

SECTION 16715

VEHICLE SIGNAL HEADS AND HARDWARE
(POLYCARBONATE)
(ADJUSTABLE, EXPANDABLE TYPE)

PART 1 GENERAL

1.01 SECTION INCLUDES

The purpose of this Specification is to describe the minimum requirements for vehicle signal heads and hardware items for the City of Houston, Texas. The traffic signal section shall be polycarbonate with Light Emitting Diode (LED) lamp indications of the colors and configuration as required and in compliance with the arrangements allowed by the Texas Manual on Uniform Traffic Control Devices (TMUTCD), latest revision.

1.02 UNIT PRICES

A. Measurement

This Item will be measured by each vehicle signal head assembly required and each traffic signal hardware item required. Vehicle Signal Heads shall consist of one (1) or more sections with visor(s), and LED indication color(s) specified. The Vehicle Signal Head housings and visors shall be Federal Highway Yellow.

B. Payment

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Vehicle Signal Head", of the various configurations complete with LED indication(s) as specified and for each type of traffic signal mounting hardware specified.

PART 2 PRODUCTS

2.01 MATERIALS

A. The traffic control signal heads shall be in accordance with the latest revision of ITE Technical Report No. 1, except as noted below.

B. Each traffic signal face shall consist of one or more signal sections rigidly fastened together as per manufacturer's recommendations in such a manner as to present a continuous pleasing appearance.

- C. The electric and optical system of the signal head shall, unless otherwise specified, be designed for operation from a power supply of 115 volt, single phase, 60 Hz alternating current and LED displays.
- D. Polycarbonate shall be used in fabricating the traffic signal heads described herein. Structural requirements for polycarbonate materials are described in Paragraphs. 2.02 and 2.03
- E. All material for the mounting attachments shall be metal.

2.02 HOUSINGS

- A. The polycarbonate vehicle signal head housing cases shall be a one-piece 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 be a minimum of 0.125 inches (3.18 mm) thick measured anywhere on the housing, and shall be internally ribbed so as to produce the strongest possible assembly consistent with lightweight. The terminal block shall either be securely mounted or integrally molded into the housing.
- B. 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 moisture proof 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.
- C. Vehicle Signal Head housing cases shall be of the sectional, adjustable, expandable type. The assembled housings for each signal face shall consist of three or more individual dual sections, each designed for housing a single complete optical unit. Individual signal sections shall be rigidly attached to form a single head either with at least four machine screws between each section or by the bolt-and-washer conduit method. Complete signal heads shall provide positive locked positioning when used with serrated brackets, mast arm, or span wire fittings.
- D. 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.

- E. 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 72 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.
- F. Any open end of an assembled signal housing shall be plugged with an ornamental cap and gasket of an approved type.

2.03 HOUSING DOOR

- A. The housing door of each traffic signal housing shall be a one one-piece polycarbonate resin material with an approximate 12-inch (300 mm) diameter circular opening for the lens as specified. The housing door shall be a minimum of 0.125 inches (3.18mm) thick measured anywhere on the housing door. The door shall be attached to the housing by means of two stainless steel hinge pins.
- B. 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 special 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.

2.04 VISORS

- A. Each traffic signal housing door shall be equipped with an easily detachable standard tunnel visor (unless requested otherwise). The visor shall be a polycarbonate resin to match the housing and door. The visor shall be rigidly attached to the door with rust-resistant connections in a manner that will prevent the leakage of light and moisture throughout the periphery of attachment.
- B. Unless requested otherwise , 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-inch (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
 - Be open at the bottom so as to prevent the accumulation of snow, dirt, and rain.
- C. Visors shall be easily removed and replaced without damage to visor or signal head.
- D. The four (4) tabs used to mount the visor to the signal shall be slotted. It shall not be necessary to completely remove the mounting screws to remove or replace the visor.

2.05 OPTICAL SYSTEM

- A. The Vehicular Light Emitting Diode (LED) Indications to be furnished with the Vehicle Signal Head shall meet the requirements of Technical Specification Section 16718, "Vehicular LED Indications".

2.06 TERMINAL BLOCKS AND ELECTRICAL

- A. Terminal blocks shall be either two or seven position and be double row, with each section consisting of two 8-32 x 5/16-in. binding screws and a conducting metal strip between the screws.
- B. The terminal blocks shall be a one-piece molded construction using phenolic materials, rated for a minimum 20 amps, 250 volt service
- C. Each LED module shall be wired to a two position terminal block located in that signal section. A seven position terminal block shall be furnished in the outermost signal section of any 3 or more section vehicle signal head assembly. All sections of the vehicle signal head assembly shall be wired to the seven position terminal block. 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.

- D. Maintain throughout the vehicle signal head the color coding for wires from the LED Module to the main terminal block as shown below:

<u>Indication</u>	<u>Color Code</u>
Red Ball / Arrow	Red
Yellow Ball	Yellow
Green Ball	Brown
Yellow Arrow	Yellow with Blue or White Tracer
Green Arrow	Brown with Blue or White Tracer
Neutral	White

2.07 VEHICLE SIGNAL HEAD TYPES

- A. Type D – One way, 3 section, 12-inch horizontal with tunnel visors and Red-Yellow-Green (RYG) LED indications.
- B. Type E – One way, 4 section, 12-inch horizontal with tunnel visors and Red-Red-Yellow Arrow-Green Arrow (RR<Y<G) LED indications.

2.08 MOUNTING HARDWARE

- A. All mounting attachments shall be aluminum. Mounting attachments and accessories shall be of one of the following types as required by the City.
 - 1. Span-Wire Clamp. The span wire clamp shall be cast from aluminum alloy 713 or equivalent, free of voids, pits, dents, molding sand and excessive foundry grinding marks. All design radii shall be smooth and intact. Exterior surface finish shall be smooth and cosmetically acceptable. The span wire clamp shall accommodate cables ¼-inch – 5/8-inch diameter, weigh not less than 1-3/4-lbs. with hardware, have a minimum length of 7-inches, have a centerline dimension from cable to clevis pin of approximately 2-inches, have a cast aluminum cable bar to protect the cable when tightening the U-bolts or J-bolts, and have a mounting opening of ¾-inch. The span wire clamp shall have ½-inch-13 UNC U-bolts with 1/2=-inch lockwashers and nuts, or J-bolts, with a minimum of 3-1/2-inch overall length to allow for mounting the cable without removing the lockwashers and nuts. The clevis pin shall be 5/8-inch diameter with a length of 2-1/4-inch and be secured with a hump back stainless steel cotter pin. The opening for the clevis pin shall be drilled and fitted with a stainless steel split bushing to reduce wear from the clevis pin.

2. Hanger Arms. Shall be cast from 319 aluminum or better. The bracket arms shall be provided as a kit containing one (1) pair of bracket arms. The arms shall have 72 tooth serrations cast into the arm to assure a positive lock with the vehicle signal head housing, along with a tri-bolt arrangement for attachment to the signal housing. Each arm shall have a threaded 1-inch opening on the opposite side of the serrated end for acceptance of a 1-inch CGB. One (1) threaded 1-inch steel or aluminum plug shall be provided with each pair of bracket arms. The opposite end of the arms shall be able to accept the slip-fitting of a 1-1/2-inch aluminum conduit pipe. A 5/16-inch-18 stainless steel square head set screw shall be provided for this opening. All aluminum hardware parts for the arms shall have an Alodine 1200 (or better) finish. All steel parts shall have yellow zinc di-chromate finish. Each bracket kit shall be complete with all necessary bolts, washers, gaskets, etc. to allow assembly of the signal to the hanger arms.
3. Cord Grip Connectors (CGB). The CGB shall be aluminum of the straight type with a 1-inch threaded male hub. The sealing grommet shall be neoprene with a steel or Teflon washer, and accommodate a signal cable diameter range of .375-.500-inches.
4. Slip Tee (1-1/2-inch). The slip tee shall be cast from aluminum alloy 319 or equal, and shall be free of voids, pits, dents, molding sand and excessive foundry grinding marks. All design radii shall be smooth and intact. The exterior surface shall be smooth and cosmetically acceptable. The top opening shall be threaded. The openings at 90-degrees apart shall not be threaded so as to accept a 1-1/2-inch aluminum conduit pipe. All openings shall be provided with 1/4-20 x 1/2-inch stainless steel square head set screws. The threaded opening shall be provided with a second set screw so as to prevent twisting. The slip tee shall be painted federal highway yellow and baked in a drying oven after painting.
5. Pole Plate. The pole plate shall be cast from aluminum alloy 319 or equal, and shall be free of voids, pits, dents, molding sand and excessive foundry grinding marks. All design radii shall be smooth and intact. The exterior surface shall be smooth and cosmetically acceptable. The top opening shall be threaded 1-1/2-inch – 11-1/2 NPS. The threaded hub opening shall be provided with 1/4-20 x 1/2-inch stainless steel square head set screws. The pole plate shall have a curvature to fit 4-inch to 18-inch diameter poles. Two (2) 3/8-inch x 3/4-inch slotted mounting holes 4-1/8-inch center to center shall be provided. The banding surface shall have a 1/8-inch rib extending above the outside edge to prevent movement of the band. The back of the pole plate shall have a 15/16-inch diameter opening capable of being threaded for 3/4-inch NPT. No painting of the pole plate is required.

6. Pipe Nipples. The pipe nipples shall be made of 1-1/2-inch aluminum conduit and shall have 1-1/2-inch NPS threaded on both ends, with a thread length of 1-1/2-inch. The pipe nipples shall be of a length as required by the City. Common lengths required by the City are 6-inch and 18-inch. The pipe nipples shall be painted federal highway yellow.
7. Aluminum Conduit. The rigid aluminum conduit shall be 1-1/2-inch diameter and 10-ft. long.
8. Suspension Eye (Eyebolt). The suspension eye shall be cast from aluminum alloy 319 or equal, and shall be free of voids, pits, dents, molding sand and excessive foundry grinding marks. A clearance hole shall be provided to accept a 5/8-inch clevis pin. The opening for the clevis pin shall be drilled and fitted with a stainless steel split bushing to reduce wear from the clevis pin. The suspension eye shall have at least 1-inch of male thread and be 11-1/2 thread per inch straight for mating to a 1-1/2-inch pipe opening. The width of the suspension eye shall be 1/2-inch, and the center of the clearance hole for the clevis pin shall be 7/8-inch from the top. Dimension from the center of the clevis pin clearance hole to the beginning of the threads is approximately 1-1/4-inch. No painting of the suspension eye is required.

END OF SECTION