

	Purchase Specification	Doc. No:-	REG1920-20190253
		Part 03/05	PS
Rudrapur	GROUP : Renewable Energy Group (REG)	Rev no	00

Section 01

Technical Specifications

Name of Work

Construction M.S. Platform for Rotational moulded polyethylene water storage tank of 3 mtr. Height (3000 ltr. capacity), Supply, Installation, Testing & Commissioning (SITC) of Solar base Pumping Machinery with PV Panels, mounting , Dual Pump Hand Pump(Modified), connection 5 Nos. Stand Post, Laying Raising Main Pipe, etc. complete including M&R/ Comprehensive Maintenance Contract (CMC) for 5 Years.

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Technical Specifications

1. Definition

Solar Hand Pumping System includes complete turnkey solution for supply, installation, commissioning and comprehensive maintenance contract (CMC) for Five Years. The Solar Hand Pump should consist of Modified India Mark II hand pump with force lift arrangement, Solar Submersible pump, Solar Panels, Hot dip galvanised Tank Tower Structure (3 mtr. Height) suitable for 3000 Lit. Rotational moulded polyethylene water storage tank, Auto water Level Controller, Stand Post 5 Nos., Solar Submersible Pump & Hand Pump should share the same riser pipe.

The required quantity of PV modules and Solar submersible Pumps (Grundfoss Make , Rating : 2 HP) are already supplied by BHEL and are available at GWSSB store locations

Whereas Supply of Module and pump is done by BHEL – supply of all balance items, Installation, Testing , Commissioning, comprehensive maintenance for 5 years of complete system including Module and pump shall be in the scope of Bidder

The GWSSB Store location addresses are noted below:

Sl. No.	Customer	District	Qty
1	GWSSB, Dang	DANG	10
2	GWSSB, Narmada	Tapi	31
3	GWSSB, Narmada	NARMADA	19
4	GWSSB, Navsari	NAVSARI	10
5	GWSSB, Vadodara	VADODARA	34
Total			104

Shifting of these material to installation site from above listed location is in the scope of bidders.

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2. Main features of the systems: -

- ⑦ Maximum Pumping Head 60 mtr.
- ⑦ Overhead water Tank Capacity 3000 Litr. Of rotational moulded Polyethylene water storage tank as per IS 12701
- ⑦ M.S. Overhead Tank Structure height 3 mtr. With provision of Railing surrounding Water Tank & Ladder with M. S. Plate for Resting bottom of Tank free from any edges & equal load distribution on structure. (**As per drawing attached**)
- Hand Pump Cylinder Depth – 30 mtr. To 45 mtr. Respectively.
- Hand Pump Yield – 700 LPH @ 40 stroke per minute.
- ⑦ The System should be suitable for 100 mm & above /onward bore size.

Note: Both Solar Submersible Pump & Hand Pump should share the same riser pipe.

Solar PV Submersible Water Pump System

1	PV Array rating (Wp) at Standard Temp Condi.	>=675 Watts
2	No. of Modules / System	As per System requirement.
3	PV array mounting arrangement	Tracking Manual
4	Type of pump & capacity	Submersible 675 Wp
5	Capacity of pump in LPD	7200 LPD
6	Total Head of Pump	60 mtr.,
7	Overall Efficiency of pump	Minimum 45%

2.1. Solar water Pumping system:

2.1.1. SPV cell & Module – Supply by BHEL

Fencing of complete installation to be done with one gate to whole Module Structure to prevent from Children or any mischief.

2.1.2. Solar Submersible Pump (2 HP):- Supply by BHEL

- Light weight S. S. Permanent magnet submersible pump with embedded controller inside motor.
- Pump type-Helical Rotor/ centrifugal type of Pump with Brushless Permanent Magnet
- Rated rpm – 500 to 3600
- Rated Voltage – 30 to 300V
- Rated Current – 8.4 amp(max)

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- **Built in features of Pump-**
 - Dry Run Protection
 - Over & Under Voltage Protection
 - Overload Protection
 - Temperature Protection
- Maximum Pumping Head 60 mtr.
- Daily yield of Solar Submersible Pump at Solar irradiance 7 KWh/m2-9000 lpd

Pump controller Panel Board

The Specification for Electric controller is as under

- Suitable for DC incoming Power Supply.
- Suitable for 0.7 KW/ 2 H.P. Pump.
- frequency > 50 HZ.
- Efficiency at max. Power > 90 %.
- DC Voltage input/ output -30 to 300 VDC.
- Maximum Amp. Input 8 Amp dc..
- Temperature range 0 to 50 degree c
- Relative Humidity 95 %
- Voltage & current harmonicas as per relevant IS Limitations.

EXCEPT FOR ITEMS 2.1.1 & 2.1.2 ABOVE – ALL ITEMS BELOW SHALL BE SUPPLIED BY BIDDER.

2.1.3. Interconnect Cable

All cable will be with PVC Insulated & sheathed copper conductor. Cable with conductor size depending upon the array current will be provided from PV array to motor. The PV array has to be located as close to the pump as possible.

2.1.4. Cable

- Cable 3 Core x 4.0 Sq.mm as per IS 694
- PVC Pipe ½ Inch for covering cable for concealed connection – 10 mtr.
- Along with end nipples & clips.

2.1.5. Junction Box

Junction box with hinged, weather-proof lid, captive screws, three cable glands entry points & one cable gland (standard)

- Input Connections for Low, High Float Switches.
- Indication for Power on, Fault, PUMP OFF, Tank Full and Tank Empty.
- Auto Operation based on the Float Level Switch signals.
- Manual Operation through membrane type On / Off Buttons.

2.1.6. Auto Water Level Controller without Battery- Automatic OFF/ON for controlling water level in the Tank.

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2.2. Civil Work

Civil work as required as per the drawing and as per the quantity mentioned in the bill of quantity of this tender shall be carried out as per detail specification noted below:

Excavation for foundation & pipe line

Work involving Excavation f o r :

- **Foundation, up to 1.5 meter. depth including sorting out and stacking useful material & disposing excavated stuff up to 50 meter. Lead**
 - a) In all sorts of soil & soft murrum.
 - b) Excavation shall be carried out as per drawing & as per item of Schedule-B & as directed by Engineer in-charge in different strata.
 - c) Excavated stuff shall be stacked within lead as mentioned.
 - d) Excavation shall be made in vertical & as per dimension required; Excavation made wider or deeper than required depth shall have to be refilled by the contractor with selected excavated stuff as instructed without any extra claim.
 - e) The decision regarding classification of strata shall rest with Executive Engineer & shall be bonded to the contractor.
 - f) The contractor shall arrange for lifting, fencing & night watch for safety of person & animals.
 - g) The rate shall be paid per cub. Meter Of excavation done as per Item of Schedule-B.
 - h) Refilling shall be done after concreting & masonry work for foundation in 15cm thick layers with watering & ramming as per instructions of Engineer-In charge.
- **Excavation for pipeline trenches including all safety provisions using site rails & stacking the excavated stuff up to lead of 90 meter. Cleaning site etc. complete for lifts & strata as specified.**
 - a) In all sorts of soil & soft murrum.
 - b) Excavation shall be carried out as specified in the item of Schedule-B as in all sorts of soil & soft murrum. Hard murrum or soft & hard rock as per the strata encountered. The lift will be as specified in item of Schedule-B.
 - c) During Excavation if road surface is required to be cut top layer material shall stacked separately & other excavated materials shall be stacked at a minimum distance of 1.5 meter. Away from the edge of the trench.
 - d) The width of trench shall be kept as per instruction of Engineer-In charge. Generally the trench shall be excavated 60 cms. Wider than the dia. of the pipe to be laid & depth shall be kept as per requirement. Minimum depth shall be kept such that top of pipe shall be meter.
 - e) If the trenches are made deeper than required as directed by Engineer-in-charge, the contractor shall have to fill up the additional depth by 1:4:8 concrete rammed and no payment shall be made for such additional work.
 - f) Contractor shall have to provide necessary timbering, shoring, wherever required as per

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instruction of Engineer-in-charge. The rate of excavation includes cost of shoring and strutting.

- g) The contractor shall maintain the trenches dry by dewatering of water due to any reason during excavation till completion of lowering jointing and testing of pipe line, bending, encasing or any ancillary works pertaining to pipe line work must be carried out by the contractor.
- h) Surplus and rejected excavated stuff shall be removed at place shown by the Engineer in charge with a radius of 1 km.
- i) Extra excavation required for joints shall not be paid extra. When hard or soft rock is encounter murrum bedding shall be provided as directed.
- j) Measurement shall be paid as per actual excavated or as stipulated above in point (g) of this item whichever is less than depth of trench shall be the top of pipe plus the O.D. of pipe plus murrum bedding if any.

Work involving Providing & Laying C.C. of 1:4:8

Providing cement concrete 1:4:8 (1 cement 4 coarse sand : 8 hand broken stone 40 mm. nominal size) and curing compl. Excluding cost of form work in foundation and plinth.

Materials:

Water shall conform to M-1 sand shall conform to M-6 cement shall conform to M-3 stone aggregate 40 mm nominal size shall conform to M-12.

Workmanship

General

Before starting concrete the bed of foundation trenches shall be cleared of all loose materials, leveled, watered and rammed as directed.

Proportion of Mix:

The proportion of cement, sand and coarse aggregate shall be one part of cement, 4 parts of sand and 8 parts of stone aggregates and shall be measured by volume.

Mixing:

The concrete shall be mixed in a mechanical mixer at the site of work. Hand mixing may however be allowed of smaller quantity of work if approved by the Engineer in charge. When hand mixing is permitted by the Engineer in charge in case of breakdown of machineries and in the interest of the work. It shall be carried out on a watertight platform and care shall be taken to ensure the mixing is continued, until the mass is uniform in colour and consistency. However in such cases 10% more cement than otherwise required shall have to be used, without any extra cost. The mixing in mechanical mixer shall be done for a period 1.5 to 2 minutes. The quantity of water shall be just sufficient to produce a dense concrete or required workability for the purpose.

Transporting and placing the concrete:

The concrete shall be banded from the place of mixing to the final position in not more than 15 minutes by the method of as directed and shall be placed in to its final position,

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compacted and finished within 30 minutes of mixing with water i.e. before the setting commences the concrete shall be laid in layers of 15 cm to 20 cm.

Compacting:

The concrete shall be rammed with heavy iron rammers and rapidly to get required compaction and to allow all the interstices to be filled with mortar.

Curing:

After the final set, the concrete shall be kept continuously wet, if required by pending for a period of not less than 7 days from the date of placement.

Mode of measurements and payments:

- The concrete shall be measured for its length, breadth and depth, limiting dimensions to those specified on plan or as directed.
- The rate shall be for a unit of one cubic meter.

Work involving Providing & Laying controlled C.C. of M-200

Material

- Water shall conform to M-1
- Cement shall conform to M-3
- Sand shall conform to M-6
- Grit shall conform to M-8
- Graded stone aggregate 20 mm nominal size shall conform to M-12

General

- The concrete mix is not required to design need by preliminary tests. The proportion of the concrete mix shall be 1:1 ½: 3 (1 cement, 1 ½ coarse sand 3 graded stone aggregate of size 6 mm to 20 mm nominal size) by volume. Concrete work shall be exposed concrete surface or as specified in the item. The Concrete mix Designed is Not Alloed in Execution of work.
- The designation ordinary M-100 M-150, M-200 M-250 specified as per I.S. correspond approximately to 1:3:6, 1:2:4, 1:1.5:3 and 1:1:2 nominal mix of ordinary concrete by volume respectively. In M-250 i.e (1) cement =0.40 cum (2) sand = 0.38 cum (3) Metal = 1 cum in volume of one cum
- The ingredient required for ordinary concrete containing one bag of cement of 50 kg. By weight (0.035 cum.) for different proportions of mix shall be as under.
- The water cement ratio shall not more than those specified as above. The cement of the mix specified as above shall be increased if the quantity of water in mix has to be increased to overcome the difficulties of placement and compaction on that the water cement ratio specified in the table is not exceeded.
- The maximum size of coarse aggregate shall be so large as possible within the limits specified but in no case greater than one fourth of the minumum thickness of the member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill the corners of the form.
- For reinforced concrete work, coarse, aggregates having a nominal size of 20 mm are generally considered satisfactory.

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- g) For heavily reinforced concrete members as in the case of ribs of main beams, the nominal maximum size of coarse aggregate should usually be restricted to 5 mm less than the minimum clear distance between the main bars, or 5 mm less than the minimum cover to the reinforcement whichever is smaller.
- h) Where the reinforcement is widely spaced as in solid slabs, limitations of size of the aggregate may not be so important, and the nominal maximum size may some times be as great as or greater than the minimum cover.
- i) Admixture may be used in concrete only with approval of Engineer in charge based upon the evidence that with the passage of time, neither the compressive strength of concrete is reduced nor other requisite qualities of concrete and steel imparted by the use of such admixtures.

WORKMANSHIP:

Proportioning:

Proportioning shall be done by volume, except cement which shall be measured in terms of bags of 50 kg weight. The volume of the such bag being taken as 0.0342 Cu. Meter. Boxes of suitable size shall be used for measuring sand and aggregate. The size of the boxes (internal) shall be 35 CMS x 25 CMS x 40 CMS deep, while measuring the aggregate and sand the boxes shall be on the basis of its dry volume and in case of damp sand allowances for bulk age shall be made.

Mixing:

- For all work, concrete shall be mixed in a mechanical mixer which along with other accessories shall be kept in first class working condition and so maintained throughout the construction measured quantity of aggregate, sand and cement required for each batch shall be poured into the form of the mechanical mixer while it is continuously running. After about half a minutes of dry mixing measured quantity of water required for each batch of concrete mix shall be added gradually and mixing continued for another one and a half minute. Mixing shall be continued till materials are uniformly distributed and uniform colour of the entire mass is obtained and each individual particles of the coarse aggregates shows complete coating of mortar containing its proportionate amount of cement. In no case shall the mixing be done for less than 2 minutes after all ingredients have been put into the mixer.
- When hand mixing is permitted by the Engineer in charge for small jobs or for certain other reasons, it shall be done on the smooth water tight platform large enough to allow sufficient turning over the ingredients of concrete before and after adding water. Mixing platform shall be so arranged that no foreign materials gets mixed with concrete nor does the mixing water flow out. Cement in required number of bags shall be placed in uniform layer on top of the measured quantity of fine and coarse aggregate. Which shall also be spread in a layer of uniform thickness on the mixing platform. Dry coarse and fine aggregate and cement shall then to mixed thoroughly by turning over to get a mixture of uniform colour, specified quantity of water shall then be added gradually and the mass turned over till a mix of required consistency is obtained. In hand mixing, quantity of cement

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shall be increased by 10 percent above that specified.

Inspection:

- Contractor shall give the Engineer-in-charge due notice before placing any concrete, in the forms to permit him to inspect and accept the false work and forms as to their strength, alignment, and general etches but such inspection shall not relieve the contractor of his responsibility for the safety of men, machinery, materials and for results obtained.
- Centering design and its erection shall be got approved from the Engineer-in-charge. One carpenter with helper shall invariably be kept present throughout the period of concrete. Movement of labour and other persons shall be totally prohibited for reinforcement laid in position. For access to different parts, suitable mobile platforms shall be provided so that steel reinforcement in position is not disturbed. For ensuring proper cover, mortar blocks of suitable size shall be cast and tied to the reinforcement. Timber, kapachi or metal pieces shall not be used for this purpose.

Transporting and laying:

- The methods of transporting and laying concrete shall be as approved. Concrete shall be so transported and placed that no contamination segregation or loss of its constituent material take place.
- All form work shall be cleaned and made free standing water dust, snow or ice immediately before placing of concrete. No concrete shall be placed in any part of the structure shall be approval of the Engineer-in-charge has been obtained.
- Concreting shall proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joints is formed. Concrete shall be compacted in its final position within 30 minutes of its discharge from the mixer. Except where otherwise agreed to by the Engineer in charge, concrete shall be deposited in horizontal layer to a compacted depth of not more than 0.45 meter when internal vibrators are used and not exceeding 0.30 meter in all other cases.
- Unless otherwise agreed to by the Engineer-in-charge, concrete shall not be dropped into place from a height exceeding 2 meters. When trunking or chutes are used they shall be kept close and used in such a way as to avoid segregation. When concreting has to be resumed on a surface which is hardened, it shall be rereaghened, swept clean, thoroughly wetted, and covered with a 12 mm thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 12 mm layer of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has not fully hardened, all Latinate shall be removed by scrubbing the wet surface with wire or brittle brushes, care being taken to avoid dislodgment of any particles of coarse aggregate. The surface shall than be thoroughly wetted, all free water removed, and then coated with neat cement grout. The first layer of concrete to be places on this surface shall not exceed 150 mm in thickness and shall be well rammed against old work, particular attention being given to corners and close sports.

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- All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators.
- Concrete shall be judged to be compacted when the mortar fills the spaces between the coarse aggregate and being to cream upto form on even surface. Compaction shall be completed before the initial setting starts i.e. within 30 minutes of addition of water to dry mixture. During compaction, it shall be observed that needle vibrators are not applied on reinforcement which is likely to destroy the bond between concrete and reinforcement.

Curing:

Immediately after compaction, concrete shall be covered with wet sacking, or other similar absorbent material approved, soon after the initial set, and shall be kept continuously wet for a period of not less than 14 days from the date of placement and for masonry work over foundation concrete may be started after 48 hours of its laying.

Sampling and testing of concrete:

Samples from fresh concrete shall be taken as per IS-1190-1959 and cubes shall be made, cured and tested at 7 days and 29 days as per requirements in accordance with IS- 516- 1959. The minimum frequency of sampling of concrete of each grade shall be in accordance with the followings.

Quantity of concrete in the work	No. of Samples
1 – 5 cmt	1 (3 Nos. either 7 days or 29 days strength)
6 – 15 cmt	2 (6 Nos. for 7 days & 29 days. strength)
15 – 30 cmt	3 (As above)
31 – 50 cmt	4 (As above)
51 - and above	4 + One additional sample for each additional 50 cu m or part thereof.

The average strength of the group of cube cast for each day shall not be less than the specified cube strength at 29 days. 30% of the cubes cast for each day may have value less than the specified strength provided the lowest value is not less than 85% of the specified strength.

Stripping:

All form work shall be removed without causing any shock or vibration as would damage the concrete, Before the soft and struts are removed the concrete surface shall be exposed, where necessary in order to ascertain that the concrete has sufficiently hardened, centring shall be gradually and uniformly lowered in such a manner as to permit the concrete to take stresses due to its own weight uniformly and gradually, where internal metal ties are permitted. They or their removable parts shall be extracted without causing any damage to the concrete and remaining holes filled with mortar. No permanently embedded metal part shall have less than 25 mm cover to the finished concrete surface, where it is intended to reuse the form work, it shall be cleaned and made good to the satisfaction of the Engineer-in-charge. After removal of form work and shuttering, the Executive Engineer shall inspect the work and satisfy by random checks that concrete produced is of good quality.

Immediately after the removal of forms, all exposed bolts etc. passing through the cement concrete member and used for shuttering or any other purpose shall be cut inside the cement concrete member to a depth of at least 25 mm below the surface of

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the concrete and the resulting holes by filled by cement mortar. All fine caused by form joints, all cavities produced by the removal of form ties and all other holes and depressing, honeycomb spots, broken edges, or corners and other defects, shall be thoroughly cleaned, saturated with water and carefully pointed and rendered true with mortar of cement and fine aggregate mixed in the proportions used in the grade of concrete that is being finished and of as dry consistency as is possible to use. Considerable pressure shall be applied in filling and pointing to ensure through filling in all voids surfaces which are pointed shall be kept moist for a period of 24 hours. If rock pockets/honeycombs in the opinion of the Engineer-in-charge are of such an extent or character as to affect the strength of the structure materially or to endanger the life of the steel reinforcement, he may declare the concrete defective and requires the removal and replacement of the portions of the structure affected.

Materials:

- The shuttering to be provided shall be of ordinary timber planks and shall conform to M- 20.
- The dimensions of scuffing and battens shall conform to the design. The strength of the work shall not be less than that assured in the design.

Workmanship:

The form work shall conform to the shape lines and dimensions as shown on the plans and be so constructed as to remain sufficiently rigid during the paring and compacting of the concrete. Adequate arrangement shall be made by the contractor to safe guard against any settlement of the form work during the course of concreting and after concreting. The form work of shuttering, centring. The form work of shuttering, centring, scaffolding, breaking etc. shall be as per design.

Cleaning and treatment of forms:

All rubbish, particularly chipping, shaving and sqm dust shall be removed from the interior of the form before the concrete is placed and as form work in counted with concrete shall be cleaned and thoroughly wetted or treated. The surface shall be them coated with soap solution applied before concreting is done. Soap solution for the proper shall be prepared by dissolving yellow scap in water to get consistency of paint. Alternatively a coat of raw inseed oil or form all the approved manufacture may be applied in case steel suffusing is used scap solution or raw limed all shall be applied after thoroughly cleaning the surface care shall be taken that the coating does not get on construction joint surfaces and reinforcement bars.

Stripping time:

In normal circumstances and where ordinary cement is used forms may be struck after expiry of following periods.

a)	Sides of walls, columns and vertical faces beams	24 to 40 hours
b)	Beam soffits, (Props, left under)	7 Days

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c)	Removal of props slab	
	i) slabs spanning upto 4.5 ii) spanning over 4.5 m	14 Days 14 Days
d)	Removal of props to beams & arches	
	i) Spanning upto 6 m ii) Spanning over 6 m	14 Days 21 Days

Procedure when removing the form work:

Work shall be removed without such shock or vibrations as would damage the reinforced concrete surface. Before the soffit form work and struts are removed, the soffits and the concrete surface shall be exposed where necessary in order to ascertain that the concrete has sufficiently hardened.

Centring:

- The centring to be provided shall be got approved. It shall be sufficiently strung to ensure resolute of the form work and concrete work before during and after pouncing concrete. Watch should be kept to see that behaviour of centring and form work in satisfactory during concreting fraction should also be such it would allow removal of forms in proper sequence without demising either the concrete or the forms to be removed.
- The props of centring shall be provided on firm foundation or base of sufficient strength in carry the loads without any settlement.
- The centring and form work shall be inspected and approved by the Engineer-in-charge before concreting. But this will not relieve the contractor of his responsibility for strength, adequacy and safety of form work and centring. If there is a failure of form work or centring, contractor shall be responsible for the damages to the work injury to life and damage in property.

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Scaffolding

- All scaffolding, hoisting arrangements and ladders etc. required for the facilitating of concreting shall be provided and removed on completion of work by contractor at his own expense. The scaffolding, hoisting arrangements and ladders etc. shall be strong enough to withstand all live, dead and impact loads expected to set and shall be subject to the approval of the Engineer-in-charge.
- However contractor shall be solely responsible for the safety of the scaffolding, hoisting arrangement, ladders, work and workmen etc.
- The scaffolding, hoisting arrangements and ladders shall allow easy approach to the work spot and afford easy inspection.
- The rate is applicable to all conditions of working and height up to 4 mts. The rate shall include the cost of materials and labour for various operations involved such as:
 - i. Splayed edges, notching, allowance for overlaps and passing angles, button centring, shuttering, strutting, propping, bulling mailing, wedging, casing, striking and removed.
 - ii. Filtering to form stop chamfered edges or a splayed external angles and exceeding 20 mm with to beams, columns and the like.
 - iii. Temporary openings in the forms for pouring concrete, if required, removing rubbish etc.
 - iv. Dressing with oil to prevent adhesion of concrete with shuttering and
 - v. Raking or circular cutting.

Reuse:

Before reuse, all forms shall be inspected by Engineer-in-charge and their suitability ascertained. The forms shall be scarred, cleaned and joints gone over, repaired where required. Inside surface shall be retracted to prevent adhesion of concrete.

Mode of measurements and payment:

- The consolidated cubical content of concrete work as specified in item shall be measured. The concrete laid in excise of sections shown on drawing or as directed shall not be measured. No deductions shall be made for opening up to 0.10 Sq.mt. .
- The rate includes cost of all materials, labour, tools and plant required for mixing placing in position, vibrating and compacting, finishing as directed, curing and all other incidental expenses for producing concrete of specified strength. The rate includes the cost of form work and centring scaffolding etc.
- The rate shall be for a unit of one cubic meter.
- The volume occupied by reinforcement shall not be deducted from RCC work.

a) The bars shall be kept in position by the following methods.

- i. In case beam and slab construction, sufficient number of pre cast cover blocks in cement mortar 1:2 (1 cement, 2 coarse sand) about 4x4 cms section and of thickness equal to the specified cover shall be placed between the bars and shuttering as to secure and maintain the requisite cover of concrete over the reinforcement.

In case of cantilevered or doubly reinforce beams of slabs, the main reinforcing bars shall be held in position by introducing chain spacers centres.

- ii. In case of columns and walls, the vertical bars shall be kept in position by

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means of timber tempters with slates shall be removed after centring bag been done below it. The bores may also be suitably tied by means of annealed steel wire to the shuttering to maintain their position during concreting.

- All bars, projecting form pillars, columns beams, sales, etc. to which the bar and concrete are to be attached or bounded to lateren, shall be protected with a coat of thin neat cement crant, if the bars are not likely to be incorporated with succeeding 10 days. This coat of thin neat cement shall be removed before concreting.

Providing for T.M.T. Bar reinforcement for R.C.C. work including bending, binding and placing in position complete (Fe - 415)

Materials:

Mild steel bars shall conform to M-18 mild steel binding wires shall confirm to M-21.

Workmanship:

- The work shall consist of furnishing and placing reinforcement to the shape and dimensions shown as on the drawings or as directed.
- Steel shall be clean and free from rust and loose mild scale at the time of fixing in position and subsequent concerting.
- Reinforcing steel shall conform accurately to the dimensions given in the bar bending schedule shown no relevant drawings. Bars shall be bent cold to specified shape and dimensions or as directed using a proper bar bender, operated by hand or power to attain proper radius of bonds, bars shall not be bent or straightened in a manner that will injure the material. Bars bend during transport or handling shall be straightened before being used on the work. They shall not be heated to facilitate bending. Unless otherwise specified a "U" type hook at the end of each bar shall invariably be provided to main reinforcement. The radius of the bend shall not be less than twice the diameter of the round bar and the length of the straight part of the bar beyond the end of the curve shall be at least four times the diameter of the round bar. In case of bars which are not round and in case of deformed bars, the diameter shall be taken as the diameter of circle having so equivalent effective area. The books shall be suitably encaned to prevent any splitting of the concrete.
- All the reinforcement bars shall be accurately placed in exact position shown on the drawings and shall be securely hold in position during placing of concrete by annealed binding wire not less than 1 mm. In size, and by using, stay blocks of metal chair spears, metal hangers, supporting wires of other approved devices at sufficiently close intervals, Rare shall not be allowed to sag between supports nor displaced during concreting or any other operations of the work. All devices used for positioning shall be of non- corrodible material. Wooden and metal supports shall not extend to the surface of concrete, except where shown on drawings placing base. On layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not be allowed. Pieces of broken stone or brick and wooden blocks shall not be used. Layers of bars shall be separated by spacer bar, precast mortar blocks or other approved devices reinforcement after being places in position shall be maintained in



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a clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To prevent reinforcement from corrosion, concrete cover shall be provided as indicated on drawings. All the bars producing from concrete and to which other bars are to be spliced and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout.

- Bars crossing each other where required shall be secured by binding wires (annealed) of size not less than 1 mm. in such a manner that they do not slip over each other at the time of fixing and concreting.
- As far as possible, bars of full length shall be used. In case this is not possible overlapping of bars shall be done as directed. When practicable, overlapping bars shall not touch each other but be kept apart by 25 mm or 1.25 time the maximum size of the coarse aggregate whichever is greater by concrete between them, where not feasible, overlapping bars shall be bound with annealed wires not, less than 1 mm thick with tight. The overlaps shall be staggered for different bars and located at point, along the span where neither shear nor bending moment is maximum.
- Whenever indicated on the drawings or desired by the Engineer-in-charge, bars shall be joined by couplings which shall have a cross-section sufficient too. The ends of the bars that are joined by coupling shall be upset for sufficient length so that the effective cross section at the base of threads is not less than the normal cross-section of the bar. Threads shall be standard threads. Steel for coupling shall conform to IS: 226.
- When permitted or specified on the drawings, joints of reinforcement bars shall be butt welded so as to welded joints shall preferably be located at points when steel will not subject to more than 75 percent of the maximum permissible stress and welds so staggered that at any one section not more than 20 percent of the rods are welded. Only electric arc welding using a process which excluded air from the molten metal and conforms to any of all other special provisions for the work shall be accepted. Suitable means shall be provided for holding bars securely in position during welding. It shall be ensured tight no voids are left in welding and when welding is done in two of three stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust, grease, paint and other foreign matter before welding, only competent welders shall be employed on the work. The M.S. electrode used for welding shall conform to IS: 814- welded pieces of reinforcement shall be tested. Specimen shall be taken from the actual site and their number of frequency of test shall be as directed.

Mode of measurement and payments:

- Reinforcement shall be measured including overlaps, separately for different diameters as actually used in the work. Where welding or coupling is recorded, in place of lap joints, such joints shall be measured for payment as lap length so measured, the weight of reinforcement shall be calculated in tones on the same basis of as per M-10 even though steel is supplied to the contractor by the department on actual weight, length shall include hooks at the ends. Wastage and annealed steel wire for binding shall not be measured and the cost of these items shall be deemed

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to be included in the rate for reinforcement.

- The rate for reinforcement includes the cost of steel binding wires its carting from store to work site, cutting, bending, placing, binding, and fixing in position as shown on the drawings and as directed. It shall also include all devices for keeping reinforcement in approved position, cost of jointing as per approved method and all wastage and space bars.
- The rate shall be for a unit of one kg. If permitted as department to provide cold twisted steel reinforcement for RCC work including bending, binding and placing in position complete for all floors.
- Cold twisted steel bars (high yield strength steel deformed bars) shall conform to M.19 mild steel binding wires shall conform to M.21.

Workman shall be applicable as noted for mild steel as above.

Filling in foundation with murrum

Filling of Foundation with murrum or selected soil in layers of 20mm thickness including watering, ramming & consolidating complete with sand filling.

Filling available excavated Earth (Excluding rock in trenches, Plinth sides of foundation etc.) in layers not exceeds 20mm depth consolidating each deposited layers by ramming & watering.

- Excavated stuff (Excluding rock) of approved quality & free from lumps or earth shall brought & used.
- Filling shall carried out in layers of 20cm. thickness & each layer shall be well watered & rammed before fresh layers are laid.

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3. Over Head Structure for tank

Structure shall be supplied by bidder as per approved drawing.

- Structure should be strong enough (Main columns and base frame for overhead Tank & supporting structure should be made out of Minimum 65mm x 65mm x 6 mm Thick Square tube) withstand against minimum wind speed 200 km/hr.
- Concrete foundation Should be of 400 x 400 x 1500 (depth) – 4 Nos. Foundation Bolt – M -16 x 700 mm (length)- 16 nos. (4nos. For each concrete foundation.
- The Structure should be sized to hold 3000 Litr. Rotational moulded polyethylene water storage tank.
- The Structure should be Hot Dip Galvanized.
- Tank structure should have the provision to connect light lamps.
- All frames of the structure should be as per approved design.
- Overhead Tank Structure Should be erected on suitable solid foundation made of reinforced cement concrete as per the ground requirement.

Civil Work:-

Civil work essential for erection of Overhead Tank Structure as per local site conditions and soil formation.

Civil work for Stand Post as per local site conditions and soil formation.

4. M.S. Ladder

- The work shall be carried out as per the specification laid down in PWD hand book vol. I & II moreover as per description of the item.
- The ladder shall be 50 cm wide of MS flats of size 10 mm x 75 mm.
- All required materials for M.S ladder should be of best quality and got approval before use from the Engineer-in-charge.
- Step shall be of 20 mm dia .MS bars fixed at 30 cm c/c.with reverted joints.
- The ladder shall be super finish and painted with anticorrosive paint with 3 coats as directed.
- All work shall be carried out in good workmanship. All types of labour including complete work shall be carried out by the contractor without any extra cost. Rate including necessary steps of 30 mm x 50 mm fixed at 3 mt. c/c as per requirement.
- Payment shall be made on Rmt basis.

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5. Distemping on wall surface & storage tank

Material

Oil bound washable distemper and primer shall be of approved brand and manufacturer. The distemper shall be of required colour and shade and the same shall conform to IS-428-1969.

Workmanship:

Scaffolding: - Where scaffolding is required, shall, erected in such a way that as far as possible no parts of scaffolding shall rest against the surface to be distempered. A properly scared and well tilled supposed platform may be used for distemping. Where ladders are used, palaces of old gunny bags shall be tied at top and bottom to prevent scratches to the walls and floors. For distemping to ceiling, proper stage scaffolding shall be erected where necessary.

Preparation of Surface:

- ② The undecorated surface to be distempered shall be thoroughly brushed free from dust, dirt, grease, mortar dropping and other foreign matter and sand. Proposed smooth new plaster surface shall be allowed to dry for at least 2 months before applications of distemper.
- ② All unnecessary nails shall be removed, pitting in plaster shall be made good with plaster of parts, mixed with dry distemper of colour to be used. The surface shall then be rubbed down again with a fine grade sand paper and made smooth. A coat of distemper shall be applied over the patches. the surface shall be allowed in dry thoroughly before the required coat of distemper is followed. The surface affected by moulds moss, funnel angles litmus afforescene etc. shall be treated in accordance with I.S. 2395 (Part-I) 1966. Before applying distemping, any unevenness shall be made good by applying putty made plaster of Paris mixed with water on entire surface including building up the undulation and then sand papering the same after it is dry.

Priming coat:

- ② A priming coat of distemper primer of approved manufacturer and abide shall be applied over prepared surface in case of new work on undecorated surface. If the distemper premiering is done after the well surface, dried completely, the distemper shall be applied.

Application of primer shall be done as under:

The primer shall be applied with a brush on the clean dry and smooth surface. Horizontal stokes shall be given first and vertical stokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to day for at lest 48 hours before oil bound distemper or paint is applied.

Oil bound distemper is not recommended to be applied within six months of the completion of wall plaster.

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Preparation of Oil bound distemper:

The distemper shall be diluted with water or any other prescribed thinner in a manner recommended by the manufacturer only. Sufficient quantity of distemper required for a day's work shall be prepared.

Application of Distemper:

- For undecorated surfaces, after the primer coat is dried for at least 48 hours, the surface shall be lightly sand papered to make it smooth for receiving the distemper, taking care not to rub out the priming coat. All loose particles shall be dusted off after rubbing. Minimum two coats of distemper shall be applied with brushes in horizontal strokes followed immediately by vertical strokes which together shall constitute one coat. The subsequent coats shall be applied after time interval of at least 24 hours between consecutive coats to permit proper drying of the preceding coat. The finished surface shall be even and uniform with out patcher, brush marks, distemper drops etc.
- Sufficient quantity of distemper shall be mixed to finish one room at a time. The application of a coat in each room shall be finished in one operation and no work shall be started in any room, which cannot be completed on the same day.
- 15 cm double bristled distemper brush shall be used. After day's work brushes shall be thoroughly washed in hot water with soap solution and hung down to dry. Old brushes which are dirty and caked with distemper shall not be used on the work.

Perceptive measurements:

- The surface of doors, windows, floors, articles, furniture etc. and such other parts of the buildings, as are not to be distempered shall be protected from being splashed upon such surface shall be cleaned of distemper splashes in any.

Mode of measurements & payment:

- Priming coat of distemper primer, scraping of surface spotted by shrunk spots, removal of oil and grease spots, treatment for infection of efflorescence, mould moss, fungus, angle and litchis and patch repairs to plaster shall be included in this item for which nothing extra shall be paid.
- All the work shall be measured not in the decimal system as in place subject to the following limits unless otherwise stated hereinafter.
 - a) Dimensions shall be measured to the nearest 0.01 m.
 - b) Area in individual items shall be worked out to the nearest 0.01 sq.m. All work shall be measured in sq. . metre. No deductions shall be made for ends , of joints, beams, pustu etc. and openings, not exceeding 0.5 sq.m. each and no addition shall be made for reveals, jambs, soffits, sills etc. of these things nor for finish all- round ends, joints, beams, ports etc.
- Deductions of opening exceeding 0.5 sq.m. but not exceeding 3 m. each shall be made as follows and not addition shall be made for revealers, jambs, soffits, etc. of these openings.
 - a. When both the faces of walls are provided with same finish, deductions shall be made on one face only.
 - b. When each face of wall is provided with different finish, deduction shall be made for that side of frame for doors, windows, etc. on which width of reveal is less than that of the other side. Where the width of reveals on the both faces of wall

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are equal. Deduction of 50% of area of opening on each face shall be made from area of finish.

- c. When only one face of wall is treated and the other face is not treated, full deductions shall be made if the width of the reveal on treated side is less than that on untreated side but if the width of the reveal is equal or more than that on untreated side neither deductions nor addition to be made for reveals, jambs, soffits, sills, etc.
- In case of opening of area exceeding 3 sq.m. each deduction shall be made for openings but jambs, sills, and soffits shall be measured.
 - No deductions shall be made for attachments such as casings, conduits, pipes, electric wiring and the like.
 - Item includes removing nails, making good holes, cracks, patches with materials similar in composition.
 - The rates includes cost of all materials, labours, scaffolding, protective measures etc. involved in all operations described above. This shall also include conveyance, delivery, handling, unloading, storing work etc.
 - The rate shall be for a unit of one sq. mtr.

Applying Priming coat & enamel paint

- The work shall be carried out as per Instruction of Engineer - in -charge.
- The paint & primer shall be used of best quality preferably ISI Marks of approval brand.
- Work shall be carried out as per Item specified.
- The payment shall be made per Sq. mt.

6. Module Mounting Structure & Tracking System

PV Modules shall be mounted on a Hot dip Galvanized iron with minimum 80 Micron thickness support structure suitable for site conditions (extreme site conditions are taken account) with facility to adjust tilt to maximize annual energy output. Support structure design and foundation arrangements shall withstand minimum horizontal wind speed relevant to site conditions. The structure is earthed using GI wire & GI Pipe type earthing pit to enhance the performance of SPV water pumping system, manual or passive or auto tracing system should be used. For manual tracking arrangement for seasonal till angle adjustment & three times manual tracking in a day should be provided.

7. Bar Fencing

Providing & fixing 1.20 mtr. High fencing with 2.0 mtr. Long M. S. angle posts 40mm x 40mm x 6mm & oil painting 3 coats fixed at 2.5mtr. c/c with five horizontal lines & two diagonals of galvanized steel barbed wire weighting 9.38Kg per 100 mtr. Strained & fixed to posts with GI stakes including fixing the position ground with 0.5 M x 0.5 M.x0.5 M block in C.C. 1:5:10 etc. complete.

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8. Rotational Moulded Polyethylene water storage tank(3000 lit.)

Polyethylene Round moulded cylindrical Storage tank as per IS: 12701-1996 approved make & contractor shall provide size mentioned in schedule "B". The same shall be free from cracked edges & defect of any sort & shall be comply with latest quality. The rates shall be inclusive of all taxes, loading & unloading charges carting to site of work etc. complete. Each storage tank shall have to be inspected through third party inspecting agency approved by GWSSB prior to supply. Inspection Agency has inspected the storage tank as per IS: 12701-1996. The minimum weight of Tank is as per IS:12701:1996 with latest revision.

Third, party Inspection of Polyethylene Rotational Moulded cylindrical storage tank is to be carried out jointly with representative of GWSSB/BHEL.

If storage tank available with department, than the storage tank shall be issued free of cost, so that the contractor shall have confirmed availability of storage tank.

9. Providing & Fixing of diff. Size GI pipes & Fittings

Providing & Supply ISI mark GI pipes with couplings of different size, Tee, elbow, nipple, stop cock & Valves, non return valve, etc.

10. Lowering, Laying & jointing of diff. Size GI pipes & Fittings

Jointing of G.I. Pipes with G.I. specials of different size of diameter in proper position, grade & alignment.

11. Lowering, Laying & jointing of 40/63 mm dia. HDPE Pipe

Lowering, laying and jointing of 40 / 63mm dia HDPE pipe of various specials such as bends, tees, reducers, guarding barricading testing etc. complete. (Excluding excavation and refilling).

GENERAL:

The pipe as per requirement shall be provided and supplied by the department. The contractor at his own cost shall cart the pipes to the site and to be stacked properly. The contractor should get the pipes thoroughly examined and tested, if necessary, for their soundness, prior to taking delivery from the store for any defects etc. Materials either at site of work or after jointing the pipes at any stage, till completion of work, It will be the entire responsibility of the contractor to rectify these defects either during laying, joint, testing or any other operation. All cost due to rectification, replacement of pipes by new once etc. shall be entirely borne by the contractor. The materials found defective shall have to be removed from the site and new materials brought from the stores shall be placed and jointed in position at his own cost. No extra payment will be made towards such work.

Refilling of Pipe line trenches

Refilling the pipeline trenches in 15 cm. thick layer including ramming, watering, consolidating, disposal of surplus stuff as directed within radius of 1 km.

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Refilling of the pipeline trenches shall done only after getting permission from the Engineer-in-charge of work. All refilling up to 15 cm. above the pipe top shall be carried out with selected earth or with the stuff brought from out side without damaging to the pipelines. The work of refilling shall be carried out in layers of 15 cm. Each layer shall be properly a watered and rammed by hand ram.

During excavation if road surface is required to be cut top layers shall be stacked separately. During refilling the same stuff shall be spread on top layers and watered and rammed properly so as to have consolidated road surface.

The contractor shall be responsible for any settlement during the passage of time and the trenches shall be refilled with stuff brought from outside if necessary, for which no extra payment shall be made. The rate includes removal of the surplus earth after completion of refilling within radius of 3 km.

Providing & Laying C.C. of 1:2:4

Providing & laying cement concrete 1:2:4(1 cement, 2 coarse sand & 4 graded stone aggregate 20mm nominal size) for reinforced concrete coping, bottom above ground level & top of RCC Platform and curing complete. Excluding cost of form works in foundation & plinth. Cement used shall be good ISI Portland cement of approved quality. The sand shall be of river sand, clean & free from Organic impurities. Course aggregates as mentioned in description of item of schedule-

B. C.C. (1:2:4) concrete shall mixed well in watertight platform in proportion as specified in schedule-B. All ingredients in required proportion shall mix first dry & than required quantity of water shall added. Mixing shall turn over twice or thrice, so that surface of the coarse aggregate coated with cement & concrete shall use within half an hour of mixing. Any quantity remaining unused after an hour of mixing will not allowed used. The concrete shall laid in required quantity in the trenches, & shall be cured minimum for ten days after completion of work. Before laying the concrete in the flooring or in foundation bottom shall be watered & leveled as per instruction of Engineer-Incharge. The rate includes lowering lying ramming & curing of concrete cost of formwork etc. comp. Payment shall make per cum of work.

Providing & casting in situ cement concrete in grade as per schedule consolidating curing etc. complete.

Contractor shall bring cement. It shall be stored & protected from moisture, to the satisfaction of the Engineer in-charge of the work. Cement shall weighed by weight or shall added to the mixture in full bags. Any cement, which is come injuriously, affected by moisture & other cause shall rejected & shall have removed by the contractor.

Concrete shall consist of cement, sand & metal chips in required proportion. All materials except cement shall carefully & accurately measured in measuring box. Cement shall either weighed or used in full bags. The size of metal may be range as per schedule.

The required quantity of water shall added by measuring in water cans as directed. Concrete shall mixed by mixer machine. Before any concrete is placed in position all loose pieces of

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timber. Stones saw dust etc. shall remove from the work. No concrete mixed 30 minutes prior of placing in form shall allow to be used on works. Proper water cement ratio shall observed. Manual Labour or machine to whatever heights & depth as required at sites shall place concrete. The mechanical needle vibrator shall have used for compactness of concrete. The concrete consolidation shall be through & no honeycomb work shall allowed. No plastering should be done before proper finishing of the surface shall be obtained, removing oil from the formwork. It should be rubbed with curber & stone if found necessary. The tank floor, inside & outside walls will plastered. Concreting shall carried out during the right time. For that sufficient number of labours put on side without claim of extra cost. Also make necessary lighting arrangement at work side for work to be provided by the contractor at his own cost. Concrete work shall be cured for a full period of 21 days. It shall kept well watered & shall protected from direct heat of sunlight by means of wet gunney bags.

All the formwork shall be provided by the contractor at his cost & shall be thoroughly wetted before the concrete is placed in position. Formwork shall be of approved quality. Where timber is used, the face in contact with concrete shall be plain & made smooth.

All the joints in formwork shall be perfectly close to prevent the loss of cement slurry from concrete. After the form works are complete, the contractor shall get it checked for strength, suitability & levels before reinforcement is placed in position. For this advance intimation shall be given to enable the Deputy Executive Engineer to check them personally. In case of break down of the formwork etc. the same shall be made good without any claim for extra cost. The ultimate responsibility for the safety & strength of formwork, lives of workman & payment for accidents for compensation shall always rest, from beginning to the completion for work, with the contractor. Before placing the steel, all centering plate must be given a coat of oil that will last in good conditions till the day of concreting. The contractor without any extra claim or cost shall provide proper inspection ladder & platform. The formwork shall be struck off only with the previous permission of Executive Engineer. The detailed specification for this item shall also confirm to specifications for all RCC & cement concrete items attached separately. Part rate 70% payment will be paid for supporting structure works for remaining 30% payment will be given after polythene tank received & put on supporting structure & fully filled up with water for 15 days & will be released after satisfactory Hydraulic test of supporting structure. Cube test certificate for column, Slab, vertical wall ring beam etc. shall be provided by contractor at his own cost & arrangement. Contractor shall produce required test certificate, otherwise payment of next bill may be stopped. The work shall be carried out strictly as per the instruction of Engineer in-charge.

The work should be carried out as per description of item & as per plan drawing & as per instruction of the Engineer In-charge of the work half round gutter shall be done in CM 1:6 proportions.

Providing 15 mm th. Cement plaster

15 mm thick cement plaster in single coat on fair or rough side or brick concrete wall for

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interior or outer plastering up to floor two level finished even & smooth in CM 1:3 using water proofing compound of approved quality including finishing etc. complete.

Cement plaster brick masonry including racking out the joints with neeru or cement finishing etc. complete.

- Proportion of the cement mortar & thickness of the plaster shall be as specified.
- Sand used shall be fine & clean river sand free from any dirt or foreign matter. If necessary, the sand shall be washed with water prior of its use as per instructions of the Engineer in charge.
- Before starting the plaster, joints of masonry shall be checked out & surface shall be well watered for about 3 hours.
- iv). The plaster shall be applied in two coats the thickness of first coat shall be applied such that surface becomes in line & level but the same shall not be smoothed. The second coat shall then to be applied while the first coat is still soft, second coat shall be smoothed. Neeru or cement finishing with sponges shall be applied on smooth surface as specified & as per instruction of Engineer in charge.
- Plaster shall be cured for 10 days.
- In case of plaster with water proofing compound contractor shall have to bring water proofing materials of approved make & its properties shall be as specified by the manufacture. The Engineer in Charge shall test the structure treated with water proofing plaster for its water tightness & contractor shall have to arrange the same as per instruction of the Engineer in charge.

The rate shall be paid as per sq. mtr finished works.

12. 40/63 mm dia ISI marked HDPE pipes :

GENERAL TECHNICAL SPECIFICATIONS:

Manufacture, supply and delivery of ISI Marked H.D.P.E. Pipes having pressure rating PN 10 and material grade PE 80 in minimum 100 meter coil or as per GWSSB requirement with "C" class G.I. Nipple for all sizes and SS-316 Nipple for 90mm and 110mm only as an option at both end having 11 TPI threading as per specification and Drawing attached herewith duly press fitted and bolted. But the pipes should be conforming to IS- 4984/1995 with latest amendment in various sizes as under;

- 40 mm nominal outside dia
- 63 mm nominal outside dia

Other detailed technical specifications should be strictly as per IS:4984/1995 with latest amendment.

- The pipes are to be manufactured as per the terms and conditions as laid down in IS:4984/1995 with latest amendments. Each pipe shall be marked with ISI certificate mark.

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- ⑦ The main tests among others to be conducted will be as per IS:4984/1995 with latest amendment.
- ⑦ The type test certificate as per IS:4984/1995 with latest amendment from the reputed inspection agency.
- ⑦ Further at the time of inspection. The inspection agency shall review the type test and if required as per IS the inspecting agency may suggest fresh type test.

The HDPE pipe shall be manufactured from any of following brand of Raw material in PE-80 Grade.

Sr.No.	Raw material in PE-80 Grade.
a)	PILENE PM 1050 12 (NOCIL)
b)	HOSTALEN GM 5010 T3 (HOECHST)
c)	MARLEX TR 480 (PHILIPS)
e)	SOLVEY ELTEX BLACK.
f)	HD 45GP004 OF IPCL / RELIANCE / GAIL (U.P.) :HDPE- P54A001 / HALDIA (W.B.):P5200

The original invoice of raw material required to manufacture ordered length of pipes and batch wise test certificate of raw material, will be verify and certify by the inspecting authority.

The raw material required for manufacturing HDPE pipes shall be as per IS Specification. For verification of invoice of raw materials, the base of above mention weight can be taken.

- Sample Coil from which sample is drawn for testing, the length, less then 100 meters will be accepted for such acceptance double marked coil only.
- The Nipples shall be fitted after inspection of relevant pipes. In case of SS316 Nipple, testing of material shall be done and the cost will be borne by the manufacturers.
- The measurement of pipes will be taken without Nipple.
- The Testing parameter shall be as under;
 - a) Dimensional and Visual verification as per IS-4984/1995 with latest revision.
 - b) Acceptance test consisting of Hydraulic Characteristics

Reversion Test Overall Migration Test Density Dispersion test. MFR Test	As per IS:4984/1995 with latest revision.
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And

Tensile tests as per IS: 14151 (Part-I)/1994.



Carbon Black Content Test: Carbon Content should not be more than 2.5%

- c) Type test as per IS: 4984/1995 with latest amendment (Once in Three Months) for Minimum 165 Hrs.
- d) All other tests shall have to be carried out as suggested in IS:4984 with latest amendment.

MARKING:

The methods of marking all the pipes to be delivered under scope of contract shall ensure that all the information will remain legible even after transportation, storage in open space etc. In general the legible and marking upon the goods shall indicate the following.

- a) ISI Certification mark on each pipe.
- b) Manufacturers brand name and/or trade mark.
- c) Class / Grade of pipes and pressure rating, Purchaser's mark as "GWSSB" be Embossed / Engraved / Inscribed on each meter and year of manufacturing.
- d) Batch or Lot No.
- e) Outside diameter and wall thickness of pipes.
- f) The appropriate letter shall be designated to denote identification of pipes.
- g) Any other important matter that the manufacturer or purchaser deems fit to be inscribed.
- h) Running length of coil in meter at the end of every meter should be Embossed / Engraved / Inscribed, if possible. i.e. 1M, 2M, 3M.....100M.

QUANTITY:

- +/- 2 % Quantity variation will be acceptable on orders placed by GWSSB.
- The Quantity Estimated for this Rate Contract may be increase or decrease.

Flat PVC Cu. Cable

3 Core Flat PVC Copper Cable suitable for Submersible Pumps shall be manufacturer as per IS 694 with BIS Mark.

- Copper Conductor shall be as per IS: 8130,
- Insulation: As per Type-A of IS:5831 latest.
- Sheath: Type ST-1, IS: 5831 latest.

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Physical Dimension :

	Size of Flat PVC Cable in mm ²	1.5 / 2.5 / 4.0 Sq.mm
1 Conductor :		
	Nos of Wire (Minimum)	Total Cross Section Area must be not less than the normal Cross Section Area of Cables as above
	Wire size in mm (Minimum)	
2 Insulation		
	Thickness, mm, Nominal	As per IS
	Thickness, mm, Minimum	As per IS
3 Sheath		
	Thickness, mm, Nominal	As per IS
	Thickness, mm, Minimum	As per IS
4 Cable Dimension :		
	Width of Cable mm Max.	As per IS
	Thickness of cable mm Max.	As per IS

Test & Inspection:

All the test are to be carried out as per IS:694 and IS:8130 including Following Test:

- Annealing test on conductor with Minimum Elongation in %
As per IS:8130/1984.
- Conductor resistance test
- Test of Sheath, Insulation and Cable Thickness as per above Table.
- Tensile strength and Elongation at break of insulation and sheath.
- Insulation resistance Test.
- High Voltage Test (Water Immersion Test). And At room Temperature Test
- Flammability Test.
- Measurement of leakage current will be done at 500 volts for record purpose only.

Color : Insulation	-----Red-----Yellow-----Blue-----	
Sheath	-----Grey-----	
Quantity tolerance	±5%	
Drum length 500 Mt.	Length tolerance ±5%	Note: Cable supplied duly wounded in drum more than 150 meter and less than 475 meter shall be accepted with condition that if any quantity remain unused should be taken back by the firm.

NOTE: Submersible Pump cable is a very specialized product to be used for Submersible Pump in a very deep well. The area of installation is physically restrictive and the environment is very hostile. There for cable should be designed and manufactured keeping in mind these factors to achieve the highest possible degree of reliability.



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Marking

The methods of marking all the cables to be delivered under scope of contract shall ensure that all the information will remain legible

even after transportation, storage in open space etc. In general the legible and marking upon the goods shall indicate the followings:

- Manufacturer's brand name and/or trade mark.
- Purchaser's mark as "GWSSB" be embossed on each meter with year of manufacturing.
- IS mark as "IS:694" be embossed on each meter.
- Running length of drum in meter at the End & Starting of the drum should be embossed/engraved/ inscribed i.e. 1 M....., 2M..., 3m.....515m. At the Timing of Winding of the Cable on the Drum, Car shall be taken that Initial meterage reading and final meterage reading may be visible.
- Any other important matter that the manufacturer deems fit to be inscribed.

Statement showing the No of Conductors, diameters and Cross Sectional Area is to be kept in Rate Contract Tender for Flat PVC Cables of Various Sizes.

Sr. No	Cable Size	Parameters		
		Diameters of Conductor	No of Conductor	Total Cross Sectional Area of Conductor
1	2	3	4	5
1	1 x 3 x 1.5 Sq.	0.3	22	1.52
2	1 x 3 x 2.5 Sq.	0.3	36	2.5
3	1 x 3 x 4.0 Sq.	0.3	57	4.03
4	1 x 3 x 6.0 Sq.	0.3	85	6.01

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13. Modified Hand Pump set

- Hand Pump Cylinder Depth – 30 mtr. To 45 mtr. Respectively.
- Hand Pump Yield – 700 LPH @ 40 stroke per minute.
- The System should be suitable for 100 mm & above /onward bore size.
- Both Solar Submersible Pump & Hand Pump should share the SAME riser pipe.
- Head Assembly
- Modified Tank with force & lift arrangement
- Modified Telescopic Pedestal
- Modified S.S. Cylinder with S. S. Components.
- 12 mm dia. X 3 mtr. Long M.S. electro galvanised Connecting rods as per IS 15500
- 32 NB x 3 mtr. Long GI Riser Pipe medium duty Screwed at both end to IS 554/85 pipe threading socketed (minimum 50mm) at one end and other protected with plastic thread protector in approx. Length 3 mtr. Confirming to IS 1239 (Part 1) 2004 with latest amendments, sockets should be as per IS 1239 (Part II) 1992 with latest amendments.
- Non Return Valve, Ball Valve & other fittings for plumbing work.
- Riser Pipe Centraliser- 3 Nos.
- Minimum expected yield of the hand pump at 40 stroke/min – 700lph.
- Civil work essential for plate form construction of Hand Pump as per UNICEF Design.

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Section 02

Comprehensive Maintenance Contract (CMC)

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Comprehensive Maintenance contract of 05 years.

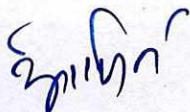
All the equipment's to be installed for commissioning of solar PV water pumping system with Modified hand pump shall be under Comprehensive Maintenance Contract for 05 (Five) years from the date of successful commissioning.

General:

The maintenance of solar PV water pumping system with Modified hand pump includes routine & periodic maintenance, overhauling, breakdown maintenance, and repairing or replacement of defective items and other components, providing of consumables shall be under CMC. The Down-Time of PV system should not be more than 72 hours (03 days).

- Immediately after successful completion of trial run period of 30 days of Solar SPV system the systematic operation, maintenance and repairs shall be taken up by the Bidder as part of the CMC for the complete SPV water pump system.
- Bidder has to visit site every 3 months and as & when required during break down. List of activities to be done during quarterly visit shall be jointly agreed and shall be as per standard norms applicable for the system.
- The servicing of all parts of system shall be carried out regularly as per requirement keeping all records for service and replacement of parts.
- In case any repair or replacement of parts is necessary during M & R period, the same shall be carried out by the Bidder without any extra cost.
Please also note following clauses regarding SPV modules and Pumps.
- Dismantling of the defective module during the CMC period and installation of the new SPV module during the CMC period is in scope of bidders. However, replacement of defective module shall be done by BHEL. Maintenance, cleaning of the SPV module is in scope of Bidders.
- Dismantling of the defective pump during the CMC period and installation of the new pump during the CMC period is in scope of bidders. Bidder will have to maintain minimum inventory of spare for this purpose also. Necessary routine maintenance as prescribed by OEM of the pump required during the quarterly visit is in scope of Bidders.

Signature and seal of Bidder



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Conditions for Maintenance & Repair for Five years

The supplier is supposed to provide continuous regular services up to 5 years from the date of completion of installation of System by way of 4 visit compulsory during year on quarterly basis & as & when required during break down. If the supplier fails in performance of Maintenance services and service contract he will be levied (L.D.) at the rate of 0.1% per day @ max 10% of the total contract amount and that will be recovered from his Security Deposit/performance security.

The payment of M & R is Yearly basis after completion of testing & commissioning work. i.e. Approved Quoted tender amount of Part -2 (M&R work) at the end of every M & R Year. Upto 5 Years.

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Section 03

Terms and Condition specific to Scope

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Terms and Condition specific to Scope

1) Programme implementation

This project is to be implemented in different tribal villages of various district of Gujrat. After receiving gramsabha tharav and consulting with in charge Engineer.

2) Scope of Pani Samiti / Gram Panchayat / GWSSB

The following items shall not be in the scope of supplier. These items shall be provided by the Pani Samiti / Gram Panchayat of respective village:

- a. Required Land for installation of Solar SP System.
- b. Required bore of suitable depth with casing pipe by GWSSB.

3) Other requirements

Three persons of village community for operation of Solar PV System shall be provided adequate training to develop their skill and capacity for handling of the Solar PV system along with O & M manual in Gujarati & English language. In case concurrent training is needed on an event of change of operator, this will be provided by the bidder without extra cost.

4) Testing and Inspection

Pre dispatch inspection

All equipment covered under Dual Pump (Hand Pump & solar PV system) of all the categories shall be subjected to pre dispatch inspection for the following. The pre-dispatch inspection will be carried out by GWSSB accredited agencies.

During inspection, the bidder should produce all the documentary evidences having procured and used new and quality components which go into the total Dual Pump (Hand Pump & Solar PV System). These documents including guarantee / warrantee / test certificate of the component manufacturer will be verified and authenticated by the inspection agencies. Such authenticated document should form a part of the total document required for clearing the bill for payment as per the schedule of payment.

Third party inspection should be carried out by inspection agency which is fixed by GWSSB/MNRE in presence of GWSSB representative at Works/ Any Govt. approved test centre.

Inspection charges for inspection of Dual Pump (Hand Pump & Solar SP system) should be borne by first agency of manufacturer & then it is reimbursed after producing receipt of payment.

Signature and seal of Bidder

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5) Packing, forwarding and transportation

Packing shall be sturdy and adequate to protect all assemblies' components and accessories from injury by corrosion, dampness, heavy rains breakage and vibration encountered during transportation, handling and storage at the plant site.

6) Transportation to site from GWSSB store, Safe keeping of BHEL supplied items

The required quantity of PV modules and Solar submersible Pumps (Grundfoss Make , Rating : 2 HP) are already supplied by BHEL and are available at GWSSB store locations For details refer page no 02 of this document).

Shifting and safe keeping of these material to installation site from respective GWSSB store shall be in the scope of bidders. Also please note that the once material has been handed over from GWSSB store , it is completely vendors responsibility for safe keeping of material till site hand over to the user. For this bidder may take insurance for issued item.

7) Erection and Commissioning (E&C)

The Bidder shall be responsible for satisfying himself and department as to the correctness of the electrical and mechanical connections between all equipment in his supply. For all above work, the Bidder shall furnish the required services of erection superintendent and other skilled and unskilled labour, erection tools, tackles and other required equipment. These materials shall be taken back by the Bidder after the erection is complete.

8) The bidder has to remove carefully the existing hand pump & other material from the source & should deposit at concern store.

9) Guarantee and Warranty

The whole system including submersible pump shell be warranted for 5 years. Required spares (Other than Modules) for trouble free operation during warranty period should be provided along with system.