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Technical specification for Design and supply of floaters and associated Anchoring and Mooring for various Floating Solar PV Projects across India.

Revision details :R 00	Prepared NY	Approved PM	Date 15.03.2022
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1.0 Introduction:

This document describes the technical specification for the design and supply of HDPE floaters for forming the PV Module Island and for laying the DC and HT cables and associated Anchoring and Mooring systems for various floating solar projects across India

2.0 The scope of Bidder shall be as follows (In brief):


1. The design and supply of complete PV Module Floatation platform along with complete floater accessories.
2. Assembly of Floaters and PV Modules and cable connection in between PV Modules.
3. The design and supply of HDPE Floaters for laying DC and HT Cables.
4. Design and supply of Mooring and Anchoring of Sl.no 1&3.
5. I&C of Mooring and Anchoring.
6. AMC of floatation platform on yearly basis.

BHEL shall define the no of PV Modules * to be mounted and the complete BOQ of floaters to form the array utilizing these PV Modules shall be in the scope of the bidder. This shall include the complete structure material for mounting the PV Modules too. Other than mounting the PV Modules , floaters to be supplied for the following:


*After signing the TC-MOU BHEL will inform the no of PV Modules and the specific technical specifications for the respective project and bidder shall submit the price as per the no of PV Modules and specifications as indicated.

1. Floaters for routing the DC Cables in the PV Module Array.
2. Floaters for mounting the SCBs/ SMBs, LA.
3. Floaters for taking DC Cables from PV Module platform to Equipment barge.
4. Floaters for laying HT Cables.
5. Walkway floaters for connecting the floating islands to land.

Details of Equipment , cables, LA along with their weights is tabulated in the table below:

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DC Power and HT cable details for floating SPV plant						
SL No	Description	Overall diameter (Max in mm)	Weight (Kg/m)	Bending radius 12D for LT and 20D for HT (Min in mm)	Route	Remarks
1	3.3kV, 1CX400 sq.mm XLPE Unarmoured AL cable	35	1.5	420	SCB to PCU	Better to use unarmoured cables with water sweallable tape for floating SPV plants
2	3.3kV, 1CX400 sq.mm XLPE armoured AL cable	37	1.9	444	SCB to PCU	Use only if customer insists for armoured cable. Add water sweallable tape.
3	33KV, 1CX150 sq.mm XLPE armoured Al cable	46	1.8	920	IFP to LPSFP	2.5MW block to LPSFP. For trefoil formation 3 times the weight shall be considered
4	33KV, 1CX240 sq.mm XLPE armoured Al cable	51	2.3	1020	IFP to LPSFP	5MW block to LPSFP. For trefoil formation 3 times the weight shall be considered
5	33KV, 1CX630 sq.mm XLPE armoured Al cable	64	4	1280	LPSFP to ground	25MW power evacuation. For trefoil formation 3 times the weight shall be considered

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Notes:

- 1) Block shape may vary based on location of PCUs (on water /on land).
- 2) In case the PCUs are placed on water, the array shall have 120 or 116 modules (landscape) in a row (ie., 2 vertical walkways onwhich SCB/SMBs are placed). If we are using 540Wp modules, the maximum number of modules in string shall be restricted to 29 Nos. Hence in a row 116 modules.
- 3) No. of SCBs shall be even number for an array. In case we are using 540Wp modules, then the number of SCBs shall be 6. In case of lesser wattage module, maximum number of SCBs shall be 8 , which are placed 4 nos. each in 2 vertical walkways.
- 4) Until and unless specified in tender we shall avoid the usage of cable trays in array.
- 5) If we are placing ESE LAs on middle of array on vertical walkways, then we need 2 Nos per 2.5MWac block.
- 6) Floater shall have additional clamping points for clamping HDPE pipes/FRP trays/ earthing strips etc other than four corners of the floater. Possibility of a clamping hole on module support member shall be explored for routing of 6 sq.mm cable below module using cable ties.
- 7) Weight of each SCB = 50Kg
- 8) Weight of 5 meter tall ESE LA assembly = 40Kg


The bidder to populate the Array layout with no of PV-Modules as indicated by BHEL as per his design taking into consideration the laying of cables and all equipments in the designated reservoir surface area. Also this Array population to cast minimum shadow (Shadow loss of the PV-Array limited to maximum 1%). This Array layout has to be submitted to BHEL along with the technical documents for verification. The Array layout to include mandatory clearances for Inverter Rooms and other utilities.

For this TC-MOU the bidder to submit his standard layout of 7MW-DC with all above considerations. PV Module to be considered is 540Wp PV Module. **PV Module data sheet is attached for ready reference.**

Warranty for Floating system: Each Floater unit used in the plant must be warranted against crack, puncture, breakage etc for which bidder shall assure for integrity of the whole system for 25 years from date of successful completion of trial run. The thermoplastic fasteners, if used also has to be warranted against its sequential failure.

Vendor has to provide 10 years warranty for his Supply BOQ and I&C of Anchoring /Mooring.

In addition to above Vendor has to provide the complete installation manual for the I&C of their floatation system and the O&M requirements of this

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floatation system. Any Cost related to O&M of the plant to be included in the price bid.

3.0 Pre-Qualification

Criteria :

The bidder must have essentially executed atleast one FSPV Plant of minimum capacity of 1MW. The bidder for above execution should have designed and supplied the floater BOQ and the anchoring and mooring system too.

The above plant to be in successful operation for minimum six months from the date of this tender opening.

Completion certificates from Customer to be submitted for validation of the above experience.

BHEL representative shall essentially visit the plant cited in the experience certificate. All expenses towards this visit of BHEL personnel to be borne by the bidder.

4.0 Pre Bid Meeting/Clarifications:

All technical clarifications w.r.t technical MOU to be mailed to the following email id.

punammishra@bhel.in


Alternatively vendor can request for a pre bid meeting or Video conferencing with BHEL.

5.0 Site Visit:

After signing the TC-MOU, for any upcoming tenders which BHEL is quoting, vendor shall plan a site visit along with BHEL.


6.0 Mandatory Documents to be submitted for the technical MOU by the bidder:

1. Details and drawings of the HDPE floaters being offered to BHEL.
2. Sample block layout of 7MW-DC.
3. Test results of the various test connected on the floaters, **bidder may indicate any patents filed for his floaters.**
4. Indicative MQP and FQP of the HDPE Floaters.
5. Details of the parent technology provider for HDPE Floaters.
6. Source of raw material suppliers.
7. Details of base polymer grades used for HDPE Floaters.
8. Details of Manufacturing plant capacity.
9. Details of the moulds for respective floaters available with the bidder.

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7.0 Vendor scope in detail:

#	Item description	Qty	Remarks	Delivery Time
1	Design of Complete Floatation System along with Anchoring and Mooring details. This design has to be approved by BHEL and End Customer. This design to include the DC Cable and HT Cable layout along with associated anchoring and mooring works.	1 Set	As per specification.	The preliminary design has to be submitted within 10 days of PO Placement. The final design to be completed within 30 days of PO Placement.
2.	Completion of Anchoring and Mooring works.			
3.	Assembly of PV Modules with Floaters and cable connection between PV Modules.			
4.	Towing the assembled blocks to designated location in the water body and connecting to the Mooring ropes.			
5	MQP and QAP of the Floats to be submitted to BHEL/End customer for Approval.			
6	Vendor shall have to execute demo I&C of minimum (1 set) of floaters with PV modules. The quantity of set shall be defined based on the project size. This I&C shall be carried out such that BHEL personnel shall be duly trained.	1 Set		
7	Array layout, shadow analysis of the Floating platform along with PV Modules populated. Vendor to indicate the shadow loss due to his proposed Array layout.	1 Set	As per specification.	Within 10 days of PO Placement.
8	Supply of the Entire BOQ as per approved design in Sl.No -1.	1 Set		

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9	Supply of Floats to Mount LAs.	1 Set		
10	Floats to mount String Combiner box or String monitoring box.	1 Set.		
11	Floats to take DC Cables from Array to the equipment platform.			
12	Floats to take the HT Cables from Equipment barge to the local pooling and from the local pooling to the land.			
13	Floats for walkways from Array to land.			
14	I & C of Mooring and Anchoring system as approved in Sl. No -1.	1 Set		
15	O&M Manual for the floatation system.			
16	Spares	As per the BHEL tender qty.		
17	AMC	Yearly		


Any other scope which is not a part of the above list, but is required for the successful operation of the Floating Platform to be specified by the vendor.

6.0 Documents which shall be provided by BHEL to bidder at time of tender:

1. PV-Module Drawing.
2. Drawing /Photographs of the Reservoir.
3. Indicative Bathymetry report.
4. Indicative Geo technical Investigation report of the reservoir bottom.
5. Technical inputs conditions for the project site.

****As the vendor has to design the complete floatation platform, hence apart from the information already furnished by BHEL, the vendor has to provide the checklist of the documents required from BHEL to design the floating platform along with anchoring and mooring. This list to be a part of Technical document.**

7.0 BHEL Scope shall include :

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- a.) Supply of PV-Modules.
- b.) Unloading of Floating pontoons/Floater at Site in Stores Area.
- c.) Storage and Security of items –supplied by Floatation vendor.
- d.) Bathymetry survey of the reservoir
- e.) Soil investigation of the Reservoir bottom.

BHEL shall not entertain any claims regarding the correctness of Sl.no (d) and (e). It is suggested to bidder to conduct his own bathymetry and Geo technical investigation.

Mandatory Technical Conditions:


GENERAL

The Floating system comprises of the Floating unit, Module support structure (if applicable) and anchoring/ mooring mechanism for the Floating Solar PV system (FSPV).

2.0 CODES AND STANDARDS

The floatation system must conform to the latest edition of any of the following IEC/ equivalent standards for floating system design qualification and type approval. The reports verified by third party NABL national or international accredited agency shall be submitted for approval to BHEL.

CODES	Description
ASTM D1693 (or equivalent ISO Standards)	Test for Environmental Stress Cracking of HDPE
ASTM D790, ISO 178	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics & Electrical Insulating Materials
ASTM D638, ISO 527	Standard Test Method for Tensile Properties of Plastics
ISO16770	Full Notch Creep Test (FNCT).
ASTM D2565, ISO 4892-2	Standard Practice for Xenon-Arc Exposure of Plastic intended for outdoor Applications
ASTM D4329,ISO 4892-3	Standard Practice for fluorescent ultraviolet (UV) lamp apparatus exposure of plastics
ASTM D1693-15 (or equivalent ISO Standards)	Standard Test Method for Environmental stress cracking of Ethylene plastics
RoHS directive 2002/ 95/EC	Test for Restriction of Hazardous Substances


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FLOATING UNIT

The floatation units of module shall be modular and easily connected to each other. Once completely connected, the floating platform must be able to support the weight of PV module, module support structure, cables, support railing (if applicable) etc. The floater system shall also be able to support the load of O&M personnel, electrical equipments as mentioned earlier in this document, MWS etc. Details of all above equipment shall be provided by BHEL in annexures.

TECHNICAL REQUIREMENTS OF FLOATING UNIT

- a. The floating units shall be standardized and designed for simple onsite installation.
- b. The floating units shall be prefabricated and modular in design with appropriate buoyancy to support the weight of at least one solar panel/equipment and one person (with minimum weight of 80 kg) per unit.
- c. The floating unit design shall facilitate ease of assembly /disassembling, replacement of any module and enable future expansion or scaling.
- d. The floatation unit should be manufactured from appropriate thermoplastic (virgin material) with UV stabilizer such that the life of floatation device shall be able to sustain for a period of 25 years.
- e. The material used in manufacturing shall withstand Environmental Stress Crack Resistance (ESCR) and have a combination of hardness and impact strength (ASTM D5397, ASTM D1693).
- f. The material used for floatation device shall be chemically resistant to acid, lye, petrol and mineral oil and also partially resistant to benzene and non-detrimental to marine life.
- g. In order to increase longevity and prevent unexpected loss of buoyancy, the floating unit shall have an average material thickness of 3 mm, with moisture retention of less than 5%. (Detailed buoyancy calculation to be submitted along with drawings at the time of drawing approval).
- h. The floating unit material shall be designed to balance the thermal expansion so that PV Panel are not stretched due to effect of thermal expansion.
- i. The complete floating system shall have at least 400 mm floating corridor along the periphery comprising of module floaters and/ or walkway floater to prevent water splash.
- j. The design of the floating system shall incorporate appropriately sized walking platforms for regular maintenance and inspection. The walking platform shall be continuous with minimum width of 400 mm, excluding cable-laying arrangement.
- k. The walkway platform shall be placed in such a way that each module in the array layout can be easily accessed through the continuous walking platform without any additional infrastructure.
- l. Bidder to take into consideration load of all electrical equipment and accessories during the design of floatation platform. Details of Electrical equipment and accessories are as provided by BHEL in annexures.

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- m. Floating system should be designed to withstand the maximum wind speed of the location.
- n. The floating units once assembled together should form an integrated structure. The relative alignment of the floating unit subsequent to complete installation shall not misalign the solar panels.
- o. The floating units shall be re-process able and recyclable at the end of its useful life.
- p. The design life of the floating units should be 25 years.
- q. Vendor to indicate the Mandatory spares as required for his designed plant life.
- r. The screw and nuts used for floater connection to have a sound locking arrangement to take care of the wave motion. The locking arrangement to prevent any loosening of screw and nuts. This shall further prevent any loosening in the floater assembly.

Desirable conditions for Floaters:

1. The Caps of the floaters after interconnecting in assembly should be easily accessible for opening and removing of water in the event of breakage of cap due to thermal expansion or thread give away. There shall be no need to take out the floater from the assembly to remove water and replace the cap due to non accessibility.
2. The PV modules shall be mounted in such a way that the clamping fixtures are easily accessible from top side in the assembled condition. There shall be no need to access from below the water for any removal/repair.
3. The Major screws of all HDPE bolts shall incorporate effective and durable additional fastener to prevent loosening over a period of time. This shall be way of Lock nuts, Split pins (only with solid Bolts)
4. Floats shall incorporate solid dummy ears at mid points on either side with thickness equal to regular connecting ears so as to enable drilling through them to fix Metallic strip, clamps or hardware for cable and tray supports, SCBs and for Water washing pipes.
5. Wherever Multi tier floater arrangement is called for to support Cables or increase/decrease heights of mounted items, OEM shall design and provide Extra length solid HDPE/LDPE bolts with nuts and lock nuts for assembling 2 or three stacks of floaters.
6. Fire resistance/fire retardance : HDPE Floater material / master batch to have constituent to resist burning due to electrical fire or sparks.
7. To provide floats in White colour to reduce inherent field temperature.
8. All batches of floats to clearly carry Mould stamping showing Batch no. Month, Week of year

MODULE SUPPORT STRUCTURE (IF APPLICABLE)

- a. The module support structure (MSS) shall be so as to allow easy replacement of any module by authorized personnel.

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The MSS and associated hardware / fasteners, if used are metallic in nature, shall be non-corrosive and suitable for site weather and marine conditions. The structures shall be either be made of anodised aluminium or the MMS shall be hot dip galvanized with average coating thickness to be minimum 80 micron and local coating thickness shall be minimum 70 microns for protection against corrosion.

For steel sections with thickness above 5mm the minimum galvanization thickness to confirm to IS-4759. Galvanization shall be measured with elcometer and Vendor shall submit the report. Material can be sent for testing to NABL accredited laboratory as and when required at cost of vendor. Test to determine corrosion performance of MMS as per the applicable IS/ASTM, as and when required.

- b. All fasteners, nuts, bolts and other hardware shall be of Stainless steel – 304 or higher grade to suit the site conditions and to ensure a life of 25 years.
- c. MSS shall be designed to withstand the extreme weather conditions in the area.
- d. The modules shall be mounted at fixed tilt .
- e. PV fixation system shall be of proven design and subjected to Mechanical test to withstand unit failure conditions under static and fatigue conditions for base wind speed. The results conforming to above test shall be submitted to BHEL on request.
- f. The design philosophy and the calculations for the MSS with suitable test reports shall be submitted for BHEL's approval.

Anchoring and mooring system

- a. The design life of the Anchoring and Mooring system shall be 25 years.
- b. Placement of plant: The floating solar PV (FSPV) power plant should be at a minimum safe distance from the edge of the land surface. In case edge of land surface has a sloped edge then this distance of array from land edge to be calculated w.r.t to the position of floating island at minimum water level condition. However, the exact positioning can be finalized at the time of detailed engineering, after conducting bathymetric study.
- c. Prevailing wind load: The floating system comprising of floating unit, PV fixation system and associated anchoring system shall be designed as per base wind speed and able to withstand dynamic conditions as per IS 875-3.
- d. The design of the mooring system shall permit minimal lateral movement of the plant in case of maximum wind loads (as per IS 875-3). The lateral excursion of the floating platform not to exceed 4mts even at minimum water level. In case the excursion of the bidders platform is more than this limit , the same to be informed to BHEL during bid submission. Anchoring design report for the project showing that the system could support the maximum wind load on site shall be submitted to BHEL.

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- e. Water variability: The mooring system should accommodate any fluctuations in water level. Further, the orientation of the plant needs to be maintained; hence, any fluctuations in water level shall allow minimal movement of the FSPV plant as per mooring system design.
 - f. The materials used in the anchoring and mooring system shall not contaminate the water and affect the aquatic ecosystem.
 - g. The materials used in the anchoring and mooring system shall have a design life of 25 years...
 - h. Dedicated floating approach walk way to be provided from the end of the reservoir/ land surface to the plant, for each block in the floating system. The block size of the floating system depends on the array layout optimization. The same shall be finalized during detailed engineering.
 - i. The design of complete system, including CFD modelling, comprising of Floating unit, MSS and anchoring system, shall be verified by suitable third party NABL accredited agency/ reputed institutions like IITs and submitted for BHEL approval.
- Detailed structural and stability calculations shall be submitted for BHEL approval.

Anchoring System:

Anchoring of the floating Island can be through Dead weight Anchors /Screw Piles/ Anchor Plates.

For dead weight anchors the following specification to be followed.

Reinforced Concrete Structure and dead weight blocks:

All RCC works shall be design mix as per IS: 456-2000.

For structural concrete items, Ordinary Portland cement (43 Grade) conforming to IS: 8112 and Fly ash based Portland pozzolana cement conforming to IS:1489 (Part-1) shall be used for anchoring blocks.

Type of **cement** for anchoring block shall be decided based on the final water test report.

Coarse aggregate for concrete shall be crushed stones chemically inert, hard, strong, durable against weathering of limited porosity and free from deleterious materials. It shall be properly graded. It shall meet the requirements of IS: 383.

Sand shall be hard, durable, clean and free from adherent coatings of organic matter and clay balls or pellets. Sand, when used as fine aggregate in concrete shall conform to IS: 383.


Reinforcement steel shall be of high strength deformed TMT steel bars with corrosion inhibitors, Corrosion Resistant Steel (CRS) re-bars, Fusion Bonded Epoxy Coated (FBEC) re-bars or Zinc Coated re-bars of grade minimum Fe-500 and shall conform to IS: 1786. Ductile detailing in accordance with IS: 13920 shall be adopted.

The bidder shall carry out the design mix of M-25 concrete on priority. The design mix shall be approved from BHEL before start of work.

* The use of nominal mix for M-20 grade may be accepted only in exceptional cases subject to approval of BHEL Engineer-In-Charge.

The same shall be adopted subject to approval from BHEL for specific work.

In case water test requires any special kind of cement or higher grade of concrete, the same shall be provided without any financial implication.

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The anchoring block system shall be made which transfer loads safely to the bed of the water body by providing hooks and inserts as required depending on soil conditions, geographical condition, regional water waves, bearing capacity, slope stability etc.

IS: 2502 Code of Practice for Bending and Fixing of Bars for concrete Reinforcement must be complied for reinforcements.

IS: 5525 and SP: 34 shall be followed for reinforcement detailing.

QUALITY ASSURANCE AND INSPECTION FOR CIVIL WORKS

INTRODUCTION


This part of the specification covers the sampling, testing and quality assurance requirement (including construction tolerances and acceptance criteria) for all civil and structural works covered in this specification. This part of the technical specification shall be read in conjunction with other parts of the technical specifications, general technical requirements & erection conditions of the contract which covers common QA requirements. Wherever IS code or standards have been referred they shall be the latest revisions. The rate for respective items of work or price shall include the cost for all works, activities, equipment, instrument, personnel, material etc. whatsoever associated to comply with sampling, testing and quality assurance requirement including construction tolerances and acceptance criteria and as specified in subsequent clauses of this part of the technical specifications. The QA and QC activities in all respects as specified in the technical specifications/ drawings / data sheets / quality plans / contract documents shall be carried out at no extra cost to BHEL. The contractor shall prepare detailed construction and erection methodology scheme which shall be compatible to the requirements of the desired progress of work execution, quality measures, prior approvals if any and the same shall be got approved by the Engineer. If required, work methodology may be revised/ reviewed at every stage of execution of work at site, to suit the site conditions by the contractor at no extra cost to BHEL

1. QA AND QC MANPOWER

The contractor shall nominate one overall QA coordinator for the contract detailing the name, designation, contact details and address at the time of post bid discussions. All correspondence related to Quality Assurance shall be addressed by the contractor's QA coordinator to BHEL. BHEL shall address all correspondence related to Quality issues to the contractor's QA coordinator. The

contractor's QA coordinator shall be responsible for co-ordination of Quality activities between various divisions of the contractor and their sub-vendors on one hand & with BHEL on the other hand. The contractor shall appoint a dedicated, experienced and competent QA&QC in-charge at site, preferably directly reporting to the Project Manager, supported as necessary by experienced personnel, to ensure the effective implementation of the approved QAP. The contractor shall finalize and submit a deployment schedule of QA&QC personnel along with their details to BHEL for approval/ acceptance and further shall ensure their availability well before the start of the concern activity.

2. LABORATORY AND FIELD TESTING


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The field laboratory for QA and QC activities shall be constructed and set-up by the contractor in line with the indicative field QA&QC laboratory set-up enclosed at Annexure-I. The Laboratory building shall be constructed and installed with the adequate facilities to meet the requirement of envisaged test setup. Temperature and humidity controls shall be available wherever necessary during testing of samples. The quality plan shall identify the testing equipment/ instrument, which the contractor shall deploy and equip the field quality laboratory for meeting the field quality plan requirements. The contractor shall furnish a comprehensive list of testing equipment/ instrument required to meet the planned/scheduled tests for the execution of works for BHEL acceptance/ approval. The contractor shall mobilize the requisite laboratory equipment and QA&QC manpower at least 15 days prior to the planned test activity as per the schedule of tests. All equipment and instruments in the field shall be calibrated before the commencement of tests and then at regular intervals, as per the manufacturer's recommendation and as directed by the BHEL. The calibration certificates shall specify the fitness of the equipment and instruments within the limit of tolerance for use. Contractor shall arrange for calibration of equipment and instruments by an NABL / NPL accredited agency and the calibration report shall be submitted to BHEL. The tests which cannot be carried out in the field laboratory shall be done at a laboratory of repute. This includes selected IITs, NCB, CSMRS, reputed government / autonomous laboratories / organizations, NITs and other reputed testing laboratories. The test samples for such test shall be jointly selected and sealed by the engineer and thereafter these shall be sent to the concerned laboratory through the covering letter signed by BHEL engineer. The test report along with the recommendations shall be obtained from the laboratories without delay and submitted to BHEL. Based on the schedule of work agreed with the engineer-in-charge and the approved FQP, the contractor shall prepare a schedule of tests and submit them to the engineer-in-charge and organize to carry out the tests as scheduled / agreed.

3. SAMPLING AND TESTING OF CONSTRUCTION MATERIALS

The method of sampling for testing of construction materials and work / job samples shall be as per the relevant IS / standards / codes and in line with the requirements of the technical specifications / quality plans. All samples shall be jointly drawn, signed and sealed wherever required, by the contractor and the engineer or his authorized representative. The contractor shall carry out testing in accordance with the relevant IS / standards / codes and in line with the requirements of the technical specifications / quality plans. Where no specific testing procedure is mentioned, the tests shall be carried out as per the best prevalent engineering practices and to the directions of the Engineer. All testing shall be done in the presence of the engineer or his authorized representative in a NABL accredited / Govt. Laboratory acceptable to BHEL. This includes all IITs, NCB, CSMRS, reputed government / autonomous laboratories / organizations, NITs and other reputed testing laboratories. The test samples for such test shall be jointly selected and sealed by the engineer and thereafter these shall be sent to the concerned laboratory through the covering letter signed by BHEL engineer. The test report along with the recommendations shall be obtained from the laboratories without delay and submitted to BHEL

PURCHASE AND SERVICE

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All Structural steel and Reinforcement steel supply is in the scope of the contractor shall be procured from Main Steel Producers enlisted by BHEL from time to time. Currently, Main Steel Producers enlisted by BHEL are SAIL, JSW Steel Ltd, Jindal Steel & Power, Tata steel Ltd. (for Reinforcement steel/TMT bars), RINL (for long products/Rolled sections and Reinforcement steel/TMT bars), Essar Steel India Ltd. (for Flat products/ Steel Plates), Electrosteel steel Ltd. (for Reinforcement steel/TMT bars) and Monnet Ispat and Energy Ltd. (for long products/Rolled sections and Reinforcement steel/TMT bars). Subsequently, if any new Main Steel Producer/s are enlisted, they may also be considered for procurement during execution of the contract if proposed by the Contractor.

FIELD QUALITY PLAN

Well before the start of the work, the contractor shall prepare and submit the Field Quality Plans (FQP) on the format given by BHEL, and obtain approval of BHEL, which shall detail out for all the works, equipment, services, quality practices and procedures etc. in line with the requirement of the technical specifications to be followed by the contractor at site. This FQP shall cover for all the items / activities covered in the contract / schedule of items required, right from material procurement to completion of the work at site. An Indicative Field Quality Plan for civil works is enclosed at Annexure (Indicative FQP for civil and structural steel works).

GENERAL QA REQUIREMENTS


The contractor shall ensure that the works, BOIs and services under the scope of contract whether manufactured or performed within contractor's works or at his sub-contractor's premises or at the BHEL's site or at any other place of work are in accordance with the BHEL technical specification, applicable standards / codes, approved drawings / data sheets / quality plans and BOQ. All the works, BOIs and services shall be carried out as per the best prevalent engineering practices and to the directions of the Engineer.

Lists of Items requiring Quality Plan and Sub-Supplier Approval has been attached at Annexure

ANNEXURE OF CHAPTER F2 TYPICAL QA/QC LAB EQUIPMENT

S.No Equipment Approximate Nos.

1. Cube Moulds for cement testing 12
2. Sieve shaker 1
3. Sieves for sand, coarse & fine aggregate 1 set for each
4. Sieves for coarse aggregate 1 set
5. Slump testing equipment 6 sets
6. Oven 2
7. Physical balance 1
8. Thermometer 4
9. Burret 2
10. Measuring cylinders 9
11. Measuring flasks 3

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12. Compression testing machine 1 set
13. Cube moulds for Concrete 18
14. Mechanical weighing machine 1 (100 kg capacity)
15. Drum Type Concrete Mixer (for trial mixes) 1

Note:

1. The equipment listed above are indicative and required to be mobilized as minimum requirement. Additional equipment if any, required for successful completion of work shall be provided /arranged by the contractor.
2. All test reports/ inspection reports have to be computerized and maintained on LAN with an access to the owner
3. Based on the schedule (L2/L3 Network), Quality control & Quality Assurance work plan shall be finalized by the contractor and the same shall be submitted to the engineer-in-charge for acceptance/approval. The Finalized work plan shall be maintained on the computer to be accessed by the owner for database and day to day monitoring.

8.0 Test reports:

Vendor to submit the MQP and FQP of the Floatation platform and mooring and anchoring system. The MQP and FQP to essentially take care of all the criteria as listed in the technical requirements of this tender document.

9.0 Marking and Packing instructions:

Vendor to provide marking and packing instructions of the Approved BOQ.

10.0 Delivery Schedule:

As per specified in the RFQ document.

11. AMC :

Vendor has to furnish AMC on yearly basis from the date of successful installation of the floating platform. This AMC to include the following:

1. Attending to and resolving any breakdown/fault of the floatation platform.
2. Mandatory 1 visit every quarter (once in three months) for the first 3 years to assess the floating platform for any failure or any sign which may lead to subsequent failure. Vendor to send the assessment report to BHEL through email.
3. 1 visit annually from fourth year till the end of tenth year.

Vendor to clearly indicate the O&M requirements of floating solar platform.

In case of O&M requirements the vendor to provide the O&M manual to BHEL.