

700 MATERIAL DETAILS

Materials shall conform to the stated requirements and/or the requirements of the referenced specifications including modifications as noted.

Copies of all Supplemental Specifications referenced in this section are on file with the City of Columbus Transportation Division.

731 - SIGN LIGHTING MATERIAL

731.01 Mercury Vapor Luminaire. Mercury vapor luminaires shall be complete lighting units consisting of a housing door frame, refractor lens, reflector, socket and lamp. The luminaire shall have a weatherproof optical system.

The projected height of the luminaire including mounting device shall be not more than 11 inches (279 mm) high when positioned to provide optimum illumination of a sign face, 12.5 feet (3.8 m) high.

The luminaire housing shall be cast aluminum of a natural finish or gray baked acrylic enamel. The housing shall be adequately reinforced, and shall contain and support the reflector and lamp socket. A flexible permanent-set and heat-resistant waterproof gasket shall be provided between the housing and door frame. The gasket shall be compressed to form a weatherproof seal when the door frame is closed. The gasket shall be suitably attached and shall be readily removable. Weepholes shall be provided in the luminaire housing or cover as required for drainage.

The door frame shall be either cast aluminum of the same finish as the housing, or an aluminum extrusion with an anodized finish. The door frame shall be hinged on one edge and fastened in place with spring loaded latches requiring no tools to open. Hinges, latches and other external hardware shall be stainless steel. When the door frame is opened, the hinge shall retain the door frame in a secure condition and shall not permit unintentional separation.

The refractor or lens of the optical system shall be borosilicate glass or its equivalent, capable of withstanding thermal shock and the impact of freezing rain or hail. The waterproof seal between refractor or lens and the door frame shall consist of a heat-resistant gasket or elastic cement.

The reflector shall be fabricated from aluminum and shaped to distribute light uniformly over the sign face, in conjunction with the lens or refractor supplied with the luminaire. The surface of the reflector shall be finished to preserve the original reflective characteristics.

Mercury lamp sockets shall be a mogul screw shell with a large center contact spring providing firm contact with the lamp base. The socket shall be porcelain-shrouded and shall include lamp grips.

The manufacturer shall provide, in addition to catalog cuts submitted for determination of compliance, complete photometric data for each type luminaire as used with a 175 watt, H39KB-175 lamp. Photometric performance data shall be certified by the manufacturer or a qualified independent testing laboratory. Minimum data centers of 1 foot (0.3 m) square areas over a vertically-oriented 10 by 10 foot (3.0 by 3.0 m) square grid with the luminaire positioned 4 feet (1.2 m) in front of the vertical centerline of the grid and one foot (0.3 m) below the bottom edge of the grid. The data shall include:

- (a) the maximum value obtained;
- (b) the minimum value obtained;
- (c) the average of the 100 measured values;
- (d) the ratio of the maximum and minimum values obtained;
- (e) the maximum ratio of illumination values obtained in any two contiguous areas.

Illumination shall be measured using a cosine-corrected receptor in the plane of the grid with the receptor optical axis perpendicular to the plane of the grid. Spectral response of the measuring device shall conform to the CIE (Commission International del'Eclairage) standard "photopic" response. The luminaire shall meet the following illumination requirements when tested under the above conditions:

1. the maximum illumination on any 1 foot (0.3 m) square area shall be 50 foot candles (540 lx).
2. the average of the individual measurements shall be at least 20 foot candles (215 lx).
3. the ratio of the maximum and minimum values obtained shall be no greater than 6.0.
4. the maximum ratio of values obtained in any two contiguous areas shall be no greater than 2.0.

The Engineer may require a special test to confirm that a mercury-vapor luminaire meets the weatherproof requirements. A luminaire complete with mounting connections and electrical conduit connections will be mounted in a manner simulating actual service. A water spray, adjusted to be equivalent to a driving rain, will be applied to the top, sides and bottom for a period of one hour. Any entrance of water resulting in wetting of a

normally live electrical component, or internal part of the optical assembly, shall be cause for rejection.

731.03 Changeable Message Sign, Electrical Type.

- (a) **General.** Electrical changeable message signs shall consist of units or groups of units containing arrangements of pixels so that by electrical circuitry different messages may be displayed.

Signs shall be contained in weatherproof cabinets. Control logic units, load switches, monitor feedback circuits, power supply, etc., shall be integrated within the sign cabinet or mounted within a separate weatherproof enclosure as required.

- (b) **Message Type.** Electrical changeable message signs shall be of the limited message or unlimited message type.

Limited message signs shall contain pixels in an arrangement so that by the energizing of selected pixels two or more messages may be displayed.

Unlimited message signs shall contain pixels arranged in full matrix or alphanumeric type modules positioned side-by-side to provide line units of the specified length. Line units shall be capable of displaying messages containing letters and numerals, limited only by the number of characters which can be accommodated. Line units shall be capable of continually displaying alternating messages.

- (c) **Display Type.** Electrical changeable message signs shall be of the lamp, light emitting diode, fiber optic, light reflecting or hybrid types.

Lamp type changeable message signs shall consist of individual incandescent bulbs. Light emitting diode changeable message signs shall consist of groups of individual light emitting diodes that, acting together, form individual character pixels. Fiber optic changeable message signs shall consist of fiber optic bundles that transmit light from a remote source to form individual pixels.

Light reflecting changeable message signs shall consist of individual light reflecting panels. Hybrid changeable message signs shall consist of individual light reflecting panels, each augmented by a light emitting pixel of the specified type. The light emitting pixels shall be displayed when the corresponding reflecting panel is in exposed position, and concealed or de-energized when the corresponding reflecting panel is in the unexposed position.

731.04 Changeable Message Sign, Drum Type. Mechanical drum changeable message signs shall consist of one or more drums of the required number of faces which are mechanically rotated.

Signs shall be contained in weatherproof cabinets. Control logic units, load switches, monitor feedback circuits, power supply, etc., shall be integrated within the sign cabinet or mounted within a separate weatherproof enclosure as required.

731.05 Internally Illuminated Fixed Message Sign. Internally illuminated fixed message signs shall be of the required legend and shall consist of an opaque housing with a face of translucent plastic. When specified, signs shall be double faced. Signs shall be illuminated by interior lamps located so the sign face is uniformly lighted.

Signs shall be one of two types, either with legend on the exterior surface to maintain legibility when unlighted due to power failure, or with legend on the interior surface so as to be invisible when the sign is unlighted. Legend shall be black silk screening or by direct applied characters and sign faces shall be white unless otherwise specified. Sign faces shall be designed for quick removal for maintenance and provided with a safety chain or like device. When specified, sign faces may be shielded by sunscreens, louvering or visors.

The housing shall be of corrosion-resistant materials which shall be of cast, extruded or formed construction. Mounting hubs shall be provided and shall be similar to traffic signal design. The sign shall be weatherproof and shall include drainage weepholes.

The sign shall be furnished with appropriate hardware for mounting by span wire, mast arm, pedestal top, or pole type bracket arms. Lamps shall be included and shall be fluorescent type with ballast.

731.06 Sign Flasher Assembly. Sign flasher assemblies shall consist of a pair of flashing beacons, and a warning sign and shall include a fixture for lighting the sign, a flasher control unit with enclosure, and mounting hardware. Mounting hardware shall be compatible with the support design.

The beacon shall be of single traffic signal sections with 8 or 12 inch (203 or 305 mm) yellow lenses. The sign lighting fixture shall be weatherproof and shielded to project its output downward on the sign. The flasher control unit shall flash the beacons at a rate for each beacon of between 50 to 60 times per minute with the light period from one half to two thirds of the total cycle. Flasher control units shall have all solid state components and shall meet NEMA TS-1, Part 6. Control units shall be housed within a weatherproof corrosion-resistant enclosure with a lockable door. Incandescent lamps shall be included. The sign, support and foundation will be paid for separately.

731.07 School Speed Limit Sign Assembly. School speed limit sign assemblies shall consist of a reflectorized sign with an internally illuminated speed limit display unit.

The unit shall be designed so that no number is visible when the sign is unlighted. The sign shall be fitted with a pair of flashing beacons arranged above and below, backing structure members with hardware for attachment of the sign to support structure, and shall include a flasher. The beacons shall be external to the sign face.

The beacons shall be yellow and of the size specified in the plans. The speed limit display unit shall be weatherproof and shall have black numerals on white background or translucent white numerals on a black background.

The flashers shall flash the beacons alternately at a rate for each beacon of 50 to 60 times per minute with the light period from one-half to two-thirds of the total cycle. Flashers shall have all solid state components and shall meet NEMA TS-1, Part 6. Backing members with hardware shall be compatible with the method of support. Incandescent lamps shall be included.

731.08 Flexible Conduit. Flexible conduit for wiring of lighted signs shall be galvanized steel flextube with a waterproof polyvinyl chloride (PVC) jacket.

731.09 Ballast Wiring Enclosure. Ballast wiring enclosure shall be weatherproof NEMA Type 4 enclosure fabricated of sheet steel galvanized in accordance with 711.02. A removable cover shall bear a warning sign conforming to 713.19, 16(d). The enclosure shall contain a panel in accordance with 713.19, 16(e). The panel shall accommodate necessary terminal blocks and bus-bars rated at 600 volts, and shall be provided with marker strips. Conduit fittings and hardware shall be included.

731.10 Timer with Enclosure. The timer shall permit automatic sign operation for a minimum of 3 times per day and for selected days of the week. The timer shall be solid state with a back-up battery to maintain timekeeping and program memory for at least 48 hours. The battery shall have a design life of 10 years under field conditions when power failures over the 10 year period would accumulate to 100 days. When installed outdoors, the timer shall be housed within a lockable, weatherproof, corrosion-resistant enclosure. Each enclosure shall be furnished with at least one padlock complying with 613.08.