Republic of the Philippines
Department of Agriculture
Western Visayas
Iloilo City

ESTABLISHMENT OF GREENHOUSE WITH HYDROPONICS FACILITY

TECHNICAL SPECIFICATIONS

Prepared:

MELWIN D. HAGONOB, ABE
Engineer II (License No. 0008100)

Reviewed:

YVONNE GRACE H. SUR, ABE
Engineer III (License No. 0005970)
Head, EPDSS

Recommended:

MOISES D. MANA-AY, ABE, MEE
Engineer IV (License No. 0006077)
OIC- Division Chief, RAED

Approved:

JOSE ALBERT A. BARROGO, ABE
OIC- RTD for Operations and Extension

I. GENERAL REQUIREMENTS

SPL1 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.

B.9 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

II. EARTHWORKS

800(1) SITE CLEARING AND GRUBBING

SCOPE AND DESCRIPTION

The work under this item shall consist of the removal and disposal, in a manner approved by the Engineer, of all vegetation, trees, stumps, roots, brush, rubbish and all objectionable matters within the right-of-way for the Project Construction all in accordance with the Drawings and these specifications or as directed by the Engineer.

803(1)a EXCAVATION (Manual)

SCOPE AND DESCRIPTION

The work under this item shall consist of excavating, removal, hauling and disposal of all excavated materials; tamping and trimming foundation bed required for the construction of permanent structures with the use of suitable excavated materials as determined by the Engineer;

hauling and disposing of all excess excavated materials to the designated waste disposal areas, all in accordance with the plans and specification or as ordered by the Engineer.

III. REINFORCED CONCRETE WORKS

900 STRUCTURAL CONCRETE WITH RSB AND FORMWORKS

CONCRETE

GENERAL

This item covers all the materials as cement, aggregates, water, admixtures and proportioning, mixing, transporting, placing, finishing, curing and protecting of concrete and including supplies, equipment, tools and all other incidentals necessary for concrete works.

CONCRETE COMPOSITION

Concrete shall compose of cement, fine and coarse aggregates, water and if necessary admixtures or agents approved by the Agency. The design of concrete mixtures and consistency shall be as specified in this section.

CEMENT

General

The cement shall conform to the requirements of the standard specifications for Portland Cement (ASTM: C150 Type 1). Concrete mixture used for foundation shall be Class A- 1:2:4 cement- sand- gravel ratio. Special cement maybe used subject to the approval of the Engineer provided it meets the requirements with respect to strength, soundness and setting time.

WATER

The water used in concrete, mortar and grout shall be free from objectionable quantities of slit organic matter, alkali, salts and other impurities.

FINE AGGREGATES

General

The term "Fine Aggregates" is used to designate aggregates in which the maximum size of particles is 3/16 of an inch, (5 millimeters). Fine aggregates for concrete, mortar and grout shall be provided by the contractor and shall consist of natural sand, manufactured sand, or a combination of both.

As a means of providing moisture control, the Contractor may be required to stockpile the fine aggregates over porous drain excessive water and to stabilize the moisture content.

Quality

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 the transporting, washing and screening operations to prevent the contamination of the sand particles. The fine aggregates shall conform to the following requirements:

a) Grading

It is assumed that the sand available in natural deposits will require processing to provide a suitable gradation. Regardless of the source, the fine aggregates shall be well graded from fine to coarse and the gradation as delivered to the mixers shall conform to the following requirements unless otherwise approved:

Sieve Designation US Standard Square Mesh	Percent by Weight Passing Individual Sizes
3/8"	100
No. 4	95/100
No. 8	85-95
No. 16	60-85
No. 30	25-60
No. 50	10-30
No. 100	2-10
No. 200	0-5

In addition to the grading limit show above the fine aggregates as delivered to the mixer shall have the fineness modules of not less than 2.30 or more than 3.00. The grading of the fine aggregates also shall be controlled so that the fineness module of at least 9 to 10 test samples of fine aggregates as delivered to the mixer shall not vary more than 0.10 from the average fineness modules shall be determined by dividing by 100, the sum of the cumulative percentages retained to US Standard sieves No. 4, 8, 16, 30, 50 and 100. At the option of the Contractor fine aggregates may be separated

COARSE AGGREGATE

Coarse aggregate shall consist of gravel, crushed gravel, or rock, or a combination thereof. Coarse aggregate shall consist of hard, tough, durable, clean and uncoated particles. All foreign materials and dust shall be removed by adequate processing. The particle shape of the smallest size of crushed coarse aggregate shall be reasonable free from flat and elongated particles. A thin flat and elongated particle can be defined as a particle having a maximum dimension greater than five times the minimum dimension. The coarse aggregate shall be graded from fine to coarse; it shall be separated into size groups.

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 Designation Number	Unit Wt. (kg/m)	Diameter (mm)	Nominal Dimensions Cross-Section Area (mm^2)	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 that 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.

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.

IV. MASONRY WORKS

1046(2)a1 CHB NON-LOAD BEARING, 4" (INCLUDING REINFORCING STEEL)

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(1) CEMENT PLASTER FINISH

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.

V. STEEL FRAMING WORKS

1047 STRUCTURAL STEEL

- **Post:** 2"Ø G.I. Pipe, Sch. 40
- **Truss:**
  Top Chord: 1 ¼"Ø G.I. Pipe, Sch. 20
  Bottom Chord: 1 ¼"Ø G.I. Pipe, Sch. 40
  Web Member: 1"Ø G.I. Pipe, Sch. 40
- **Girt (Beam):** 1 ¼"Ø G.I. Pipe, Sch. 40
- **Diagonal Bracing:** 1 ¼"Ø G.I. Pipe, Sch. 40
- **Purlins:** 1"Ø G.I. Pipe, Sch. 20
- **Connections:** Bolts and Nuts, eyebolts, and locking profile fasteners
- **NFT Table Framing:** 1"Ø G.I. Pipe, Sch. 20

VI. PAINTING WORKS

1032(a)3 STEEL PAINTING

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.

VII. ROOFING AND COVERING WORKS

SPL2 PE PLASTIC, INSECT NET MESH, SHADE NET, WEED ELIMINATOR, AND OTHER ACCESSORIES

Roof coverings shall be made of 200 micron PE plastic covered with vents. It shall be incorporated with retractable shade nets (30% heat and light control, silver-colored) for protection against excessive heat from sunlight.

- **Roofing:** Polyethylene Plastic, 200 Micron
- **Shade:** Silver Shade Net, 40% Shade
- **Ground Cover:** Heavy Duty Weed Control Ground Cover Breathable Fabric Membrane

- **Connections and Accessories:** Aluminum C-Profile, Wiggle Wire, Stainless Cable, V-Groove, Pillow Block (1 1/4"), and Stainless Clip

VIII. HYDROPONIC SYSTEM

SPL3 PVC TUBES, PVC PIPES, PE PIPES, FITTINGS, CONTROLLER, SUBMERSIBLE PUMP, MULTI-FANS, COOLING PADS, ALUMINUM FRAMES, HYDROPONIC POTS, INPUTS AND FERTILIZERS, AND OTHER ACCESSORIES

- **PVC Tubes:** 2 1/2" x 4" x 8' PVC Tubes
- **PVC Pipes:** 4" PVC Pipe, Orange
- **PE Pipes:** 40mm x 30m Polyethylene Pipe
- **Fittings:** 4" PVC Elbow, 4" x 2" PVC Tee Reducer
- **Controller:** 1/2" PVC Ball Valve
- **Pump:** 1.0 Hp Submersible Pump
- **Cooling System:** Multi-fans with Evaporative Cooling Pad
- **Hydroponic Pots:** Styro Hydroponics Cup spaced @ every 0.20m BW
- **Pot Holder:** 2mm thk. NFT Channel Rectangular PVC
- **Gutter:** 2mm thk. Rectangular PVC Gutter
- **Drainage:** 2"Ø PVC Pipe S1000
- **Spaghetti Tube:** 5mmØ
- **Electric Motor:** 1.0 Hp (minimum)
- **With Portable EC/ PH/ Temperature Controller**
- **Coupled with Inputs and Fertilizers**

Note:

Upon completion the contractor shall provide the following services:

- The contractor shall conduct training to the recipient before the turn-over of the project.
- Shall provide supervision and agronomic support for eight (8) weeks (minimum).