ITEM 670.5171--11 M - 100 WATT HPS COBRA HEAD LUMINAIRE WITH SOLID STATE BALLAST AND STRAY VOLTAGE INDICATOR LAMP
ITEM 670.5172--11 M - 150 WATT HPS COBRA HEAD LUMINAIRE WITH SOLID STATE BALLAST AND STRAY VOLTAGE INDICATOR LAMP

DESCRIPTION:

The Contractor shall furnish and install each High Pressure Sodium (HPS) Cobra Head luminaire with fittings, insulators and all necessary hardware to complete the installation in accordance with the plans, specifications and as directed by the Engineer.

MATERIALS:

The luminaire shall be high pressure sodium designed for use with a horizontally mounted 100 or 150 watt lamp, and shall be fully weatherproof. The luminaire shall operate satisfactorily when used with any commercially available 100 watt-55 volt, ANSI code S54SB-100, designation LU100, or 150 watt-100 volt, ANSI code S56SD-150, designation LU150/100 high pressure sodium lamps.

The luminaires shall be equipped with a built-in Solid State Electronics ballast and Stray Voltage indicator lamp, and shall be designed to operate at 120 VAC, 60 hertz. Luminaires shall be designed for proper heat dissipation of heat generated by lamp and ballast.

Terminals shall be provided in the luminaire housing for circuit wire connections. All exposed electrical live parts shall be adequately protected to comply with all safety requirements subject to approval of the Director of the Division of Street Lighting. Luminaire shall be UL listed for wet locations and dirt proof.

The luminaire shall be fabricated in accordance with either Alternate A or B below:

Alternate “A”: One piece die-cast aluminum housing with a slip fitter shall form the upper half of the luminaire. The slipfitter shall be suitable for mounting on either 1.5 NPS or 2 NPS standard pipe bracket and shall be engaged to provide a minimum adjustment of three degrees above and below horizontal. Mounting and adjusting bolts shall be hot dipped galvanized steel, zinc plated with yellow chromate finish or stainless steel. Slipfitter mounting device shall provide double clamping, assure rigid mounting and prevent rotation of the luminaire. Housing shall be equipped with bird shield.

Luminaire components shall include a reflector, a refractor, a porcelain or FRP mogul socket, a terminal board, a twist-lock three prong receptacle for photo electric control, a solid state electronics ballast with built-in starting aid and Stray Voltage indicator lamp. Internal mechanical support protective coating shall consist of not less than 0.00762 mm of zinc plate or cadmium plate plus an olive drab chromate treatment. All hardware, screws, washers, nuts, etc. shall be stainless steel or approved rustproof finished steel.

The lower half of the luminaire shall be die cast aluminum designed to provide a safe and secure seat for the refractor with sufficient free play to eliminate the possibility of breakage due to expansion during seasonal and operating temperature changes. It shall be equipped with a latch on the street side and shall be hinged to the upper half of the luminaire on the house side. The hinged attachment shall allow for easy removal of the lower half, but be made secure against accidental disengagement of the lower from upper half of the luminaire. The latching arrangement shall be such as to prevent relative motion between latch members. A means shall be provided to prevent accidental opening of the latch. The lower half of the luminaire shall be provided with weep holes for drainage.
The aluminum die casting for the upper and lower halves of the luminaire shall meet the provisions of the ASTM specifications, designation B85, Alloy Composition SG100B or be equal to Aluminum Association Casting Alloy #360 or #380. The attaching clamp of the slipfitter shall either be a die casting of an aluminum alloy of the same composition, or be made of hot dipped galvanized or stainless steel. Die casting for the upper and lower housings shall be painted on external surfaces with a coat of baked-on epoxy base enamel, alkyd enamel, acrylic enamel, or equal, applied to give the casting a gray colored protective finish with good metal adhesion, having abrasion, corrosion and weather resistance metal.

Luminaires shall have a means of identification permanently attached to the lower housing of the unit in order to identify the size from street level. The identification shall consist of a square plate with black numbers on a gold background. The number “10” shall indicate 100 watt and “15” 150 watt luminaries.

Alternate “B”: The upper half of the luminaire shall be of the same general construction and assembly as Alternate “A”

The lower half shall be in two (2) die cast aluminum sections. One section shall be equipped with a vibration proof retaining device on the street side for fastening part in place. If screws are used it shall be of captive type. This section shall be hinged to upper half of the luminaire on the house side. Hinge arrangement shall be of an approved design. Hinged attachment shall be made secure against accidental disengagement from the upper half of the luminaire. The other section shall be of the same general construction as the lower half for Alternate “A”, except that the easy removal of that section is not required.

The reflector shall be fabricated from aluminum alloy sheet nominally 10.16 mm thick, mechanical polished and have electro-chemically or chemically Alzak processed or Alglas coated or vacuum aluminized 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 not be less than 0.8128 mm. 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, 0.775 milligrams per square centimeter, applied by an anodic oxidation process in order to comply with Class M1 finish.

The Alglas coating shall be a transparent, flexible finish consisting of more than 95% silica chemically cured and bonded to the aluminum.

The lower edge of the reflector shall be provided with a flanged section for additional strength and shall not have rough or sharp edges. The reflector shall be secured to prevent the possibility of contact with live terminals.

Seals and/or Gaskets: A heat and compressive-set resistant gasket for filter and sealing action shall be used around the socket or between the reflector and refractor to prevent entrance of foreign material into the optical system. A non-porous gasketing system may be used as an alternate, with either an activated charcoal filter or a heat and moisture resistant filter covering a vent port in the reflector.

A heat, moisture and compressive-set resistant gasket shall be securely fastened to the flange of the reflector, and upon closing of the luminaire shall firmly seat between the flange of the reflector and refractor thus sealing
the optical system. Gasket shall not adhere to the refractor when luminaire is opened. Gasketing material shall produce no deleterious effect on the luminaire components. Gasket shall not exhibit undue or harmful changes due to environmental conditions.

**Refractor:**

100 Watt Luminaire, shall consist of ultra-violet stabilized polycarbonate plastic with a high transmission factor and molded with a system of light controlling prisms on both inside and outside surfaces to provide Type II, Medium, Semi-Cutoff light distribution. Polycarbonate refractor shall have a nominal wall thickness of 2.54 mm. Polycarbonate shall be General Electric UV stabilized Lexan 303 or approved equal.

150 Watt Luminaire, 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 provide Type III, Medium, Semi-Cutoff light distribution.

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

**Electrical components** in the luminaire shall include a solid state electronics ballast (built-in starting aid, capacitor, Stray Voltage indicator lamp), porcelain or FRP shrouded mogul socket with spring type center contact and providing sufficient gripping 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.

The solid state electronics ballast shall be power factor corrected to at least 97% and shall operate on a 120 volt AC 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 luminaires lower portion from upper portion. 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:

1. **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.

2. **Voltage Transformation** - The line voltage shall be matched with the required lamp operating voltage. The ballast shall operate the lamps as close to a “unity” crest factor as possible, but not to exceed 1.05 crest factor.

3. **Voltage Stabilization** - Compensation shall be made for the line voltage changes and lamp voltage changes. The ballast design shall provide for minimum change in lamp wattage as the lamp operating voltage rises.
4. Current Limitation - The lamp shall be supplied with the proper starting and operating current. During warm up lamp power shall never exceed final lamp operating power. Luminaires operating with specified ballast shall not have a nominal lamp drop out over the entire (+/-5%) line voltage change with a gradual 30% voltage reduction taking place over a 3 minute period.

When operated at nominal line voltage, either open circuited or short circuited, the ballast shall have an average temperature rise of no more than 125% of its rated temperature rise. Operation shall be of sufficient time to achieve a stable temperature level. The ballast may be equipped with automatic resetting type thermal protectors if required to meet the above and a transient voltage suppressor.

The presence of a cycling lamp shall not cause damage to the solid state electronics ballast

The starting aid and power factor correction capacitor are not required since they are built in solid state electronics ballast assembly.

**SOLID STATE ELECTRONICS BALLAST ELECTRICAL DATA FOR NOMINAL 100 WATT, 55 VOLT OR 150 WATT, 100 VOLT HPS LAMP**

<table>
<thead>
<tr>
<th>Ballast type:</th>
<th>solid state electronics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lamp Watts:</td>
<td>100 or 150</td>
</tr>
<tr>
<td>Lamp Volts:</td>
<td>55 volt nominal for 100 watt lamp</td>
</tr>
<tr>
<td></td>
<td>100 volt nominal for 150 watt lamp</td>
</tr>
<tr>
<td>Maximum Lamp Voltage:</td>
<td>90 volt for 100 watt (S-54)</td>
</tr>
<tr>
<td></td>
<td>100 volt for 150 watt (S-56)</td>
</tr>
</tbody>
</table>

| Lamp Starting Amperes: | 2.2 (100 Watt), 2.0 (150 Watt) |
| Lamp Operating Amperes: | 1.8 (100 Watt), 1.7 (150 Watt) |
| Crest Factor for Lamp Operating Current: | 1.05 maximum |
| Line Voltage: | 120 nominal (95 to 135 range) |

Allowable Line Voltage Reduction: Lamp shall start and operate at 95 volts. Percent (%) allowable line voltage dip: 30%
Lamp shall not drop out over the entire voltage range (+/-5% of the voltage) with a 30% voltage reduction.

| Line Starting Amperes (Maximum): | 0.5 (100 Watt), 1.0 (150 Watt) |
| Line Operating Amperes (Minimum): | 1.0 (100 Watt), 1.4 (150 Watt) |
| Line Wattage variation with +/- 5% Line Voltage variation: | +/- 12% maximum |
| Power Factor: | 97% minimum |
| Efficiency: | 85% minimum |

Starting Pulse Requirements (within the voltage range of 95-135):

| Pulse peak voltage (min): | 2,650 |
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Pulse peak voltage (max): 4,000
Pulse width: 1 microsecond (min) measured at 2,250 volts
Pulse repetition rate: 50 per second - minimum
Pulse peak current: 0.2 ampere - minimum

Pulse shall occur within +20 electrical degrees of the peak of the open circuit voltage wave. The pulse output lead from the ballast shall be connected to the center contact of the mogul lamp socket.

All current-carrying components of luminaire shall withstand, without adverse effects, the maximum voltage delivered by the solid state electronics ballast. The ballast shall be capable of starting and operating the lamp at minus 20° Fahrenheit.

Maximum average “restrike” after a 5 seconds interruption at 77° Fahrenheit shall not exceed one minute.

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 luminaires shall be provided with an approved 3 wire, 15 amperes, 120 volt twist lock receptacle for photo electric control securely mounted at the top. Wiring from the terminal strip to the photo electric control shall be #16 size stranded wire, with silicon rubber insulation, fiberglass sheath and lacquer finish or UL-1015 standard, AWS (CSA TEW-FT1) and color identified as white for neutral, black for line and red for load. Wires may be either soldered/crimped or attached by means of spade terminals with plastic insulation to the receptacle terminals. As an alternate insulation, a cross linked polyethylene rated at 125°C may be used.

Contact material of twist lock receptacle shall be phosphor bronze, 70-30 brass or tin plated steel of double wiping type, with contact to be made on both sides of each blade. Receptacles shall comply with the requirements of NEMA-EEI-TDJ-148 specifications, and shall be readily accessible without prior removal of any electrical components

All luminaires shall be provided with a protective covering device to be attached over the twist lock receptacle. The covering device shall provide weatherproof protection for the receptacle when the photo electric control is not installed. The covering device shall not be subject to deterioration due to sunlight or environmental conditions and shall be resistant to acid and alkalis. The device shall be readily removable without tools, or shall remain securely in place over receptacle during operation of luminaire in field.

The terminal board shall be equipped with three clamp-type pressure terminals. In addition to the two terminals for connection to the phase leg and neutral of the primary circuit, the terminal board shall be equipped with an additional terminal wired through the twist lock receptacle to the primary circuit for auxiliary 120 volt controlled circuit. The terminals shall be properly identified for connection, with notations on terminal board, color coding or wiring diagram.

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

Optical requirements:

100 Watt Luminaire, when equipped with 9,500 lumens, 100 watt, 55 volt lamp shall provide a light pattern
with maximum candlepower not less than 4,400. The luminaire classification as regards Vertical Light Distribution shall be “Medium”. The luminaire classification as regards Lateral Light Distribution shall be “Type II” The luminaire classification as regards Vertical Control shall be “Semi-cutoff”

150 Watt Luminaire, when equipped with 16,000 lumens, 150 watt, 100 volt lamp shall provide a light pattern with maximum candlepower not less than 6,600. The luminaire classification as regards Vertical Light Distribution shall be “Medium”. The luminaire classification as regards Lateral Light Distribution shall be “Type III” The luminaire classification as regards Vertical Control shall be “Semi-cutoff”

Total downward light efficiency of the luminaire shall not be less than 77% with not less than 54% of the bare lamp lumens being directed on the downward street side of the luminaire, and not less than 23% of the bare lamp lumens being directed on the downward house side of the luminaire.

The manufacturer shall submit for approval to the Division of Street Lighting complete certified photometric test data giving the following information:

1. Isocandela diagrams graphically represented on rectangular coordinates as qualified 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 lines numerically equivalent to 5 percent and 25 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 of horizontal foot candles based on 7.6m mounting height with correction factors for 4.6m, 6.1m, 9.1m and 10.7m mounting heights


Photometric tests shall be conducted in accordance with latest ANSI “American National Standard Practice for Roadway Lighting”. The tests shall be performed by an independent and recognized testing laboratory.

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)-10HS-55V (100 Watt), or 15HS-100V (150 Watt), 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 12.7mm high.

The inscription “Property of New York City” shall appear on the inside of upper housing casting in letters
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approximately 12.7mm high.

CONSTRUCTION DETAILS:

High pressure sodium vapor lamps and luminaires shall be installed, and the electrical supply lines connected, in conformance with the latest requirements of the Division of Street Lighting of the City of New York Specifications, except as modified on the plans and these specifications.

METHOD OF MEASUREMENT:

These items shall be measured by the number of high pressure sodium vapor lamps and luminaires installed and operational.

BASIS OF PAYMENT:

The unit price bid for 100 or 150 watt high pressure sodium vapor lamps and luminaires shall include the cost of furnishing necessary shop drawings; furnishing and installing luminaires (with refractor, reflector, ballast, receptacle, receptacle cover, cables from ballast to luminaire, and miscellaneous electrical equipment) and lamps, 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.