



Republic of the Philippines
Department of Agriculture
Western Visayas
Iloilo City

INSTALLATION OF GREENHOUSE WITH DRIP AND MICRO-SPRINKLER IRRIGATIONS SYSTEM

TECHNICAL SPECIFICATIONS

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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 1/2 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

Description	No. of Unit
1. Concrete Mixer 1 bagger	1 unit
2. Bar Cutter	1 unit
3. Welding Machine	1 unit

B.7(2) OCCUPATIONAL SAFETY AND HEALTH PROGRAM

As compliance to the requirements of RA 11058 and DOLE Department Order 198-18 (its Implementing Rules and Regulations) and the applicable provisions of the Occupational Safety and Health Standards (OSHS).

The agency obligation and responsibilities is to provide appropriate funds for implementing this OSH program including orientation and training of its employees on OSH, provision and dissemination of IEC materials on safety and health, provision of Personal Protective Equipment (PPE) when necessary and other OSH related requirements and activities, to ensure the protection for our workers and employees against injuries, illnesses and death through safe and healthy working conditions and environment.

In line with the project implementation, the contractor shall conduct risk assessment as required to prevent workplace accidents as well as comply with other provisions of this OSH program. That they must also fully be aware of the penalties and sanctions for OSH violations as provided for in RA 11058 and its Implementing Rules and Regulations.

The following are the minimum labor and Personal Protective Equipment (PPE) that the contractor needs to provide on-site:

- Part-time Safety Practitioner/ First Aider
- First Aid Kit
- Safety Helmet

- Safety Shoes
- Safety Gloves
- Safety Vest
- Gas/Dust Mask
- Cabinet/Medicine

II. EARTHWORKS

800(1) SITE CLEARING AND LAY-OUT WORKS

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.

1707 LEVELLING COURSE

(Refer to ITEM 200, Part C, Volume II (Blue Book))

Aggregate Subbase Course

Description

This item shall consist of furnishing, placing and compacting an aggregate subbase course on a prepared subgrade in accordance with this Specification and the lines, grades and cross-sections shown on the Plans, or as directed by the Engineer.

Material Requirements

Aggregate for subbase shall consist of hard, durable particles or fragments of crushed stone, crushed slag, or crushed or natural gravel and filler of natural or crushed sand or other finely divided mineral matter. The composite material shall be free from vegetable matter and lumps or balls of clay, and shall be of such nature that it can be compacted readily to form a firm, stable subbase.

The subbase material shall conform to Table 200.1, Grading Requirements

Grading Requirements

Sieve Designation		Mass Percent Passing
Standard, mm	Alternate US Standard	

50	2"	100
25	1"	55 – 85
9.5	3/8"	40 – 75
0.075	No. 200	0 - 12

The fraction passing the 0.075 mm (No. 200) sieve shall not be greater than 0.66 (two thirds) of the fractions passing the 0.425 mm (No. 40) sieve.

The fraction passing the 0.425 mm (No. 40) sieve shall have a liquid limit not greater than 35 and plasticity index not greater than 12 as determined by AASHTO T 89 and T 90, respectively.

The coarse portion, retained on a 2.00 mm (No. 10) sieve, shall have a mass percent of wear not exceeding 50 by the Los Angeles Abrasion Tests as determined by AASHTO T 96.

The material shall have a soaked CBR value of not less than 25% as determined by AASHTO T 193. The CBR value shall be obtained at the maximum dry density and determined by AASHTO T 180, Method D.

Construction Requirements

Preparation of Existing Surface.

The existing surface shall be graded and finished as provided under Item 105, Subgrade Preparation, before placing the subbase material.

*SUBTOPIC REFERENCES FOR ITEM 1707

SUBGRADE PREPARATION

105.3.3 Subgrade in Common Excavation

Unless otherwise specified, all materials below subgrade level in earth cuts to a depth 150 mm or other depth shown on the Plans or as directed by the Engineer shall be excavated. The material, if suitable, shall be set side for future use or, if unsuitable, shall be disposed off in accordance with the requirements of Subsection 102.2.9.

Where material has been removed from below subgrade level, the resulting surface shall be compacted to a depth of 150 mm and in accordance with other requirements of Subsection 104.3.3.

All materials immediately below subgrade level in earth cuts to a depth of 150 mm, or to such greater depth as may be specified, shall be compacted in accordance with the requirements of Subsection 104.3.3.

Placing

The aggregate subbase material shall be placed at a uniform mixture on a prepared subgrade in a quantity which will provide the required compacted thickness. When more than one layer is required, each layer shall be shaped and compacted before the succeeding layer is placed.

The placing of material shall begin at the point designated by the Engineer. Placing shall be from vehicles especially equipped to distribute the material in a continuous uniform layer or window. The layer or window shall be of such size that when spread and

compacted the finished layer be in reasonably close conformity to the nominal thickness shown on the Plans.

Spreading and Compacting

When uniformly mixed, the mixture shall be spread to the plan thickness, for compaction.

Where the required thickness is 150 mm or less, the material may be spread and compacted in one layer.

The moisture content of subbase material shall, if necessary, be adjusted prior to compaction by watering or by drying out, as required in order to obtain the required compaction.

Immediately following final spreading and smoothing, each layer shall be compacted to the full width by means of approved compaction equipment. Any irregularities or depressions that develop shall be corrected by loosening the material at these places and adding or removing material until surface is smooth and uniform. If the layer of subbase material, or part thereof, does not conform to the required finish, the Contractor shall, at his own expense, make the necessary corrections.

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 may be 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 M e s h	Percent by Weight Passing Individual S i z e s
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.

902 (1)a. 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 ²)	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 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.

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 make, 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 faces 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 AND ROOFING WORKS

1047 STRUCTURAL STEEL

- **Post:** 2"Ø G.I. Pipe, Sch. 40
- **Truss:**
 - Top Chord:** 1 ½ "Ø G.I. Pipe, Sch. 20
 - Bottom Chord:** 1 ½ "Ø G.I. Pipe, Sch. 20
 - Web Member:** 1' ½"Ø G.I. Pipe, Sch. 20
- **Girt (Beam):** 1 ½ "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
- **Drip Stand Framing:** 1" x 1" x 5mm Angle Bar

SPL – 1. ROOFING AND SIDING WORKS

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

1032(1)c. 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.
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- 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.
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- 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.
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- All works and substrates shall be repainted or refinish indicated as requiring repainting or refinishing in schedules, drawings, or specifications.

V. WATER TANK AND PEDESTAL

- **Polyethylene Water Tank:** 2000 Liters capacity.
- Concrete platform shall be provided as specified in the detailed plan.

VI. OVERHEAD SPRINKLER AND DRIP IRRIGATION SYSTEM

SPL3. OVERHEAD MICRO SPRINKLER IRRIGATION SYSTEM

- **Controllers-** shall be provided with the provision of adjusting the desired irrigation time and interval. It shall be provided with enclosure box.
- **Electric pump with pressure tank** – ¾ hp electric driven motor pump pressure tank shall capable of supplying 28.44 psi
- **Sprinkler head** – Shall be 104 lph with 2.5m wetted diameter @ 28.44 psi
- **Portable Thermohygrometer** shall be provided.
- **Filter** shall be provided to minimize clogging of the sprinkler head.

SPL4 DRIP FERTIGATION SYSTEM (NUTRIENT TANK, DRAINAGE TANK, PUMP WITH PRESSURE TANK, PLANTING BUCKET AND STAND, PIPES AND FITTINGS, THERMOHYGROMETER)

- **Controllers-** shall be provided with the provision of adjusting the desired irrigation time and interval.
- **Drip Irrigation system** – Shall include 2000 cubic meter polyethylene tank, 3/4 hp electric pump with pressure tank, Portable Thermohygrometer, discs filter, flow regulator (ball valves). Floater, 1 ½" Ø HDPE pipe (mainline), ¾" Ø LDPE distribution line and button drippers in 5mm PE hose.
- **Planting Stand and Bucket**
 - Planting stand shall be fabricated using 1" x 1" x 4mm angle bar. It shall be provided with drain catchment made of 1.5mm HDPE pond liner.
 - Planting Bucket (8" Ø polypropylene bucket) shall be placed securely to the planting stand at designed spacing.

Note: Planting stand dimensions shall be adjusted based on the sizes of the planting bucket provided by the contractor.
- **Drainage tank** – Design Specifications and dimensions shall be referred to the reflected Detailed Engineering Design.
- **Wirings and Accessories:** All wiring installation shall be done in PVC conduits
- **Portable Thermohygrometer** shall be provided.

Note:

Upon completion the contractor shall provide the following services:

- The contractor shall provide agricultural inputs, production materials and training of recipients on the operation of the facility for crop production for one (1) cycle per site with the following crops.
 1. Ampalaya (Hybrid)
 2. Hot Pepper (Siling Labuyo)