The material shall also exhibit the following properties when tested under NYSDOT Test Method 701-13F:

- A minimum one hour compressive strength of 17 MPa, a 24 hour strength of 24 MPa, and a 28 day strength of 35 MPa.
- Be able to withstand 50 cycles of freeze-thaw (10% NaCl solution) with a maximum loss of 4%.

**Primer.** The primer shall be a two component methyl methacrylate resin system capable of enhancing the bond between the polymer concrete and the substrate. It shall have a curing time of 20 to 60 minutes at temperatures between 2°C and 40°C inclusive.

**Flammability.** The polymer concrete shall not support or sustain combustion within five (5) minutes after mixing.

**PACKAGING.** The material delivered from the manufacturer shall be in moisture proof bags and the contents shall weigh within ±3% of the labeled bag weight. The manufacturer's name, address, date of manufacture and mixing instructions shall be printed on each bag.

**BASIS OF ACCEPTANCE.** Application for material approval shall be submitted to the Director of the Materials Bureau accompanied by at least a 25 kg, production run, sample of material. Upon approval, the name of the product will be placed on the Department's Approved List. Products so listed will be acceptable at the work site on the basis of the brand name labeled on the container. The Department reserves the right to sample and test the material at any time.

### SECTION 722 - WATER SUPPLY

#### 722-01 DUCTILE IRON WATER PIPE, FITTINGS AND ENCASEMENT

**SCOPE.** This specification covers the material and quality requirements for ductile iron water pipe, miscellaneous fittings, coatings and encasement.

**GENERAL.** Ductile iron water pipe, fittings and encasement shall conform to the requirements of the following:

- Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
- Polyethylene Encasement for Ductile-Iron Pipe Systems
- Ductile Iron and Gray Iron Fittings, 3 NPS through 48 NPS for Water
- Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
- Thickness Design of Ductile-Iron Pipe
- Ductile-Iron Pipe, Centrifugally Cast, for Water
- Ductile-Iron Compact Fittings, 3 NPS through 24 NPS and 54 NPS through 64 NPS, for Water Service

**BASIS OF ACCEPTANCE.** Ductile iron water pipe and fittings will be accepted on the basis of the Manufacturer’s certification that the material conforms to this specification. The certification for iron fittings shall list a fitting description, quantity, bare fitting weight and source, (AWWA Standard C110, C153 or Manufacturer, if fitting is not listed in either standard). The certification shall accompany the material delivered to the project site.

The Department reserves the right to sample and test this material subsequent to delivery at the project site.
722-02 STEEL WATER PIPE AND FITTINGS

SCOPE. This specification covers the material and quality requirements for steel water pipe and miscellaneous fittings.

GENERAL. Steel water pipe and fittings shall conform to the requirements of the following:

- Steel Water Pipe - 6 NPS and Larger
- Coal-Tar Protective Coatings and Lining for Steel Water Pipelines
- Enamel and Tape - Hot Applied
- Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 NPS and Larger - Shop Applied
- Field Welding of Steel Water Pipe
- Steel Pipe Flanges for Waterworks Service - Sizes 4 NPS to 144 NPS
- Dimensions for Fabricated Steel Water Pipe Fittings
- Cold-Applied Exterior Tape Coatings for the Exterior of Special Sections, Connections and Fittings for Steel Water Pipelines
- Liquid-Epoxy Coatings for Steel Pipelines
- Fusion-Bonded Epoxy Coatings Systems for the Interior and Exterior of Steel Water Pipelines
- Tape Coating Systems for the Exterior of Steel Water Pipelines
- Extruded Polyolefin Coatings for the Exterior of Steel Water Pipelines
- Heat-Shrinkable Cross-Linked Polyolefin Coatings for the Exterior of Fittings for Buried or Submerged Steel Water Pipelines
- Cold-Applied Petroleum Tape and Petroleum Wax Tape Coatings for the Exterior of Special Sections, Connections and Fittings for Buried Steel Water Pipelines
- Coating the Exterior of Aboveground Steel Water Pipelines and Fittings
- Bolted, Sleeve-Type Couplings for Plain-End Pipe
- Stainless-Steel Pipe, 4 NPS and Larger
- Fabricated Steel Mechanical Slip-Type Expansion Joints
- Polyurethane Coatings for the Interior and Exterior of Steel Water Pipe Fittings

AWWA C200  5
AWWA C203  10
AWWA C205
AWWA C206
AWWA C207
AWWA C208
AWWA C209  15
AWWA C210
AWWA C213  16
AWWA C214
AWWA C215
AWWA C216  20
AWWA C217
AWWA C218  25
AWWA C219
AWWA C220
AWWA C221
AWWA C222  30

BASIS OF ACCEPTANCE. Steel water pipe and fittings will be accepted on the basis of the Manufacturer's certification that the material conforms to this specification. The certification shall accompany the material delivered to the project site.

The Department reserves the right to sample and test this material subsequent to delivery at the project site.

722-03 CONCRETE WATER PIPE

SCOPE. This specification covers the material and quality requirements for concrete water pipe.

GENERAL. Concrete water pipe shall conform to the requirements of the following:

- Reinforced Concrete Pressure Pipe, Steel Cylinder Type
- Prestressed Concrete Pressure Pipe, Steel Cylinder Type
- Reinforced Concrete Pressure Pipe, Nongleyninder Type
- Concrete Pressure Pipe, Bar-Wrapped, Steel Cylinder Type

AWWA C300  5
AWWA C301  10
AWWA C302
AWWA C303  15

BASIS OF ACCEPTANCE. Concrete water pipe will be accepted on the basis of the Manufacturer's certification that the material conforms to this specification. The certification shall accompany the material delivered to the project site.

The Department reserves the right to sample and test this material subsequent to delivery at the project site.

NEW YORK STATE DEPARTMENT OF TRANSPORTATION
STANDARD SPECIFICATIONS of January 2, 2002
722-04 WATER VALVES AND HYDRANTS

SCOPE. This specification covers the material and quality requirements for water valves and hydrants.

GENERAL. Water valves and hydrants shall conform to the requirements of the following:

- Metal-Seated Gate Valves for Water Supply Service  AWWA C500
- Cast-Iron Sluice Gates  AWWA C501
- Dry Barrel Hydrants  AWWA C502
- Rubber-Seated Butterfly Valves  AWWA C504
- Ball Valves (6 NPS through 48 NPS)  AWWA C507
- Swing Check Valves for Waterworks Service (2 NPS through 24 NPS)  AWWA C508
- Resilient-Seated Gate Valves  AWWA C509
- Double-Check Valve Backflow Prevention Assembly  AWWA C510
- Reduced-Pressure Principle Backflow Prevention Assembly  AWWA C511
- Air-Release, Air/Vacuum and Combination Air Valves for Waterworks Service  AWWA C512
- Open-Channel, Fabricated Metal Slides  AWWA C513
- Reduced-Wall, Resilient Seated Gate Valves for Water Supply Service  AWWA C515
- Power Actuating Devices for Valves and Sluice Gates  AWWA C540
- Protective Epoxy Interior Coatings for Valves and Hydrants  AWWA C550

BASIS OF ACCEPTANCE. Water valves and hydrants will be accepted on the basis of the Manufacturer’s certification that the material conforms to this specification. The certification shall accompany the material delivered to the project site.

The Department reserves the right to sample and test this material subsequent to delivery at the project site.

722-05 PLASTIC WATER PIPE AND FITTINGS

SCOPE. This specification covers the material and quality requirements for plastic water pipe and fittings.

GENERAL. Plastic water pipe and fittings shall conform to the requirements of the following:

- Polyvinyl Chloride (PVC) Pressure Pipe 4 NPS Through 12 NPS for Water Distribution  AWWA C900
- Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings (14 NPS through 48 NPS) for Water Transmission and Distribution  AWWA C905
- Polyethylene Water Pipe and Fittings, 4 NPS through 63 NPS, for Water Distribution and Transmission  AWWA C906
- Polyvinyl Chloride (PVC) Pressure Fittings for Water, 4 NPS through 8 NPS  AWWA C907
- PVC Self-Tapping Saddle Tecs for Use on PVC Pipe  AWWA C908
- Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 NPS through 12 NPS  AWWA C909
- Fiberglass Pressure Pipe  AWWA C950

BASIS OF ACCEPTANCE. Plastic water pipe and fittings will be accepted on the basis of the Manufacturer’s certification that the material conforms to this specification. The certification shall accompany the material delivered to the project site.

The Department reserves the right to sample and test this material subsequent to delivery at the project site.

722-06 WATER SERVICE PIPE, SERVICE VALVES AND FITTINGS

SCOPE. This specification covers the material and quality requirements for water service pipe, service valves and fittings.
§722-06

GENERAL. Water service pipe, service valves and fittings shall conform to the requirements of the following:

Underground Service Line Valves and Fittings
Polyethylene (PE) Pressure Pipe and Tubing (½ NPS through 3 NPS) for Water Service
Steel Water Service Pipe (½ NPS to 4 NPS)
Seamless Copper Water Tube, Type K

AWWA C800
AWWA C901
ASTM A53
ASTM B88

BASIS OF ACCEPTANCE. Water service pipe, service valves and fittings will be accepted on the basis of the Manufacturer's certification that the material conforms to this specification. The certification shall accompany the material delivered to the project site.

The Department reserves the right to sample and test this material subsequent to delivery at the project site.

722-07 WEDGE TYPE MECHANICAL RESTRAINT GLANDS

SCOPE. This specification covers the material and quality requirements for wedge type mechanical restraint glands.

GENERAL. Wedge type mechanical restraint glands shall have a number of individually activated wedges around the circumference of a pipe which grip the pipe surface and bolts through the gland which are attached to a fitting or a gland that restrains a pipe bell. Glands shall be constructed of high strength ductile iron in accordance with ASTM Standard A536, and shall have a minimum pressure rating exceeding the system test pressure identified in the Owner requirements. Glands shall be specifically manufactured for the type of pipe used, and may be solid or split ring (two piece). Glands shall be manufactured with twist off bolts.

BASIS OF ACCEPTANCE. Wedge type mechanical restraint glands will be accepted on the basis of the Manufacturer's certification that the material conforms to this specification. The certification shall accompany the material delivered to the project site.

The Department reserves the right to sample and test this material subsequent to delivery at the project site.

722-08 INSULATION FOR WATER MAINS

SCOPE. This specification covers the material and quality requirements for insulation for water mains.

GENERAL. Insulation for water mains shall be made of fiberglass, cellular glass, urethane or cellular phenol and shall conform to the requirements of the following:

Fiberglass Pipe Insulation
Cellular Glass Insulation
Urethane Foam Pipe Insulation
Spray Applied Urethane Insulation
Rigid Cellular Phenolic Pipe Insulation
Waterproof Jacket for Insulation

ASTM C547
ASTM C552
ASTM C591
ASTM C1029
ASTM C1126, Type III
ASTM C1136

BASIS OF ACCEPTANCE. Insulation for water mains will be accepted on the basis of the Manufacturer's certification that the material conforms to this specification. The certification shall accompany the material delivered to the project site.

The Department reserves the right to sample and test this material subsequent to delivery at the project site.
SECTION 723 - LIGHTING

723-01 ALUMINUM LIGHT STANDARDS AND ARMS

SCOPE. This specification covers the material and quality requirements for aluminum light standard shafts and aluminum bracket arms.

MATERIAL REQUIREMENTS

General. All light standards and arms shall be designed in accordance with the latest edition of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals. The ARTBA Guide to Standardized Highway Lighting Pole Hardware may be used in conjunction with the AASHTO Standard Specifications in lieu of actual design computations. Wind pressure for design purposes shall be determined in accordance with the above AASHTO Standard Specifications, utilizing the wind speeds listed below. In addition, the dimensions of all lighting hardware shall also be consistent with the requirements of the appropriate maintenance agency.

Shaft. The shaft shall be a one-piece, seamless, round tapered spun aluminum tube of alloy 6063. The aluminum shaft shall be heat treated for its full length to produce a T6 temper, and an anchor base shall be welded to the bottom of the shaft. Shafts, which are to be mounted without transformer bases, shall be equipped with a 100 mm wide by 150 mm to 200 mm high reinforced handhole centered 0.35 m to 0.45 m above the base of the shaft, and located 90 degrees from the plane of the arm and on the side away from traffic if possible. Each handhole shall have a cover with stainless steel attachment screws to secure the cover. A grounding nut shall be provided inside the shaft opposite the handhole to accommodate a 12 mm threaded bolt or stud. The shaft shall have a satin finish accomplished by mechanical rotary grinding.

An anchor base shall be joined to the shaft by means of complete circumferential welds, externally at top of anchor base and internally at bottom of shaft.

The anchor base shall be a one-piece permanent mold casting, aluminum alloy 356-T6 provided with four (4) slots to receive 25 mm diameter bolts. The casting shall be free of cracks, pits, blow holes and non-metallic inclusions. Each anchor base shall be provided with four anchor bolt covers fabricated from aluminum alloy with stainless steel screws for attaching the covers.

If bracket arm light standards are proposed, a removable ornamental cast aluminum pole cap with stainless steel setscrews to hold it in place shall be provided and installed on the top of each shaft. A 36 millimeter diameter hole shall be furnished near the top of each shaft where the arm is to be attached to provide a cable entrance from the shaft into the bracket arm. The opening shall have an approved metal or rubber grommet placed to provide a smooth cable guide for pulling the electrical cable through. The pole cap and hole are not required for davit arm light standards. Wall thickness and tube diameters for 129 km/h wind zones shall conform to Table 723-01-1 Light Standard Dimensions.

Truss Arms. The upper and lower members shall be fabricated from seamless tubing of 6063-T6 or 6061-T6 aluminum alloy. The upper member shall be the continuous or wiring member and shall have a 3 mm minimum wall thickness. Truss bracket arms shall be designed with the upper and lower members joined near the luminaire end of the arm. The arms shall be braced with one or two vertical pipe struts depending on the arm length. Each truss bracket arm shall be equipped with a 50 mm pipe size slip fitter tenon projecting 125 mm from the luminaire end. The arm shall be secured to the shaft with a bolt type or clamp type attachment similar to those shown in drawings ASA 2-1 or ASA 2-2 of the ARTBA Guide to Standardized Highway Lighting Pole Hardware. Attachments that require welding a fitting directly onto the shaft, similar to ARTBA drawing SPS 2-1, will not be allowed on aluminum light pole shafts. Bolts and nuts shall be fabricated from AISI Type 302 stainless steel according to ANSI B1.1. Washers shall be fabricated from AISI 300 series stainless steel according to the requirements of ANSI B18.21.2. In projects where arm lengths are intermixed, the rise for each length is to be set to keep the upper chord of all arms at approximately equal slopes.
§723-01

**TABLE 723-01-1 LIGHT STANDARD DIMENSIONS**

<table>
<thead>
<tr>
<th>Maximum Pole Height (m)</th>
<th>Maximum Arm Lengths (m)</th>
<th>Minimum Wall Thickness (mm)</th>
<th>Minimum Diameter Bottom X Top (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>4.6</td>
<td>4</td>
<td>200 X 150</td>
</tr>
<tr>
<td>9</td>
<td>4.6</td>
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<td>200 X 150</td>
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<tr>
<td>9</td>
<td>6</td>
<td>6</td>
<td>225 X 150</td>
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<td>5</td>
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<td>11</td>
<td>6</td>
<td>6</td>
<td>250 X 150</td>
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<td>13</td>
<td>4.6</td>
<td>4</td>
<td>250 X 150</td>
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<td>6</td>
<td>6</td>
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<td>14</td>
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<td>250 X 150</td>
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<td>16</td>
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<td>250 X 150</td>
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<tr>
<td>8</td>
<td>4.6*</td>
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<td>4.6*</td>
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<td>6</td>
<td>250 X 150</td>
</tr>
<tr>
<td>16</td>
<td>4.6*</td>
<td>6</td>
<td>300 X 150</td>
</tr>
</tbody>
</table>

*NOTE:* Twin-Arm.

**Single Bracket Arms.** 1.2 to 2.4 meters. The single member arms shall be fabricated from seamless tubing of 6063-T6 or 6061-T6 aluminum alloy. Wall thickness shall not be less than 3 mm. The arms shall be designed in accordance with AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals. Each arm shall be equipped with a 2 NPS pipe size slip fitter tenon projecting 150-200 mm from the luminaire end. The arms shall be secured to the shaft with a bolt type or clamp type attachment similar to those shown in drawings ASA 2-1 or ASA 2-2 of the ARTBA Guide to Standardized Highway Lighting Pole Hardware. Attachments that require welding a fitting directly onto the shaft, similar to ARTBA drawing SPS 2-1, will not be allowed on aluminum light pole shafts. Bolts and nuts shall be fabricated from AISI Type 302 stainless steel according to ANSI B1.1. Washers shall be fabricated from AISI 300 series stainless steel according to the requirements of ANSI B18.21.2.

**Bracket Arms for Wood Utility Poles.** Bracket arms to be mounted on wooden utility poles shall be tapered, seamless tube aluminum with a 3 mm minimum wall thickness. The bracket arm shall be welded to an appropriate connection plate at the pole end and have a 50 mm slip-fitter tenon at the luminaire end. A 32 mm cable opening on the underside near the pole shall be protected with a rubber grommet. Arms over 1.8 meters long shall be trussed, with upper and lower members securely joined by means of vertical strut(s). All aluminum shall be alloy 6063-T6 and all connecting hardware such as nuts, bolts, etc. shall be stainless steel.

**Davit Arm Poles.** For davit arm poles the top of the shaft shall terminate in a tenon (or twin tenons for double arm poles) and be equipped with a friction fit outer sleeve to produce a flush joint with the arms(s). The davit arm(s) shall be constructed of the materials and methods specified for the shaft and as dimensioned on the drawings. The davit arm(s) shall be secured to the shaft in a flush connection with two stainless steel bolts, nuts and lockwashers. The davit arm(s) shall terminate in a cast or fabricated flush tenon for a slipfit connection to the luminaire. The tenon shall be secured to the davit arm by stainless steel bolts.

**SHIPPING.** Shafts and arms shall be tire-wrapped with a heavy water resistant paper, for protection during shipping and installation. All small parts shall be boxed.
§723-02

Wind speeds. Poles, arms and attachments covered by this specification shall be designed for the following wind speeds in accordance with the AASHTO Standard mentioned above.

- 129 km/h - Counties of Allegany, Bronx, Cattaraugus, Chautauqua, Erie, Genesee, Kings, Livingston, Monroe, Nassau, New York, Niagara, Orleans, Ontario, Queens, Richmond, Rockland, Suffolk, Wayne, Westchester & Wyoming.
- 113 km/h - All Other Counties.

Welding. All aluminum welding on light standards shall be performed in the shop, using the inert metal-arc welding process. Filler metal shall conform to the A.W.S. Specification A5-10. Welders shall be certified by A.S.M.E. Section 9 or A.W.S. D 1.2.

Vibration Shims. Vibration shims (dampeners) shall be provided by the pole manufacturer for all aluminum poles nine (9) meters or longer. Vibration shims shall also be provided for poles installed in excessively windy locations or on viaducts with continuous vibration.

BASIS OF ACCEPTANCE. Acceptance of the shaft, anchor base, truss bracket arms, and single member arms covered by this specification will be based on:

- Manufacturer’s certification of compliance with these specification requirements.
- Submission, to the Engineer, of design and fabrication details for each shaft, anchor base and arm intended for a particular design load as specified in the contract documents. The design and fabrication details being submitted shall have been approved and signed by a professional engineer licensed to practice in New York State. This submission shall be sent in time to be received at least 10 working days prior to the date the Contractor orders the poles, anchor bases and arms.

723-02 HIGH MAST POLE, HEAD FRAME ASSEMBLY WITH LUMINAIRE RING AND LOWERING DEVICE

SCOPE. This specification covers the material and quality requirements for the pole and head frame assembly with luminaire ring and lowering device to be used in a high mast lighting system.

MATERIAL REQUIREMENTS

General. The steel pole, head frame assembly, luminaire ring and lowering system shall be designed to meet or exceed “AASHTO Standard Specifications, for Structural Supports for Highway Signs, Luminaires and Traffic Signals.” The design wind loading shall be chosen to be consistent with the location of the structure and the height factor. See §723-01 Aluminum Light Standards and Arms. It shall be the contractor’s responsibility to obtain verification of all necessary weights and effective projected areas as required in the plans.

Poles. The steel pole shall be capable of supporting the combined weight and projected area of both lowering system and number of luminaires with built-in ballast as shown on the contract plans.

The pole shall consist of sections of tapered steel tubes, round or polygonal (8 or more equal sides) in cross section, which telescope into each other with an overlap of 1.5 diameters. Steel used in fabricating the shaft shall have a minimum yield strength of 345 MPa after all fabricating operations have been completed.

In the base of the pole will be located an adequate size hand hole complete with a weatherproof cover and lock. A plate shall be welded opposite the hand hole for mounting the lowering system winch (unless externally mounted on the portable power drive), circuit breakers and other hardware. The hand hole area shall have a 1.8 meter reinforcing sleeve. The hand hole and plate shall be designed to accommodate the required High Mast Head Frame and Lowering Assembly.

The finished pole shall be galvanized in accordance with §719-01 Coating and Repair Methods, Type 1. If A588M weathering steel is used for the pole, all slip joints shall have a barrier coating conforming to the requirements of the Materials Bureau or as stated in the proposal.
§723-02

**Anchor Base.** The anchor base shall be fabricated of steel meeting or exceeding the yield strength of ASTM-A-36M. The anchor base shall telescope the butt end of the pole and be welded on the inside bottom and outside top.

**Anchor bolts, nuts, and washers.** Anchor bolts and nuts shall be fabricated of steel meeting or exceeding ASTM A-572M (minimum yield strength 345 MPa). The top of the anchor bolts shall have a minimum of 230 mm of thread and a minimum of 300 mm of galvanizing in accordance with ASTM-A-153. Each bolt shall be furnished with two (2) heavy duty, galvanized, hex nuts with a strength equal to or exceeding the proof load of the bolts. The Contractor may wish to install pre-assembled anchor bolt cages, subject to approval by the Engineer, in lieu of the design shown on the plans.

Washers shall be plain hardened washers. Nuts, washers and a minimum of the top 300 mm of the anchor bolts shall be hot-dipped galvanized in accordance with the requirements of §719-01Galvanized Coating and Repair Method, Type II.

The pole manufacturer shall design the anchor bolts and nuts in accordance with “AASHTO Standard Specification for Structural Supports for Highway Signs, Luminaires and Traffic Signals.”

**Welding.** Pole sections shall have no more than two longitudinal welded seam and no transverse seams. All welding shall be performed in accordance with the N.Y.S. Steel Construction Manual. Longitudinal welds shall have a minimum 60% penetration. All circumferential welds for slip joints and shaft to base shall be 100% penetration. All 100% welds shall be inspected ultrasonically by the State.

**Reinforcing sleeve.** The reinforcing sleeve shall be fabricated of steel meeting or exceeding AISI 1020 steel. The sleeve shall be galvanized under the same ASTM specification as the pole.

**Head Frame.** The head frame shall be capable of supporting the combined weight and projected areas of the luminaire ring assembly and luminaires with built in ballast as shown on the plans. The luminaire ring shall be designed to use the number and configuration of luminaires shown on the plans.

The head frame shall be equipped with a suitable weather resistant and bird proof cover.

The head frame shall be a zinc-coated steel structure attached to the pole by means of a steel slip fitter and secured by at least four (4) stainless steel set screws.

The head frame shall provide at least three point suspension for the luminaire ring assembly.

For raising and lowering the luminaire ring assembly, three 7X19 aircraft-grade stainless steel, hoisting cables, of sufficient size to support the load shall be included. Hoisting cable sheaves shall be grooved to the exact diameter of the hoisting cable for 180° bearing surface and be equipped with suitable guides to prevent jumping the sheaves. Sheave bearings shall be permanently lubricated on stainless steel shafts.

Permanently lubricated power cable sheave(s) shall be provided over a stainless steel shaft. The grooved diameter of the sheave(s) shall be coordinated with the power cable diameter and be equipped with guides to prevent jumping the sheave(s).

The power cable supplied shall be a minimum of 6 meters longer than the street lighting pole installed. It shall be a water proof cable with the necessary number of conductors and sized to properly operate the street lighting system.

Three latching devices shall be provided to support the luminaire ring assembly when in the latched position. There will be no tension on the hoisting cables when the luminaire ring is in the latched position. The latches shall be actuated from the ground. Locking of the luminaire ring shall be signalled by indicators visible from the ground. All moving parts of the latch mechanism shall be serviceable from the ground. The latching mechanism shall not be impaired by the formation of ice and shall not require adjustment. Each of the latches, independently, shall be strong enough to support eight times the weight of the luminaire ring assembly and all luminaires installed.

**Lowering System and Luminaire Assembly.** The luminaire ring assembly shall be fabricated of steel with the appropriate number of 50 mm nominal steel pipe mounting arms. It shall be zinc plated and prewired to distribute the power to the required number of luminaires. Power cables shall be positively attached to the...
ring assembly through a watertight wiring chamber, with watertight cable connectors. A 600 volt terminal block, completely prewired shall be included in the watertight wiring chamber. A watertight twist lock power receptacle shall be installed in the luminaire ring to allow testing of the luminaires at ground level. A cable support shall be provided to hold the power cable in the luminaire ring.

Attached to the luminaire ring assembly shall be a spring loaded roller contact guidance mechanism with a minimum of three arms that maintain positive contact with the pole surface, centering and guiding the ring assembly during lowering to prevent jamming. Rollers shall be made of water resistant non-marking material with permanently lubricated bearings on stainless steel shafts.

Winch Assembly, if permanently mounted in the pole, shall be a worm-gear self-locking type (Torque rated) and designed for both hand operation or operation by means of a portable power unit. Winch Cable shall be 6 mm or greater diameter, stainless steel aircraft cable to support the load. There shall be a take-up guide on the winch assembly to eliminate cable 'fall-off'. Compression springs shall be used in the connection of the hoisting cables to the luminaire ring assembly, but ultimate support of the luminaire ring will not be sacrificed by individual or total compression spring failure.

The lowering system shall also include circuit breaker assembly, twist-lock receptacle and plugs for the power cable.

**BASIS OF ACCEPTANCE:** Acceptance of the steel poles and appurtenances will be based on the delivery, by the Contractor to the Engineer, of the manufacturer's certification, signed by a N.Y. State P.E., of compliance with the specification requirements and the details of the poles and their appurtenances as indicated in the contract documents. As a condition of acceptance, the Contractor shall submit five copies of the shop drawings, used to fabricate the poles and appurtenances, to the Engineer along with the required certification as per §670-3.02.

When the Contractor proposes to use a shape of pole and/or appurtenances different from that indicated in the contract documents, written approval of the change in shape must be received from the Engineer prior to fabrication of the poles and/or appurtenances. Where the pole and/or appurtenances to be used are not as indicated in the contract documents, the manufacturer shall certify, in writing, to the Engineer, that the pole and/or appurtenances are equal to or superior to the pole and/or appurtenances indicated in the contract documents. Additionally, the differences shall be highlighted on the shop drawings submitted to the Structures Division for approval.

It will be the responsibility of the Contractor to ensure that the required certifications and shop drawing copies are received by the Engineer prior to the arrival of the poles and/or appurtenances on the site. The Engineer will require ten (10) working days, measured from the date of receipt, to approve any request for a change in shape of poles and/or appurtenances.

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**723-03 PORTABLE POWER DRIVE FOR HIGH MAST LUMINAIRE LOWERING SYSTEM**

**SCOPE.** This specification covers the functional requirements for a portable power drive unit, and winch when necessary, issued for a High Mast Luminaire Lowering System.

**MATERIAL REQUIREMENTS.** The portable power drive unit shall be a heavy duty reversing electric drill motor and drive shaft coupled with a torque limiter which shall supply all of the necessary driving power to the winch. A portable winch assembly shall be included with the portable power drive unit unless the winch has been permanently installed in the base of the high mast pole. The power drive shall be provided with a step down transformer and a remote control cord which will enable the operator to stand at least 5 meters from the pole. The unit shall be designed so as to be simply strapped to the base of the pole with a quick-connect securing mechanism that will accommodate any size or shape pole. The unit shall be capable of raising or lowering the lowering ring and luminaires at an approximate rate of 3 meters per minute. All aspects of the power drive shall be compatible with the detailing of the pole base and the lowering system for which it is to be used.
§723-03

Detail specifications, parts lists, instruction sheets and shop drawings of the portable power drive shall be submitted in accordance with §670-3.02 Shop Drawings.

BASIS OF ACCEPTANCE: Acceptance of the portable power drive will be based on the manufacturer's certificate of compliance with these specification requirements, and the Engineer's approval of the detail specifications and shop drawings.

723-04 THRU 723-09 (VACANT)

723-10 ANCHOR BASE (ALUMINUM)

SCOPE. This specification covers the material and quality requirements for cast aluminum anchor bases for lighting standards.

MATERIAL REQUIREMENTS. Aluminum anchor bases shall be a one piece casting of 356.0 aluminum alloy. The casting shall be free of cracks, pits, blow holes and non-metallic inclusions. Each anchor base shall be provided with four anchor bolt covers fabricated from B443.0 aluminum alloy with stainless steel screws for attaching the covers.

BASIS OF ACCEPTANCE. Anchor bases will be accepted upon the manufacturer's certification that they meet the requirements of this section.

723-11 THRU 723-14 (VACANT)

723-15 BREAKAWAY TRANSFORMER BASE (ALUMINUM)

SCOPE. This specification covers the material and quality requirements for Breakaway Aluminum Transformer Bases for Lighting Standards.

GENERAL. Transformer bases shall be one-piece aluminum alloy sand or aluminum alloy permanent-mold castings. The bases shall be equipped with a removable, aluminum or plastic, trapezoidal shaped door (approximately 0.33 m high; 0.18 m wide (top); 0.23 m wide (bottom). Each door shall be secured to the base with a stainless steel screw(s).

For attachment to the shaft anchor base, each transformer base shall be supplied with four (4) loose bearing plates or other acceptable bearing surfaces and four (4) 25 mm diameter by 95 mm long or longer hot-dipped galvanized hexhead machine bolts.

A grounding connection, accommodating a 12 mm threaded bolt or nut shall be provided inside each transformer base.

The light pole manufacturer shall obtain the base and bolt circle dimensions from the plans and shall then provide the Contractor with a template print, giving complete information for setting the anchor bolts.

Transformer bases shall be so designed as to minimize the possibility of hooking or snagging an impacting vehicle.

MATERIAL REQUIREMENTS. Transformer bases shall be cast of Aluminum-Alloy 356.0-T6 (SG70A-T6) in conformance with ASTM B26M, Aluminum-Alloy Sand Castings or ASTM B108, Aluminum-Alloy Permanent Mold Castings. The trapezoidal shaped door shall be fabricated from B443.0 (S5A) or 356.0-T6 (SG70A-T6) Aluminum Alloy.

Transformer bases and doors may be made of an Aluminum Alloy equivalent to 356.0-T6 (SG70A-T6) upon approval of the Materials Bureau.

TESTS. To determine acceptable breakaway characteristics, transformer bases shall be subjected to dynamic laboratory testing. The test shall apply to transformer bases accommodating poles of less than 317 kg in weight (including luminaire and bracket) and poles of less than 15 meter mounting height only. A full size
pole, together with luminaire or a suitable weight to simulate the luminaire, shall be mounted on the transformer base. A ballistic pendulum, equipped with a crushable nose, as approved by FHWA, and weighing 820 kg, shall be swung in such a manner so as to strike the transformer base at a velocity of 35 km/h. The point of impact shall be at a height of 0.5 meters from the bottom of the transformer base.

Transformer bases shall be considered to have acceptable breakaway features if they produce a change in velocity of 5.0 meters per second or less. For further specific information concerning the test equipment and procedure, contact the Materials Bureau.

BASIS OF ACCEPTANCE. The Department requires the submission of Materials Details as defined in §101-34.1. The manufacturer or supplier shall prepare and submit the appropriate material in accordance with the procedural directives of the Materials Bureau. Upon approval by the Materials Bureau, the name of the product and/or supplier, and the reference number assigned to the approved Materials Details will be placed on the Approved List. Such products shall then be accepted on the basis of their brand name and conformance to the approved Materials Details.

The supplier shall provide two copies of the approved Materials Details through the Contractor to the Engineer as part of the evidence of acceptability for the material at least 10 days prior to the use of the product.

723-16 THRU 723-18 (VACANT)

723-19 RIGID PLASTIC CONDUIT

SCOPE. This specification covers the material requirements for rigid plastic conduits (PVC and high-density PE) for use as raceway for wires or cables of an electrical system. Rigid plastic conduit is acceptable for up to 75°C wiring service. Rigid PVC (polyvinyl chloride) conduit is suitable for installation above or below ground and with or without concrete encasement; high-density PE (polyethylene) conduit is intended for below ground installations only, and with or without concrete encasement.

GENERAL. Under these requirements either Class 1, Heavy Wall PVC or Class 2, High Density PE conduit may be supplied for underground installation. For above ground use, only Class 1 conduit shall be allowed.

MATERIAL REQUIREMENTS. Rigid plastic conduit shall conform to the requirements of UL 651A.

All fittings, couplings and expansion fittings shall conform to the applicable requirements of UL514A. Solvent cement for joining Class 1 conduit and conduit fittings shall meet the requirements of ASTM D2564, or alternately be of the type recommended by the conduit manufacturer. Unless otherwise recommended by the manufacturer, fittings for Class 2 conduit shall be of a drive-on type and solvent cement will not be needed for “jointing.”

BASIS OF ACCEPTANCE. Rigid plastic conduit shall be accepted upon the basis of the manufacturer's certification that it meets the requirements of this specification, as well as being Underwriters Laboratory Listed. Fittings, couplings and solvent cement shall be accepted upon the manufacturer's certification that they meet the requirements of this specification.

723-20 METAL STEEL CONDUIT, ZINC COATED

SCOPE. This specification covers the material requirements for zinc coated rigid metal steel and intermediate metal steel conduits, used as raceways for wires or cable of an electrical system. Steel conduit may be embedded in concrete or earth; or may be used under all atmospheric conditions, including those locations classified as hazardous; and may be used in high voltage (over 600 volts) installations.

GENERAL. Under these requirements, either Class 1, Rigid Metal Steel Conduit or Class 2, Intermediate Metal Steel Conduit may be supplied. In addition, Class 1 and Class 2 conduits may be interchanged in the same run, providing the ends of both of the conduits are reamed, so as to create beveled edges and a smooth
§723-20
area over which the wires and cables will pass. Where conduit is to be jacked or exposed to the atmosphere, only Class I, Rigid Metal Steel Conduit, is permitted.

Additionally, conduit exposed to the atmosphere shall be PVC coated.

MATERIAL REQUIREMENTS. The zinc coated metal steel conduit shall conform to the requirements of UL 6, Class 1 - Rigid Metal Conduit; or UL 1242, Class 2 - Intermediate Metal Conduit. All fittings, couplings and expansion fittings shall be zinc coated and shall meet the same specifications as the conduits. Condulets shall be gasketed and shall be furnished with stainless steel or brass screws for the cover. Expansion fittings shall be metallically connected for continuity of grounding on either side.

The zinc coating on the outside surfaces shall be equivalent to a minimum thickness of 0.02 mm.

BASIS OF ACCEPTANCE. Metal steel conduit may be accepted upon the manufacturer's certification that it meets the requirements of this section.

723-21 AND 723-22 (VACANT)

723-23 P.V.C. COATED GALVANIZED STEEL CONDUIT

SCOPE. This specification covers the material and quality requirements for P.V.C. coated galvanized steel conduit.

GENERAL. P.V.C. Coated Galvanized Steel Conduit. The hot-dipped galvanized Rigid Steel Conduit; prior to plastic coating, shall conform to N.E.M.A. Standards Publication No. RN 1, and ANSI C80.1.

Elbows in standard and special radii shall be coated as above except that no coupling will be coated with the elbow. Separate couplings will be furnished as required and ordered.

BASIS OF ACCEPTANCE. P.V.C. coated galvanized steel conduit will be accepted upon manufacturer's certification that it meets the requirements of this section.

723-24 FLEXIBLE LIQUID-TIGHT STEEL CONDUIT

SCOPE. This specification covers the material and quality requirements of flexible liquid-tight steel conduit.

GENERAL. The flexible liquid-tight steel conduit shall be of the size indicated on the plans. It shall conform to the requirements of Underwriters' Laboratory specification UL 360 and shall be listed with Underwriters' Laboratory Inc. Connectors furnished under this specification shall be standard liquid-tight connectors.

BASIS OF ACCEPTANCE. Flexible liquid-tight steel conduit will be accepted upon manufacturer's certification that it meets the requirements of this section.

723-25 AND 723-26 (VACANT)

723-27 HIGH PRESSURE SODIUM VAPOR LUMINAIRES (STANDARD MOUNT)

SCOPE. This specification covers the material and quality requirements for high pressure sodium vapor luminaires.

MATERIAL REQUIREMENTS. The luminaires shall be of the high pressure sodium vapor type designed for use with high pressure sodium vapor lamps, color corrected or clear, and fully weatherproof.

The luminaires shall be constructed so they cover a complete self contained insect resistant and shock resistant unit. The entire luminaire assembly shall be completely pre-wired, at the factory, requiring only the connection of the primary circuit wires to the electric power source for its operation. All metallic component parts of the luminaire shall be made of a rust-resistant alloy or coated with an approved rust-resistant finish. Weep holes shall be provided for drainage.
Easy access to the lamp and major electrical components shall be provided requiring no special tools to gain entrance for maintenance purposes. The luminaire shall be provided with a means to prevent accidental exposure of the inner electrical components and accidental separation of the component parts.

The luminaire shall be equipped with an adjustable lamp socket to simplify beam angle setting and an appropriate refractor for the wattage and lighting distribution specified.

The luminaire casing shall be precision die-cast aluminum for the wattage of the lamps specified, and painted inside and out with a coat of baked on epoxy enamel, or polyester powder, virtually pinhole free, leaving no exposed metal. The underside of the luminaire shall be marked with the standard NFMA decal, visible from the ground, indicating the type and wattage of the lamp.

The luminaire shall contain a complete ballast assembly to which are mounted the necessary electrical components for multiple operation including ballast, solid state starting aid, capacitors, adjustable twist-lock three prong receptacle for photo-electric control when specified, and a dead back terminal board with pressure type terminals.

The ballast shall be a high power factor (exceeding 90%) 3 coil lag type (magnetic regulator) capable of operation on a 120 volt, 60 cycle, multiple circuit (unless otherwise shown on the plans) and able to operate the lamp in an open or short-circuit condition for six months without significant loss of ballast life.

The ballast assembly shall be capable of starting and operating the lamp at a temperature of minus twenty nine degrees Celsius.

The entire ballast assembly shall be readily removable as a single unit and utilize quick disconnect plugs.

The slipfitter shall be suitable for mounting on a 50 mm standard pipe bracket and capable of securely fastening flush to the mounting brackets without the need of separate mounting parts or rearrangement of mounting components. Leveling and clamping of the luminaire to the bracket shall be accomplished by the tightening of bolts and capable of adjusting the luminaire at least three degrees above and below horizontal. Bird shields shall be supplied and installed on all slipfitter installations.

The optical assembly shall consist of a die cast aluminum lens holder with a glass or aluminum 'Alzak' finished, hydroformed, gasketed reflector, a heat and impact resistant refractor, and a porcelain or polyester enclosed mogul socket. The mogul socket shall be equipped with lamp grip and a spring type center contact.

If a photo-electric control is specified, the receptacle shall be provided with a fully weatherproof covering that is readily removable without tools.

Luminaires shall be complete with compatible high pressure sodium lamps having the following characteristics:

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Mean lumens at 10 hours/start</td>
<td>90%</td>
</tr>
<tr>
<td>Warm-up time</td>
<td>3 to 4 minutes</td>
</tr>
<tr>
<td>Restart time</td>
<td>1 minute</td>
</tr>
<tr>
<td>Maximum power variance around design center</td>
<td>±5%</td>
</tr>
<tr>
<td>Lowest ambient starting temperature</td>
<td>-29°C</td>
</tr>
</tbody>
</table>

The unit shall be supplied with an ANSI-IIES medium, semi-cutoff vertical light distribution unless otherwise specified on the plans or ordered by the engineer. It shall be adjustable for a Type II, III or IV lateral light distribution and set at the factory for the distribution shown on the plans. For high mast installations a Type V distribution shall be provided. The downward light efficiency shall be at least 73%.

**BASIS OF ACCEPTANCE.** Acceptance of the roadway luminaire will be based on manufacturer's certification of compliance with these specification requirements and on inspection by the Engineer that no damage or defects are evident.

### 723-28 LOW PRESSURE SODIUM VAPOR LUMINAIRES (UNDERDECK MOUNT)

**SCOPE.** This specification covers the material and quality requirements for Low Pressure Sodium Vapor Underdeck Luminaires.
§723-28

MATERIAL REQUIREMENTS. The luminaire shall be of the low pressure sodium vapor type suitable for underdeck or wall mounting, designed for use with a horizontally mounted lamp, fully weatherproof and watertight. The luminaire shall operate satisfactorily with any appropriately sized low pressure sodium lamp now commercially available.

The luminaire shall be equipped with a built-in ballast, and shall be designed for operation on a 120 volt, 60 hz. multiple circuit unless otherwise shown on the plans.

The luminaire shall provide efficient even illumination and shall be optically sealed and gasketed. It shall be mechanically strong and easy to maintain. The ballast components shall be mounted in a structurally sound manner within the housing of the luminaire, with provision made for optimum heat dissipation of the ballast. The reflector, socket, terminal board, fuse and ballast components shall be readily accessible. When closed for operation, the optical assembly shall be sealed against the entry of all contaminants.

The luminaire shall withstand severe outdoor conditions due to radical seasonal changes in temperature and shall be structurally capable of operating satisfactorily in winds of 129 km/h.

All exposed electrical live parts shall be protected to observe adequate safety precautions, subject to approval of the Engineer.

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

All components shall be corrosion resistant. Metals in contact with each other shall be compatible to prevent corrosion. Screws washers and nuts shall be stainless steel.

The luminaire housing shall be constructed of either heavy duty aluminum or heavy duty plastic and shall support the ballast, capacitor component, socket, lamp support, fuse, and terminal board. Those portions of the housing which support the ballast, and to which are connected the mounting hardware and the conduit, shall be aluminum. The underside of the housing shall be marked with the standard NEMA decal indicating the type and wattage of the lamp. All mounting hardware required for attaching the luminaire to the underdeck structure and for adjusting the luminaire about its longitudinal axis through an angle of 45 degrees from horizontal, shall be furnished with the luminaire when required. The luminaire shall be capable of being mounted flush against underdeck or, when required, suspended by rods from the underdeck. The mounting hardware shall be made of stainless steel, prevent rotation of the luminaire, and be capable of adequately supporting the luminaire in winds of 129 km/h.

The reflector shall be fabricated from an aluminum alloy sheet mechanically polished and electrochemically processed to a specular finish. It shall not darken to the extent that it cannot be wiped clean with a soft cloth.

The refractor shall be formed of clear, heat resistant, ultra-violet stabilized polycarbonate plastic, free from imperfections and capable of being removed without the use of tools.

It shall be equipped with a latching arrangement and shall be hinged to the housing of the luminaire. Provisions shall be made to prevent accidental detachment of the refractor or any other luminaire part.

The ballast shall be a modified constant wattage type with high power factor (over 90%) and capable of regulating the output power within ±5% when the input voltage fluctuates ±10%. The ballast and lamp shall be capable of starting and operating at ambient temperatures of minus 29 degrees Celsius.

The lamp socket shall be bayonet type provided with a means to hold the lamp against vibration and achieve close contact between lamp and socket terminals.

A means shall be provided to reduce entrance of foreign material through the wiring opening into the optical system.

The terminal board shall be equipped with two clamp type pressure 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.

The fuse holder shall be gasketed and provide external access to the fuse.

Photometric distribution shall be symmetric or asymmetric as specified.
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BASIS OF ACCEPTANCE. Low pressure sodium vapor underdeck luminaires will be accepted upon the manufacturers certification that they meet the requirements of this section and are U.L. approved and on inspection by the Engineer that no damage or defects are evident.

723-29 HIGH PRESSURE SODIUM VAPOR LUMINAIRES (UNDERBRIDGE MOUNT)

SCOPE. This specification covers the material and quality requirements for High Pressure Sodium Vapor Luminaires (Underbridge Mount).

MATERIAL REQUIREMENTS. The luminaires shall be of the high pressure sodium vapor underbridge type designed for use with high pressure sodium vapor lamps.

The luminaires shall be constructed to be a complete self contained waterproof and shock resistant unit. The entire luminaire assembly shall be completely pre-wired, at the factory, requiring only the connection of the primary circuit wires to the electric power source for its operation. All metallic component parts of the luminaire shall be made of a rust-resistant alloy or coated with an approved rust-resistant finish.

Easy access to the lamp and major electrical components shall be provided requiring no special tools to gain entrance for maintenance purposes. The luminaire shall be provided with a means to prevent accidental exposure of the inner electrical components and accidental separation of the component parts.

The luminaire casing shall be precision die-cast aluminum for the wattage of the lamps specified, and marked with the standard NEMA decal, visible from the ground, indicating the type and wattage of the lamp.

The ballast shall be a high power factor (exceeding 90%) 3 coil lag type (magnetic regulator) capable of operation on a 120 volt, 60 cycle, multiple circuit (unless otherwise shown on the plans) and able to operate the lamp in an open or short-circuit condition for six months without significant loss of ballast life.

The ballast assembly shall be capable of starting and operating the lamp at a temperature of minus twenty nine degrees Celsius.

All mounting hardware required for attaching the luminaire to the underdeck structure and for adjusting the luminaire about its longitudinal axis shall be furnished with the luminaire. The luminaire shall be capable of being mounted flush against underdeck or suspended from the underdeck. The mounting hardware shall prevent rotation of the luminaire and be capable of adequately supporting the luminaire in winds of 129 km/h.

The optical assembly shall consist of a die cast aluminum lens holder with a glass or aluminum 'Alzak' finished, hydroformed, gasketed reflector, a heat and impact resistant refractor, and a porcelain or polyester enclosed mogul socket. The mogul socket shall be equipped with lamp grip and a spring type center contact.

Luminaires shall be complete with compatible high pressure sodium lamps having the following characteristics:

- % Mean lumens at 10 hours/start: 90%
- Warm-up time: 3 to 4 minutes
- Restart time: 1 minute
- Maximum power variance around design center: ±5%
- Lowest ambient starting temperature: -29°C
- Bulb finish: Clear

The unit shall be specifically designed and set to produce an ANSI-IES cutoff, type IV light distribution unless otherwise specified on the plans or ordered by the engineer. The downward light efficiency shall be at least 73%.

BASIS OF ACCEPTANCE. Acceptance of the underdeck luminaire will be based on manufacturer's certification of compliance with these specification requirements and on inspection by the Engineer that no damage or defects are evident.
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723-30 MERCURY VAPOR LUMINAIRES (STANDARD MOUNT)

SCOPE. This specification covers the material and quality requirements for Mercury Vapor Luminaires.

GENERAL. The luminaire shall be of the mercury vapor type designed for use with a horizontally mounted mercury vapor lamp, color corrected or clear and shall be fully weatherproof. The luminaire and lamp combination shall produce Type II, III, or IV light distribution conforming to ASA Standards, and as shown on the plans. The luminaires shall be equipped with a built-in ballast for the wattage and operating voltage shown on the plans. The components comprising the assembly of the upper half of the luminaire shall include a reflector, a porcelain enclosed mogul socket, a twist-lock three prong receptacle for a photo-electric control, and a ballast.

BASIS OF ACCEPTANCE. Mercury vapor luminaires will be accepted upon the manufacturer's certification that they meet the requirements of this section.

723-31 MERCURY VAPOR LUMINAIRES (UNDERBRIDGE MOUNT)

SCOPE. This specification covers the material and quality requirements for Mercury Vapor Luminaires (Underbridge Mount).

GENERAL. The luminaire shall be complete for surface or pendent mounting, as shown on the plans. The luminaire shall be equipped with a prismatic refractor, be shock resistant, and protected with a cast guard. The door and guard assembly shall be equipped with stainless steel pressure latches and a safety chain. The housing shall be gasketed against which the door shall seat when closed. The luminaire shall provide a maximum candela beam of 60 degrees from the vertical for roadways up to 15 meters in width, and 70 degrees for wider roadways and approximately 180 degrees horizontal spread. The ballast shall be an integral part of the luminaire and shall be capable of operating a 175 watt or 250 watt mercury vapor lamp at minus 29°C. The lamps shall be included with the luminaire.

BASIS OF ACCEPTANCE. Mercury Vapor Luminaires will be accepted upon the manufacturer's certification that they meet the requirements of this section.

723-32 THRU 723-39 (VACANT)

723-40 CAST-IRON JUNCTION BOX

SCOPE. This specification covers the material and quality requirements for Cast-Iron Junction Boxes.

GENERAL. Junction boxes shall be hot-dipped galvanized cast-iron with a hot-dipped galvanized cast-iron cover. The cover shall be fastened to the box with brass or stainless steel screws. The box shall be so constructed that when the installation is complete and the cover is secured the box will be water tight.

Galvanizing shall be as specified in §719-01, Type II.
The Manufacturer shall refer to the plans for details and dimensions.

BASIS OF ACCEPTANCE. Junction boxes will be accepted upon the manufacturer's certification that they meet the requirements of this section.

723-41 THRU 723-44 (VACANT)

723-45 PRECAST REINFORCED CONCRETE FOUNDATIONS AND PULLBOXES

SCOPE. This specification covers the material and quality requirements for precast reinforced concrete foundations and pullboxes.
MATERIAL REQUIREMENTS. The requirements for Precast Reinforced Concrete Foundations and Pullboxes shall be identical to the requirements for §706-04 Precast Concrete Drainage Units with the following exceptions:

- Only five (5) sets of shop drawings will be required.
- The requirements for 'Steps for Manholes, §725-02' do not apply.

BASIS OF ACCEPTANCE. The pullbox units will be accepted on the basis of manufacturer's certification that the units were manufactured from materials conforming to these specifications and that the properties of the finished units also meet the specification requirements.

The Department reserves the right to test plastic or hardened concrete at any time. If hardened concrete is tested, 100 mm diameter cores shall be drilled by the manufacturer.

723-46 THRU 723-49 (VACANT)

723-50 PHOTOELECTRIC CONTROL

SCOPE. This specification covers the material and quality requirements for Photoelectric Controls.

MATERIALS REQUIREMENTS. Photoelectric controls shall function to energize artificial lighting when natural lighting falls to a preset value, and to de-energize when natural lighting rises to a preset value. The photoelectric control shall be factory calibrated to energize the luminaire at approximately thirty (30) lux and de-energize at approximately thirty (30) lux. The photoelectric controls shall be adjustable by means of an outside adjustment system. The adjustment mechanism shall be easily accessible and provide a precise foolproof light level adjustment. Photoelectric controls which cannot be adjusted while the unit is in service or have to be disconnected while making adjustments will not be acceptable.

Photoelectric controls shall be suitable for mounting in all three-pronged locking type receptacles that conform to Electrical Engineering Institute (EEI) or National Electrical Manufacturers Association (NEMA) Standard Specifications.

In the event of failure of any component of the control system, the artificial lighting shall be energized.

The housing for the photoelectric control shall be weather resistant and shall be unaffected by ultraviolet rays. A neoprene sponge gasket shall be cemented to the bottom of the base to seal out weather, dust and insects, and shall conform to EEI-NEMA Standards.

The photocell shall be hermetically sealed to prevent electrolysis from moisture. The manufacturer shall certify that each cell has had 24 hours of light preconditioning before assembly.

The photoelectric control shall be solid state and shall be capable of being faced in any direction except south. Generally, it is recommended that the photo sensitive device face north, as this affords maximum spectrum response.

The photoelectric controls shall have an operating voltage range of 105-285 volts, 50/60 cycle and shall be suitable for operation on nominal distribution voltages of 120, 208, 240, and 277 volts.

The controls shall be temperature compensated, and shall be suitable for operation from -40°C to +71°C and shall be completely unaffected by humidity. The switch mechanism shall be snap acting of sufficient capacity to adequately handle loads of 1000 watts of incandescent lighting, or 1800 volt-amperes of ballasted lighting. The photoelectric control shall be able to withstand an inrush current of a maximum of 170 amperes.

Time delay devices shall be built into the photoelectric control to prevent switching of artificial lighting due to transient lighting changes.

The photoelectric controls shall also be equipped with a built-in expulsion-type surge and lightning protection arrester.

BASIS OF ACCEPTANCE. Photoelectric controls will be accepted upon the manufacturer's certification that they meet the requirements of this section.
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723-51 THRU 723-59 (VACANT)

723-60 ANCHOR BOLTS

SCOPE. This specification covers the material and quality requirements for anchor bolts.

MATERIALS REQUIREMENTS. Anchor bolts shall meet the requirements of ASTM F568 Class 8.8, or ASTM A449, or they may be manufactured from steel meeting the requirements of ASTM A576, Grades 1020 through 1050 inclusive, having a minimum yield strength of 345 MPa. A hex nut, lock washer, and flat washer shall be supplied with each anchor bolt and their dimensions shall be shown on the plans. The hex nut and flat washer shall be manufactured in accordance with ASTM A325M or A325 and the lock washer shall be manufactured in accordance with Table 730-22-1 Steel Fasteners. The nuts, washers and the top 300 mm of the anchor bolts shall be galvanized in accordance with the requirements for Type II or Type V galvanizing as stated in section 719-01, Galvanized Coatings and Repair Methods.

The anchor bolt dimensions shall be shown on the plans.

SHIPPING. Anchor bolts, hex nuts, and washers shall be shipped to the construction site at a time convenient to the masonry construction.

BASIS OF ACCEPTANCE. Anchor bolts will be accepted upon the manufacturer's certification that they meet the requirements of this section.

723-61 THRU 723-69 (VACANT)

723-70 SINGLE CONDUCTOR CABLE

SCOPE. This specification covers the material and quality requirements for single conductor cable used in highway lighting.

MATERIAL REQUIREMENTS. Single conductor cable shall be copper, Type THW, RHW-2, or XHHW-2 (XLP) as designated by Underwriter's Laboratory Specifications. The single conductor cable shall have heat and moisture resistant insulation for a maximum operating temperature of 75°C, in wet and dry conditions.

BASIS OF ACCEPTANCE. Single conductor cable shall be accepted upon the manufacturer's certification that it meets the requirements of this specification as well as being Underwriter's Laboratory approved.

723-71 SINGLE CONDUCTOR DIRECT BURIAL CABLE

SCOPE. This specification covers the material and quality requirements for direct burial 600V type USE cable for use in conduit or in trenches as shown on the plans and as directed by the Engineer.

MATERIAL REQUIREMENTS. Cable shall bear Underwriters Laboratories Label for type USE. It shall consist of copper conductor, and insulation constructed to conform to ICEA (Insulated Cable Engineers Association) Pub. No. S-66-524 and NEMA Pub. No. WC-7 "Thermoplastic - Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy."

Cable shall consist of 7 copper strands up to and including #2 AWG and shall be constructed of 19 copper strands in larger sizes.

Insulation shall be chemically cross linked (vulcanized) polyethylene insulating compound.

Cable shall be mechanically spliced and insulated using the highest quality poured splices available for underground 600V cables.

Cable shall be factory or shop twisted in a duplex or a triplex configuration in accordance with the publications listed in (a) above and as indicated by the plans.
§724-03

BASIS OF ACCEPTANCE. Single Conductor Direct Burial Cable will be accepted upon the manufacturer's certification that it meets the requirements of this specification as well as being Underwriter's Laboratory approved.

723-72 THRU 723-74 (VACANT)

723-75 GROUND WIRE

SCOPE. This specification covers the material and quality requirements for ground wire used in highway lighting.

MATERIAL REQUIREMENTS. Ground wire shall be #6, soft-drawn bare copper wire, 7 strand single conductor for 600 volts.

BASIS OF ACCEPTANCE. Ground wire shall be accepted upon the manufacturer's certification that it meets the requirements of this specification as well as being Underwriter's Laboratory approved. All ground wire shall also carry the Underwriter's Laboratory approval label.

SECTION 724 - TRAFFIC SIGNALS

724-01 SIGNAL CABLE

SCOPE. This specification covers the material requirements for signal cable for use with traffic signal systems and for installation in underground ducts or as an aerial cable supported by a messenger.

MATERIALS REQUIREMENTS. The cable shall conform to the requirements of the International Municipal Signal Association (IMSA) Specification 20-1. The gauge and number of conductors shall be as specified in the plans. The conductors shall be stranded copper wire.

BASIS OF ACCEPTANCE. Acceptance of material will be based on the manufacturer's certification of compliance with these specification requirements.

724-02 SPAN WIRE

SCOPE. This specification covers the material requirements for span wires used in the suspension of traffic signal heads. Span wires may be used as a single span wire or a dual span wire including a tether wire. The same wire may be used as messenger wires or guy wires.

MATERIALS REQUIREMENTS. Span wire shall meet the requirements of ASTM B228, Grade 30 EHS.

BASIS OF ACCEPTANCE. Acceptance of span wire will be based on the manufacturer's certificate of compliance with these specification requirements, together with supplementary sampling and testing at the discretion of the Materials Bureau.

724-03 TRAFFIC SIGNAL POLES

SCOPE. This specification covers the material requirements and fabrication details for poles used for traffic signals. Traffic signal poles are classified according to the following applications:

A. Span Wire. Span wire poles are used for supporting a steel cable or cables to which are attached traffic signals and overhead signs.

B. Mast Arm. Mast arm poles consist of a vertical shaft and an approximately horizontal arm to which are attached traffic signals and overhead signs. These poles may also be equipped with more than one mast arm.

C. Post Top Mount Post top mount poles are used for mounting traffic signals directly on the top of