89 FURNISH AND INSTALL LED UNDERPASS LUMINAIRE: ITEM 618 986

This S.P. supplements 618 and 621 of the DC Standard Specifications.

(A) DESCRIPTION

The Contractor shall furnish and install underpass luminaires at locations shown on the Contract Drawings. This work shall include the development of mounting details for each luminaire. The intent is to attach the luminaires to the existing bridge girders at Benning Road, to the enclosure around the boardwalk at the Amtrak Bridge, and to the existing bridge abutment at New York Avenue.

(B) MATERIALS

The totally enclosed, weather-resistant luminaire shall operate LED lamps with wattage as specified on the Contract Drawings. The luminaire shall be UL listed Suitable for Wet Locations as a down light. LED color temperature shall be 4000 Kelvin, and lumen output shall be a minimum of 2750 Lumens. The LED shall deliver 70 percent of initial lumens at 50,000 hours of operation. The luminaire shall have IESNA full cutoff, fully shielded optics.

The driver shall be a multi-chip, high-output, long-life LED driver with constant current, class II, 120-240V operating voltage, 50/60Hz, 350mA drive current. The luminaire shall come standard with a cast aluminum thermal management system for optimal heat sinking.

The luminaire shall have a polycarbonate, one-piece, vandal resistant door for use in non-supervised locations.

The luminaire shall include a precision die-cast aluminum housing and lens frame. A junction box shall be provided with the fixture. The luminaire shall be mounted using manufacturer's recommendations. The Contractor must submit and the District must approve catalog cuts from individual vendors before procurement of the luminaires is undertaken (4 copies).

Photometric calculations shall be provided with the catalog cuts for the underpass luminaires verifying that the illumination meets DDOT requirements. To be acceptable, the average maintained illuminance shall be 2.0 foot-candles with an average-to-minimum uniformity ratio no greater than 3 to 1. A 0.70 light loss factor shall be used in the calculations. Calculations shall be provided for a grid with 2 ft. by 2 ft. spacing along the path at each underpass to be illuminated.

The Contractor must submit shop drawings of the mounting detail to be used at each underpass luminaire location. Shop drawings shall show types, sizes, accessories, layouts, elevations and sectional views, component, assembly and installation details, and all other information required to illustrate how the luminaires will be mounted. They shall be accompanied by calculations or other sufficient information to provide a comprehensive

description of the modifications to the existing or proposed structures that are required to mount the luminaires. Shop drawings and calculations as submitted shall be sealed, dated and signed by a Professional Engineer registered in the District of Columbia.

(C) CONSTRUCTION METHOD

The luminaire mounting means shall comply with the luminaire manufacturer's installation guide. The installation of liquid tight conduit to the luminaire, if needed, shall be done using fittings approved for that type of installation. The wire connecting the fixture to the junction box shall be included as part of the fixture installation. The Contractor shall make sure that after making all wire connections that the optical assembly is properly installed and screws are properly tightened.

(D) MEASURE AND PAYMENT

The unit of measure for furnish and install LED underpass luminaire will be per each. Payment will be made at the contract unit price per each luminaire installed and fully operational and will include the luminaire and drivers, mounting hardware, wiring, catalog cuts, photometric calculations, shop drawings, and all labor, equipment, materials and all incidentals necessary to complete the work. The cost for the ½ inch liquid-tight conduit, fittings and all wires from the fixture to the junction box shall be a part of supplying and installing the fixture.

90 FURNISH AND INSTALL STREETLIGHT CIRCUIT CONTROL CABINET AND CONTROLLER: ITEM 618 987

This S.P. supplements 618 and 621 of the DC Standard Specifications.

(A) DESCRIPTION

The Contractor shall furnish all necessary labor, equipment and materials to procure and install the controller and cabinet in accordance with provisions of the Special Provisions outlined in this section.

(B) MATERIALS

The technical specifications for the streetlight controller, the Module 336-SS Controller cabinet and all peripheral electronic components within the cabinet are noted below. The Contractor shall procure controller equipment in strict conformance with these specifications. The Contractor must submit and the District must approve catalog cuts from individual vendors before procurement is undertaken (4 copies).

CABINET

The lighting cabinet shall be a weatherproof cabinet with dimensions shown on the electrical detail sheet (or sized as needed to fit lighting control equipment). The cabinet top shall be slanted to the right side, side that is 90 degrees from the front door, to prevent

standing water. The cabinet and door shall be fabricated from 0.125-inch minimum thickness sheet aluminum. All exterior seams for the cabinet and door shall be welded and the welds ground smooth. All edges shall be finished to a radius of 0.25-inch minimum. Cabinet fabrication shall conform to the requirements of ASTM Designation B 209 for 5052-H32 aluminum sheets. Welding on the cabinet shall be done by the gas metal arc (MIG) or gas tungsten arc (TIG) process using bar aluminum welding electrodes. Electrodes shall conform to the requirements of the American Welding Society (AWS) A5.10 fir ER5356 aluminum alloy base welding electrodes. Procedures, welders and welding operators for welding on aluminum shall be qualified in accordance with the requirements of AWS B3.0, "Welding Procedures and Performance Qualification," and to the practices recommended in AWS C5.6. The surface of each aluminum cabinet shall be finished to conform to the requirement of Military Specification MIL-A8625C "Anodic Coatings for Aluminum and Aluminum Alloys" for a type II, Class I coating, except that the anodic coating shall have a minimum thickness of 0.0007 inch and a minimum coating weight of 27 milligrams per square inch. The cabinet shall be cleaned by immersion in inhibited alkaline cleaner such as Daklite 61A or Diversey 909, or equivalent, six to eight ounces per gallon, 160 degrees F for five minutes, then rinsed in clean cold water. The cabinet shall then be etched in a solution of sodium fluoride, one and one-half ounces plus sodium hydroxide, four to six ounces per gallon, at 140 to 150 degrees F for 15 minutes, then again rinsed in clean cold water. The cabinet shall then be De-smutted in a 50 percent by volume nitric acid solution at room temperature for two minutes, then again be rinsed in clean cold water. The anodic coating shall be sealed in a five percent aqueous solution of nickel acetate (pH 5.0 to 6.5) for 125 minutes at 208 to 212 degrees F.

The cabinet shall have a single front door equipped with a lock. When the door is closed and latched, the door shall be locked. The latching handles shall be removable. The operating handle shall be cadmium-plated steel with a 7.5 inch overall length and provided with a 1.0 inch Allen type hex head. The cabinet doorframe shall be double-flanged out on all four sides and shall be provided with strikers to hold tension on and form a firm seal between the door gasketing and the cabinet doorframe. The flange width shall be a minimum of one inch. The depth of the double flange shall be a minimum of one inch from the outside edge to the cabinet surface. The dimensions of the cabinet door opening shall be as shown in the electrical detail sheets. The cabinet lock shall be solid brass, 6-in tumbler, and rim-type. The lock shall have rectangular, spring-loaded bolts. The bolts shall be 0.375-inch long and 0.75-inch wide by 0.375-inch thick (dimension tolerance is +- 0.125-inch). The lock shall be left-hand. Keys shall be removable in the locked position only. The lock shall be rigidly mounted. The front portion of the lock shall extend 0.25-inch to 0.375-inch beyond the outside surface of the door. The lock shall be of custom keying to be determined by the Contractor in consultation with DDOT. Two keys and two removable handles shall be furnished with each cabinet. Keys shall be distinctively shaped as compared with standard number 2 or 3 keys. A ring shall be welded to the end of each door handle that allow placement of the handle on a minimum 3/16" tether or key ring.

The latching mechanism shall be a 3-point draw roller type. The center catch and push rods shall be cadmium-plated. The push rods shall be turned edgewise at the outward support and shall be O.25-inch by 0.74-inch minimum. Supports shall be 0.105-inch steel,

minimum. Rollers shall have a minimum diameter of 0.375-indh and shall be equipped with ball bearings and nylon wheels. The center catch shall be fabricated of 0.1875- inch steel, minimum.

The door's hinging shall be assessed by the Contractor but be comprised of a minimum of four (4) butt-type hinges. Each hinge shall have a fixed pin. The door shall be provided with catches to hold the door open at 90 degrees and 180 degrees, plus or minus 10 degrees. The catches shall be capable of holding the door open at 90 degrees in a 60-mph wind at a perpendicular to the plane of the door. The door shall open to the left when facing the door. Door hinges, pins and bolts shall be made of stainless steel. The hinges shall be bolted to the cabinet. The hinge pins and bolts shall not be accessible to vandals.

The cabinet shall be equipped with racks and or shelves to hold the necessary lighting control equipment. The design of the racks and shelves shall be in conjunction with the lighting controller manufacturer. All racks and shelves shall not be coated in any way to increase resistance of connection to chassis ground.

Gasketing shall be provided on the door opening and shall be dust-tight. Gaskets shall be 0.25 inches minimum thickness closed-cell neoprene and shall be permanently bonded to the metal. The mating surface of the gasketing shall be covered with a silicone lubricant to prevent sticking to the mating surface.

The bottom of the cabinet shall mate with the proposed foundation - see and confirm dimensions shown on the electrical detail sheets.

Each cabinet shall be equipped with two electric fans with ball bearings and the capacity of at least 100 cubic feet of air per minute for each. Each fan shall be independently wired of one another and shall have separate thermostat control. Each fan shall be mounted within the cabinet and be vented out the top of the cabinet. Each fan shall be thermostatically controlled and shall be manually adjustable to turn on between 33 and 65 degrees C with a differential of not more than 6 degrees C between automatic turn on and turn off. The cabinet fans circuits shall be fused at 125 percent of the amperage of the fan motor. The fuse holders shall be accessible from the front of the cabinet. Intakes (including Filters) shall be modified from Caltrans requirements to pass a minimum of 100 cubic feet of air per minute per intake.

Fluorescent lighting shall be installed in the top of the front of the cabinet and the switches shall be installed on the front door for both lamp control and door open alarm. Each fluorescent lamp and switch shall be equipped with noise suppression devices. Activation of the fluorescent lamp and associated switches shall not cause any disruption of the lighting controller and associated equipment. Fluorescent lamps and associated ballasts shall be rated for high output in cold environments providing high light output in ambient temperatures of -25 degrees C. The cabinet lights shall be fused. The fuse holder shall be accessible from the front of the cabinet.

The cabinet shall be fitted with a 0-10V dimmer control. Lighting systems shall be wired to the dimmer control to allow for the lumen output to be reduced via use of the dimmer control.

CONTROLLER

PLC-Multipoint or approved equal.

A photo-sensor based lighting control panel shall detect ambient light on the trail and switch trail lighting according to light-level conditions and time control. A location's lighting control system shall consist of an illuminance sensor and a microprocessor controller with operator interface, controlling lighting contactors, with a panelboard and transformer, mounted in a service cabinet. The Lighting Controller shall be capable of independently switching two (2) levels of lighting circuits in response to the available daylight and time clock settings. The controls shall be capable of using an illuminance sensor input, measuring fc.

The following table shows the light level settings corresponding to ambient illumination:

Channel	Group	On	Off	Time On	Time Off
1	Night1	2 fc	5 fc	4:00 p.m.	12:00 a.m.
2	Night2	2 fc	5 fc	4:00 p.m.	12:00 a.m.

The illuminance sensor shall be capable of measuring from 0 to 250 fc. The sensor shall be pole mounted, facing north.

The microprocessor controller shall operate from 24VDC. The controller shall receive analog input from the illuminance sensors. The controller shall be capable of independently switching four (4) relay outputs. Program information and factory configuration is stored in EEPROM. Site controller configurations shall be stored in battery-backed memory. Battery shall hold values at least two years during power outage.

An operator interface shall be mounted on the front of the panel and shall have a 4-line LCD display, navigation and arrow keys. The operator interface shall allow viewing current sensor level and control status and editing of operating parameters. Each of the individual channels shall have parameter adjustments. Each display will have text prompt and will range check the responses entered by users.

Parameter	Range	Default
ON/OFF Delay	0-99 minutes	3 min
Low Setpoint	0-250	2
High Setpoint	0-250	5
Hold On Timer	0-240 minutes	30 minutes

The lighting controller shall be capable of two modes of control: RUN mode for normal automatic operation and SETUP mode for modification of set points.

Each output circuit shall have a 10 Amp inductive load rating, capable of operating 120V electrically held lighting contactors. Indication shall display individual circuit status, power on, and sensor condition.

In the event of controller or sensor failure, the system shall turn on the Night Lighting contactors.

The lighting controller cabinet shall be housed in a NEMA 36 enclosure of sufficient size to include all lighting panelboards, lighting controller, low voltage control and lighting contactors. All components shall be pre-wired, factory tested and configured in the control panel enclosure.

Input power is shown in the Contract Drawings. Control transformer shall provide internally 120VAC. Low voltage control shall be 24VDC. Control power supply shall be appropriately fused with power distributed using 14 gauge wire. High- and low-voltage components shall be separated by a barrier.

Internal wireway shall be used to allow for adequate wire routing and organization within the lighting control cabinet from feeder panelboards and out-to-lighting circuits. Wireway shall have sufficient density of slots to allow the wiring to pass to the terminated devices. 14 gauge wire shall be used for internal control wiring.

In addition to the operator interface display, the front panel shall include HAND / OFF / AUTO selector switches. In HAND mode, the associated contactor shall be energized. In OFF mode, the associated contactor shall be de-energized. In AUTO mode, the contactor shall receive control from the lighting controller. Status LEDs confirming contactor status shall be provided and shall be integrated into the HAND / OFF / AUTO selector switches. Operator legend and indication nameplates shall be provided.

Lighting contactors shall be single or double pole, 20 Amp, electrically held with 120V coils. The contactors shall be housed in the lighting control cabinet. Auxiliary contact shall provide status to the lighting controller.

The lighting panelboard shall be shown on the Contract Drawings. The panelboard frame shall hold up to 18 individual circuits and main circuit breaker shall be rated at 100A. The bus and neutral shall be copper. Lighting circuit breakers shall be single pole, 20A and bolt onto the bus. Visual indication of open, close and trip conditions shall be provided. The panelboard will mount in the lighting control cabinet. Surge suppression shall protect the incoming circuits.

The lighting control panel shall be certified to comply with the standards of UL/ANSI 508A for industrial control equipment.

The lighting control system shall be warranted for two years.

(C) CONSTRUCTION METHOD

The Contractor shall set the controller cabinet assembly on the permanent foundation ensuring that the foundation anchor bolts penetrate the designated holes in the base of the cabinet. The Contractor shall ensure that the front cabinet door is oriented properly in accordance with instructions on the Contract Drawings. The Contractor shall level the cabinet, if necessary, using stainless steel shims placed where appropriate between the base of the cabinet and the foundation. The Contractor shall use stainless steel washer and bolts to affix the leveled cabinet securely to the foundation. All four bolts shall be tightened to ensure a secure and stable fit on the concrete foundation.

The Contractor shall pull all cables through the conduits into the controller cabinet allowing a minimum of five (5) feet of slack cable inside the cabinet. The Contractor shall attach an identifying, waterproof tag onto each cable identifying the specific field equipment being services by that particular cable run. The Contractor shall furnish and install a new No. 6 bare solid copper ground cable from the appropriate terminal in the controller cabinet to the ground rod extending above the top of the controller cabinet foundation.

The Contractor shall schedule and endure the completion of the installation of secondary electrical service connect from the controller cabinet to the Potomac Electric Power Company power source as shown on the Contract Drawings. The Contractor shall maintain constant communications with counterparts at PEPCO to ensure that PEPCO Officials are apprised of the project schedule for the purpose of avoiding project delays attributable to secondary electrical service installation.

The Contractor shall terminate all cables at their appropriate place on the terminal block of the controller cabinet. The Contractor shall cut the cables pulled into the controller cabinet at the appropriate length, strip the conductors and affix terminal lugs at the end of the conductors. All cables shall be dressed and arranged using cable ties in a neat, orderly manner in accordance with accepted industry standards.

The Contractor shall apply a generous quantity of duct seal into each conduit entering the cabinet to help regulate cabinet humidity and to impede the flow of moisture or other matter between the cabinet and the underground conduit/manhole network. The duct seal shall penetrate at least four (4) inches into each conduit entering the cabinet and shall totally encapsulate the conduit and cables. The duct seal shall be installed after all cable is terminated and dressed.

The Contractor shall apply a generous bead of waterproof sealant inside and outside the controller cabinet at all points where the cabinet is in physical contact with the concrete controller cabinet foundation to preclude the flow of moisture and debris between the inside of the cabinet and the outside environment.

(D) MEASURE AND PAYMENT

The unit of measure for furnish and install streetlight circuit control cabinet and controller will be per each. Payment will be made at the contract unit price per each. The price will include the cost of the controller, cabinet, breakers, lighting contactors, ground bars, neutral bars, dimmer control and all peripheral electronic components and all required labor, equipment and materials to install the cabinet in the field and render the lighting system operational. The cost associated with arranging and providing secondary electrical service to the cabinet is not included in this pay item.