PROJECT	:	CONSTRUCTION OF PUMP HOUSES, PERIMETER FENCE AND IMPROVEMENT OF THE DISCHARGE SYSTEM AND ITS APPURTENANCES
SUBJECT	:	SCOPE OF WORKS AND SPECIFICATIONS
LOCATION	:	BRGY. REAL, CALAMBA, LAGUNA
DATE	:	March 21, 2023

C. CIVIL WORKS

I. SCOPE OF WORKS

C.1 Earthworks

Excavation:

Except when specifically provided to the contrary, excavation shall include the removal of materials of whatever natured encountered, including all obstructions of any nature that would interfere with the proper execution and completion of the work. The removal of said materials shall conform to the lines and grades shown or ordered. Unless otherwise provided, the entire construction site shall be stripped of all vegetation and debris, and such materials shall be removed from the site prior to performing any excavation or placing any fill. The Contractor shall furnish, place, and maintain all supports and shoring that may be required for the sides of the excavations, and all pumping, ditching, or other approved measures for the removal or exclusion of water, including taking care of storm water and waste water reaching the site of the work from any source so as to prevent damage to the work or adjoining property.

The walls and faces of all excavations in which workers are exposed to danger from unstable ground shall be guarded against by a shoring system, sloping of the excavation, or some other acceptable method. The contractor shall furnish, install, and maintain such sheeting, bracing, etc., as may be necessary to protect the workers and to prevent any movement of earth which could injure or delay the work or endanger adjacent structures. In excavations which workers may be required to enter, excavated or other materials shall be effectively stored and retained at least 600mm or more from the edge of the excavation. All excavation and trenching operations shall conform to any and all national, provincial and local safety requirements.

Excavation Beneath Proposed Structures. Except where otherwise specified for a particular structure or ordered by the Engineer, excavation shall be carried to the grade of the bottom of the footing or slab. Where shown and ordered, areas beneath proposed structures shall be over-excavated. When such over-excavation is shown on the drawings, both over-excavation and subsequent backfill to the required grade shall be performed by the Contractor at his own expense. When such over-excavation is not shown but is ordered by the Engineer, such over-excavation and any resulting backfill will be paid for under a separate unit price bid item if such bid item has been established; otherwise payment will be made in accordance with negotiated prices. After the required excavation or over-excavation has been completed, the exposed surface shall be scarified to a depth of 150 mm (6-in.) brought to optimum moisture content, and rolled with heavy compaction equipment to ninety-five percent (95%) of maximum density.

Excavation Beneath Areas to be Paved. Excavation under areas to be paved shall extend to the bottom of the aggregate base, if such base is called for; otherwise it shall extend to the bottom of paving. After the required excavation has been completed, the exposed

surface shall be scarified, brought to optimum moisture content, and rolled with heavy compaction equipment to ninety percent (90%) of maximum.

C.2 Columns and CHB Wall

1. Preparation of Equipment: All equipment for mixing and transporting concrete shall be clean. Debris shall be removed from spaces to be occupied by concrete. Forms shall be properly coated. Masonry filler units that will be in contact with concrete shall be well drenched. Reinforcement shall be thoroughly clean of deleterious coatings. All laitance and other unsound material shall be removed before additional concrete is placed against hardened concrete.
2. Mixing, Placing and Curing of Concrete: All concrete shall be mixed until there is uniform distribution of materials and shall be discharged completely before mixer is recharged. Curing shall be maintained above 10°C and in moist condition for at least the first 7 days after placement.
3. Formworks Design and Removal: Forms shall result in a final structure that conforms to shapes, lines, and dimensions of the members as required by the design drawings and specifications. It should be tight to prevent leakage of mortar, also it shall be properly braced or tied together to maintain position and shape. Forms shall be removed in such manner as not to impair safety and serviceability of the structure. All concrete to be exposed by form removal shall have sufficient strength not to damage thereby.
4. General Procedures: Placed CHB, steel reinforcements, concrete, ties and all other appurtenances as shown and as required to provide a complete and workable installation. Where steel reinforcement spacing details are shown, the reinforcement bars shall conform thereto and shall be placed as indicated; provided, that the reinforcement bars shall be complete and adequate regardless of whether or not these reinforcement bars are specifically shown.
5. Laying of CHB Wall: Excavated areas shall be in a reasonably dry condition when the reinforcement bars, concrete and CHB are laid. All inside spaces shall be filled with grout/mortar and shall encase fully the reinforcing steel. The minimum thickness for wall shall be 150 mm. The reinforcement shall be limited to a maximum spacing of 1200 mm on center. The minimum diameter shall be 10 mm. Horizontal reinforcement shall be provided in the top of the wall footing and at the top of the wall openings.
6. Column Fabrication: Excavated areas shall be the same as CHB wall laying. Shoring and scaffolding shall be undertaken properly and adequately so as to support or brace masonry units during construction and throughout the period of hardening its grout. Grouting shall be done in layers that will assure proper filling of all voids and keyed properly to prevent slippage of bond. The number of vertical reinforcement shall not be less than four (4), nor the diameter less than 10 mm. Lateral ties as shown shall enclose all longitudinal bars. Lateral ties shall be placed not less than 38 mm and not more than 125 mm from the surface of the column. Maximum tie spacing shall be 200 mm.
7. Reinforcement: At time concrete is placed steel reinforcements shall be free from coating that would destroy or reduce bond. Steel reinforcement shall be cut to its desired length as specified on the plan.
8. Testing: Testing of masonry materials shall be done by applicable government bodies or their authorized agencies, according to testing procedures and other relevant requirements needed for such tests. In the absence of the above, testing shall be done in accordance with ASTM C140-70, Method of Test for Concrete Masonry Units.

C.3 Backfill/Restoration

1. A newly laid CHB wall shall be backfilled at least 0.60 m to 0.80 m above the top of the footing at the end of each day with selected material obtained from the excavation. Materials used for backfill shall be selected, free from grass, roots, brush or other vegetation, or rocks having maximum dimensions larger than 150mm (6 in). If in opinion of the Engineer, said material is unsuitable for backfill purposes, borrow material having the sand equivalent value

of not less than twenty (20) (ASTM – D2419) shall be used for this portion of the trench backfill. Selected material shall first be brought up to mid – height of the column post and CHB wall's dimension below natural ground level and then compacted; then the remainder of the backfill to 150mm (6in) above the pipe maybe placed and compacted. Such material shall be compacted to ninety five percent (95%) of max. density where the trench is located under proposed structures and ninety percent (90%) of max. density elsewhere. Compaction shall be obtained by tamping it not more than 150mm (6in) layers or by using excess water and passing a concrete vibrator between the pipe and the side of the trench. Obtain and complete (IR) inspection request form prior to backfilling; the works may proceed upon approval of the Supervising Engineer. Remainder of the trench shall be backfilled not later than the following day.

Barricades and warning lights satisfactory to the Engineer shall be provided and maintain for all in which case of heavy steel plates, adequately braced bridges or other type of crossing capable of supporting vehicular traffic shall be furnished.

2. Concrete pavement shall be replaced with the same kind or better material in conformance with the latest specifications, rules and regulation, and subject to the inspection and approval of the agency having jurisdiction.

C.4 Sintra Signboard

The work calls for the performance to install sintra sign board,letterings and all miscellaneous items, but required for proper execution of the work. Materials to be applied shall be thoroughly clean, free from rust, free from any defect or scratches that might affect the quality of the items coated with primer.

The contractor shall verify all measurements in the field; submit shop drawings to the Engineer or owner's representative, showing sizes, details and method of installation. Installation work shall not commence until all shop drawings are approved.

C.5. Metal Louver Doors and Steel Gate:

Doors and gate shall be fabricated and of sizes indicated on the drawings and shall be of the quantity and workmanship acceptable to the Engineer. Louver blades shall be factory made. The contractor shall guarantee the finished doors against defects due to fabrication and installation, for a period of sixty days (60) after the final acceptance of the building. Before the fabrication of the doors, the surfaces shall be galvanized and shop painted with one coat of an approved rust-inhibitive synthetic epoxy primer.

M.1 Mechanical Works

1. *Exhaust Fan:* Use 1 set of exhaust fan with 75mm to 100mmø pvc pipe connector. Exhaust fan installation shall be in accordance to standards and specified drawing.

II. MATERIAL SPECIFICATIONS

A. Concrete Hollow Blocks

Size of concrete hollow blocks shall be 12.5cm (5") x 20cm x 40cm no deforms and dried as delivered.

B. Concrete

1. *Portland cement:* Cement shall conform to the Standard Specifications for READY MIXED CONCRETE, ASTM C-94 or on the Specification for Portland Cement, ASTM C 150 or PNS 07. An air-entraining admixture, conforming to ASTM C-260, shall be added to either Type I,

Type II or Type III Portland Cement. Mixture shall be 1:3:6 or as suggested by the Engineer depending on type of cement. Use 40 kg bag of cement.

2. Aggregates: All aggregates used for concreting shall conform to ASTM C 33 or PNS 18 and shall be checked daily for any variances in moisture current. Said variances shall be corrected and/or taken into consideration for each batch.
   a. Coarse Aggregates: Shall be uniformly and evenly graded for each application in accordance A.C.I. Standard 318. Unless otherwise approved, aggregate shall be sound, crushed, angular grantic stone. Smooth or rounded stone (river rock) shall not be acceptable.
   b. Fine Aggregates: Shall consist of natural sand, manufactured sand or a combination thereof.

3. Water: Water used in mixing concrete shall be clean and free from injurious amounts of oils, acids, alkalis, slats, organic materials, or other substances that may be deleterious to concrete or reinforcement.

C. Metal Reinforcement

Reinforcing bars may be galvanized or epoxy coated in accordance with Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement, ASTM A 767 or Specification for Epoxy-Coated Reinforcing Steel Bars ASTM A 775. Use minimum fy = 227 Mpa (grade 33).

D. Formworks:

4. Use ordinary plywood with dimension 4' x 8' x 1/2 "dried as delivered.
5. Use coco lumber size 2" x 2" x 12' and 2" x 3" x 12' free from deformation and pests that could destroy its quality.

E. Metal Louver Doors:

1. Frame: 18 gauge galvanized metal
2. Blades: 20 gauge Z-formed galvanized metal factory made
3. Hinges: 20mmØ x 60mm stainless steel
4. Jamb: 18 gauge galvanized metal
5. Paint: Epoxy primer and top coat
6. Barrel Bolt: 12mmØ galvanized steel and length is as specified

F. Table and Chair

(a) Table Dimension: 19.4in (W) x 30in (L) x 21-28in (H), Foldable
(b) Chair Dimension: 19.4in (W) x 22.4in (L) x 33in (H), Foldable

G. Board and Lettering Works

1. Board: Sintra
2. Letterings: Printed

H. Painting Works

1. Concrete: Latex paint for concrete wall.
2. Steel: Epoxy primer with epoxy paint gray top coat.

W. DISCHARGE PIPE SYSTEM

A. Galvanized Iron Pipes

1. **Pipe Description**: Pipes shall conform to the requirements of the ASTM A53/A53M or ASTM A120 and shall be Schedule 40.

2. **Pipe Construction**: The pipe shall be practically straight and both ends of the pipe shall be at right angle to the axis of the pipe. The inside and outside surfaces of the pipe shall be free from injurious defects. Unless otherwise specified, the length of the pipe shall be 6 meters. The tolerance shall be plus 6 meters without negative tolerance. Pipes shall be clearly marked with Trademark, Nominal Size, Length and Class of Pipe.

3. **Pipe Dimensions**: Pipe shall conform to the following dimensions and weights:

Nominal Pipe Size, in	2	3	4
Nominal Diameter, mm	50	75/80	100
Outside Diameter, mm	60.3	88.9	114.3
Tolerance (outside diameter)	±1%	±1%	±1%
Wall Thickness, mm	3.9	5.49	6.02
Tolerance (wall thickness)	-12.5%	-12.5%	-12.5%
Weight per meter, kg	5.00-5.43	10.3-11.3	14.5-16.1

4. **Pipe Thread**: The pipe threads shall be made according to "American Standard Pipe Taper Thread (NPT) with taper angle equal to 1°47'.

Nominal Pipe Size, in	2	3	4
Nominal Diameter, mm	50	75/80	100
Thread per inch	11 ½	11 ½	11 ½
Pitch, in	0.087	0.087	0.087

5. **Coatings**: Pipes shall be coated with zinc both inside and outside surfaces.

6. **Random Testing**: For every size, two (2) sample pipes representing each lot of one hundred (100) pieces or less shall be tested for compliance with this specification. Any visible defect or failure to meet the quality standards herein will be grounds for rejecting the entire order.

7. **Certification**: The manufacturer shall furnish a sworn statement that the inspection and metallurgical and pressure tests have been results thereof comply with the requirements of the applicable Standard(s) herein specified. A copy of the Certification shall be submitted to Calamba Water District.

B. Water Meter

1. ***Meter Description:*** The water meter shall conform to requirements of ISO 4064 part 1: Measurement of Water Flow in Closed Conduits-Meters for Cold Potable Water, subject to the following additional requirements.

   a. Meter shall be manufactured by a company with a minimum of 40 years experience in the manufacturing of water meters.

   b. Meter capacity and dimensions shall be:

Meter Size		75mm (3")	100mm (4")
Maximun Registration	m³	1,000,000	10,000,000
Maximum Water Temperature	°C	50	50
Maximum Working Pressure	bar	16	16
Starting Flow	m³/h	0.22-0.40	0.25-0.60
Maximum Flow rate	m³/h	80-170	120-300
Transitional Flow q_t ±2%	m³/h	1.4-8.0	2-12
Minimum Flow q_{min} ±5%	m³/h	0.8-1.2	1.5-1.8
Overall Length	mm	200-300	250-360
Weight	kg	14.1-15.5	19.0-19.4

c. The meter body (or casing) shall be brand new manufactured from cast iron, coated with polyester. Meter bodies shall be smoothly finished free from defects. Bodies which have been repaired are not acceptable. All coating shall be free from defects of any kind. Meter bodies shall have a common inlet-outlet axis and shall be suitable for horizontal installation.

d. Meter shall be factory tested and shall register in accordance with ISO 4064 standards. Any meter not meeting these standards will be subject to rejections.

2. **Register:** Register compartments shall be self-contained and hermetically sealed. Register compartments that rely upon a compressed gasket for the hermetical sealing and which can be opened to repair the gear train, shall include an approved desiccant capsule. Register reading shall be of straight reading in cubic meter.

3. **Pulse Output**: Register shall include electrical outputs with a range of electric output options. Pulser can be easily fitted on site without disturbing the calibration seal or interrupting the water supply. The pulser / electrical output shall be uni-directional designed to interface with almost all data loggers products, providing a pulse resolution in accord with the fitted position on the register.

Maximum Contact Voltage	24-28 V dc
Electrical Output/Pulse	Volume and Flow rate
Maximum Contact/Current	50 mA
Maximum Power	0.25w

4. **Dial Lens:** The lens covering the register dial shall be securely fastened to achieve hermetical sealing and shall be of clear tampered glass of 5mm minimum thickness (or of suitable synthetic polymer which shall of be of high impact, ultra violet stabilized polycarbonate resin film of clear transparency.). Dial lens shall be resistant to impact and abrasion. Impact resistance shall be taken as the capability to resists the impact of a 12mm diameter steel ball dropped from a height of one (1) meter without sustaining any evident damage. Abrasion resistance shall be taken as the capability to resist permanent scratch marks using a material not harder than Philippine one-peso coin. Meter dial lenses shall be held in place by a hinged lid or similar holding device of suitable synthetic polymer.

5. Register Box Ring (Bonnet) and Lid: Register box ring and lid shall be of the same material composition as the meter body or of suitable synthetic polymer.

6. Sealing: Each meter shall be supplied with 2.5mm diameter copper wire and other suitable type of seal system to discourage unauthorized opening or removal of the meter and also to indicate if such unauthorized act has been made. All elements of the sealing system, including length of wire, location of wire holes, etc., shall be suitable for covering all possible means of tampering, in particular, disturbance of the coupling nuts: of the accuracy adjustment device, if there is any: and of the register assembly. The seal shall be blank and suitable for sealing by a compression tool. The sealing elements shall be provided in such a way that after sealing, both before and after the water meter has correctly installed, there is no possibility of altering or dismantling the meter without damaging the sealing elements.

7. Steel-flange: The flange shall be cast iron and shall be furnished with bolts, nuts and gaskets. The flange bolt circle and boltholes shall match with the two (2) ends water meters.

8. Cable and/or Pulse Output Connector: The cable/ connector shall be adaptable to the CWD multi-log data logger.

9.Test Method and Equipment: The methods and means to be employed in determining the compliance of water meter shall be in accordance with ISO 4064/3. (Test methods and equipment)

a. Initial Accuracy test
b. Pressure Tightness Test
c. Head Loss Test
d. Accelerated Endurance Test
e. Metallurgical Test
f. Final Accuracy test

10. Warranty: The manufacturer also guarantees that replacements, (whole meter), replacement parts and service shall be made available within thirty (30) calendar days from notice during a period of at least five (5) years from date of acceptance.

11. Certification: The manufacturer shall furnish a sworn statement that the inspection and all of the specified tests have been results thereof comply with the requirements of the applicable Standard(s). A copy of the Certification shall be submitted to Calamba Water District including laboratory test of accuracy from a reliable local laboratory such as in Maynilad / Manila Water.

12. Equivalency of Standards and Codes: Wherever reference is made in the Technical Specifications to specific standards and codes to be met by the goods and materials to be furnished or tested, the provisions of the latest edition or revision of the relevant standards and codes shall apply, unless otherwise expressly stated in the Contract. Where such standards and codes are national or relate to a particular country or region, other authoritative standards that ensure substantial equivalence to the standards and codes specified will be acceptable.

Bidders are also required, as part of the technical specifications, to complete their statement of compliance demonstrating how the items comply with the specification.

C. Cast Iron Fittings

Cast iron fitting shall conform to the requirements of AWWA C110 (AMERICAN STANDARD FOR CAST IRON AND DUCTILE IRON FITTINGS, 2-IN THROUGH 48-IN., FOR WATER AND OTHER LIQUIDS) or ISO R13 (CAST IRON PIPES, SPECIAL CASTING AND CAST IRON PARTS FOR PRESSURE MAINLINES).

a. Fittings are manufactured of ductile iron grade 70-50-05 (minimum tensile strength: 70,000psi; minimum yield strength: 50,000; minimum elongation: 5%) as specified in AWWA C110 or C153.

b. Fittings shall be furnished with mechanical or flanged joints.
   i. Mechanical Joints: All mechanical joint fittings will be Bell and Bell unless otherwise specified. Mechanical joint fittings shall be rated for 350 psi working pressure for sizes 4" – 24".

   ii. Flanges: All flanges are plain without projections and are furnished smooth or with shallow serrations. The flanges shall conform to ISO 7005 – 2. Flanged fittings shall be rated for 250 psi working pressure for sizes 4" – 64".

   iii. Bolts, Studs and Nuts: Bolts are hex head machine bolts with regular or heavy hex nuts as specified. Studs with one hex nut each are required for tapped flanges. Bolts, studs and nuts are low-carbon steel per ASTM A307 Grade B; threads are ANSI B1.1 Coarse Thread Series, Class 2A external and Class 2B internal. Recommended studs are the same length as corresponding bolt length with "tap end" threaded approximately the same length as flange thickness.

c. All fittings shall be epoxy coated internally and externally in accordance to AWWA C116 (PROTECTIVE FUSION-BONDED EPOXY COATINGS FOR THE INTERIOR AND EXTERIOR SURFACES OF DUCTILE-IRON AND GRAY-IRON FITTINGS FOR WATER SUPPLY SERVICE).

D. Gate Valves

All valves shall conform to the AWWA Specifications C509 (STANDARD FOR RESILIENT SEATED GATE VALVES). Component parts are constructed of heavy, rugged proportions for extra strength to withstand pipe strain and possible shifting in underground service. Gate valves shall be designed for minimum water working pressure of 1.0 MPa (150 psi).

a. The body shall be cast iron.

b. The gate valve shall be flanged and mechanical joint. Flanges and drilling shall conform to ISO 7005 – 2.

c. All the resilient gate valves have a full bore with same nominal diameter as the pipeline. The full bore ensures minimum pressure loss, as the valve does not cause any reduction in the flow path, other great advantages are that the full bore allows drilling and facilitates pipe pigging to ensure high quality potable water.

d. The ductile iron core is full vulcanized with EPDM rubber internally and externally. No iron parts are exposed to the medium and the excellent rubber vulcanization prevents creeping corrosion underneath the rubber.

e. The fixed integral wedge nut reduces the number of moveable valve parts and risk of malfunction.

f. The valve shall be non-rising stem with a minimum two "O" ring seals (at least one above the stem collar).

g. The valve shall have 50mm (2 in) square operating nut with cast arrow showing direction in which the nut is to be turned open the valve.