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DEPARTMENT OF AGRICULTURE WESTERN VISAYAS
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ESTABLISHMENT OF BRGY. PATICUI SOLAR POWERED IRRIGATION SYSTEM (SPIS)


Brgy. Paticui, Hinigaran, Negros Occidental

TECHNICAL SPECIFICATIONS

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A. PROVISION OF FIELD OFFICE FOR THE ENGINEER (Rental Basis)

ITEM A.1.1(8) – PROVISION OF TEMPORARY FACILITY (Rental Basis)

1. REQUIREMENTS

1.1 Office for the Engineer

The Contractor shall provide and maintain field offices, including all the necessary electricity, water, drainage and telephone services for the use of the Engineer.

The office shall have at least a minimum floor area of 48 square meters, including 1 bedroom, and toilet & bath. The office shall be ready for occupancy for the duration of the Contract and its location shall subject to the approval of the Engineer. The facility shall include provision of the following equipment for monitoring and supervision of engineers including issuances of reports and site-specific instructions.

The Contractor shall be responsible for the maintenance and protection of all facilities to be provided during the duration of the Contract.

2. MEASUREMENT AND PAYMENT

2.1 Measurement

1. Lump-sum items shall be provided for the provision of:
 - Provision of Facility for the Engineer.

2.2 Payment

The quantities determined as provided above shall be paid for at the appropriate contract price.

Payment will be made under:

Pay Item Number	Description	Unit of Measurement
A.1.1 (8)	Provision for the facility of the engineer (rental basis) with equipment	lot

B. OTHER GENERAL REQUIREMENTS

B.1. PROJECT BILLBOARD, MARKER, SIGNBOARD, & COA BILLBOARDS

B.1.1 Description

This Item shall consist of furnishing and installing project billboard in accordance with this Specification and details shown on the Plans, or as required by the Engineer. The item also includes installation of project marker as specified on plan.

The project billboard shall comply in all respects with the "COA Circular No. 2013-004" dated January 30, 2013. The information and publicity on projects of Government Agencies including Foreign Funded Projects are being guided by this Circular.

The project billboard will be erected as soon as the award has been made. It will be located at the beginning and at the end of the subproject throughout the project duration.

The project marker made of concrete hollow blocks and reinforced with steel bars, plastered in a 0.88m x1.4m dimension and with concrete foundation underneath, marker information sees on the approved plans/drawings.

The size, materials and design to be used for the project signboard will specifically adhere to the General Guidelines No. 2.2.3 of the Circular while the content of the information shall conform to the General Guidelines No. 2.2.6 and the sample format shown in "Annex A" of the Circular.

B.2 MOBILIZATION AND DEMOBILIZATION

The contractor shall mobilize and move into the Project site (in accordance with his approved Construction Program and Equipment Moving in and utilization schedule) the required construction equipment needed for the successful completion of the Contract Work immediately after receipt of the approved Construction program. Notwithstanding the approved Equipment Moving-in and Utilization Schedule, the initial equipment required to be mobilized by the Contractor to the Project site within twenty (20) calendar days after the date of receipt of the approved Construction program is listed below:

MINIMUM EQUIPMENT REQUIREMENT FOR SOLAR POWERED IRRIGATION PROJECT

Description	No. Of Unit
1. Concrete Mixer 1 bagger	1 unit
2. Dump Truck	1 unit
3. Bar Cutter & Bender	1 unit
4. Chain Block	1 unit
5. Welding Machine	1 unit

If for the reasons or causes other than "major calamities", the contractor fails to mobilize fully the initial equipment required within the said period, and all other equipment listed in his approved Equipment moving-in and Utilization Schedule, at the discretion of the Secretary/Director, he may be given an extension of time to mobilize them fully but in no case shall it exceed thirty(30) calendar days. Failure to fully mobilize the required construction equipment within the said period will be a ground for contract rescission.

Demobilization shall include dismantling and removal from the site of the Contractor's Construction Plan, materials and equipment, and all temporary facilities with the exception of some facilities which DA-Western Visayas shall consider to remain and which shall be handled over to DA-Western Visayas at the time of demobilization shall also include clean-up of the site after completion of the Contract Work as approved by DA-Western Visayas and transportation from the site of Contractor's employees.

C. DRILLING WORKS

C.1 WELL CONSTRUCTION (with groundwater/pumping test)

Scope

This item shall consist of furnishing all plant, labor, equipment, appliances, and materials and performing all operations in connection with drilling, sampling, constructing, developing, and testing the well.

Construction Requirements

Cutting must be carefully collected for every meter of penetration or at every change of lithology. Penetration rate shall be closely monitored so as to have supplemental data in the evaluation of the hydraulic parameters of the lithology encountered.

Rotary drill is recommended to pave way for electric logging after the drilling exploratory well. Electric logging is used to locate the exact aquifer zone(s). When aquifer zones have been properly located, it is recommended that aquifer testing should be conducted to determine the aquifer characteristics such as maximum yield, before the final well-design be constructed

Drilling shall be done up to 25 meters (minimum) below the ground surface. Submersible pump must be at the most applicable level inside the casing. Please see attached geo-resistivity results.

Well perforations should have slot opening of at least 15% of the surface area of the pipe.

Stages of Well Development

1. Jetting.

After the well is installed, it is jetted starting from the bottom of the perforated pipe to remove the trapped mud and fine aquifer materials.

2. Pumping at low discharge.

After the jetting fluid significantly clears up, well development is continued by pumping. Initially the pump is operated at a very low and controlled discharge until the water clears and pumping is stopped for at least ten minutes after which pumping is resumed.

3. Pumping at intermediate and higher discharge. The well should be developed at intermediate discharges, and up to a pumping rate that is 50% or more above the designed pump discharge.

Scope of Work

- a. Site preparation and Rig Set-up
- b. Drilling and Installation of Surface casing
- c. Drilling of Pilot Hole
- d. Electric logging and Preparation of Well Design
- e. Reaming from 0 m. to 20.00m (25.00 m.) 6" dia.
- f. Installation of Casing and Screen with Centralizer
- g. Installation of Gravel Pack Materials
- h. Development by Bailing
- i. Treatment with Sodium Hexametaphosphate
- j. Development by High Velocity Jetting
- k. Development by Surging including Bailing Out of Sediments
- l. Development by Air-lift Method Using Air Compressor
- m. Well Development by Pumping
- n. Step-drawdown pumping test with five (5) steps at one-hour duration each
- o. Discharge rate increasing in equal fraction of the expected maximum yield
- p. Continues Constant Discharge Pumping Test
- q. Grouting

NOTE

- Pump testing shall be conducted to determine if the designed discharge is applicable. The size of submersible pump may be changed depending on the result of the test.
- Must be AMTEC Tested (System Test).

D. SOLAR MOUNTING STRUCTURES AND ACCESSORIES

D.1 STRUCTURAL EXCAVATION

Scope

The work under this section shall include excavation and trimming of foundation as required for the construction of permanent structure foundation, or pipes and other structure specified in the plans. All excavation works should be done using 0.50 cu.m.

Foundation shall be excavated using according to the outline of the footings and floors of structure as shown on the Drawings or as directed by the DA-WV Project Engineer, and shall be of sufficient size to permit free movement of workers

On excavation of common materials, the foundation bed upon which structures are to be placed shall be finished accurately to the established lines and grades after thorough compaction and trimming of the foundation with the use of suitable tools and equipment.

If at any point, material is excavated beyond the lines and grades any part of the structure, the over excavation shall be filled with selected materials approved by the DA-WV Project Engineer and shall be placed in layers of not more than 20 cm thick, moistened and thoroughly compacted by special roller, mechanical tampers or by other approved methods. The cost of filling over-excavation ordered by the DA-WV Project Engineer shall be borne by the Contractor.

On excavation of rock materials, the bottom and side surfaces of excavated rock excavation upon or against which concrete and weep holes are to be placed shall conform to the required grades and dimensions as shown on the drawing or as established by the DA-WV Project Engineer. If at any point, materials are excavated beyond the required limits, the over excavation shall be filled with concrete at the expense of the Contractor including the cost of all materials required.

All foundations for other types of structures on soft ground not requiring piling shall be excavated to a depth of 50centimeters below the proposed bottom of concrete shown on the drawings and to a maximum width of 60 centimeters of the outermost lines of said base and should be backfilled with selected materials in layers not exceeding fifteen (15) centimeters in thickness. Such layers shall be rammed firmly in place and the final surface shall be thoroughly wetted before any concrete is placed thereon.

METHOD OF MEASUREMENT

The cost of excavation of material which is incorporated in the Works or in other areas of fill shall be deemed to be included in the Items of Work where the material is used. Measurement of Unsuitable or Surplus Material shall be the net volume in its original position. For measurement purposes, surplus suitable material shall be calculated as the difference between the net volume of suitable material required to be used in embankment corrected by a shrinkage factor or a swell factor in case of rock excavation, determined by laboratory tests to get its original volume measurement, and surplus common, unclassified and rock material. The Contractor shall be deemed to have included in the contract unit prices all costs obtaining land for disposal of unsuitable or surplus material.

BASIS OF PAYMENT

The accepted quantities measured shall be paid for at the contract unit price for each of the Pay Items listed below that is included in the Bill of Quantities which price and payment shall be full compensation for the removal and disposal of excavated materials including all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this Item

Pay item Number	Description	Unit of Measure
D.2	Structural Excavation	Cubic Meter

D.2 STRUCTURAL BACKFILL

SCOPE

Work under this Item shall consist of furnishing, placing, blending, conditioning and compaction of random fill and structural backfill where required for various structures included in the works.

MATERIAL REQUIREMENTS

Materials for the various fills and backfills shall be obtained from required excavations and from borrow areas designated by the DA-WV Project Engineer. There is no guarantee that all materials in any borrow areas will be suitable for use in the fills and the Contractor shall move or modify his operations, as directed, to avoid unsuitable material. The Contractor shall move or modify his operations, as directed to avoid unsuitable material. The Contractor shall maintain and operate sufficient excavating and hauling equipment so that an adequate amount of fill material from all sources will be available as required. Operation in borrow areas should not endanger roads, buildings and other existing structures. Borrow areas shall be graded to provide ready drainage from all parts of the excavated areas. When operations in a borrow area have terminated, the area shall be dressed to a neat appearance with adequate drainage to the satisfaction of the DA-WV Project Engineer.

Materials for structural backfill shall consist of compactable soil taken from foundation or channel excavations. Any additional materials needed shall be obtained from borrow areas mentioned above.

The suitability of fill or backfill materials shall be subject to the approval of the Project Engineer. Materials containing brush, roots, and others organic matter will not be considered suitable for fill or backfill. Unsuitable material to be wasted will be specifically designated by the DA-WV Project Engineer at the time the material is excavated. Materials for structural backfill shall consist of compactable soil approved by the Project Engineer. It shall not contain individual particles larger than ten (10) centimeters.

Vibratory Plate Compactor/Power Tampers. Compaction of material where it is impractical to use vibratory rolled shall be performed by the use of Vibratory/Power Tampers weighing not less than 80 kilograms.

BASIS OF PAYMENT

Payment for structural backfill will be made at the contract unit price per cubic meter, backfill in the Bid Proposal, which payment shall constitute full compensation for furnishing all labor, equipment, and other incidentals necessary to complete the item.

Payment will be made under:

Pay item Number	Description	Unit of Measure
D.2	Structural Backfill	Cubic Meter

D.3 LEVELING COURSE

SCOPE

This item shall consist of approved granular fill material furnished and placed as required to replace unsuitable material encountered below foundation elevation of concrete structures, pipes, and concrete posts.

MATERIALS AND METHOD OF CONSTRUCTION

The leveling course shall be of coarse aggregate of sizes fall within the range of 3/16 inch to 1 1/2 inches (0.5cm to 3.75cm) or any size or range of sizes within such limits. Coarse aggregate for concrete shall be furnished by the Contractor and shall consist of crushed rock or mixture of natural gravel and crushed rock. Course aggregates as delivered shall have a uniform and stable moisture content. Any rewashing found necessary to provide clean aggregates shall be done prior to finish screening. Rewashing shall not be performed in finish screens.

Coarse aggregates shall conform to the requirements of ASTM C-33 and shall consist of hard, dense, uncoated durable rock fragments.

Gravel beddings shall consist of natural or processed aggregates such as gravel, sand or stone fragments, which shall conform to the following grading requirements:

Requirements for Grading

Sieve Size (mm)	Percent by Weight Passing		
	Grading A	Grading B	Grading C
75.00	100	100	100
5.00	35-70	40-90	50-100
0.075	0.20	0.25	0.30

After the unsuitable material has been removed as required by the DA-WV Project Engineer, gravel blanket shall be placed in thoroughly compacted layers, not exceeding those specified in the Drawing or as directed by the Project Engineer.

METHOD OF MEASUREMENT

Leveling Coarse will be measured by the number of cubic meter of materials acceptably placed and computed based on the neat lines of construction drawings prepared by the Contractor and approved the Project Engineer.

BASIS OF PAYMENT

The volume measured as provided above will be paid for the contractor unit price per cubic meter, which price and payment shall constitute full compensation for furnishing all labor, tools, equipment supplies and materials and all incidentals or subsidiary works necessary for the successful completion of the work.

Payment will be under:

Pay item Number	Description	Unit of Measure
C.3	Leveling Course	Cubic Meter

D.4 REINFORCING STEEL BARS

SCOPE

All reinforcing steel bars required for the works as detailed in the Construction Drawings or as directed by the Project Engineer

MATERIAL REQUIREMENTS

All reinforcing steel bars shall be Grade 33, deformed type and conforming to the requirements of ASTM Designation A-615 or its latest version. The nominal dimensions and unit weights of bar designation shall be in accordance with the following table:

Bar Designation Number	Unit Wt. (kg/m)	Diameter (mm)	Nominal Dimensions Cross-Section Area (mm ²)	Perimeter (mm)
10mm	0.616	10	78.54	31.42
12mm	0.888	12	113.1	37.7
16mm	1.579	16	201.1	50.27
20mm	2.466	20	314.2	62.83

Bar number are based on the number of weights of a millimeter included in the nominal diameter of bars. The nominal diameter of a deformed bar is equivalent to the diameter of plain bar having the same kilogram per meter of the deformed bar.

All reinforcing steel bars will be furnished in commercial standard lengths and the Contractor shall cut all and bend reinforcing steel bars to the details and dimensions shown on the Drawings.

METHODS OF CONSTRUCTION

All reinforcement shall be placed strictly in accordance with the drawings and as instructed in writing by the Engineer. Nothing shall be allowed to interfere with the required disposition of the reinforcement, and the

contractor shall ensure that all parts of reinforcement are placed correctly in position and are temporarily fixed where necessary to prevent displacement before or during the process of tamping and ramming the concrete in place. The ties, links or stirrups connecting the bars shall be taut so that the bars are properly braced around which they are intended to fit. The length of each size of reinforcing steel bars to be furnished is computed by taking the theoretical length of steel bars shown in the Drawings multiplied by 1.07 to get the actual length required for the work. Placed correctly in position and are temporarily fixed where necessary to prevent displacement before or during the process of tamping and ramming the concrete in place.

All reinforcement shall be furnished in the full lengths indicated on the drawings. Splicing bars, except where shown on the drawing, will not be permitted without the written approval of the Engineer. Splices shall be staggered as far as possible. Additional splices, other than those shown on the drawings; and allowed by the Engineer, shall be at the contractor's own expense.

Steel reinforcement shall be protected at all times from injury. When placed in the work, it shall be free from dirt, detrimental scale, paint, oil, loose, rust, grease or other foreign substances. Reinforcement in any member shall be placed and then inspected and approved by the Engineer before the placing of concrete begins. All steel reinforcement shall be accurately placed in the position shown on the drawings and firmly held during the placing and setting of concrete. Concrete placed in violation of this provision may be rejected and its removal is required.

METHOD OF MEASUREMENT

Measurement for payment for reinforcing steel bars will be made on the weight of reinforcing steel bars actually placed with the concrete structure in accordance with the Drawings and Bar Schedule approved by DA-WV or as directed by the Project Engineer and weights will be computed based on the published manufacturer's weights or in the absence thereof, on the weights specified in the table presented on these Item

Steel bars in laps or splices indicated in the approved reinforcement Drawings as required by DA-WV will be measured for payment. Additional steel bars in laps which are authorized for the convenience of the Contractor and such items as wires, clips, chairs, or other devices for securing the steel bars will not be measured for payment but the weight for its equivalent lap splices will be measured for payment instead.

BASIS OF PAYMENT

Payment for installation of reinforcing steel bars measured as provided above, will be paid for at the contract unit price per kilogram of material installed which price and payment shall constitute full compensation for furnishing all materials, labor, tools, equipment and all incidentals and subsidiary works necessary for the successful handling and placing the materials.

Payment will be made under:

Pay item Number	Description	Unit of Measure
D.4	Reinforcing Steel Bars	Kilograms

D.5 FORMWORKS

All forms shall be of wrought plywood and shall be built tight and of sufficient rigidity to prevent distortion due to the pressure of the concrete and other loads incident to the construction operations. Forms shall be constructed and maintained to prevent warping and the opening of joints due to shrinkage of plywood and lumber.

The forms shall be substantial and unyielding and shall be so designated that the finished concrete will conform to the proper dimensions and contours. The Contractor shall take into consideration the effect of vibration on the formwork and smoothness of re-used forms shall be always maintained. Any warped or bulged lumber must be resized before being re-used. Form which are unsatisfactory in any aspect shall not be re-used.

In determining the time for removal of forms, consideration shall be given to the location and character of the structure, the weather, and other conditions influencing the setting of the concrete and the materials used in the mix. In general, the forms of any positions of the structure shall not be removed until concrete is strong enough to prevent injury to the concrete when the forms are removed.

Method of form removal likely to cause overstressing of the concrete shall not be used. In general, the forms shall be removed from the bottom upwards. Forms and their supports shall not be removed without the written approval of the Engineer. Supports shall be removed in such a manner as to permit the concrete to take the stresses due to uniformly and gradually to its own weight.

D.6 CONCRETE WORKS (CLASS A)

This section describes and specifies work required for plain and reinforced concrete, including formwork intended to be used for the Project under the Contract in accordance with the Drawings, Bill of Quantities, and as directed by the Engineer.

At the beginning of each month, the Contractor shall submit to the Engineer his concreting programme for that month, stating the pouring dates, so that adequate checking and supervision can be provided before and during the pouring operation. No pouring shall be allowed unless the Engineer has been given a week-advanced notice of the intention to pour.

All applicable provisions of the latest revision of the ACI Building Code (ACI-318-85) and American Society for Testing Materials (ASTM) shall govern in all cases not specifically provided for herein.

All cement requirements of concrete works for the contract shall be contractor-furnished. The form to the requirements of the standard specifications for Portland Cement (ASTM: C150 Type 1). all cement shall be stored in suitable weatherproof and approved storage sheds which will protect the cement from dampness. Cement shall be used in the order of its delivery to the site, new deliveries shall not be used unless the cement from earlier deliveries has been completely used.

The term "Fine Aggregates" is used to designate aggregates in which the maximum size of particles is 3/16 of an inch (6 millimeters). As a means of providing moisture control, the Contractor may be required to stockpile the fine aggregates over a porous drain to get rid of excess water and to stabilize the moisture content.

Fine aggregates shall conform to the requirements of ASTM C-33 and shall consist of hard, tough, durable uncoated rock particles. The Contractor shall exercise every possible precaution in transporting, washing, and screening operations to prevent contamination of sand particles.

Fine aggregate from different sources of supply shall not be mixed or stored in one pile nor used alternately in the same class of construction or mix.

The term "Coarse Aggregate" is used to designate aggregates of such sizes as to fall within the range of 3/16 inch to 1 1/2 inches (0.5cm to 3.75 cm) or any size or range of sizes within such limits. Coarse aggregates for concrete shall be furnished by the Contractor and shall consist of crushed rock or mixture of natural gravel and crushed rocks. Coarse aggregates as delivered shall have a uniform and stable moisture content. Any rewashing found necessary to provide clean aggregates shall be done prior to finish screening. Rewashing shall not be performed in finish screens.

Coarse aggregates shall conform to the requirements of ASTM C-33 and shall consist of hard, dense, uncoated durable rock fragments.

The mixture for all classes of concrete as follow:

Class A of concrete mixture will be used in the construction.

The Contractor shall provide the required samples of concrete to Engineer without cost. Sampling will, in all cases, be performed by or under the direct supervision of the Project Engineer and Contractor shall provide without cost to DA all-available tools and labor as may be required. Concrete sampling shall be carried on during concrete operations at the rate of one standard sample for each 75 cubic meters of concrete or fraction thereof placed during each continuous placing operation but in no case shall there be less than one sample for each day concreting. Each standard sample shall consist of three (3) standard cylinders 6-inch diameter and 12 inch high. The Contractor shall keep a record of the samples and the portion of the structures and volume represented which shall be available to DA on demand.

Sampling shall conform to ASTM Designations C-172, preparation, storage, and curing to ASTM Designation C-31, and testing to ASTM Designation C-39. The samples are tested by an approved testing laboratory at the expense of the Contractor.

D.7 SOLAR POWER MODULE MOUNTING STRUCTURE

SCOPE

Work under this item shall consist of furnishing, placing, welding and aligning of structural post, support beams, Bracing and Aluminum Railings required for the mounting structures included in the works

MATERIALS AND METHOD OF CONSTRUCTION

1. Concrete Pedestal 0.25m x 0.25m dimensions with post and 3" diameter G.I. pipe schedule 40 anchor bolted to a 0.25m x 0.25m 10mm thick base plate.
2. Support beam 2" x2"x 2mm G.I. Square Tube and 2"x3"x3mm C-Channel (cleared from rust and primed with red oxide).
3. Bracing 2"x2" 5mm Angle Bar (cleared from rust and primed with red oxide)
4. Aluminum Railings (4.4m/pc)

D.8 SOLAR POWER MODULE (6600 Wp, Minimum)

SCOPE

Work under this item shall consist of furnishing, placing, fixing, and aligning of solar modules required for the solar array included in the works.

MATERIALS AND METHOD OF CONSTRUCTION

The Solar modules shall be aligned, fixed, and bolted on the aluminum rails using aluminum mid-clamps and end clamps as shown in the plans. The solar modules should have the minimum specifications as follows:

1. Brand New
2. 6600 WP Total Solar Power Modules (minimum)
12 pcs Solar Modules @550 Wp, or its equivalent
3. Manufactured in ISO 9001-Certified Factories
4. Must be CE Marked
5. Must have TUV certification (IEC 61215)
6. Cell type: Mono-crystalline

The installation of solar modules shall be in accordance with approved plans agreed by the Project Engineer of the Department of Agriculture Western Visayas (DA-WV).

The number of panels may be changed based on the actual power of the pump used.

WARRANTY

The Solar Power Module shall have a minimum of five (5) years warranty from the date of acceptance of the Department of Agriculture (DA-WV)

D.9 INVERTER AND CONTROLLER 5.5KW WITH ACCESSORIES

1. Brand New
2. 1 unit INVERTER AND CONTROLLER 5.5KW WITH ACCESSORIES
3. Pump is running
4. Input power and alarm indication for; service needed in case of no contact to pump, overvoltage, over temperature, overload, and dry running.
5. Maximum Power Point Tracking (MPPT)
6. AC/DC compatibility
7. Overcurrent Protection
8. No load Protection
9. Operating History Memory
10. Enclosure Class IP66
11. Sine wave Filter
12. RS485/Ethernet Capability

WARRANTY

The inverter shall have a minimum of five (5) years warranty from the date of acceptance of the Department of Agriculture western Visayas (DA-WV).

D.10 SUBMERSIBLE PUMP (5 HP)

Pump

1. 1 unit-5 Hp minimum Submersible Pump
2. Capacity: 190.61cu.m/day
3. Total Dynamic head: 21.30m, minimum

Motor Specification: Built into Pump

1. Built-in frequency converter
2. Can be supplied by either DC or AC Voltage source
3. Inverter and control unit must be integrated in the motor
4. Built-in maximum power point tracking (MPPT)
5. Enclosure class: IP68

Motor protection:

The built-in electronic unit must protect the motor in case of: (as standard, without additional equipment)

1. Dry running
2. Over and under voltage
3. Overload
4. Over-temperature

D.11 PIPES FITTINGS AND OTHER ACCESSORIES

1. Delivery Pipe 3" diameter G.I. Pipe Schedule 40
2. Distribution Pipes:
A. 2" dia HDPE Pipe SDR 17 ,55m
3. Gate Valve 2" and Gate Valve 1 1/2 ", Transition Fittings, Elbow and Saddle Clamp and Pipe Clamp

E. ELEVATED TANK

E.1 Structure Excavation	(Refer to Item D.1-Solar Mounting Structures and Accessories)
E.2 Structural Backfill	(Refer to Item D.2-Solar Mounting Structures and Accessories)
E.3 Leveling Coarse	(Refer to Item D.3-Solar Mounting Structures and Accessories)
E.4 Reinforcing Steel Bars	(Refer to Item D.4-Solar Mounting Structures and Accessories)
E.5 Formworks	(Refer to Item D.5-Solar Mounting Structures and Accessories)
E.6 Concrete Works (Class A)	(Refer to Item D.6-Solar Mounting Structures and Accessories)
E.7 Tank Post and Frame and Water Tank	

SCOPE

Work under this item shall consist of furnishing, placing, welding and aligning of structural post, support beams, Bracing required for the mounting structures included in the works

MATERIALS AND METHOD OF CONSTRUCTION

1. Concrete Pedestal 0.3m x 0.3m dimensions with post and 4" diameter G.I. pipe schedule 40 anchor bolted to a 0.3m x 0.3m 10mm thick base plate.
2. Angle Bar Frame 3" x3"x 1/4"
3. Bracing 2"x2" 5mm Angle Bar (cleared from rust and primed with red oxide)
4. 1 1/4" dia. G.I Railings
5. 2000 Liters Capacity Tank

SCOPE

This item shall consist of the installation of valves and water tank in accordance with the plans/drawings or as directed by the Engineer.

MATERIAL REQUIREMENT

All materials shall conform to AWWA and ISO specification for valve installation. Valves used are the following:

50mm diameter Gate Valve with female threaded to be attached to the distribution pipe; and

Storage Tank shall be a -2000 liters PVC Tank color blue, as shown on the plans. It must be brand new.

CONSTRUCTION REQUIREMENTS

Valves shall be installed as specified herein and as shown on the drawings. All valves shall be new and of current manufacture.