CALAMBA WATER DISTRICT
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24/7 Public Service
PAB ACCREDITED QMS CERTIFICATION BODY
MSA-008
PHP QMS 21 93 0047

SCOPE OF WORKS AND SPECIFICATIONS

PROJECT : **Supply of Labor and Materials for the Rehabilitation of CWD Building Electrical Load Schedule with Single Line Diagram**

LOCATION : **Lakeview Subdivision, Brgy. Halang, Calamba, Laguna**

DATE : **October 4, 2023**

I. General

All works shall be in accordance with the governing codes and regulations of the latest edition of the Philippine Electrical Code, with the rules and regulations of the National and Local Authorities concerned in enforcement of electrical laws and ordinance and with the rules and regulation of the utility companies concerned.

Contractor shall furnish all labor, equipment and materials as approved by the owner or his/her representative and shall perform all operations with electrical system shown in the drawings, their test and inspection complete in accordance with specifications and drawings and subject to terms and conditions of the contract and materials to bring the electrical system to operating condition and ready for use by the owner.

Electrical works shall be under the full supervision of a duly licensed and registered electrical engineer. Failure to do so shall mean a non-compliance to the drawings, bill of quantities and specifications.

Submit and secure approval by the Engineer or by duly authorized representative of the Calamba Water District (CWD) before, fabrication or delivery or installation of items to the jobsite. Submittal shall include the sample, manufacture's name, trade name, place of manufacture, catalog model or number, nameplate data, size, layout dimensions, ratings and capacity.

All work activities should be done from 6 PM to 6 AM only. This is not to hinder the normal business or office hours. This includes cleaning and removal of unnecessary items that may affect the usual office works.

Estimated duration of project to be finished is 180 calendar days. If there are unforeseen circumstances for the electrical rehabilitation project, notify the Engineer or representative of CWD-TSD.

II. Panelboard / Indoor Circuit Breakers

Main Panelboard power supply will be 230 V +/- 10%, 60 Hz, three phases, three wires. Unless otherwise specified in the single line diagram, the Panel Boards shall be designed and tested to withstand a prospective symmetrical fault level of 65 kA rms for one second.

Panel Board shall conform to UL 50 and UL 67. Custom built Panel boards as detailed in drawing shall be NEMA 4/1 Enclosure, free standing, 3 pole for Main Panelboard and 2 pole for other panels. All panels shall be finished in light gray enamel (ANSI #61) over a rush inhibitor. Where "space only" is indicated, make provisions for the future installation of a breaker sized as indicated. Provide a separate ground bus marked with white stripe along its front and bonded to the steel cabinet for connecting grounding conductors.

Panels and cabinets shall be fabricated by reputable fabricators as approved by CWD. The contractor shall provide shop drawings before fabrication and must have an approval from the engineer-in-charge. Bus ampacities shall be 1.25 A/mm2 or 800 A/in2 for copper bus bars to be shown in the shop drawings.

Enclosure shall be fabricated from first quality sheet steel and shall not be less than 2.5 mm in thickness. The framework shall be constructed from folded sheet steel or structural sections and shall provide satisfactory strength and rigidity and shall not depend on the control units which it houses for this support or rigidity.

Panelboard shall be totally enclosed and adequately sealed to prevent the ingress of dust, water and fire.

No hygroscopic insulating material shall be used.

Captive screws shall be used where there is a risk of objects falling into inaccessible or live areas during normal maintenance. In particular, attention should be given to terminal screw.

The main incomer circuit breaker shall have a certified breaking capacity of 65 kA rms, unless otherwise specified on the Panelboard Equipment data sheets. The circuit breaker shall be of the horizontal fix type and shall be fitted with safety shutters. Means shall be provided for padlocking the shutters and circuit breaker in the isolated position. The circuit breaker shall not be padlock able in the "On" position.

The branch circuit breakers shall be heavy duty, bolt-on and load break type (industrial type), capable of interrupting, without damage, the fault rating of the system.

Circuit breaker shall be on of approved top brands on the market today. Circuit breaker comply with Underwriters Laboratories (UL) standards as follows; UL 489, "Molded Case Circuit Breakers, Molded Case Circuit Switches and Molded Case Enclosures", UL 1699, "Arc Circuit Fault Circuit Interrupters",

and UL 1998 "Software in Programmable Components". Submit UL Certificate of Compliance for Approval. Use only one brand of circuit breaker.

III. Wires

Wires and cables for lighting, power and auxiliary systems shall be nylon, jacketed, plastic insulated for 600 volts working pressure, type THHN/THWN-2 unless otherwise noted. Cables shall be of approved top brands in the market today. Cables shall comply with Underwriter's Laboratories (UL) standards as follows; UL 83 "Thermoplastic Insulated Wires and Cables (THHN/THWN-2)"; UL 758 "Appliance Wiring Materials (AWM)"; UL 1063 "Machine Tool Wire (MTW) (stranded conductors only)'; and PNS 35 "Thermoplastic Insulated Copper Wires and Cables 600 Volts". Submit UL Certificate of Compliance for approval.

All feeder cables/wires shall be color coded. Color coding or wires are as follows:
Line A – Red
Line B – Yellow
Line C – Blue
Ground wire – Green

All connections of cables/wires to terminals of circuit breakers shall use electro-tin-plated copper terminals lugs. Sizes of terminal lugs depend on circuit breakers.

IV. Conduits

µPVC nonmetallic conduit pipe, junction box, utility box and fittings embedded in concrete slabs, concrete wall and partitions shall be high-impact. µPVC nonmetallic conduit shall be of approved top brands in the market today and shall follow these specifications: Impact Strength of 80 Joules, Tensile Strength of 55 MPa, Flattening of NO BREAKING at 100% and Vicat softening temperature, °C, min. of 85.5 °C min.

All metallic (RSC) conduits, cabinets and equipment shall be properly grounded and bonded by means of copper straps. The conduits of each system shall be grounded by connecting to the ground. Ground rod shall be of approved top brands in the market today.

Painting (light gray enamel) of all exposed metallic electrical conduits, enclosures and equipment.

V. Grounding System

Ground rod shall be copper clad steel sectional type ground rod at least 19mmØ and 3000mm in length or as indicated in the plan. The rod shall have a hard continuous clean smooth surface throughout the length of the rod.

VI. Testing and Commissioning

The testing and commissioning required by this specification shall be the responsibility of the contractor. These requirements reflect only the minimum standards and procedures to be followed before electrical facilities to be turned over to or as being mechanically complete. It shall be the responsibility of the contractor to make any additional test or commissioning checks necessary to provide a safe, reliable and functionally sound electrical installation.

Contractor shall obtain CWD approval to apply alternative testing methods from what is described in this specification.

All test equipment shall be provided by the contractor and subject to review by the CWD-TSD. Test equipment's to be used by the contractor shall comply with the following requirements for accuracy, calibration and suitability for the intended testing.

a. 500-volt mega ohm tester
b. AC ammeter with 0-15/30A range with 5% accuracy
c. AC voltmeter with 0-150/300/750 volt ranges and 1000 ohm per volt sensitivity
d. Volt-ohm-mili ampere meter with multiple ranges, 1000 ohms per volt AC and 20,000 ohms per volt DC
e. Phase sequence meter
f. Ground testing meter, direct reading, Earth resistance tester or equal

CWD shall witness all the tests and shall be notified 3 working days in advance of the tests.

Prior to electrical testing, contractor shall take all the necessary safety precautions such as issuing notices of intended testing, posting safety signs, barriers, and ensuring that the necessary lockout and tag procedures are followed. In addition to the above, person in charge of the testing shall be completely familiar with the vendor or the supplier's instructions.

Test values shall exceed or be equal to the minimum values specified in this specification or specified by the vendor/supplier. In the absence of specific data and subject to CWD approval, other acceptable standards may be substituted to determine the acceptability of the test results.

CWD shall be advised immediately when equipment and facilities fail to meet established testing standards or intended function during testing and inspection. Equipment or material that fails due to improper installation or handling shall be replaced. Replacement equipment or material shall be new and identical to the replaced equipment. No additional cable splices shall be allowed.

The specific commissioning requirements, including the commissioning team and the necessary procedures for assuring the operability and proper functioning of the various systems and equipment shall be developed by the contractor and to be submitted for approval.

Short time insulation measurements shall be made with Mega ohm testers (Megger). Resistance measurements shall be recorded after sixty (60) seconds of the applied voltage. Equipment rated from 1000V or less shall be tested at 500V.

Check cable sizes against applicable drawings and check for proper color coding for compliance with job specifications.

Before being connected to equipment, installed wire and cable having all splices, potheads, stress cones, and metallic insulation shielding complete shall be checked in accordance with the following requirements:

a. Test for continuity of all conductors, where applicable, continuity of metallic insulation shielding (if any) to ground.

b. Insulation test on each conductor rated 600V or less; Measurements shall be made between each phase conductor and between each phase conductor and ground. The conductor shall be tested with a 500V megger. Insulation resistance for satisfactory power installations shall not be lower than the values given by the formula; Minimum insulation resistance = [(Cable Voltage Rating) / 1000) + 1 Mega ohm] x 10.

Maximum test voltage shall be 80 percent of the factory test voltage.

Contractor shall perform the following ground inspection and tests;

a. Ground potential survey to be performed, total ground grid integrity measured and equipment grounding to be verified.

b. Check and tighten all hardware connections. The maximum allowed resistance for each ground rod and a test ground rod shall not exceed 25 ohms for the individual rod. If the resistance is greater than 25 ohms, the ground rod shall be removed, re-cleaned, re-installed, and retested.

c. The loop ground system shall be tested. The resistance to ground of the total system loop with all ground rods connected and equipment grounding disconnected shall be less than one (1) ohm. If necessary, additional ground rods shall be added to achieve total ground potential of one (1) ohm or less.

d. All work prior to start of installation shall be accompanied by the inspection report and approved by the engineer-in-charge in the project execution.

Test Report Forms shall be submitted by the contractor for approval.

VII. Hauling of Wastes and Demolished Materials

The old (existing) panel boards, cables/wires and conduits should be removed by the contractor after the new installed items. These items should be turnover to CWD. The affected areas like walls for plastering and painting and other works to be done due to removal of the said items.

Rectification of service entrance post going to the main panel board shall be included in the works of the contractor. Any other miscellaneous activities pertaining to the said activity shall also be done by the contractor.

It also includes housekeeping and cleaning / removal of excess and unnecessary materials.

VIII. Submission of As-Built Drawings (Schedule of Loads and Single Line Diagram)

After the completion of electrical work activities, the contractor must submit as-built drawings duly signed by a Professional Electrical Engineer.

Prepared by:

10/06/23

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10/6/23

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