

ITEM 690

TRAFFIC SIGNAL HEADS

690.1 Description. This Item shall govern the minimum design and requirements for adjustable face aluminum or polycarbonate functional requirements for traffic control signal heads and signal heads hardware.

690.2 General. The traffic control signal heads shall be in accordance with the Latest Edition of Institute of Transportation Engineers (ITE) Technical Report No. 1, except as noted below. The Contractor shall supply written certification of compliance from the manufacturer.

Each traffic signal face shall consist of a number of signal sections rigidly fastened together in such a manner as to present a continuous pleasing appearance. Assembled signal sections shall not exhibit light leakage.

The traffic signal head shall consist of a system of one or more signal faces installed and illuminated in a definite sequence by a remote timing device, which shall indicate to traffic approaching the signal face the right of way at the intersection or giving warning of existence of a hazardous condition, thus facilitating an orderly movement of traffic through the intersection.

The electrical and optical system of the signal head shall, unless otherwise specified, be designed for operation from a power supply of 120 volt, single phase, 60 Hz alternating current and 60-150 watt incandescent lamps conforming to Item 693 "Traffic Signal Lamps".

Structural requirements for aluminum and polycarbonate materials are described in Section 690.4.

Unless otherwise specified in the drawings, the material for the mounting attachments shall be cast aluminum alloy.

The signal, including one or more lenses, shall be sectional in construction, requiring one section for each lens.

The design of the signal shall be such, that with the aid of simple tools and addition of standard signal fittings; these signal assemblies with the addition of standard bracket assemblies will assemble into two-way, three-way, four-way and horizontal signal head configurations.

690.3 Standard Signal Face & Heads. Signal face and signal arrangement shall be as shown in the drawings.

The "Standard Signal Face" shall consist of three or more lenses, each mounted in an individual housing case. The signal face shall be for vertical or horizontal installation and shall be so assembled that the red lens will be located at the top if vertically mounted and at the left if

horizontally mounted, the yellow lens at the center if vertically mounted and to the right of the red lens if horizontally mounted, and the green lens at the bottom of the signal face if vertically mounted three section signal face, or to the right of the yellow lens if a horizontally mounted three section signal face. If more than three sections are required on a signal face, the lens shall be arranged as shown on the attached drawings, however, the arrangement shall not be in conflict with arrangements as shown in the Latest Edition of the "Texas Manual on Uniform Traffic Control Devices for Streets and Highways".

All housing cases of each of the multiple-way signal heads shall be rigidly attached, at top and bottom, to 1-1/2" (38mm) (inside diameter) tubular supporting arms radiating from hubs at the vertical central axis of the head and rigidly attached thereto in a manner that will assure permanent alignment of the separate housings. The hub shall be designed to conform to the type of mounting attachment specified in the drawings and provisions shall be made for carrying the leads from each housing enclosed in the supporting arms to a single outlet in the mounting attachment. All units of the assembled head shall be of adequate strength for the purpose intended and shall be constructed of materials not affected by continuous exposure to corrosive atmospheres, particularly salt air.

A metal spacer in place of the bottom pipe bracket will be acceptable for multiple-way span-wire and mast-arm mounted signal heads.

Signal Faces to be installed vertically or horizontally on mast arms shall be mounted by the appropriate and necessary hardware as approved by Harris County. Any signal heads to be installed vertically or horizontally on the signal pole shall likewise be mounted by hardware as approved by Harris County.

Unless otherwise called for in the drawings, all supporting arm assemblies shall have threaded connections, not welded, and shall be assembled with full threaded crosses, not elbows.

690.4

Housings. The Polycarbonate resin material with sides, top, and bottom integrally molded. The housing shall be injection molded from ultraviolet and heat stabilized flame retardant, permanently colored polycarbonate resins. The housing shall at least 0.125 inches (3.18 mm) thick anywhere on the housing and shall be internally ribbed so as to produce the strongest possible assembly consistent with light weight. The terminal block shall either be securely mounted or integrally molded into the housing (see Section 690.4, Paragraph 11).

The silicon aluminum alloy traffic signal housing cases, also designated herein as optical-unit housings, if required in the drawings, shall be die cast of a silicone aluminum alloy by a process imparting a smooth homogeneous finish. Casting shall be accurately formed and free from pouring faults, sponginess, cracks, blowholes, or other defects affecting their strength and appearance.

All visors shall be of a silicon aluminum alloy and may be of cast material or of sheet metal having a minimum thickness of 1/16" (1.6 mm).

The signal housing cases, fittings, and accessories shall be of noncorrosive, rust resistant material capable of withstanding constant exposure to sunlight and corrosive atmospheres, including salt air, and shall provide adequate strength for the purpose of which it is utilized.

Provision shall be made for accommodation of the particular type of mounting specified and attachment of doors, optical units, and other such accessories as may be specified for the particular installation. All traffic signal housing cases, together with doors, lenses, and mounting attachments shall comprise a dust and moistureproof housing for the optical units, connecting wiring, and terminal block. The housing cases shall be of such construction as to assure permanent alignment of the lens in the traffic signal face. Design of door, housing, and visor shall be such that no light is visible in the profile view of the traffic signal face.

Traffic control signal housing cases shall be of the sectional adjustable expandable type. The assembled housings for each signal face shall consist of three or more individual sections, each designed for housing a single complete optical unit. Individual signal sections shall be rigidly attached to form a single "Signal Face" either with at least four machine screws between each section or by the three bolt and two washer method. Complete signal faces shall provide positive locked positioning when used with serrated brackets, mast arm, or span wire fittings.

The top and bottom of each signal section shall be provided with a serrated ring surrounding a two inch diameter hole, such that positive locking of signal faces can be accomplished when mounted with serrated ring.

The serrated ring at the top of each signal shall be raised 0.128 inches above the surrounding body and rib plane to prevent water trapped between signal sections or falling on top of a signal from entering into the housing.

Portions of cases providing for attachment to supporting arms shall be molded with large bosses for the supporting arms. Each housing case shall be so attached to its supporting arm that it will be adjustable by rotation about its vertical axis in such a manner that any pair of adjacent cases may be adjusted individually to give indications in two directions as close as 15 degrees apart and may be rigidly clamped in any position throughout the range of adjustment. Provision shall be made for carrying the traffic signal leads enclosed in the mounting attachment.

Both the top and bottom of each traffic signal housing case shall be provided with an opening of two inches (50 mm) in diameter to accommodate 1-1/2" (38 mm) pipe brackets. A locking ring shall be integrally cast or molded around the bottom opening. Around the top

opening shall be either an integrally cast or molded locking ring or a separate splined locking ring designed to fit into notches. The locking rings shall have a minimum of 46 evenly spaced teeth and shall be so designed that the top and bottom rings will mate to provide a perfectly aligned signal head with flush connection between the outer circumference of the sections.

Threaded metal inserts shall be provided in a walled off portion of each signal for terminal block mounting. It shall be possible to place an insulating cover over the terminal block, that will match the wall surrounding the terminal block.

Any open end of an assembled beacon face housing shall be plugged with an ornamental cap and gasket.

690.5 Housing Door. The housing door of each traffic signal housing shall be a one piece polycarbonate resin material or die cast in a silicon aluminum alloy with an approximate 12 inch (300 mm) diameter circular opening for the lens as specified. The door must be of the same material as the housing. The housing door shall be at least 0.125 inches (3.18 mm) thick anywhere on the housing door.

- A. Silicon Aluminum Alloy Door. The door shall be provided with hinges and lugs for attachment to the main body casting, so spaced as to hold the door in perfect alignment when closed. The door shall be securely gasketed to the traffic signal housing with a weatherproof gasket.
- B. Polycarbonate Resin Door. The door shall be attached to the housing by means of two stainless steel hinge pins.

Two stainless steel wing screws shall be installed on the side of the door to provide for opening and closing the door without the use of tools. Wing screws shall have a flat-bearing surface or stainless steel flat washer to prevent gouging of the housing door by the wing screws. Wing screws shall remain captive in the housing door when the door is open.

690.6 Visors. Each traffic signal housing door shall be equipped with an easily detachable standard tunnel or full circle visor (unless otherwise indicated). The visor shall be a polycarbonate resin or a silicon aluminum alloy to match the housing and door. The visor shall be rigidly attached to the door with stainless steel screw type connections in a manner that will prevent the leakage of light and moisture throughout the periphery of attachment.

Unless otherwise called for in the drawings, the visor on the front of each door shall:

- Be circular in section;
- Have a downward tilt of 2 to 8 degrees;
- Encompass approximately 300 degrees of the lens;

- Extend outward from the face of the lens a minimum of 9-1/2" (240 mm) for 12" (300 mm) diameter lens (measured at its outer visible circumference);
- Be of such design that the encircled portion of the lens will not be visible in the profile view of the traffic signal face; and,
- Be open at the bottom so as to prevent the accumulation of snow and dirt

Visors shall be easily removed and replaced without damage to visor or signal head.

690.7 Optical System. Each lens shall be provided with an optical unit consisting of a reflector assembly with leads to the terminal block (which is to be furnished in each complete housing) together with all bolts, nuts, screws, clips, hinges, lugs, and incidentals necessary for mounting the various parts of the optical assembly.

The optical system shall consist of a red, yellow, yellow arrow, green, green arrow, or special stenciled design traffic signal lens with a nominal size of 12 inches (300 mm) or as specified. Lenses shall be permanently marked, in an inconspicuous manner, indicating the top of the lens and the name or trademark of the manufacturer. All lenses shall be glass and shall have a a high transmission value, have a specific gravity of not less than 2.50, and conform to all ITE specifications.

Lenses and optical system shall be capable of withstanding continuous illumination of a 150-watt lamp in a 12 inch (300 mm) head without distortion of lenses. Lens and reflector design shall conform to ITE Standard (ITE Report No. 1) and to American Standards Association D-10.1-1958UDC 657.057 optical specifications. No painting of arrow is allowed on glass lenses.

Contractor shall submit to Harris County the certified test report by the Electrical Testing Laboratories (ETL) for the traffic signal lamps. Heat resistant lamp receptacle is required.

Each lens and reflector assembly shall be designed such that the reflector and lens form essentially a sealed unit. This shall be accomplished through the use of a precision molded neoprene gasket. The gasket shall marry the lens to the reflector to form this unit.

690.8 Reflectors. The reflector shall be approximately parabolic in section, made of high quality ALZAK aluminum and shall conform to the ITE Standards, reasonably free from chips, bubbles, streaks, and wrinkles.

Alzak reflectors shall be made of specular Alzak aluminum the thickness of the anodic coating to be a minimum of 0.0001 inches (0.0025 mm) or its equivalent, spun or drawn from metal not less than 0.025 inches (0.635 mm) thick equipped with a bead or flange on the outer edge to stiffen the reflector and insure its being held true to shape.

The reflector assembly shall include a Neoprene gasket between the reflector and reflector retaining ring.

The reflector assembly shall be designed so that it can be swung out of the housing, and removed without the use of tools.

The reflecting surface shall be totally free of flaws, scratches, defacements or mechanical distortion.

690.9 Lamp Receptacle. The lamp receptacle shall be of weatherproof molded construction capable of withstanding without deterioration the high temperatures within the optical unit during operation and shall be equipped with a lamp grip to render it impossible for the lamps to be loosened by vibration. The receptacle in the 12 inch (300 mm) signals shall be set so as to place the filament of a standard 150-watt lamp in the proper focal position with respect to the reflector. Lamp receptacles shall be able to be rotated to place the opening between the filament leads up.

The lamp receptacles shall be of the fixed focus type and it shall be possible without the use of tools to rotate the lamp receptacles about its axis in order to provide lamp filament orientation.

Reflector holder and lamp receptacle holder. The reflector holder and lamp receptacle holder shall consist of a structure of such design as to securely hold the reflector and lamp receptacle. It shall be provided with hinges and/or lugs so spaced as to give clearance to the hinges or lugs for the door and rigidly hold the reflector in place. Materials used in the construction of the above parts shall be of rust resisting material and not subject to corrosion when subjected to continued exposure in corrosive atmospheres, particularly salt air.

690.10 Reflector Ring. The reflector and the lamp receptacle shall be held in place in a molded polycarbonate ring by means of a special neoprene gasket.

This reflector ring shall swing from two stainless steel hinge pins molded into the reflector ring and clip-locked into the signal body.

690.11 Wiring. Each reflector assembly shall be provided with two flexible insulated, color-coded leads (red, yellow or green depending upon the lens color of the section) not smaller than No. 18 American Wire Gauge. These leads are to be securely fastened to the lamp receptacle and connected to the terminal block by means of solderless wire connectors or binding screws and spade lugs.

690.12 Terminal Blocks. Each optical unit shall be wired to a two-post terminal block located in that signal section. The terminal block in the top or red signal section shall have a six-post terminal block instead of the two-post unit described above. All sections of the signal face assembly shall be wired to the six-post terminal ready for field installation. All terminal blocks shall be securely mounted in an accessible position and shall be of

weatherproof molded construction, equipped with identified terminals. Binding screws shall be provided for the field and interior wires.

If specified, and/or shown in the drawings, a Terminal Compartment shall be provided for the side of pole-mounted signal heads in addition to the signal face assembly terminal block specified above. The terminal compartment shall be located as called for in the item description and drawings.

The Terminal Compartment shall be equipped with a readily accessible moistureproof cover and weatherproof molded-construction connector block with identified terminals for signal and field wires. Separate terminals shall be provided for the interior wires and the field wires. In addition to the interior wires required above, the supplier is also required to furnish and install all other leads necessary to connect the terminal block of the multiple section face to the terminal block in the Terminal Compartment. Each lead shall be brought to a separate terminal in the Terminal Compartment except that the commons from one housing can all be brought to the same terminal in the Terminal Compartment. The color coding on leads from the individual optical units shall be maintained from the lamp holder to the individual terminals in the signal head Terminal Compartment except that the commons from each housing shall be grouped and carried to one terminal. The wiring shall be so arranged that any one optical unit can be individually illuminated through connections to terminals in the Terminal Compartment.

The Terminal Block installed in the Terminal Compartment shall be equipped with Pressure-Type Connectors having a minimum capacity of two No. 12 AWG solid-copper conductors per connector and shall be provided with barriers and rated for 25 amperes, 250-volt service. This multiple-connector terminal block is to be equipped with a minimum of twelve sets of connectors, with separate terminals for the interior and the fieldwire connections. Any variations from the above requirements will be covered in the Traffic Standard drawings.

Use of Terminal Compartments containing terminal blocks does not eliminate the requirement for terminal blocks specified above.

690.13 Mounting Attachments. All mounting attachments shall be cast aluminum specified in the drawings.

Provision shall be made for carrying the signal leads enclosed in the mounting attachment. The mounting attachment together with supporting arms and assembled housings, shall comprise a dust-and-moisture-proof enclosure for optical units and lead wiring.

690.14 Traffic Signal Hardware. Horizontal Signal Head Span Wire Hardware Kit. The hardware shall be in accordance with drawing number 1, which is part of this specification. All hardware shall be packaged in the same box.

Horizontal Signal Mid Mast Arm Kit. The hardware shall be in accordance with drawing number 2, which is part of this specification. All hardware shall be packaged in the same box.

Horizontal Signal End Mast Arm Kit. The hardware shall be in accordance with drawing number 3, which is part of this specification. All hardware shall be packaged in the same box.

Vertical Signal Kit. The hardware shall be in accordance with drawing number 4, which is part of this specification. All hardware shall be packaged in the same box.

690.15 Material & Colors (Polycarbonate Signal Faces and/or Signal Heads Only). All material used in construction of major traffic signal components shall be polycarbonate resin. This material shall withstand 70 foot-pounds (95 Joules) of impact without fracture or permanent deformation.

Material for hardware shall be cast aluminum of adequate strength for the intended purpose.

The color of the completed traffic signals shall be Federal Yellow with the exception of the underside of the visors which shall be painted a flat black. The yellow color shall be completely impregnated in the resin material.

690.16 Paint & Painting (Metal Signal Faces and/or Signal Heads). Before shipment, all exposed metal surfaces except for the inside of the visors of the assembled traffic signal head shall be given two coats, separately baked on, of high grade highway yellow enamel. The inside of the visors shall be provided with two coats of high grade dull black finish paint.

Any variation in color of enamel will be covered in the Item Description.

690.17 Guarantee. The signal shall be guaranteed against imperfections in workmanship or material for a period of 2 years from date of completion. Traffic signal lamps, if the Contractor is required to furnish under this Item, shall be guaranteed for a period of 180 days from date of completion at no cost to Harris County.

690.18 Measurement and Payment. Traffic Signal Heads shall be paid by each signal head assembly installed, including all required mounting hardware.

There are line code(s), description(s), and unit(s) for this Item.

NOTE: This Item requires drawings that shall be incorporated into the contract documents.

NOTE: This Item requires other Standard Specifications

Item 693 "Traffic Signal Lamps"

END OF ITEM 690