Special Specification 6374
Traffic Signal Pole Assemblies (City of Houston)

1. DESCRIPTION

Installation. Fabricate, furnish, and install steel traffic signal pole assemblies

2. MATERIALS

All items will be new materials of the latest product in production to the commercial trade, and will be of the highest quality as to materials used and workmanship. The manufacturer of these items must be experienced in design and construction of such items and must furnish evidence of having supplied similar items, which have been in successful operation, for not less than three (3) years.

3. CONSTRUCTION

3.1 Traffic Signal Pole Assemblies

The traffic signal poles must be designed in accordance with the 1994 edition of the American Association of State Highway and Transportation Officials (AASHTO) standard specifications and as shown on the plans.

3.1.1 Anchorage: Included with each pole will be a minimum of four L-type steel anchor bolts, complete with double hex nuts, lock washers and flat washers. Nuts, washers and minimum 12” of anchor bolts must be hot-dip galvanized to ASTM - A153. Anchor bolts must meet the requirements of ASTM F1554, Gr. 55. An anchor bolt template will be included with each pole assembly.

3.1.2 Wind Resistance: Entire pole and arm assembly to be rated to withstand AASHTO requirements for 90 mile per hour wind.

3.1.3 Welds: All welds must meet the requirements of AWS D1.1.

3.1.4 Material Certification: Material certifications must be provided for all ASTM numbers referred to in this specification.

3.1.5 Design Drawings: Complete design drawings and complete technical data must be submitted for approval to the City of Houston before starting fabrication. Shop drawings will be signed and sealed by a Registered Professional Engineer.

3.1.6 Pole Unit: The pole unit and all materials used in its manufacture must meet the requirements of AASHTO, specifically 1994: Standard Specifications of Structural Supports for Highway Signs, Luminaries and Traffic Signals.

3.1.7 Pole Shaft and Arms: Pole shaft and arms must be circular or octagonal in cross-section with no transverse joints or welds and no more than two (2) longitudinal welds per pole or arm. Refer to the standard drawings for exact sizes on the pole diameters. They must be uniform in cross-section and must uniformly taper from the pole shaft to the end of the arm. The end of the arm will be at a...
height above the pavement, as detailed on the standard drawing, with design vertical loadings, when installed on the pole.

3.2 Pole Shaft.

The pole shaft for the Type 1 poles must be fabricated from a minimum of 3-gauge (0.2391 in) hot rolled commercial steel. The shaft will have only one (1) longitudinal, automatically, electrically welded joint, and must have no intermediate horizontal joints nor welds. After forming and welding, the tapered shaft must be longitudinally cold rolled over a hardened steel mandrel under sufficient hydraulic pressure to flatten the weld and increase the physical characteristics of the shaft. The shaft must meet the chemical and physical properties of ASTM-A595 GR. A, having a minimum yield strength of 55,000 psi. Only one (1) length of steel sheet will be used, which must be formed into a continuously tapered shaft, having a taper of approximately 0.14 in. per foot.

The pole shaft for the Type 2 poles must be fabricated from a minimum 0.375 in. hot rolled commercial steel. The shaft will have only one (1) longitudinal, automatically, electrically welded joint, and must have neither intermediate horizontal joints nor welds. The shaft must meet the chemical and physical properties of ASTM-A572 GR. 55, having a minimum yield strength of 55,000 psi. Only one (1) length of steel sheet will be used, which must be formed into a continuously tapered shaft, having a taper of approximately 0.14 in. per foot.

The base plate must conform to ASTM-A36 or ASTM A572 steel. It will telescope the shaft and be attached by means of two continuous welds, one on the inside of the base at the end of the shaft, the other on the outside at the top of base. The base plate must be arranged to accept four (4) 2-1/4 in. diameter anchor bolts on an 18 in. bolt circle.

The pole shaft must be furnished with a reinforced handhole frame with steel cover and a 1/2 in. - 13 UNC grounding provision. Dimensions will be as shown on the detail drawings.

Each pole shaft must include a steel pole plate welded to shaft for the mast arm connection. It must be arranged to accept four (4) connecting bolts. Pole plate material must conform to the requirements of ASTM-A36 or ASTM A572 Grade 50 steel.

As required, each pole must be provided with an ornamental pole top. The final shaped pole top must be mechanically attached to the top of the shaft to provide access for wiring signals secured by a J-hook wire support; also provided. Pole top material must conform to the requirements of AA-319.0F aluminum.

The pole shaft will be drilled in the field at required signal locations, repair galvanizing coating in accordance with item 445,"galvanized"

3.3. Mast Arm

The mast arm must be fabricated from a minimum 7-gauge (0.179 in.) hot rolled commercial steel in accordance with ASTM A595 Grade A and must have a yield of not less than 55,000 psi. It will be fabricated and formed into a round shape as required, using the same cold rolling process as the pole shaft and must have the same physical properties and yield strength. Arm dimensions must be equivalent in strength for the loads shown in the plans.
Mast arm will be a straight flange plate mounted style and must include a steel arm plate with four (4) connecting bolts. Arm plate material must conform to the requirements of ASTM-A36 or ASTM A572 Grade 42 steel. Bolts must be internally mounted to pole plate and meet the requirements of ASTM F3125 Grade A325.

A slip joint must be permissible for arms forty (40) feet and greater in length. The slip joint should be made in the shop but may be match marked and shipped disassembled. An automatic submerged arc process must weld pole shaft and arm. Pole and arm diameters must be uniform at any cross-section and should be reasonably straight.

Tenons for mounting the vehicle signal head assemblies must be provided on the mast arm at locations required. Refer to the standard drawings for tenon details.

3.4. **Luminaire Arm.**

The luminaire arm will be fabricated from 2 in. Schedule 80 pipe.

The length of the luminaire arm will be as shown in the standard drawings or required in the plans.

The luminaire arm must be connected to the pole shaft with simplex fittings, and in accordance with details shown on the standard drawings.

3.5. **Hot-Dip Galvanizing.**

3.5.1. **Surface Preparation**

Before being incorporated into an assembled product, steel plates 3/4 in. or more in thickness may require blast cleaning to remove rolled-in mill scale, impurities, and non-metallic foreign materials. After assembly, all weld flux must be mechanically removed.

The iron or steel product is degreased by immersion in an agitated 4.5%-6% concentrated caustic solution elevated to a temperature ranging from 150 to 190- degrees Fahrenheit. It is then pickled by immersion in a heated sulfuric acid solution of 6%-13% concentration, controlling the temperature between 150 and 190-degrees Fahrenheit. It is next rinsed clean from any residual effects of the caustic or acid solutions by immersion in a circulating fresh water bath.

Final preparation is done by immersion in a concentrated zinc ammonium chloride flux solution heated to 130-degrees Fahrenheit. The solution's acidity content is maintained between 4.5-5.0 pH. The assembly is air dried to remove any moisture remaining in the flux coat and/or trapped within the product.

3.5.2. Pole shaft and arm will be hot-dip galvanized after fabrication in conformance with ASTM A123 requirements, with a minimum of two (2) ounces per square foot of galvanized coating.

3.5.3. All ancillary parts for pole structures will be hot-dip galvanized after fabrication in conformance with ASTM A153 requirements. The galvanized coating must be a minimum thickness of two (2) ounces per square foot. All threaded material must be brushed or retapped after galvanizing. Fabricated products will be free and clear of teardrop edges, flaking zinc, rough appearance, holes covered with zinc membrane, and similar unattractive finishes. In general, the complete product must be...
smooth, clean and unscarred when delivered. Any part of the structures not meeting these requirements must be rejected.

3.6. **Power Coating Over Galvanizing**

3.6.1. **Surface Preparation.** The pole shaft, arm and ancillary parts must be prepared in accordance with the hot-dip galvanizing requirements of Part 2.06 in this section.

3.6.2. **Top Coat.** All galvanized exterior surfaces visually exposed are to be coated with a Urethane or Triglycidyl Isocyanurate (TGIC) Polyester Powder to a minimum film thickness of 2.0 mils. The galvanized exterior should be etched, preheated, then powder coated. The coating must be electrostatically applied and cured in a gas-fired convection oven by heating the steel substrate to a minimum of 350-degrees Fahrenheit and a maximum of 400-degrees Fahrenheit.

3.6.3. **Packaging.** In order to protect the finish during transportation, a wrapping of 3/16” U.V. inhibited plastic-backed packing foam must be applied before shipment of small poles. Larger poles are cradled in a 1 in. rubberized foam base. A nylon ripcord must be placed beneath the wrapping the entire length of the pole for removal of the wrapping without the use of knives or any other sharp instrument that may damage the painted surface.

3.7. **Installation.**

Location or avoid conflict with utilities. Stake the traffic signal pole assembly locations for verification by the Engineer.

Use established industry and utility Locate traffic signal pole assemblies as shown on the plans unless otherwise directed to secure a more desirable safety practices when working near overhead or underground utilities. Consult with the appropriate utility before beginning work.

Construct foundations for new traffic signal pole assemblies in accordance with item 416, “Drilled Shaft Foundation”, and the details shown on the plans. Orient anchor bolts as shown on the plans.

Erect structures after foundation concrete has attained its design strength, as required on the plans and Item 421, “Hydraulic Cement Concrete.” Coat anchor bolt threads and tighten anchor bolts in accordance with Item 449, “Anchor Bolts.” Ensure that the structure is plumb. Do not use springing or raking of columns, towers, or anchor bolts to achieve plumb.

4. **MEASUREMENT**

Payment for Traffic Signal Pole Assemblies will be measured by each traffic signal pole assembly installed.

5. **PAYMENT**

Payment for the work performed and materials furnished in accordance with this item will be paid for at the unit price bid for “Traffic Signal Pole Assemblies (City of Houston)”, of the various types and sizes as specified.
This price is full compensation for furnishing, fabricating, galvanizing, assembling, and erecting the pole upon a foundation; furnishing and erecting required mast arms and luminaire arms; furnishing and placing anchor bolts, nuts, washers, and templates; and materials, equipment, labor, tools, and incidentals.

New drilled shaft foundation will be paid for under item 416, “Drilled Shaft Foundation”.