Amend **Section 622 - Roadway Lighting System** to read as follows:

"SECTION 622 - ROADWAY LIGHTING SYSTEM

622.01 Description. This work includes furnishing and installing a roadway lighting system according to the contract.

This work includes furnishing and installing electrical conductors and conduits, fittings, pullboxes, and other materials necessary to maintain the existing roadway lighting system.

Furnish and install the incidental parts necessary to complete the roadway lighting.

Electrical equipment shall conform to the NEMA Standards. Material and workmanship shall conform to the latest requirements of the "National Electrical Code," herein referred as the Code; General Order Nos. 6 and 10, of the Hawaii Public Utilities Commission; the standards of the ASTM; the ANSI; Local Joint Pole Agreement; local power company rules; and local ordinances that may apply.

622.02 Materials. Materials shall conform to the following:

Pullboxes	712.06(B)
Conduits	712.27
Disconnect and Protective Devices	712.35

Concrete shall conform to Section 601 - Structural Concrete and shall be Class B.

Materials will be subject to inspection. Failure of the Engineer to note faulty material or workmanship during construction will not relieve the responsibility of the Contractor for removing or replacing such materials and redoing the work at no cost to the State.

622.03 Construction Requirements.

(A) Equipment List and Drawings. Within 10 days following the award of the contract, the Contractor shall submit to the Engineer for acceptance 6 copies of a list of materials and equipment that the Contractor will incorporate in the work. The list shall include the name of the manufacturer, size and catalog number of the unit, detailed scale drawings and wiring diagrams of special equipment, and proposed

deviations from the contract. If required, submit for acceptance samples of the material that the Contractor will use at no cost to the State.

Upon completion of the work, submit an 'As Built' plan showing in detail construction changes.

(B) Excavation and Backfill. Excavation and backfill shall conform to Section 206 - Excavation and Backfill for Conduits and Structures.

Excavate carefully to prevent damage to pavements, sidewalks, and other improvements. Contractor shall repair all damages to the original condition at no cost to the State.

(C) Installation.

(5) Circuits. Encase the cables installed underground in conduits or other accepted encasement.

Before installing the wires and cables in conduits, pull a wire brush, swab and mandrel through each conduit for the removal of extraneous matter and verification of the absence of obstructions and debris from the conduit system.

Pull the cables directly from their cores or reels into the conduits. Do not pull off and lay the cable on the ground before installation. Make the pulls in one direction only. Lubricants used shall be as recommended by the cable manufacturer or accepted by the Engineer.

Do not leave wires or cables under tension nor tight against bushings or fittings. Remove damaged ends resulting from the use of pulling grips soon after pulling the cable. Maintain the cable end seals. Do not pull open ended cables through the conduits. Cables shall be continuous from pulling point to pulling point. The Engineer will not permit splices from pulling point to pulling point. Make splices, taps and terminations with pressure-indented connectors or lugs as appropriate or specified in the contract.

When requiring splicing, join the conductors by a 'western union' type splice or by using an accepted connector. Use the connectors for splicing conductors, No. 8 AWG or larger. Solder the "western union" type splice by the pouring or dipping method. Cable splices and termination shall be according to the cable manufacturer's recommendation. Submit the cable manufacturer's splicing instruction sheets for acceptance.

Trim the conductor insulation to a conical shape. Roughen the conductor insulation before applying splice insulation. Splice insulation includes layers of thermoplastic electrical insulating tape not over 0.007 inches thick conforming to Federal Specification MIL-I-7798. Apply the splice insulation a thickness equal to and well lapped over the original insulation. For high voltage and multiple lighting conductor splices, apply two layers of synthetic oil resistant rubber tape conforming to ASTM D 119 over each conductor before placing the thermoplastic tape. Then cover the splice well with at least two layers of asphaltic impregnated open mesh fabric tape and a coating of high grade insulating paint or similar material. Leave at least two feet of slack for each conductor at each splice.

Coil at least five feet of slack neatly near each lamp post foundation at both ends of each cable run.

(6) Secondary Connections. Make the connections from the secondary power supply line to fuse kits with copper cable to match the existing secondary cable material. Sizes shall be as specified in the contract.

(7) Bonding and Grounding. Secure the metallic cable sheaths, conduits and lamp posts mechanically and electrically to form a continuous system. Ground them effectively as specified in the Code and in the contract.

(8) Pullboxes. Install pullboxes at the locations shown in the contract.

Install pullboxes so that the covers are level with the curb or sidewalk grade or one inch above the existing ground.

(9) Conduits. Lay the polyvinyl chloride (PVC) conduits carefully in trenches prepared to receive the conduits. Conduits under roadway areas and driveways shall be concrete encased PVC, Schedule 40 or shown in the contract.

Lay the conduit that will be placed in concrete structure or encased in concrete to the required lines and grades. Support the conduit rigidly in place by masonry material, manufactured conduit spacers, or other accepted means. Wire the conduit so that the Contractor will not dislodge the conduit during the placing and tamping of the concrete. The thickness of the concrete around the conduits shall be shown in the contract. Use only hand shovels in compacting the concrete. Cure the concrete jackets to least 50% strength before permitting vehicular traffic.

Install rigid PVC conduit according to Article 347 of the Code. PVC conduit connections shall be of the solvent-weld type. Make solvent-weld joints according to the conduit manufacturer's recommendations and as accepted by the Engineer. The Engineer will permit pre-assemblying sections of conduit.

Make directional changes in non-metallic conduit runs such as bends and changes to clear obstructions with curved segments using accepted deflection couplings or with short lengths of straight ducts and couplings. The deflection angle between two adjacent lengths of duct shall not exceed 6^{O} and the bends shall not have a radius of less than 12 times the nominal size of the conduit unless using factory-made ells.

Thread the fittings for connecting non-metallic conduits to rigid metal conduits on the side that will be connected to the metal conduit. Metal conduits entering pullboxes shall end in insulating grounding bushings. Non-metallic conduits shall end in end bells.

Cap or plug and mark the ends of conduits shown or specified. Provide each conduit run with a No. 10 gage flexible zinc-coated pull wire or one-eight inch polyolefin line extending uninterrupted through handholes for the entire length of run. Double an additional two feet of wire or polyolefin line back into the conduit at both ends of the run.

Ends of conduit runs shall extend at least 24 inches past the face of curb or edge of pavement, unless the ends end in pullboxes. Locate the ends accurately by special markers, markings on curbs or as specified by the Engineer.

Keep the interior of conduits clean during the construction. Plug the ends of conduits temporarily to keep the ends clear during construction. Install the conduits to drain toward a pullbox. The Contractor may consider a single run to drain toward both ends.

(E) Electric Service. During relocation, reconstruction or other improvements of existing roadway lighting facilities, keep the existing roadway lighting system operational in its entirety during hours of darkness. Schedule the work accordingly and provide a temporary lighting system if necessary, to keep the project area illuminated during the hours of darkness.

(F) Field Test. Before acceptance of the work, make the following tests on lighting circuits, in the presence of the Engineer.

(1) Test for continuity of each circuit.

(2) Test for grounds in each circuit.

(3) A megger test on each circuit between the circuit and round. The insulation resistance shall not be less than the values specified in Table 622-I when measured with an instrument having a voltage rating of 500 volts.

TABLE 622-I - INSULATION RESISTANCE

Cable or Circuit	Minimum Resistance (ohms)
No.14 - No.12 wire	1,000,000
25 to 50 amperes	250,000
51 to 100 amperes	100,000
101 to 200 amperes	50,000
201 to 400 amperes	25,000
401 to 800 amperes	12,000
over 800 amperes	5,000

(4) A functional test to show that each part of the system functions according to the contract.

Correct the faults in the material or the installation revealed by these tests at no cost to the State. Repeat the tests until no fault appears.

(G) Salvaging Electrical Equipment. The contract directs the Contractor to Section 202 - Removal of Structures and Obstructions, regarding existing highway facilities. When shown in the contract or specified by the Engineer, remove and salvage the existing electrical equipment including luminaires, standards, mast arms, ballasts, transformers, cabling, and pullboxes, otherwise the existing electrical equipment shall become the property of the Contractor and the Contractor shall remove and dispose of the existing electrical equipment at no cost to the State.

Underground conduits and foundations not reused in the work shall be abandoned in place.

Do not salvage and stockpile the removed equipment at the work site. Remove at the end of each work day.

622.04 Method of Measurement. The Engineer will measure the adjustment of street light pole base per each.

622.05 Basis of Payment.

The Engineer will pay for the accepted adjusted street light pole base at the contract unit price per each complete in place. The price includes full compensation for adjusting the pole base, excavating and backfilling; restoring sidewalks, pavements and appurtenances damaged or destroyed during construction; and furnishing equipments, tools, labor, materials and other incidentals necessary to complete the work.

The Engineer will consider additional materials and labor, needed to complete the installation of the system and not shown in the contract as included in the bid price of the various contract items.

The Engineer will consider additional materials and labor needed to implement temporary lighting systems as incidental to the bid price of the various contract items.

The Engineer will make payment under:

Pay Item	**Pay Unit**
Adjust Street Light Pole Base	Each"

END OF SECTION