SECTION 623 - TRAFFIC SIGNAL SYSTEM

623.01 Description. This work includes furnishing labors, materials, tools, machinery and equipment necessary to install and construct an operating traffic signal system complete in place according to the contract. *|

The traffic signal system includes:

(1) installing the electrical service and metering facilities and paying for the electric company's charges;

(2) trenching, structural excavating, backfilling, restoring work, and installing pullboxes;

(3) Providing a complete and operating traffic signal system with:

(a) controller,

(b) cabinet,

(c) auxiliary and support equipment,

(d) vehicle detectors,

(e) signal standards,

(f) traffic signals and appurtenances,

(g) signal head mounting,

(h) concrete foundations,

(i) cables,

(j) wiring,

(k) cleaning and adjusting signal heads,

(l) painting and

(m) restoration work.

(4) Coordinating work and arranging for inspection of work with the Engineer and other agencies as required.

(5) Turning over to the Department a complete and operating traffic signal system according to the contract. *|

The Contractor shall furnish and install the incidental parts that the contract does not show and that are necessary to complete the traffic signal system as though such parts were in the contract. *|

Electrical equipment shall conform to the NEMA Standards and this contract. Material and workmanship shall conform to the "National Electric Code", (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. *|

The following definitions apply:

(1) **Actuation** - The operation of types of detector.

(2) **Clearance Interval** - The length of time of display of the signal indication following the right-of-way interval.

(3) **Detector for Traffic Actuation** - A device that pedestrians or vehicles can register their presence with a traffic-actuated controller. *|

(4) **Extendible Portion** - That part of the green interval that follows the initial portion. *|

(5) **Extension Limit** - The maximum time that a traffic phase may retain the right-of-way after actuation on another traffic phase, after timimg out the initial portion. *|

(6) **Flashing Feature** - That feature incorporated to stop normal signal operation and cause the flashing of any predetermined combination of signal lights. *|

(7) **Initial Portion** - That part of the green interval that is timed-out or separately controlled by a traffic-actuated controller before the extendible portion of the interval takes effect.

(8) **Interval** - Several divisions of the time cycle during which signal indications do not change. *|

(9) **Interval Sequence** - The order of appearance of the signal indications during successive intervals of a time cycle.

(10) **Magnetic Vehicle Detector** - A detector actuated by the movement of a vehicle passing through its magnetic field.

(11) **Major Street** - The roadway approach or approaches at an intersection normally carrying the greater volume of vehicular traffic.

(12) **Manual Operation** - The operation of a signal controller by a hand-operated switch. *|

(13) **Minimum Period** - In semi-traffic-actuated controllers, the shortest time for which the right-of-way will be given to the approaches not having detectors.

(14) **Minor Movement Interval** - An auxiliary phase added to a controller phase (parent phase) and modified by an auxiliary movement controller.

(15) **Minor Street** - The roadway approach or approaches at an intersection normally carrying the smaller volume of vehicular traffic.

(16) **Non-Parent Phase** - A controller phase not modified by an auxiliary control unit. *|

(17) **Parent Phase** - A controller phase modified by an auxiliary control unit. *|

(18) **Passage Period** - The time allowed for a vehicle to travel at a selected speed from the detector to the nearest point of conflicting traffic.

(19) **Pedestrian Detector** - A detector, usually of the push-button type, installed near the roadway and operated by hand.

(20) **Pressure-Sensitive Vehicle Detector** - A detector installed in the roadway, actuated by the pressure of a vehicle passing over its surface.

(21) **Pre-Timed Controller** - An automatic control device for supervising the operation of traffic control signals according to a pre-timed cycle and divisions. *|

(22) **Recall Switch** - A manually operated switch in an actuated controller to provide for the automatic return of the right-of-way to a street.

(23) **Right-of-Way** - The privilege of the immediate use of the highway.

(24) **Signal Indication** - The illumination of a traffic signal lens or equivalent device, or of a combination of several lenses or equivalent devices.

(25) **Time Cycle** - The number of seconds required for one complete revolution of the timing dial or complete sequence of signal indications.

(26) **Traffic-Actuated Controller** - A digital control device for supervising the operation of traffic control signals according to the varying demands of traffic as registered with the controller by loop detectors or pedestrian push buttons. *|

(27) **Traffic Phase** - A part of the cycle allocated to traffic movements receiving the right-of-way or to combinations of traffic movements receiving the right-of-way simultaneously during one or more intervals.

(28) **Unit Extension** - The minimum time, during the extendible portion, for which the right-of-way must remain on traffic phases following an actuation on that phase, subject to the extension limit.

623.02 Materials. Concrete shall conform to Section 601 - Structural Concrete.

Reinforcing steel shall conform to Section 602 - Reinforcing Steel.

Steel plate covers and anchor bolts shall conform to ASTM A 36 and A 307 respectively. The Contractor shall zinc-coat the anchor bolts if exposed. *

Other materials shall conform to the following:

Dark Green Enamel Paint	708.03
Paint Thinner	708.04
Pullboxes	712.06(B)
Conduits	712.27
Conductors and Cables for Traffic Signal System	712.34(B)
Controller Equipment	712.37
Traffic Signal Standards	712.38
Traffic Signals and Appurtenances	712.39
Epoxy Sealer	712.54
Hot Applied Rubberized Sealant	712.58

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

The Engineer may make inspection or sampling of certain materials at the factory or warehouse before delivery to the work site, when required. *

623.03 Construction Requirements.

(A) Equipment List and Drawings. Within ten (10) days following notification of award of the contract, the Contractor shall submit to the Engineer for acceptance six (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, dimensions and catalog number of the materials and equipment, detailed scale drawings and wiring diagrams of special equipment, and proposed deviations from the contract. If required, the Contractor shall submit for acceptance samples of the materials that the Contractor will use. *

Upon completion of the work, the Contractor shall submit an "As Built" or corrected plan showing in detail the construction changes. |

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

The Contractor shall do the necessary excavation to modify an existing traffic signal system to prevent damage to pavements, sidewalks and other improvements. The Contractor shall place the material from the excavation to prevent damage and obstruction to vehicular and pedestrian traffic and interference with surface drainage. *|

(C) Installation.

(1) Standards. The Contractor shall install each traffic signal and controller standard with its shaft precisely vertical on a concrete foundation. *|

Locations of standards shown in the contract are approximate. The Engineer will decide the exact locations in the field. | *|

(2) Signal Heads. The Contractor shall assemble the signal heads to give the signal arrangement shown in the contract. The Contractor shall plumb or level the members, arrange the members symmetrically, and assemble the members securely. Installation shall be such that the Contractor conceals the conductors within the standards and mounting assemblies as much as possible. *|

The Contractor shall not install signal heads at the intersections until the other signal equipments, including the controller, are in place and ready for operation at that intersection. The Contractor may mount the signal heads if the Contractor covers the faces or does not direct the faces toward traffic. *|

Before final acceptance of the traffic signal system, the Contractor shall adjust the direction of signal heads as ordered. *|

(3) Controller and Cabinet. The Contractor shall mount the controller cabinet according to the contract. The Contractor shall assemble, wire, and house the controller and auxiliary equipment specified in the cabinet. *|

(4) Vehicle Detectors. Vehicle detectors shall be inductive loop detectors installed according to details shown in the contract. The saw cut groove shall be air blown to remove debris before the Contractor inserts the loop cable. The loop cable shall be continuous within the roadway. The Contractor shall splice in the pullbox. The Contractor shall fill the saw cut groove with epoxy sealer or hot applied rubberized sealant. As accepted by the *|

Engineer, the Contractor may use a sealant designed for use as a protective seal for traffic inductive loop detectors installed in asphalt concrete or concrete pavements.

(5) Traffic Signal Standard and Controller Foundations and Pullboxes. The Contractor shall construct the foundations and boxes required carefully at the locations designated. The Contractor shall pour the foundations and boxes in areas that the Contractor have carefully excavated to receive the foundations and boxes. The Contractor shall construct each unit as detailed in the contract and connect each unit properly with the facilities of which each unit is a component part.

The Contractor shall mix, place, and cure the concrete according to Section 601 - Structural Concrete, and Section 503 - - Concrete Structures. The Engineer will allow hand mixing.

The Contractor shall set the anchor bolts for the foundations to fit the bases of the standards that the Contractor will install.

The Contractor shall give pullbox frames and covers two (2) coats of asphaltic base paint after installation.

(6) Conduits. Conduits shall be direct burial shown in the contract. Conduits under paved areas subject to vehicular traffic shall be PVC Schedule 80.

The Contractor shall install the ducts to drain towards either one or both pullboxes, manholes, or signal standard foundation.

The Contractor shall make directional changes in conduits, 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 (2) adjacent lengths of ducts shall not exceed six (6) degrees. The bends shall not have a radius of less than twelve (12) times the nominal size of the conduit. The Contractor may use factory-made ells.

The Contractor shall cut the rigid PVC conduits with a hacksaw. The Contractor shall square and trim the ends after cutting to the remove rough edges. The connections shall be of the solvent weld type. The Contractor shall make the solvent weld joints according to the conduit manufacturer's recommendations and as accepted.

The Contractor shall use the rigid PVC conduit for drilling or jacking.

The Contractor shall thread the PVC fittings for connecting PVC conduit to rigid metal conduit on the metal conduit side.