ITEM 11670.501825 M - 250 WATT HIGH PRESSURE SODIUM VAPOR OFFSET LUMINAIRE AND POLE (BUREAU OF ELECTRICAL CONTROL)
ITEM 11670.501925 M - TWIN 250 WATT HIGH PRESSURE SODIUM VAPOR OFFSET LUMINAIRES MOUNTED ON SINGLE POLE (BUREAU OF ELECTRICAL CONTROL)
ITEM 11670.501840 M - 400 WATT HIGH PRESSURE SODIUM VAPOR OFFSET LUMINAIRE AND POLE (BUREAU OF ELECTRICAL CONTROL)
ITEM 11670.501940 M - TWIN 400 WATT HIGH PRESSURE SODIUM VAPOR OFFSET LUMINAIRES MOUNTED ON SINGLE POLE (BUREAU OF ELECTRICAL CONTROL)

DESCRIPTION:

The Contractor shall furnish and install metal light standards with shoe bases; 250 Watt or 400 Watt High Pressure Sodium Vapor (HPS) luminaires; hardware, fittings, insulators, anchor bolts; all in accordance with the plans, the specifications and as ordered by the Engineer.

MATERIALS:

The materials shall conform to the requirements of the “General Specifications for Street Lighting Facilities,” contained in the publication “City of New York SPECIFICATIONS - Complied 1970 for Use with State of New York Department of Transportation Construction Contracts” except as modified on the Plans and in the Specifications.

Luminaires shall be of the high pressure sodium type designed for use with a horizontally mounted 250 watt or 400 watt lamp. It shall be UL listed for wet location and meets UL 1572 rain test requirements. The luminaire shall operate satisfactorily when any appropriately sized high pressure sodium lamp now commercially available is used in the luminaire.

The luminaire shall be equipped with a built-in ballast, and shall be designed for operation on a 120 volt, 60 hertz multiple circuit.

The luminaire shall be designed for adequate heat dissipation of the heat generated by the lamp and ballast.

All exposed electrical live parts shall be protected to observe adequate safety precautions subject to approval by the Engineer and the Bureau of Electrical Control.

Luminaire Housings shall be heavy duty die cast aluminum, joined by stainless steel hinges, and provided with twin trigger latches for easy access to internal components.

The components comprising the assembly of the luminaire shall include a reflector, a porcelain enclosed mogul socket, a terminal board, a twist lock three prong receptacle for photo electric control and a transformer ballast.

Protective coating on internal mechanical supports shall consist of not less than 0.008mm of zinc plate, of not less than 0.008mm of cadmium plate plus an olive drab chromate treatment. All screws, washers and nuts shall be stainless steel or steel of an approved rustproof finish.

The luminaire housing shall also be painted on external surfaces as follows:

A coat of baked on epoxy base enamel, alkyd enamel, acrylic enamel or equal, shall be applied to give the castings a gray colored protective finish with good metal adhesion, having abrasion, corrosion and weather resistance and leaving no exposed metal.

The lower housing shall have a means of identification permanently attached to allow for identification of size of unit from street level. The identification shall consist of a black number on a gold colored square “25” for 250 watt and “40” for 400 watt.

All Hardware shall be non-corrosive type.
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Luminaires shall be equipped with an external leveling device for both horizontal and vertical adjustments.

Maximum protected area shall be 0.353m² without photo-electric control; 0.358m² with photo-electric control.

The luminaire will have two options of mounting on the pole.
Trunnion mounting
Slipfitter mounting

Slipfitter accepting 48mm to 76mm OD poles or tenons mounting option shall be available.

Reflector shall be fabricated from aluminum alloy sheet nominally 1.1mm thick, polished and have electrochemically ALZAK processed to a specular finish. Reflector shall be formed in such a manner, that at any point on the reflector contour the thickness of metal shall be not less than 0.81mm. Reflector shall not darken to the extent that it can not be wiped clean with a soft cloth. The Alzak coating shall have the following characteristics: The reflecting surface shall have a dense protective coating of aluminum oxide not less than 1.2 milligrams per cm², applied by 2n anodic oxidation process in order to comply with class S1 finish.

Seals and/or Gaskets shall be provided at all critical points to prevent entry of contaminants. A special polyester fiber “Breathing-Seal” shall be provided at lower edge of front housing to filter air entering the fixture.

Refractor shall consist of heat resistant borosilicate high impact glass with a high transmission factor and molded with a system of light controlling prisms on both inside and outside surfaces to give the light distribution, type and control classification when used in conjunction with a high pressure sodium lamp rated 250 watts or 400 watts as required, described herein under “Optical Requirements.”

A refractor holding device shall be provided for easy removal of refractor without binding or chipping, and shall be so made as to eliminate possibility of refractor breaking due to pressure on it. The holding device shall have a positive locked position to prevent accidental disengagement.

The electrical components in the luminaire shall include a ballast with solid-state starting aid, capacitor, porcelain shrouded mogul socket with spring type center contact and providing sufficient gripping action to prevent backing out of lamp, twist-lock receptacle for photo-control and terminal board with pressure type terminals, all to be pre-wired and tested at the point of manufacture.

Ballast shall be power factor corrected to at least 90% and shall operate on a 120 volt circuit.

The ballast shall be pre-wired to the lamp socket and terminal board, with polarized quick disconnect plugs installed where required for disassembly of the lower half of luminaire from upper half. The pulse output lead from the ballast shall be connected to the center contact of the mogul lamp socket. The ballast assembly shall be readily removable from the luminaire.

The functions of the ballast shall include, but not necessarily be limited to, the following:

a. Voltage Amplification - The required lamp starting voltage shall be delivered to the arc tube electrodes and this amplified pulse or lamp ignition voltage shall continue until the lamp arc is struck.

b. Voltage Transformation - The line voltage shall be matched with the required lamp operating voltage.
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c. Voltage Stabilization - The line voltage changes and the lamp voltage changes shall be compensated for, and ballast design shall provide for minimum change in lamp wattage as the lamp operating voltage rises.
d. Current Limitation - The lamp shall be supplied with the proper starting and operating current.

When operated on a ballast having the requirements specified, a nominal lamp shall not drop out over the entire plus or minus 10 percent line voltage range with a gradual 30 percent voltage reduction taking place over a 3 minute period.

The electronic starter shall have a short-duty cycle, operating only during those periods when the source is energized and the lamp is nonconducting. The starting pulse shall be a low energy, high voltage pulse suitably timed with respect to the 60 hertz open circuit voltage wave of the ballast reactor to cause ionization sufficient for the arc to strike. The starting pulse shall occur every other half-cycle or every half-cycle and shall cease as soon as the arc strikes. Electronic starter components shall be such as to prevent damage caused by luminaire operation in ambient temperature of approximately 30°C.

The solid-state starting aid shall be easily accessible and readily replaceable when required for maintenance.

BALLAST ELECTRICAL DATA FOR NOMINAL 250 WATT AND 400 WATT, 100 VOLT HPS LAMP

<table>
<thead>
<tr>
<th>LAMP WATTAGE</th>
<th>250 WATT</th>
<th>400 WATT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lamp Starting Amperes</td>
<td>2.7 Amp</td>
<td>3.0 Amp</td>
</tr>
<tr>
<td>Lamp Operating Amperes</td>
<td>2.7 Amp Nominal</td>
<td>3.9 Amp Nominal</td>
</tr>
<tr>
<td>Line Volts</td>
<td>120 Nominal</td>
<td>120 Nominal</td>
</tr>
<tr>
<td>Percent (%) Allowable Line Voltage Dip</td>
<td>30%</td>
<td>30%</td>
</tr>
<tr>
<td>Power Factor</td>
<td>90% Minimum</td>
<td>90% Minimum</td>
</tr>
<tr>
<td>Efficiency</td>
<td>83% Minimum</td>
<td>83% Minimum</td>
</tr>
</tbody>
</table>

All current-carrying components of luminaire shall withstand without adverse effects, the maximum pulse peak voltage delivered by ballast.

The ballast insulation system shall be made up of compatible, high grade materials, suitable for long life at Class F (155°C) temperatures. The coils shall be made of copper wires, coated with a modified polyester enamel. The coils shall be precision wound on molded high temperature material bobbins with excellent dielectric strength and thermal stability.
The entire core and coil assembly shall be impregnated with a tough, permanent, chemical and moisture resistant coating. All windings shall withstand for 10 seconds a 3,500 volt high potential test of the core.

Ballast shall be capable of starting and operating the lamp at a temperature of -30°C.

Tests indicating compliance with ballast temperature, regulation, efficiency, and lamp arc voltage rise shall be performed by an independent laboratory or certified by the manufacturer if performed by the manufacturer.

All units shall be provided with a twist lock receptacle for photo control securely mounted at the top. Mounting shall be of weatherproof construction. Twist lock receptacle shall be Harvey Hubbel Cat. #NY 15030, Leviton Cat. #5115, Westinghouse Cat. #6320-975001, General Electric Catalogue #35-121226, or an approved equal; 3wire, 15 amperes, 120 volts; wiring from the terminal strip to the photo-electric control shall be No. 16 size stranded wire, with silicone rubber insulation, fiberglass sheath and lacquer finish and identified as follows: white for “neutral”, black for “line”, and red for “load”, soldered or crimped to the receptacle terminals.

Wiring may also be attached to the receptacle terminals by means of spade terminals in plastic insulation. Instead of the above insulation, the wiring from the terminal strip to the phot-electric control may have cross linked polyethylene insulation of 125°Centigrade rating.

Contact material of twist lock receptacle shall be phosphor bronze and shall be of double wiring type, with contact to be made on both sides of each blade. Receptacles shall comply with the requirements of NEMA-EEI-TDJ-148 Specifications.

The receptacle shall be readily accessible without prior removal of any electrical components, and shall be pre-wired to the terminal board. All units shall be provided with a protective covering device to be attached over a twist lock receptacle. The covering device shall provide weatherproof protection for the receptacle when the photo control is not installed. The covering device shall not be subject to deterioration due to sunlight or environmental conditions and shall be resistant to acids and alkalies. The device shall be readily removable without tools, or shall remain securely in place over receptacle during operation of luminaire in field.

The whole luminaire assembly shall be completely pre-wired requiring only the connection of the primary circuit wires for its operation.

The terminal board shall be equipped with two terminals for connection to the phase leg and neutral of the primary circuit. The terminals shall be properly identified for connection, with notations on terminal board, color coding or wiring diagram.
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Photometric Performance. The luminaire shall be equipped with a 250 Watt or 400 Watt HPS Lamp in the standard luminaire position.

The following offset luminaire manufacturers, having compatible photo-metric performances, as tabulated below are acceptable:

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Luminaire</th>
<th>Catalog Number</th>
<th>Photometric IES Curve#</th>
<th>Original Tilt (T)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Electric</td>
<td>Turnpike</td>
<td>RPFS25S1H1GLN3RFG</td>
<td>35-177863</td>
<td>45</td>
</tr>
<tr>
<td>Cooper Industries</td>
<td>Off Roadway</td>
<td>ORL25SCxxx ORL2Sxxx</td>
<td>ORL2Sxxx</td>
<td>0</td>
</tr>
<tr>
<td>American Electric</td>
<td>Interstate</td>
<td>185 Interstate</td>
<td>AE2213I.IES</td>
<td>45</td>
</tr>
</tbody>
</table>

If the Contractor proposes to use luminaire other than the above approved luminaires, he/she shall submit a sample, to the NYSDOT and NYCDOT Bureau of Street Lighting, at 34-02 Queens Blvd., L.I.C., NY 11101, together with test reports, lighting design calculations showing established illumination criteria are being met for the roadway. The submittal shall also include photometric IES curve number being used and catalog cuts showing full compliance with specifications.

The manufacturer shall submit for approval to the Bureau of Electrical Control complete certified photometric test data, giving the following information:

1. Isocandela diagrams graphically represented on rectangular coordinates as specified in the A.N.S.I. “American National Standard Practice for Roadway Lighting.” The diagrams shall show location of maximum candlepower isocandela line and the quasi-isocandela line numerically equivalent to 2 ½ percent and 10 percent of the rated bare lamp lumens, thereby describing Luminaire Classification as regards Vertical Light Distribution, Lateral Light Distribution and Vertical Control.

2. Candlepower distribution curves graphically representing in polar coordinates:
   a. The average vertical traverse through the lateral angle of maximum candlepower.
   b. The average lateral traverse through the vertical angle of the cone of maximum candlepower.

3. Isolux lines on a horizontal plan, based on 12.2m mounting height.
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4. Co-efficient of utilization curves for street and house side of luminaire. The tests shall be performed by an independent and recognized testing laboratory or by manufacturer’s laboratory, the test data shall be certified.

The luminaire shall be so designed as to avoid reflecting radiant energy into the arc tube appendage, in order to minimize increase of lamp operating voltage from stabilized bare lamp operation in open air to stabilized in-luminaire operation. A maximum of 7 volts is allowed for this increase.

An Identification Number, NYC-(year)-4HS, shall be placed on the reflector flange and on the inside of the casting for the ballast housing for each unit in a convenient location in letters approximately 13mm high.

The offset type luminaire shall be equal to those manufactured by General Electric Co., Cooper Industries, American Electric as tabulated elsewhere in this specification.

Lamp shall be of the high pressure sodium type of nominal 250 watt or 400 watt size, as required, with a nominal lamp operating voltage of 100 volts. The lamp shall operate satisfactorily when installed in the specified high pressure sodium luminaire manufactured in accordance with the following Bureau of Gas and Electricity specifications.

The nominal lamp voltage of 100 volts is the voltage at which a design center lamp will operate in open still air when connected to a standard linear inductor for one hour with the input line voltage adjusted to maintain the lamp at 250 watts or 400 watts as appropriate. Allowable lamp voltage range is shown under Electrical Characteristics below. Linear inductor shall have a value of 100 ohms.

Lamps shall meet the following requirements:

**PHYSICAL CHARACTERISTICS OF LAMP**

<table>
<thead>
<tr>
<th>Base</th>
<th>Mogul</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulb</td>
<td>E-18</td>
</tr>
<tr>
<td>Bulb Material</td>
<td>Borosilicate Glass</td>
</tr>
<tr>
<td>Bulb Finish</td>
<td>Clear</td>
</tr>
<tr>
<td>Maximum Overall Length</td>
<td>250mm</td>
</tr>
<tr>
<td>Light Center Length</td>
<td>146mm</td>
</tr>
<tr>
<td>Arc Length, Approximately</td>
<td>70mm</td>
</tr>
<tr>
<td>Bulb Temperature Maximum</td>
<td>400° C (752° F)</td>
</tr>
<tr>
<td>Base Temperature Maximum</td>
<td>210° C (410° F)</td>
</tr>
</tbody>
</table>
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MOUNTED ON SINGLE POLE (BUREAU OF ELECTRICAL CONTROL)

<table>
<thead>
<tr>
<th>Arc Tube Material</th>
<th>Aluminum Oxide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eccentricity, Base to Bulb</td>
<td>4° maximum</td>
</tr>
<tr>
<td>Eccentricity, Arc Tube to Lamp Axis</td>
<td>5 mm maximum</td>
</tr>
<tr>
<td>Burning Position</td>
<td>5° above Horizontal, or equivalent</td>
</tr>
</tbody>
</table>

**OPERATING CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Lumens (average)</td>
<td>27,500 for 250 watts and 50,000 for 400 watts</td>
</tr>
<tr>
<td>Average Life at 10 Hrs./start</td>
<td>24,000 hrs</td>
</tr>
<tr>
<td>Percent Mean Lumens at 10 Hrs./start</td>
<td>90%</td>
</tr>
<tr>
<td>Warm-up Time</td>
<td>3-4 minutes</td>
</tr>
<tr>
<td>Restart Time</td>
<td>1 minute nominal</td>
</tr>
<tr>
<td>Apparent Color Temperature</td>
<td>2100° K approximately</td>
</tr>
<tr>
<td>Low Ambient Temperature at which Lamp will start and operate</td>
<td>-30° C</td>
</tr>
</tbody>
</table>

The ceramic arc tube shall consist of high quality aluminum oxide free from defects and irregularities. Electrodes shall be properly mounted in the arc tube with end caps adequately sealed to ceramic. Arc tube shall be supported inside the evacuated glass bulb in a manner to prevent damage or misalignment in shipping and handling, or during operation.

The rating in watts and volts and the manufacturer’s name or trade mark shall be indelibly marked on each lamp.

**Lighting Poles** for the 250 Watt and 400 Watt High Pressure Sodium Luminaires shall be designed as follows:


The contractor shall furnish shop drawings meeting the provisions of Paragraph 670-3.02, “Shop Drawings,” of the Standard specifications. These drawings shall include, but not be limited to, details of the pole, base plate, anchor bolts, shoe base, anchor rods, and other appurtenances. Drawings must be approved before purchase or manufacture of materials is commenced.

The poles shall be designed to maintain the mounting height from the luminaire to the top of the pavement, as shown on the plans.
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Each pole shall consist of a shaft with a shoe base, anchor bolts, tenon, and miscellaneous attachments. The shoe base shall rest on top of the concrete parapet or on top of the transformer base at grade.

The poles shall be aluminum. Where aluminum poles are designed and used, all parts and fittings shall be aluminum, unless otherwise specifically shown or specified.

For aluminum poles, the shaft sections shall be made from seamless extruded aluminum tubing of 6063 alloy, cold tapered, welded to the base and heat treated to T6 temper.

The vibration damper shall be provided inside the shaft.

The shoe bases shall be made of 356-T6 alloy, and shall be so designed to withstand the full bending moment of the shaft.

Hardware for aluminum poles shall be stainless steel, except anchorage and leveling shims.

Anchor bolts for aluminum poles shall be hot rolled steel, ASTM Designation A576 (379 MPa minimum yield) galvanized in accordance with section 719-01 of “Materials Details.” Each anchor bolt shall have at least 2 nuts furnished with each pole. Each anchor bolt shall be threaded at the top end. Top end with nuts shall be galvanized. The anchor bolts shall be capable of resisting at yield strength stress.

Each pole shall have a 63.5mm pipe tenon welded on the top.

Electrical Equipment shall conform to the requirement of the “General Specifications for Street Lighting Facilities,” contained in the publication “City of New York SPECIFICATIONS - Compiled 1970 for Use with State of New York Department of Transportation Construction Contracts.”

CONSTRUCTION DETAILS:

In general, high pressure sodium vapor lamps and luminaires shall be installed, and the electrical supply lines connected, in conformance with the requirements of the “General Specifications for Street Lighting Facilities” contained in publication “City of New York SPECIFICATIONS - Compiled 1970 for Use with State of New York Department of Transportation Construction Contracts,” except as modified on the plans and herein below.

Anchor bolts for lamppost shall be properly set in place prior to the pouring of the concrete footings.

Metal work shall comply with Section 616 - Structural Steel.

METHOD OF MEASUREMENT:
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These items shall be measured by the number of 250 watt and 400 watt, or twin 250 watt and twin 400 watt, luminaires installed on their respective poles and supports.

BASIS OF PAYMENT:

The unit price bid for 250 watt and 400 watt high pressure sodium vapor luminaires shall include the cost of furnishing necessary shop drawings; furnishing and installing luminaires (with refractor, reflector, ballast, receptacle, transformer, cable from transformer to luminaire, and miscellaneous electrical equipment) and lamps on their respective poles, anchor bolts; and all other labor, materials and incidentals necessary to complete the work; all as shown on the plans, provided in the specifications and directed by the Engineer.

Concrete foundations, branch feeders, excavation, trenching and backfill will be paid for separately under their appropriate items.