTORID BED, SEDIMENTATION TANK AND SCREEN CHAMBER					VENDOR DRAWING NO.				REV. 00	
					Size	SHT. No 1	NO. OF SHT. 1			

REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD
ZONE			ZONE			ZONE			ZONE			ZONE			ZONE			ZONE		
1			2			3			4			5						9		

TECHNOLOGY PROVIDER NEERI				NAME		SIGN.	DATE	NO. OF VAR.
				DRN. PRADEEPA			17.05.18	
				CHD. AMIT SINHA			17.05.18	N.A.
				APPD. M.S.S.N			17.05.18	
DEPT. FEASD CODE 450	UNTOL. DIMS. GR. L/M/F		SCALE NTS	WEIGHT (KG) -N.A.-	REF. TO ASSY. DRG. -N.A.-	ITEM NO. -N.A.-	NO. OF ITEMS -N.A.-	
TITLE GA OF PHYTORID BED, SEDIMENTATION TANK AND SCREEN CHAMBER				BHEL DRAWING NO. PY-DG-1-M107-1040-01				
				VENDOR DRAWING NO.				REV. 00
				Size		SHT. No 1	NO. OF SHT. 1	
10		11		12				

CHECK LIST

Note: 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>Sl. No.</u>	<u>Description</u>	Enclosed or [Yes/ No]	Remarks/ Comments By Bidder
1.	Bidder to confirm compliance with PY-AS-4-M107-8436-01 and its annexure without any deviations. In case there are any deviation taken, the same shall be clearly brought out as per annexure-V.		
2.	Bidder has already raised pre-bid queries (if any) on Purchase specification.		
3.	Bidder to Confirm Compliance with scope, terminal points and exclusions for Mechanical/ Electrical/ C&I Sub-Sections of Purchase Specification.		
4.	Bidder shall submit completely filled following Annexures enclosed with Technical Purchase Specification Annexure-I: Key Information Annexure-II: List of Recommended Spare Parts Annexure-III: Special Tools and Tackles Annexure-IV: Commissioning spares Annexure-V: Deviation from specification		
5.	Tentative Electrical Load List is enclosed with offer.		
6.	Bidder shall furnish the list of Erection and commissioning spares along with their offer.		
7.	Bidder to fill Deviation list (Refer Annexure-V). Only those deviations indicated in this list will be considered during technical evaluation of offer. Bidder to indicate the deviations which are impractical.		
8.	All other requirements except for the deviation brought out under deviation list, have been taken into consideration.		
9.	Bidder to Confirm Compliance with Typical QAP enclosed with purchase specification PY-AS-4-M107-8436-01		

I. KEY INFORMATION

- | | | | |
|------|---|---|--------|
| 1.0 | Name of the Bidding Company | : | |
| 2.0 | Registered in (mention the name of the Country) | : | |
| 3.0 | Name, designation, telex & telephone
number and postal address of responsible
officer of Bidder to whom all
reference shall be made for expeditious
coordination. | : | |
| 4.0 | Name, designation, telex & telephone
number and postal address of
responsible officer of Indian Agent. | : | |
| 5.0 | Bidder's proposal number | : | |
| 6.0 | Bidder's proposal date | : | |
| 7.0 | Validity of offer, counted from the
date of opening of bid | : | |
| 8.0 | Guaranteed completion period, counted
from date of issuance of LOI/TOI | : | |
| 9.0 | Confirm that Scope of supply and services are
exactly as per specification requirement. | : | Yes/No |
| 10.0 | Confirm technical compliance with specification | : | Yes/No |
| 11.0 | Confirm that List of Recommended Spares has
been furnished as per Annexure-II | : | Yes/No |

- | | | |
|------|--|--------|
| 12.0 | Confirm that list of Special Tools & Tackles are furnished :
per Annexure-III | Yes/No |
| 13.0 | Confirm that list of Commissioning spares are furnished :
per Annexure-IV | Yes/No |
| 1.0 | Confirm that deviations, if applicable, have :
been furnished in Annexure-V | Yes/No |

Signature of Bidder's

Authorized representative with date.....

Date

II. LIST OF RECOMMENDED SPARE PARTS

Bidder shall tabulate in the proforma below list of all spare parts 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.	Description	Quantity	Unit	Total	Delivery	Remarks
		No	Price	Price	Period	

III. SPECIAL TOOLS AND TACKLES

Bidder shall indicate and supply the following tools and tackles for operation, maintenance and replacement of equipment and component, supplied under the specification.

Sl.No.	Description	Quantity	Model No. / Type

IV. COMMISSIONING SPARES

Bidder shall indicate and supply the following tools and tackles for operation, maintenance and replacement of equipment and component, supplied under the specification.

Sl.No.	Description	Quantity	Model No. / Type

V. 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.

Sl. No.	CLAUSE NO.	DESCRIPTION AS PER SPECIFICATION	DEVIATION BY BIDDER

We confirm that all the deviations / exceptions, to the Technical 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 with date.....

Date

VENDOR DOCUMENTATION PROCEDURE

Sl. No.	Document Name / Type	To Contain	Required With Offer	Required After P.O
			Compliances from Vendor & No. of Sets Reqd.	No. of Sets Required – Engg., Approval/Review Activities and Customer Submission.
1	(a) Drgs, Data Sheets, Catalogues. BOM etc. (b) PIDs, SLDs, Block-Schematics etc. (wherever applicable)	Adequate Information. Other Information to be furnished as defined in the applicable Tech Specs.	Compliance for submission	3 (Addl. Copies Required – wherever Docs. are subject to review by customer.)
2	Terminal Point (s)	List of Scope Terminal Point (s) & Process Data etc. – wherever applicable.	Compliance for submission	2
3	Deviations if any	To be clearly listed, furnishing reasons for non-compliance	In the format identified in the specification	NA (No deviations are acceptable after PO)
4	Project completion activity “Bar-chart” matching with BHEL Project Schedule	Schedules for the various activities / milestones	Compliance required to meet BHEL Delivery Sch.	1
5	SPARES for Erection / Commissioning	a) Informative List required with Technical & Commercial bids. a.1) To consider as Part of main scope of Supply.	Vendor to Confirm Supply in their Offer.	1

Sl. No.	Document Name / Type	To Contain	Required With Offer	Required After P.O
			Compliances from Vendor & No. of Sets Req'd.	No. of Sets Required – Engg., Approval/Review Activities and Customer Submission.
		b) Such Spares List is subject to Review during Detail Engg.		
6	“Operation and Maintenance Spares” / “Mandatory Spares” List	a) List by Vendor	1) To Enclose with Offer. 2) To indicate price for the listed items in commercial offer	
7	Vendor’s “Bill of Material”	1) This doc. shall be approved by BHEL 2) Submission of this Document is essential during initial Submission stage of Engg. Docs. & the same be progressively updated as the Detail Engg. Progresses. 3) All Dispatchable Units shall be identified in this Doc with “Dispatch Tag-No.” 4) The Dispatch Tag no. shall be written on an ‘Al- Strip’ and tied to the dispatchable unit or be	Bidder compliance required	1

Sl. No.	Document Name / Type	To Contain	Required With Offer	Required After P.O
			Compliances from Vendor & No. of Sets Req'd.	No. of Sets Required – Engg., Approval/Review Activities and Customer Submission.
		prominently painted on each Item with washable paint. PL. NOTE – This system shall be followed being an essential part of Field Quality Assurance Practices & for proper Identification of Items at Site.		
8	Quality Assurance Plan (QAP) & Factory Testing Procedure Documents	1) Approval from BHEL required. 2) Submission along with the Engg. Docs.	A) Submission –if already standardized with BHEL / Draft proposal & it may be finalized after Review. B) Submission compliance from Vendor required	1
9	FQAP (Field Quality Assurance Plan) & Site Erection, Testing & Commissioning Procedure documents	1) Approval from BHEL site. 2) Submission along with the Engg. Docs.	Same as for Sl-11 above	1
10	<u>Erection Documents & Drawings:-</u>	1) To contain final MDL, BOM, Handling & Storage Instructions	Bidder compliance required	1

Sl. No.	Document Name / Type	To Contain	Required With Offer	Required After P.O
			Compliances from Vendor & No. of Sets Reqd.	No. of Sets Required – Engg., Approval/Review Activities and Customer Submission.
		Doc., Initial-Fill & Consumables Items list, Erection & Commissioning Spares List, Operation & Maintenance spares list / Mandatory Spares List etc. 2) The drgs. Shall be kept in plastic pouches and neatly arranged, submitted in an aesthetic, appropriate & durable folder(s). Documents filed appropriately in Folder in – seriatim of MDL.		

Sl. No.	Document Name / Type	To Contain	Required With Offer	Required After P.O
			Compliances from Vendor & No. of Sets Req'd.	No. of Sets Required – Engg., Approval/Review Activities and Customer Submission.
11	O&M Manual Document Folder(s)	1) Submission before schedule eqpt. Dispatch (Draft copy shall be submitted beforehand for review by BHEL) 2) The manual shall be submitted in an aesthetic, appropriate & durable folder(s). Each vol. Shall be marked with its Vol. No. 3) <u>This Manual shall include primarily following information: -</u> i) Operational & safety instructions. ii) Environmental Safety instructions & indicating compliances of the Regulations in-force. iii) Guidelines incorporating requirements for Operation of the Equipment in Hazardous Environment- wherever applicable. iv) Master document List (MDL) doc. v) Bill of material (BOM) doc. vi) Erection Instructions.	Bidder compliance required	Adv. Copy (1 set) - for review by BHEL. Final Copies –(3 sets)

Sl. No.	Document Name / Type	To Contain	Required With Offer	Required After P.O
			Compliances from Vendor & No. of Sets Reqd.	No. of Sets Required – Engg., Approval/Review Activities and Customer Submission.
		vii) Operational & Maintenance Instructions for all Systems / Items with adequate sketches Catalogue information included-(and applicable Model no. marked therein), Overhaul schedules etc. viii) Lubrication Schedule ix) Initial-Fill Items List x) Approved QAP's Shop Tests & Calibration Reports. xi) Approved FQAP – along with related docs, with site testing & commissioning Protocols etc. xii) Sub-Vendor O&M manuals.		
12	“As –Built” Drawings & Documents	Submission within three weeks –after commissioning at site	Bidder compliance required	3
13	Compact Disc (CD)	1) MDL, All drawings, Documents, Data sheets – as Listed in approved MDL Doc. , all applicable Catalogues	Bidder compliance required	3

Sl. No.	Document Name / Type	To Contain	Required With Offer	Required After P.O
			Compliances from Vendor & No. of Sets Reqd.	No. of Sets Required – Engg., Approval/Review Activities and Customer Submission.
		(Scanned), BOM & all items covered in the O&M Manuals & the “As-built” Drgs. 2) To submit along with the submission of “As-built” drgs. & docs.		

Notes:

Obtaining timely approvals from NEERI for the smooth execution of the project shall be the responsibility of the Bidder. Any changes resulting from the review by NEERI has to be borne by the Bidder. No time or cost benefit shall be sought by the Bidder due to the review by NEERI.

VENDOR'S NAME & ADDRESS:			QUALITY PLAN							MQP. NO.:			
			CUSTOMER: BHEL, HYDERABAD PROJECT: Lake Purification & Restoration in Telibhanda lake PRODUCT:Air system & Dosing System			BHEL PO No: PO DATE: BHEL SPEC:REV:				REV NO:		DATE:	
										PAGE 1 OF 2			
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	

1	Dosing Tank 100L (Syntex or equivalent PVC storage tank)	Material properties	Major		100%	Catalogue		IR	√	2		1	
2	PVC Pipes, valves and fittings for air supply system	Chemical & Mechanical properties	Major	Physical	10% samples from lot	Catalogue		IR	√	2		1	
		Make, Type & Rating check	Major	Physical	10% samples from lot	Catalogue		IR	√	2		1	
3	Blower	Performance test for blower	Major	Test certificate review	100%	Catalogue		TC & IR	√	2	-	1	
		Make, Model, Type, & Rating,	Major		10% samples from lot			IR	√	2			
		Routine test for motor	Major	Test certificate review	100%			TC	√	2		1	

Notes:-

1. This MQP should be read along with specification (latest revision as per PO), approved drawings & approved datasheet.
2. Drawing/datasheet shall prevail over quality plan for contradiction if any.
3. Any project/customer specific requirements which shall be notified have to be fulfilled by the vendor at the time of execution of order.
4. **This is an indicative list of tests /checks. The manufacturer is to furnish each equipment wise detailed QAP in BHEL format which is attached separately indicating practice and procedure (meeting IS /IEC /relevant standards) along with relevant supporting documents.**

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR 3. CUSTOMER /CUSTOMER'S CONSULTANT 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.

VENDOR'S NAME & ADDRESS:			QUALITY PLAN							MQP. NO.:			
			CUSTOMER: BHEL, HYDERABAD PROJECT: Lake Purification & Restoration in Telibhanda lake PRODUCT:Auxiliary System			BHEL PO No: PO DATE: BHEL SPEC:REV:				REV NO:		DATE:	
										PAGE 1 OF 1			
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P W V			REMARKS

1	Three phase starter	Make, Model, Type, & Rating check	Major	Test certificate review	100%	Catalogue		IR	√	2		1	
2	Measuring instruments	Make, Model, Type, & Rating check, Test Certificate	Major	Physical	100%	BHEL Spec/ Appd drg /data sheet	BHEL Spec/ Appd drg /data sheet	IR	√	2		1	
3	Cable	Make, Model, Type, & Rating, BOM check, Test Certificate	Major	Physical	100%	Catalogue		IR	√	2		1	
4	Power Distribution Board	Make, Model, Type, & Rating check	Major	Physical	100%	BHEL Spec/ Appd drg /data sheet	BHEL Spec/ Appd drg /data sheet	IR	√	2		1	
		Routine & Acceptance Test as per IS / IEC	Major	Physical	1 sample /each size	As per IS /IEC standards BHEL Spec	As per IS /IEC standards BHEL Spec	IR	√	2		1	

Notes:-

1. This MQP should be read along with specification (latest revision as per PO), approved drawings & approved datasheet.
2. Drawing/datasheet shall prevail over quality plan for contradiction if any.
3. Any project/customer specific requirements which shall be notified have to be fulfilled by the vendor at the time of execution of order.
4. **This is an indicative list of tests /checks. The manufacturer is to furnish each equipment wise detailed QAP in BHEL format which is attached separately indicating practice and procedure (meeting IS /IEC /relevant standards) along with relevant supporting documents.**

Abbreviations:-

MTC – Material Test certificate	AS – Alloy Steel
IBR – Indian Boiler Regulations	SS – Stainless Steel
DFT – Dry Film Thickness	TC – Test Certificate
PMI – Positive Material Identification	IS – Indian Standards
IR – Inspection Record	

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR 3. CUSTOMER /CUSTOMER'S CONSULTANT 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.

VENDOR'S NAME & ADDRESS:			QUALITY PLAN							MQP. NO.:			
			CUSTOMER: BHEL, HYDERABAD PROJECT: Lake Purification & Restoration in Telibhanda lake PRODUCT: Sewage Inlet system			BHEL PO No: PO DATE: BHEL SPEC:REV:				REV NO:		DATE:	
										PAGE 1 OF 2			
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	

1	Screen	Material Properties	Major	Physical	100%	Catalogue		IR	√	2	-	1		
		Dimension check	Major	Physical	100%			IR	√	2				
2	Submersible pump with Motor	Performance test for pumps	Major	Test certificate review	100%			TC & IR	√	2	-	1		
		Make, Model, Type, & Rating,	Major		10% samples from lot			IR	√	2				
		Routine test for motor	Major	Test certificate review	100%			TC	√	2		1		
3	Pipes & Fittings (MS & GI) for Submersible pumps	Chemical & Mechanical properties	Major	Test certificate review	100%	Catalogue		IR	√	2		1		
		Make, Type & Rating, Dimension check	Major	Test certificate review	10% samples from lot	Catalogue		IR	√	2		1		
4	Valves (Gate/Sluice) /NRV(MS)	Chemical & Mechanical properties	Major	Test certificate review	100%	Catalogue		IR	√	2		1		
		Make, Type & Rating, Dimension check	Major	Test certificate review	10% samples from lot	Catalogue		IR	√	2		1		

Notes:-

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR 3. CUSTOMER /CUSTOMER'S CONSULTANT 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.

VENDOR'S NAME & ADDRESS:			QUALITY PLAN							MQP. NO.:			
			CUSTOMER: BHEL, HYDERABAD PROJECT: Lake Purification & Restoration in Telibhanda lake PRODUCT: Sewage Inlet system				BHEL PO No: PO DATE: BHEL SPEC: REV:			REV NO:		DATE:	
										PAGE 2 OF 2			
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P W V			REMARKS

1. This MQP should be read along with specification (latest revision as per PO), approved drawings & approved datasheet.
2. Drawing/datasheet shall prevail over quality plan for contradiction if any.
3. Any project/customer specific requirements which shall be notified have to be fulfilled by the vendor at the time of execution of order.
4. **This is an indicative list of tests /checks. The manufacturer is to furnish each equipment wise detailed QAP in BHEL format which is attached separately indicating practice and procedure (meeting IS /IEC /relevant standards) along with relevant supporting documents.**

Abbreviations:-

MTC – Material Test certificate	AS – Alloy Steel
IBR – Indian Boiler Regulations	SS – Stainless Steel
DFT – Dry Film Thickness	TC – Test Certificate
PMI – Positive Material Identification	IS – Indian Standards
IR – Inspection Record	

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR 3. CUSTOMER /CUSTOMER'S CONSULTANT 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.

MASTER DOCUMENT LIST (DOCUMENTS TO BE SUBMITTED DURING DETAIL ENGG.)					
	LAKE PURIFICATION USING PHYTORID TECHNOLOGY	Cat	Submission status		
S.No.	Drg./ Doc. Name	A/I	Rev.0	Rev.1	----
MECHANICAL					
M.01	DESIGN BASIS	A	1 week from PO		
M.02	EQUIPMENT LAYOUT OF THE PHYTORID SYSTEM	A	1 week from PO		
M.03	GA OF FLOATING RAFTER SYSTEM	A	1 week from PO		
M.04	DATASHEET & GA OF SCREENS	I	2 weeks from PO		
M.05	DATASHEET & GA OF RAW SEWAGE PUMPS	I	2 weeks from PO		
M.06	DATASHEET & GA OF AIR BLOWERS	I	3 weeks from PO		
M.07	DATA SHEET & GA DRAWING OF HYPOCHLORITE DOSING SYSTEM	I	2 weeks from PO		
M.08	DATA SHEET & GA DRAWING OF POLY DOSING SYSTEM	I	2 weeks from PO		
M.09	DATA SHEET OF PIPES	I	2 weeks from PO		
M.10	DATA SHEET OF VALVES	I	2 weeks from PO		
M.11	PIPING LAYOUT OF DIFFUSER SYSTEM	A	1 week from PO		
CIVIL					
C.01	GA OF SCREEN CHAMBER				
C.02	GA OF SEDIMENTATION TANK				
C.03	GA OF PHYTORID TANK				
C.04	GA OF BLOWER ROOM				
ELECTRICAL					
E.01	ELECTRICAL LOAD LIST • Tabulation of all motors (loads in hp) • Tabulation of all 120V vital AC loads (loads in kW) • Tabulation including hp, voltage, and number of phases	I	1 week from PO		
E.02	GAD, TB DWG & PERFORMANCE CURVE FOR RAW SEWAGE PUMP MOTORS	I	2 weeks from PO		
E.03	GAD, TB DWG & PERFORMANCE CURVE FOR AIR BLOWER MOTORS	I	3 weeks from PO		
E.04	GAD, TB DWG & PERFORMANCE CURVE FOR DOSING PUMP MOTORS	I	2 weeks from PO		
E.05	GAD, TB DWG & PERFORMANCE CURVE FOR AGITATOR MOTORS	I	2 weeks from PO		
E.06	DATA SHEET OF POWER CABLES	I	2 weeks from PO		
E.07	GA & WIRING DRAWING OF POWER DISTRIBUTION PANEL	A	3 weeks from PO		
E.08	GA & WIRING DRAWING OF LOCAL PANEL	A	3 weeks from PO		
INSTRUMENTATION					
I.01	DATASHEET FOR LEVEL SWITCH	I	2 weeks from PO		
I.02	DATASHEET FOR FLOW METER	I	2 weeks from PO		
I.03	DATASHEET FOR INSTRUMENT CABLES	I	2 weeks from PO		
QUALITY					
Q.01	QAP (FORMAT AS ATTACHED WITH THE SPECIFICATION)		2 weeks from PO		
MISCELLENOUS					

MIS.01	SUB VENDOR LIST FOR BOUGHT OUT ITEMS	I	1 week from PO		
MIS.02	AS BUILT DRAWINGS	I	20 weeks from PO		
MIS.03	COMMISSIONING SPARES	I	3 weeks from PO		
MIS.04	RECOMMENDED SPARES LIST	I	3 weeks from PO		
MIS.05	LIST OF CONSUMABLES	I	3 weeks from PO		
MIS.06	OPERATIONAL AND MAINTENANCE MANUAL	I	12 weeks from PO		

Note: All subsequent revisions shall be submitted within 5 working days by Vendor and comments shall be provided by BHEL within 5 working days.

		DATA SHEET for INSTRUMENTATION CABLES	PY-AS-4-M107-8436-01-INST-DS-03 REV. 00
GENERAL	1	Type of Cables & Quantity	: 1Pair x 0.5MM2 & Bidder to calculate Quantity.
	2	Voltage Grade	: 600 / 1100 V
	3	Screening type	: Overall Screening
	4	Conductor material	: Annealed Stranded Tinned Copper as per IS 8130
	5	No of Strands / Dia of Strands	: 7 / 0.3mm (Min)
	6	Insulation material / Thickness	: Extruded HR PVC type C as per IS 5831 / 0.8
	7	Pair Identification	: Blue & Black
	8	No of Twists	: Min..13
CONSTRUCTION DETAILS	9	Material	: Aluminium Mylar Tape
	10	Nominal Thickness	: 0.075 mm
	11	Drain Wire size & Material	: 0.5 MM2 & Annealed Tinned multi stranded copper
	12	Drain wire (No of strands x dia)	: 7 x 0.3 mm
	13	Drain wire Overlapping x Coverage	: 25% x 100%
	14	Rip Cord	: Required
	15	Inner sheath material	: Extruded FR PVC Type ST-2 as per IS:5831
	16	Inner sheath thickness	: 0.3 mm
	17	Inner sheath colour	: Black
	18	Dia Over Inner Sheath tolerance	: $\pm 2\%$
	19	Outer sheath material	: Extruded FR PVC Type ST-2 as per IS:5831
	20	Outer sheath thickness	: 1.24
	21	Outer sheath colour	: Black
	22	Dia Over Outer Sheath tolerance	: $\pm 2\%$
ELECTRICAL PARAMETERS	23	High Voltage test (Between conductors)	: 1KV - AC / 1 Minute
	24	High Voltage test (Between core & conductors)	: 1KV - AC / 1 Minute
	25	Resistance test @ 20 Deg C for conductor	: 12.5 Max Ω /Km
	26	Resistance test @ 20 Deg C for drain wire	: 30 Max Ω /Km
	27	Mutual Capacitance core to core @ 1 kHz	: 250 pF/Mtr (max)
	28	Capacitance Pair to Screen	: 400 pF/Mtr (max)
	29	L/R Ratio	: 40 μ H/ Ω (max)
	30	Insulation resistance	: 100 M Ω / Kms (min)
	31	Embossing on Cables	: Instrument cables, Vendor name, Cable Size, Seq length
Test & Certificates	32	Type test as per IS 1554, Part-1	: Certificate Review
	33	Insulation resistance test, conductor resistance test, Capacitance test, High Voltage test, Drain wire resistance test, Continuity test etc.,	: Certificate Review
	34	Visual & Dimension Check	: 100% Witness
Notes:		1) Bidder shall procure signal cable from M/s.Guptha Power Infrastructure Ltd., M/s.Pagoda Cables, M/s. Udey Pyrocables Pvt Ltd., M/s.Leoni Cable solutions, M/s. Associated Cables Pvt., Ltd., M/s.Apar industries Ltd., M/s. Advance Cable Tecch Pvt Ltd., M/s. Lapp India Pvt Ltd., M/s. Elkey Telcelinks Ltd., M/s. Suyog Electricals Ltd., M/s. Polycab Wires Pvt Ltd., M/s. TC Communication Pvt Ltd., M/s.Special Cables Pvt Ltd., M/s.Paramount Communication Ltd., M/s.Delton Cables Ltd., M/s. KEI Industries Ltd., M/s. CMI Ltd., M/s.Cords Cables Ltd., M/s. Middle East Specialised cables Co., M/s. KEC International Ltd., and M/s.Thermo Cables Ltd.,	

 HYDERABAD		DATA SHEET for MAGNETIC FLOW METER		PY-AS-4-M 107-8436-01-INST-DS-01 REV. 00	
GENERAL	1	Tag No	:	Magnetic Flow Meter -01	
	2	Service/ Application	:	Sewage/ Waste water	
	3	Line size & Material	:	Bidder to design & Indicate	
	4	Process temp.(Min./Normal/ Max.)	:	Bidder to design & Indicate	
	5	Process pressure(Min./Normal/ Max.)	:	Bidder to design & Indicate	
	6	Process Flow(Min./Normal/ Max.)	:	Bidder to design & Indicate	
SENSOR & TRANSMITTER	7	Flow meter supply / installation	:	Meter vendor/Remote mount in field (or) on sensor.	
	8	Instrument counter flange	:	By vendor	
	9	Principle	:	Electromagnetic	
	10	Meter Size	:	Same as Pipe Size	
	11	Calibration Range	:	Bidder to design for min to max range.	
	12	Electrode & Grounding ring	:	SS316	
	13	Accuracy	:	0.5 % of span.	
	14	Process connection	:	Flanged ,CS,300# RF min	
	15	Mounting Orientation	:	Horizontal, along with pipe.	
	16	Enclosure protection	:	IP 65(min.)	
	17	Electrical Connection	:	1/2" NPT (F) with suitable glands	
	18	Transmitter output	:	4-20mA	
	19	Transmitter Housing	:	Die-cast Aluminum	
	20	Power supply to Transmitter	:	230VAC [Sensor will powered from transmitter].	
	21	Transmitter Mounting	:	Either on sensor (or) Remote on 2" pipe	
	22	Interconnecting Cable	:	Min. 20meters [between sensor & transmitter]	
	23	Local Display	:	To be Provided on transmitter	
	ACCESSORIES & ES	24	Flow totalisation	:	Required-in Built
25		Parameter Setting	:	To be Provided with Front keypad	
26		Cable glands	:	SS Double Compression type part of vendor	
Test & Certificates	27	Dummy plugs	:	one number of SS304	
	28	mounting kit	:	Mounting bracket with nut, bolts etc.,	
	29	Calibration Certificate	:	100% Review	
	30	Material Test certificate	:	100% Review	
	31	Hydro test certificate	:	100% Review	
Notes:	32	Ingress protection certificate	:	100% Review	
	33	Visual,Dimension Inspection	:	100% Witness	
Notes:		1) Bidder shall procure Magnetic Flow meter from M/s.Emerson, M/s.Yokogawa, M/s.Endress+Hauser, M/s.ForbesMarshall. Final data sheet shall be shared to BHEL for review/approval before manufacturing.			

		DATA SHEET for LIQUID LEVEL SWITCH		PY-AS-4-M 107-8436-01-INST-DS-02 REV. 00	
GENERAL	1	Range & Qty.	:	Bidder to design & 2 No's	
	2	Type	:	Float Type	
	3	Function	:	Low Level and Low level detection	
	4	Mounting	:	Top Mounted	
	5	Service	:	Raw Sewage sump	
	6		:		
	7		:		
SWITCH DETAILS	8	Opearting Press / Temp	:	Atm. / 40 °C	
	9	Process Connection	:	Top mounted Flanged, 300#	
	10	Electrical Connection	:	2 Nos of 1/2" NPT (F)	
	11	Protection	:	IP 65	
	12	Float Material	:	SS316	
	13	Casing/Housing	:	Die cast Al	
	14	Switch type	:	Micro switch (SPDT)	
	15	No. of contact	:	2 NO + 2 NC.	
	16	Contact rating	:	5A,240VAC	
	17	Power Supply from	:	Local Box for tripping Pumps in sump on Low	
	18		:		
ACCESSORIES	19	Counter Flange, Gasket	:	Required,to be provided by vendor	
	20	Cable Glands	:	SS Double Compression type.	
	21	Cable entry Plugs	:	Reqd, SS 304	
	22	Tag Plate	:	Reqd, SS 304	
	23	Bolts + Nuts	:	Reqd. A193GrB7 + A194Gr2H	
	24	Mounting on tank	:	Reqd. to mount on top of tank.	
	25		:		
Test & Certificates	26	Material compliance	:	100% Review	
	27	Functional Test	:	100% Review	
	28	Ingress Prot. Test	:	100% Review	
	29	Visual & Dimension Check	:	100% Witness	
Notes:		1) Bidder shall procure Level Switch from M/s.DK Instruments, M/s.Levecon, M/s.Gauge bourdon, M/s. Pune Techtrols, M/s. Chemtrols, M/s.Scientific devices, M/s.V Automat, M/s.IGEMA GmbH & M/s. Magnetrols Inc.			