



Republic of the Philippines  
**Department of Agriculture**  
Western Visayas  
Parola, Iloilo City

## TECHNICAL SPECIFICATIONS

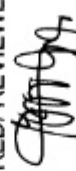
### ESTABLISHMENT OF VICTORIAS ORGANIC DEMO FARM SOLAR- POWERED IRRIGATION SYSTEM (SPIS)

Hda. Marilou, Brgy. XIV, Victorias City, Negros Occidental

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## **I. GENERAL ITEM**

### **SPL1. TEMPORARY FACILITY**

The Contractor shall furnish all materials, labor, equipment, tools and install such temporary works as are necessary for the successful completion of the Contract Work. The Contractor shall negotiate the site for his construction camp, office, and work areas.

These temporary works and construction plan shall include but shall not be limited to the following:

1. Construction camp for housing, feeding and accommodation for all the Contractor's employees. The Contractor shall also, with-in close proximity of his camp, provide an office and sleeping quarter for DA-RAED 6 monitoring employees, complete with facilities and shall have a minimum floor area of 48 sq.m.
2. Facilities such as haul roads, potable water, supply, drainage, lighting, sewage disposal system, sanitation, first aid and fire protection facilities.
3. Workshops, laboratory, warehouses, site offices, stockpile areas, storage areas for materials, equipment, spare parts, fuel and oil.
4. River diversion system including construction of cofferdam.
5. All other temporary facilities not specifically listed but nevertheless required for the proper functioning of the camp set-up and construction activities.

Temporary works shall conform to all government standards and codes and shall meet the sanitary requirements of the Department of Health.

### **SPL2. PROJECT SIGNBOARD, COA BILLBOARD, AND PROJECT MARKER**

Project Marker made of concrete hollow blocks and reinforced with steel bars, plastered finished in a 0.88m x 1.4m dimension and with concrete foundation underneath, marker information sees on the approved plans / drawings.

Commission on Audit (COA) Billboard printed of white tarpaulin, 8 ft x 8 ft dimension; resolution 70 DPI; Font: Helvetica; Font Size: Main information – 3 inches; Sub. Information – 1 inches; and Font color: Black.

Department of Agriculture (DA) Billboard shall be on standard billboard measuring 1.2m x 2.4m (4ft x 8ft) using ½ inch plywood or Tarpaulin posted on 3/16-inch plywood. Billboard shall be installed in front of project site.

### **SPL3. MOBILIZATION/ 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 date of receipt of the approved Construction Program are 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. Concrete Vibrator	1 unit
4. Bar Cutter & Bender	1 unit
5. Service Vehicle	1 unit
6. 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 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 said period will be a ground for contract rescission.

Demobilization shall include dismantling and removal from the site of Contractor's Construction Plant, 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.

**II. SOLAR PUMP/ARRAY/MOUNTING STRUCTURE**

**803 STRUCTURE EXCAVATION**

The work under this Section shall include clearing removal, hauling and disposal of all excavated materials tamping and trimming of foundation bed required for the construction of permanent structure.

Trimming the sides of excavations to the required profiles and levels as well removing all loose material should be executed prior to consecutive process.

Bottoms of excavations shall be approved by the Engineer's Representative before any concrete is laid.

**404 REINFORCING STEEL BARS**

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. 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 reinforcing steel bars shall be Grade 40 or PS 275, deformed type and conforming to the requirements of ASTM Designation A-615 or its latest revision. The nominal dimensions and unit weights of bar designation shall be in accordance with the following table:

Bar Number	Designation	Unit (kg/m)	Wt.	Diameter (mm)	Nominal Cross-Section (mm <sup>2</sup> )	Dimensions Area	Perimeter (mm)
10 mm		0.616		10	78.54		
12 mm		0.888		12	113.10		
16 mm		1.578		16	201.06		

Wire for bending reinforcement bars shall be of soft black annealed mild steel wire. The diameter of the Wire shall not be less than 16 S.W.G. (1.6mm) and the binding shall be twisted tight with proper pliers. The free ends of the binding wire shall be bent inwards.

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.

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.

#### 414

#### 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 so as to prevent warping and the opening of joints due to shrinkage of the plywood and lumber.

The forms shall be substantial and unyielding and shall be so designed 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 shall be responsible for any damage or default resulting therefrom.

The number of spacing of the form struts and braces shall be such that the forms will be and uniformly lock joints between form sections shall be free from play or movement. The shape, strength rigidity, water tightness and surface smoothness of re-used forms shall be always maintained. Any warped or bulged lumber must be resized before being re-used. Forms which are unsatisfactory in any respect shall not be re-used.

In the determining of 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 the 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 uniformly and gradually to its own weight.

The Contractor shall include in his prices for any formwork which may have to be left in position due to the impossibility of removal of same.

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, Bills 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 the 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 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  $\frac{3}{16}$  of an inch (6 millimeters). As a means of providing moisture control, the Contractor may be required to stockpile the fine aggregates over 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  $\frac{3}{16}$  inch to 1  $\frac{1}{2}$  inches (0.5 cm to 3.75 cm.) 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. Coarse aggregate as delivered shall have 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 mixtures for all classes of concrete shall be designed by the Contractor and approved by the Engineer to obtain the compressive strength at the age of twenty-eight (28) days.

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 to be tested by an approved testing laboratory at the expense of the Contractor.



#### **1705 STRUCTURE BACKFILL (25% compaction)**

Backfill and fill shall be a structurally sound material such as gravel or native soil free of rocks with size more than 5cm, lumps, vegetables and other organic materials obtained from suitable excavated material and/or from approved borrow pits.

#### **SPL4 SOLAR POWER MODULE MOUNTING STRUCTURE**

1. Concrete pedestal 0.25m diameter with post 2 1/2" diameter G.I. pipe schedule 40 welded to the reinforcement.
2. Support beam- 2"x4"x5mm G.I. Tubular Pipe (cleaned from rust and primed with red oxide).
3. Bracing- 2"x2"x5mm G.I. Tubular Pipe (cleaned from rust and primed with red oxide)

#### **SPL5 SOLAR POWER MODULES (3,600 WP)**

1. 3,600 WP Total Solar Power Modules (Minimum)
- 12 pcs. Solar Modules @ 300 Wp, or its equivalent
2. Manufactured in ISO 9001- Certified Factories
3. Must be CE marked
4. Must have TUV Certification (IEC 61215)
5. Cell type: Mono-crystalline

#### **SPL6 INVERTER AND CONTROLLER (4.0 HP)**

**1 Unit- 4.0 hp (Minimum)** inverter with system monitoring:

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

#### **SPL7 SUBMERSIBLE PUMP (2.0HP)**

##### Pump

1. 1 unit – **2.0 hp (Minimum)** Submersible Pump
2. Capacity : 9.0 cu.m/hr (40 gpm), Minimum
3. Total Dynamic Head: 26.1 m (85.60 ft), Minimum
4. Pump Efficiency : 66%, 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

### **III. POWER HOUSE**

<b>803</b>	<b>STRUCTURE EXCAVATION</b>	<i>(Refer to Item II, 803- Solar Pump/Array/Mounting Structure)</i>
<b>414</b>	<b>FORMWORKS</b>	<i>(Refer to Item II, 414- Solar Pump/Array/Mounting Structure)</i>
<b>405</b>	<b>CONCRETE WORKS (3,000 PSI)</b>	<i>(Refer to Item II, 405- Solar Pump/Array/Mounting Structure)</i>
<b>404</b>	<b>REINFORCING STEEL BARS</b>	<i>(Refer to Item II, 404- Solar Pump/Array/Mounting Structure)</i>
<b>704.3</b>	<b>MASONRY</b>	

#### **CONCRETE HOLLOW BLOCKS**

Cement for solid or hollow blocks and mortar shall be Ordinary Portland Cement ASTM 150-74 and white cement ASTM: C 91-71.

Concrete blocks shall be hard, sound, durable, sharp, rectangular shape, clean with well define arises free from racks and flaws or other defects. Concrete blocks shall be either obtained from an approved local factory.

Blocks manufactured on the site shall be cured in the shade by being kept thoroughly moist with water applied by sprinklers or other approved means for a period of at least seven (7) days. The blocks shall be stocked on a clean and level platform free from earth or other impurities during the curing process and shall be stocked in honey-comb fashion after curing. The blocks shall not be used prior to one (1) month after the date of manufacture.

Concrete blocks (solid or hollow) shall be of the following dimensions: -

Height = 200 mm + 1 % Tolerance

Length = 400 mm + 1 % Tolerance

Width = as required + 1 % Tolerance

Web thickness = not less than 20 mm for block (40\*20\*10)

Cement and sand mortar (1:3) mix, shall be composed of one part cement to three parts of sand by volume.

Cement mortars shall be used within thirty (30) minutes after mixing. Hardened mortars shall not be used in the work and shall, upon the request of the Engineer, be immediately removed from the site.

#### **1027 PLASTERING**

This section of the specifications covers plaster work related with the drawings, bill of quantities, and as directed by the engineer. The contractor shall attend upon other trades and protect all work specified under this section from damage during subsequent operations, make good any defects, clean away debris upon completion and throughout leave all work in perfect condition to Engineer's satisfaction.

Damaged or defective materials shall not be used in the works. Any defective materials or materials damaged during or after installation shall be removed and replaced at the contractor's expense.

All materials shall be of approved made, and samples shall be submitted for engineer's approval. These materials shall include but not be limited to all kinds of cements, sand and additives.

The mixing shall be done manually/mechanically. It is important to note that the quantity of water used shall be carefully controlled. The required amount of water shall be placed in the pail and the plaster added gradually and allowed to soak for 5 minutes. It shall then be stirred to a uniform consistency free from lumps and no more material shall be mixed than can be used in half an hour.

All plastering shall be executed in a neat workman like manner. All races except circular work shall be true and flat and angles shall be straight and level or plumb. Surfaces of undercoats shall be well scratched to provide a key for finishing coats.

All tools, implements, vessels and surfaces shall always be kept scrupulously clean and strict precautions shall be taken to prevent the plaster or other materials from being contaminated by pieces of partially set material which would tend to retard or accelerated the setting time.

All surfaces, to be plastered, shall be clean and free from dust, loose mortar and all traces of salts are to be- thoroughly sprayed with water, but all free water shall be allowed to dry and disappear from the surface before the plaster is applied.

Plastering shall not be commenced until the background has been suitably prepared. Block work joints shall be deeply raked out, efflorescence brushed off and all dust and foreign matter removed.

The finished surface shall be true and shape and angle even in all directions, with straight arises free of cracks and trowel marks and to the entire satisfaction of the Engineer.

## 1708    **LEVELING COURSE**

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.

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 (0.5 cm to 3.75 cm.) 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. Coarse aggregate 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 (mm)	Size	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 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.

#### **403    PREFABRICATED DOOR**

Doors/ windows shall be fabricated in the shop and transported to the project site when needed for installation. All welded connections shall be 6-mm. continuous fillet welds done in accordance with AWS shielded arc welding. Anchor bolts in concrete shall be embedded to the depth and in shapes as shown on the Drawings. Nuts and washers shall be secured in place and nuts shall be tightened as specified by the Project Engineer.

All metal works except cast-iron unless otherwise specified, shall be primed with red lead-oxide anti-rust paint before a final coat of coal tar epoxy paint is applied. Metal members to be immersed in water or metal members or parts have started to rust before paint is applied, such areas shall be thoroughly cleaned with steel brush or sandblasting before the primer is applied.

#### **1705   STRUCTURAL BACKFILL                      (Refer to Item II, 1705- Solar Pump/Array/Mounting Structure)**

#### **1032   PAINTING WORKS**

All surfaces shall be free from dust and other dust generating activities. Prior to commencement of painting and finishing works, thoroughly examine substrates scheduled to receive coatings.

Substrates shall not be coated whose condition will adversely affect execution, permanence, or quality of work and which cannot be put into an acceptable condition through preparatory work specified herein.

All substrates shall be sound, non-dusting, and free of grease, oil, dirt, and other matter detrimental to adhesion and appearance of coatings. Minimum temperature shall be 8 °C.

All works and substrates shall be repainted or refinish indicated as requiring repainting or refinishing in schedules, drawings, or specifications.

### **IV. ELEVATED TANK**

#### **803    STRUCTURE EXCAVATION                      (Refer to Item II, 803- Solar Pump/Array/Mounting Structure)**

#### **1705   STRUCTURAL BACKFILL                      (Refer to Item II, 1705- Solar Pump/Array/Mounting Structure)**

#### **414    FORMWORKS AND SCAFFOLDINGS**

##### **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 so as to prevent warping and the opening of joints due to shrinkage of the plywood and lumber.

The forms shall be substantial and unyielding and shall be so designed 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 shall be responsible for any damage or default resulting thereof.

The number of spacing of the form struts and braces shall be such that the forms will be and uniformly lock joints between form sections shall be free from play or movement. The shape, strength rigidity, water tightness and surface smoothness of re-used forms shall be always maintained. Any warped or bulged lumber must be resized before being re-used. Forms which are unsatisfactory in any respect shall not be re-used.

In the determining of 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 the 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 uniformly and gradually to its own weight.

The Contractor shall include in his prices for any formwork which may have to be left in position due to the impossibility of removal of same.

#### SCAFFOLDINGS

No scaffolds shall be erected, moved, dismantles, or altered except under the supervision of competent persons or the supervising engineer.

Scaffolds and their components must be capable of supporting without failure 4 times the maximum intended load.

Steel scaffolding shall be used in accordance with manufacturers recommendations, proper seating and locking of all connections, using the corrective devices.

During setting up and dismantling of scaffolds, warning signs, safety Gordon and other safety measures shall be provided to ensure safety.

405	CONCRETE WORKS (3,000 PSI)	(Refer to Item II, 405- Solar Pump/Array/Mounting Structure)
404	REINFORCING STEEL BARS	(Refer to Item II, 404- Solar Pump/Array/Mounting Structure)
1032	PAINTING WORKS	(Refer to Item II, 1032- Solar Pump/Array/Mounting Structure)
		<ul style="list-style-type: none"><li>• Color Scheme for DA- Western Visayas Logo: Combination of four (4) colors (Light Gray, Yellow Mango, Forest Green, Earth Brown).</li><li>• Minimum of three (3) coatings application.</li></ul>

#### V. PIPES, FITTINGS, AND OTHER ACCESSORIES

##### **SPL8 PIPE CASING (6"Ø G.I. PIPE, SCH. 40), DELIVERY PIPE (4"Ø G.I. PIPE, SCH. 40), DISTRIBUTION PIPE (1"Ø HDPE PIPE, SDR 11), FITTINGS AND OTHER ACCESSORIES**

1. Pipe Casing: 6" dia. G.I Pipe, Sch. 40
2. Delivery Pipe: 4" dia. G.I Pipe, Sch. 40
3. Distribution Pipes:
  - a. 2" dia. HDPE Pipe, SDR 11 (Main)- 50 Linear Meters
  - b. 1" dia. HDPE Pipe, SDR 11 (Lateral)- 200 Linear Meters
4. Drainage Pipe: 4" dia. G.I Pipe, Sch. 40

5. Fittings (Transition Fitting Reducer, Reducing Tee, Couplings, Elbows): G.I Pipe, Sch. 40
6. Flow Control: 4" dia. Gate Valve (Main), 1" dia. Gate Valve (Lateral) ; Body Material: Brass;  
Connection: Flange

#### PIPE LAYING AND INSTALLATION

Before laying and installing, the pipe shall be excavated cleared levelled at design slope. Pipe shall be laid and covered. All pipes shall be connected by coupling band and supported by concrete collar. A concrete manhole must be constructed in every 3 lengths of pipe depending on the actual site condition/location.

*\*Note:*

- *Drilling works will be shouldered by the local government unit of Victorias City, Negros Occidental.*
- *Must be AMTEC Tested (System Test).*