



Republic of the Philippines  
**CAVITE STATE UNIVERSITY**  
 Don Severino delas Alas Campus  
 Indang, Cavite

**BILL OF QUANTITIES**

<b>CONSTRUCTION OF IFAS-SBR WITH TERTIARY TREATMENT FACILITY (PHASE I)</b> <b>ABC: ₱ 29,869,775.28</b> <b>COLLEGE/UNIT/CAMPUS: MAIN CAMPUS</b>					
Item No.	Description	Unit	Quantity	Unit Price (Pesos)	Amount (Pesos)
I	MOBILIZATION (Pesos _____ _____ and _____ centavos)				
II	CONCRETE WORKS (Pesos _____ _____ and _____ centavos)				
III	CARPENTRY WORKS (Pesos _____ _____ and _____ centavos)				
IV	STEEL WORKS (Pesos _____ _____ and _____ centavos)				
V	FACILITY WORKS (Pesos _____ _____ and _____ centavos)				
VI	ELECTRICAL WORKS (Pesos _____ _____ and _____ centavos)				
VII	MECHANICAL WORKS (Pesos _____ _____ and _____ centavos)				
<b>GRAND TOTAL</b>					_____
<b>Write grand total in words</b>		_____			
		_____			
		_____			

Submitted by: \_\_\_\_\_ Date: \_\_\_\_\_  
 Name of Bidder/Bidder's Representative: \_\_\_\_\_  
 Position: \_\_\_\_\_  
 Construction Company/Contractor: \_\_\_\_\_

## **CAVITE STATE UNIVERSITY**

### SCOPE OF WORK:

#### **A. CONSTRUCTION OF IFAS-SBR WITH TERTIARY TREATMENT FACILITY (PHASE I)**

##### GENERAL NOTES:

1. The project should be finished for 210 calendar days.
2. Actual site inspection is a must.
3. Building permits, necessary clearances and other government taxes should be shouldered and settled by contractor.
4. The contractor shall be responsible for training the maintenance personnel assigned to the facility. They shall conduct the necessary procedures and protocols to ensure that the personnel assigned to the facility will be knowledgeable about the operation of the sewage treatment plant.
5. The contractor should have a minimum of 5 years of experience in constructing sewage treatment facilities and should also have successfully implemented the same technology in their previous projects.
6. This set of specifications shall govern the methods of construction and the kinds of materials to be used for the proposed project shown in the plans and detailed drawings.
7. The plans, detailed drawings and these specifications shall be considered as complementing each other, so that what is mentioned or shown in one, although not mentioned or shown in the other, shall be considered as appearing on both. In case of conflict between the two, the same should be referred to the project inspector for resolution.
8. All parts of the construction shall be finished with first class workmanship, to the fullest talent and meaning of the plans and these specifications, and to the entire satisfaction of the project inspector and the end-user.

#### **B. Technical Description**

##### **I. Mobilization**

1. This work includes the following:
  - a. Site preparation
  - b. Site temporary enclosure may be blue sack or any suitable materials that may enclose the workplace.
  - c. Mobilization and Demobilization
  - d. Office/Bunk house, etc.
2. Demobilization includes cleaning up of site, clearing, hauling and disposal of waste and construction debris. Restoration of any damages shall also be done before exiting the area.
3. The area should be cleared/cleaned before and after construction work at least ten meters away from the building line. Notify the end-user regarding the properties that need to be hauled away from the site prior to construction.
4. Excavation and backfilling works shall be done mechanically. Excess soil will be hauled and disposed to the nearest and permitted dumping area.
5. For gravel bedding, recommended size to lay in compacted soil is G-1.

##### **II. Concrete Works**

1. Concrete compressive strength shall attain a minimum of **3500 psi** after **28 days**. All applicable provisions of the ACI-318-71 Building Code Requirements for Reinforced Concrete shall be applied herein.
2. For concrete waterproofing, use integral waterproof TCN Cysta Integra (or equal) with application rate of minimum 8 gallons for every 1 cubic meter of fresh concrete. Use also, bentonite water stops with minimum size 25mm x 40mm x 5m per roll.
3. Supply and installation of ceramic tiles for concrete table.
4. Reasonable number of tests on the concrete may be required by the project inspector during the progress of the work. Not less than two (2) cylindrical specimens shall be reserved for the 28th day test. The Contractor shall pay for the cost of material testing.
5. Compression and slump test shall be made for every 50 cu.m. of concrete or a fraction thereof; but not less than 1 set of test shall be made from any one batch of concrete and all 3 tests shall be made from the same batch.
6. In case of failure of test cylinders to meet the specified strengths, the Contractor shall

at his expense obtain concrete core samples from the poured concrete and the compressive strength of same be taken by a competent testing authority to determine the conclusive strength and integrity of the concrete poured.

7. All steel reinforcing bars to be used in this construction shall consist of round deformed steel bars with lugs or projections on their sides to provide a greater bond between the concrete and the steel. All steel reinforcing bars to be used shall be **Grade 40**. Reinforcing bars shall conform to ASTM Specifications A-615.
8. All steel reinforcing bars shall be accurately placed and secured against displacement by tying them together at each bar intersection with **Gauge No. 16 galvanized iron wire**. Provide bar supports and other accessories necessary to hold reinforcing bars in the proper positions while concrete is being placed.
9. The steel reinforcing bars indicated for footings, columns, slabs, beams, girders, and other concrete members shall all conform to the number, size and spacing as indicated in the drawings or schedule of steel reinforcements.
10. No metal reinforcement shall be installed in place unless it is free from rust, scale, or other coatings, which will destroy or reduce the bond with concrete.
11. The contractor shall furnish 2 copies of the manufacturer's certificate of mill tests of all reinforcing steel. The contractor shall at his own expense employ an approved testing laboratory which shall conduct testing of all reinforcement sizes of each bulk under the supervision of the project inspector.

### III. Carpentry Works

1. Provide formworks and scaffolding for the completion of the project.
2. Form lumber shall be of best grade available in order to ensure the good result on the finish product.
3. Construct forms sufficiently tight to prevent leaking. It must be securely braced to prevent displacement and to ensure safety as support of construction loads. Form works after fixing, shall be cleaned out and coated by used oil prior to pouring. Spilling of oil on reinforcement and previously concreted surface should be avoided. Forms will be removed only after the concrete has set.
4. Forms shall not be removed until the concrete has attained sufficient strength to support its own weight and any loads that may be placed on it. Side forms of beams and girders may be removed earlier than the bottom forms, but additional posts or shoring must be placed under the beams or girders until they have attained their strength.
5. Remove all honeycombed surfaces. All voids shall be filled with 1:2 mixture of mortar and dry pack shall be smoothed to a uniform appearance of the concrete surfaces.
6. Pegs and nails shall be of the sizes and types indicated or necessary to suit the purpose and conditions encountered and shall rigidly secure members in place.

### IV. Steel Works

1. Use G.I. Pipe 38 mm. Ø Sch. 40
2. Use #16 Dyna Bolt for its base connection to the concrete catwalk.
3. Use E-60/11 for welding of G.I. Pipe connections.
4. Use 6mm. thk. plate for base plate of each railing column.

### V. Facility Works

1. For concrete mortar, use 150mm thk. concrete hollow blocks.
2. Adopt class A mortar mixture (1:2) ratio.
3. Use concrete block for window opening (please see attached plan)
4. Use prefabricated 1 way steel louver door made from z-channel 1/2" x 3" x 1.5mm and with cylindrical lockset.
5. See plan for details.
6. Use #120 sandpaper, #9 and #2 paint brush and masking tape #1.
7. Application of epoxy reducer and primer flat latex and 2 coats of permacoat top coating.
8. Use concrete neutralizer of any brand before applying of the first coating of concrete walls, and painted walls should have at least 3 coats of paint.

### VI. Electrical Works

1. Supply and installation of panel boards, circuit breakers, contactors and other electrical devices in accordance with the plan including the tapping to the source.

- NOTE: Bolt-on type, NEMA Standard should be used.
2. Supply and installation of conductors and RSC or IMC conduits/ PVC conduit/junction box/utility box from main panel to machines and equipments.
    - a. PVC orange conduit pipe for all embedded electrical raceway.
    - b. RSC or IMC pipe for service entrance and all exposed electrical raceway.
    - c. THHN/THW copper conductor wire. Phelps Dodge or approved equal. Refer to Schedule of loads for wire size.
    - d. Utility and junction boxes should be PVC and deep type.
    - e. Support brackets/hangers, clamps and rods should be galvanized steel.
  3. Supply and installation electrical primary poles (9 sets), use pre-stressed concrete pole of 50ft, class 3A or equivalent.
    - a. Primary pole #1 - Pole dressing includes Load Break Switch 15 kV 600 amps, Lightning Arrester 15 kV, Power Fuse Assembly type SMU-20 15 kV, Insulators and connectors, brackets and guy supports, wires, machine bolts and other necessary accessories.
    - b. Primary pole #2, #3, #4, #5, #6 and #7 (Straight-run construction) - Pole dressing includes steel crossarms, insulators, connectors, grounding, brackets, guy supports, machine bolts and other necessary accessories.
    - c. Primary pole #8 (Double dead-end construction with back-arm) - Pole dressing includes steel crossarms, insulators, connectors, grounding, brackets, guy supports, machine bolts and other necessary accessories.
    - d. Transformer Pole #9 (Dead-end construction) - Pole dressing includes steel crossarms, insulators, fuse cut-out 15 kV, Fuse links 10 amps, Lightning Arrester 15 kV, grounding wires, connectors, grounding rods, mounting brackets, guy supports, machine bolts and other necessary accessories.

NOTE: Maintain 40 meters maximum distance of primary poles.

4. For distribution transformers, supply and install 3 units of three-phase 100 KVA 13.8kV/240v with connectors and accessories.
5. Supply and installation of 4/0 bare ACSR (1872 meters) and 2/0 bare ACSR (624 meters) for primary lines and neutral wire.
6. For programmable logic controller, use main Delta.
7. The installation shall conform to good engineering practice and in particular comply with the requirements laid down in the following documents which are mandatory and modified only by specific agreement:
  - a) PEC - Philippine Electrical Code
  - b) MERALCO - Manila Electric Company
  - c) All applicable codes and ordinance of the municipality and laws of the Republic of the Philippines.
8. The contractor shall furnish and install as indicated in the plan necessary panel boards of multibreaker type as shown under schedule of load. Circuit breaker shall be of magnetic thermal type, bolt-on, with the rating and number of poles as indicated in the load schedule. It shall be installed in a perfectly fit cabinet of appropriate size.
9. **PVC conduit orange pipe** is required for this project. Rigid steel conduit shall be for service entrance and feeders unless indicated in the plan. Conduit runs shall be continuous. Conduit installed in concrete slab shall be located so as not to affect the structural strength of the slab. There shall be no more than three (3) conductor in a single conduit/raceway.
10. Unless otherwise indicated or specified, conductors shall be THHN type, stranded. Connections shall be made except in boxes provided for the purpose. Conductors spliced shall be without solder.
11. All boxes shall be deep type metal, coated with primer and paint or PVC. All junction boxes shall be fitted with a standard cover. They shall be of sizes sufficient to accommodate the number of conductors entering the box. All switches unless specified shall be flush type and rated not less than 15A, 250 V.
12. The contractor shall furnish all lighting fixtures schedule indicated in the drawing, the exact location and heights of fixture shall be governed by the structural limitation of the building.
13. Any apparent conflict between the drawings and specifications and any controversial

or unclear points shall be referred to the electrical inspector for final decision. He shall have the power to reject any work or materials which in his judgment are not in full accordance with the specification.

14. The contractor shall furnish, install, and connect ground rods and all other materials required to provide a permanent and effective grounding system for the project. Exposed non-current carrying parts of all electrical equipment regardless of voltage shall be grounded.
15. When the electrical installation is completed, the contractor in the presence of the electrical inspector shall conduct testing and commissioning which includes circuit insulation and switching operation test, that are required to freely and completely demonstrate that the electrical system has been installed and will operate in accordance with all applicable specification and codes, free from grounds, shorts, or defects. All necessary instruments and personnel required for the testing shall be furnished by the contractor at no extra cost to the end user.
16. Include tapping to existing primary lines, energization of distribution transformers, testing and commissioning of all electrical devices and equipments installed.

## **VII. Mechanical Works**

1. For air distribution system, use dedicated root blower of 25.0 hp, 2 units to reaction tank and 1 unit of 25.0hp root blower to equalization tank and 2 units of 25 hp to sequencing batch reactor tank.
2. To transfer the wastewater from EQT to SBR tank, use 2 units of 5.0 hp non-clog submersible pump with automated float level switch.
3. To transfer the wastewater from SBR tank to Reaction tank , use 2 units of 5.0 hp non-clog submersible pump with automated float level switch.
4. For sludge wasting install 1 unit each of 2 hp non-clog submersible pump from SBR and RT. Both tanks shall transfer sludge to Septic tank's digestive chamber.
5. In EQT, for the downpipe and manifold requirement, install PVC pipe with Ø 40mm schedule 40. Use EPDM fine bubble diffuser with Ø 250mm disc sizes.
6. In SBR, for the downpipe and manifold requirement, install PVC pipe with Ø 40mm schedule 40. Use EPDM fine bubble diffuser with Ø 250mm disc sizes.
7. In RT, for the downpipe and manifold requirement, install pvc pipe with Ø 40mm schedule 40. Use EPDM coarse bubble diffuser with Ø 150mm disc sizes.
8. For chemical dosing system that will feed directly to Reaction Tank, install 1 unit of 3 hp motor compressor with 1 unit of 15 mm dia regulator valve, 4 unit of 15 mm dia solenoid valve, 1 unit of 4 gals SS-304 pressurized tank and 3 units of 82 gals of pressurized tank.
9. For filtration system, install 2 unit of 1.2ØM x 1.82M Ht Frp Tank equipped with auto control valve head.
10. For disinfection system that will feed directly to Chlorine Contact Tank, install 1 unit of automated feeder pump with capacity of 1,000mL/min with 1 unit of 200L capacity PET Container.
11. For syphoning of existing grease trap and septic tank, use sanitary pvc pipe with Ø 100mm schedule 40 Ø 100mm pvc 90 and 45 deg elbows, Ø 100mm pvc coupling, Teflon tape 1/2, and solvent cement 400cc.
12. For pumping wastewater, use 0.5 hp non-clog submersible transfer pump with automated float level switch.
13. The effluent for the treated wastewater should conform to the general effluent standard set by the DENR Administrative Order (DAO) 2016-08. These parameters are as follows:
  - a) Ammonia as  $\text{NH}_3 - \text{N}$ : < 0.50 mg/L
  - b) BOD: 30 mg/L
  - c) Nitrate as  $\text{NO}_3 - \text{N}$ : 20 mg/L
  - d) Phosphate: <1 mg/L
  - e) Surfactant (MBAS): 3 mg/L
  - f) Total Suspended Solids (TSS): 70mg/L
  - g) Oil and Grease: 5 mg/L
  - h) Color: 100 TCU
  - i) pH: Range 6.5-9.0

- j) Fecal Coliform: 200 MPN/100mL
- k) Temperature: <3

- C. Resident site engineer is a must for the projects to be undertaken by the contractor of the university. In cases where there are electrical works, it is required that an electrical engineer or a master electrician be a part of the contractor's team to supervise all electrical works. Likewise, master plumbers must supervise plumbing works. It can be considered when only one person is the master plumber and master electrician at the same time as long as his major duty is supervision of both fields. Safety engineer is a must as per DOLE requirement. **Note: All key personnel should be included in the list of personnel for submission.**
- D. In cases of participation in two or more projects, the set of workers and foreman shall be different per project, however, the set of engineers and equipment may be reused.
- E. Construction safety and health program as well as construction schedule (PERT/CPM/S-Curve) shall be provided by the winning bidder.
- F. See plans/consult the end-user and project inspector for details and extent of work. The silence of specifications, plans, special provisions and supplementary specifications as to any detail, or the apparent omission therein of detailed description or definition of the quality of materials and workmanship shall be regarded to mean that only materials and workmanship of first class quality are to be used or employed.