1064 - TUBULAR DELINEATOR

1064.1 GENERAL

a. Work

The Contractor shall furnish and install tubular white or yellow tubular delineators with retroreflective sheeting, as shown in the plans, details, and specifications and in accordance with Part VI of the Manual on Uniform Traffic Control Devices (latest adopted revision).

1064.2 MATERIALS

The material for tubular delineators shall be in accordance with this specification.

a. Approved Materials List

All material for tubular delineators used by the Contractor shall be from the City's approved list of vendors. It is important that users be completely knowledgeable of all application requirements and procedures prior to product application. It is the responsibility of the installer to contact the supplier of all illuminated overhead street name sign materials if questions regarding application procedures or conditions arise

b. Flush Mounted Tubular Delineator

(1) Post

The delineator post shall be 36" long and consist of a tubular round post a minimum of 3.15 inches in diameter with 0.125 inch wall thickness and meet the requirements for Category 1 devices specified in NCHRP Report No. 350. All posts shall be easily replaceable and constructed of UV-stabilized thermo-plastic polyurethane for superior durability, conforming to the following material specifications:

(a) Post material Properties

Property	ASTM Test	Results
Specific Gravity (min)	D 792	1.10
Hardness (min)	D 2240	90 A
Tear Strength (min lb/in)	D 624, Die C	800
Tensile Strength @ yield, (min PSI)	D 412	4,000
Tensile Strength @ break (min %)	D 412	450
Cold Temp. Impact Test (-7º F)	FL/DOT	Pass
Gloss (min units)	N/A	12.1

(2) Bases

The posts shall mount to a base unit with two plastic locking pins. Bases shall weigh a minimum of 1 pound and be constructed of a UV-stable high-impact thermos-plastic styrenic alloy conforming to the following material specifications.

(a) Base Material Properties

Property	ASTM Test	Results
Specific Gravity (min)	D 792	1.02
Gardner Impact (min)	N/A	160
Flexural Strength (min)	D 790	5,500

(3) Colors

The posts and bases shall be constructed of UV-stabilized polymers and colors. The color shall be solid throughout and stabilized to resist UV degradation.

(4) Locking Pins

The posts shall secure to the base unit with two rust-proof black plastic locking pins to prevent dislocation when posts are impacted and to ease replacement of old or damaged posts. The pin removal

tool shall be supplied by the contractor and delivered to the City Inspector at the conclusion of the installation.

(5) Reflective Sheeting

All posts shall have retro-reflective sheeting applied and shall be at a minimum ASTM D 4956 Type II High Intensity sheeting. The minimum reflective sheeting shall be two 3-inch wide wraps of sheeting the same color as the post applied one inch down from the top of the post with a three inch gap between the two wraps. The post shall be retro-reflective for 360 degrees.

c. Ground Mounted Tubular Delineator

(1) Post

The delineator post shall be 36" long and consist of a modified T-shaped tubular post a minimum 3.00 inches wide by 2.00 inches deep, with 0.125 inch wall thickness comprised of flat front and curved rear surfaces and slides to create areas of opposing compression stresses on the inner and outer walls when impacted resulting in superior rebound. All posts shall be capable of sustaining a minimum of fifty bumper and direct wheel-over impacts at 60mph without damage to the post or the reflective sheeting applied to the post. All posts shall meet the requirements of NCHRP Report No. 350. All posts shall be easily replaceable and constructed of UV-stabilized thermo-plastic polyurethane, conforming to the following material specifications:

(a) Post Material Properties

Property	ASTM Test	Results
Specific Gravity (min)	D 792	1.10
Hardness (min)	D 2240	80 A
Tear Strength (min PSI)	D 624, Die C	600
Tensile Elongation @ break (min %)	D 412	600
Tensile Strength @ yield, (min %)	D 412	4,000
Colt Temp. Impact Test (-7º F)	FL/DOT	Pass

(2) Ground Anchor Insert

The ground anchor insert is identical in shape to the T-style shape of the post, but smaller. The critical dimensions of the post are sized to fit snuggly within a 2" 12 gauge steel sign post, contacting the face, end edges and back lobe preventing spinning with the tube. It shall be fastened to the post with two mechanical fasteners conforming to the following material specifications.

(a) Anchor Insert Material Properties

Property	ASTM Test	Results
Specific Gravity (min)	D 792	1.10
Hardness (min)	D 2240	90 A
Tear Strength (min lb/in)	D624, Die C	800
Tensile Strength @ yield, (min PSI)	D 412	4,000
Tensile Strength @ break (min %)	D 412	450

(3) Ground Anchor

(a) Material

Steel ground anchor shall conform to the standard specification for hot rolled carbon sheet steel, structural quality, ASTM designation A570, Grade 50. Yield strength after cold-forming is 60,000 psi minimum.

(b) Shape and Cross Section

The cross section of the ground anchor shall be 2" square tube formed of 12 gauge (0.105` U.S.S. gauge) steel weighing 2.42 lbs/foot. All ground anchors shall be carefully rolled to size and shall be welded directly in the corner by high frequency resistance welding and externally scarfed to agree with corner radii. All ends shall be cut square.

(c) Finish

Ground anchors shall be manufactured from hot-dipped galvanized steel conforming to ASTM A653, G90, Structural Quality, Grade 50, Class 1. The corner weld is zinc coated after scarfing operation. The steel is also coated with a chromate conversion coating and a clear organic polymer topcoat. Both the interior and the exterior of the post shall be galvanized.

(d) Telescoping Properties

The finished anchor shall be straight and have a smooth, uniform finish. It shall be possible to telescope the ground anchor insert into the anchor freely.

(e) Tolerances

Tolerances shall be as indicated in the following table:

Tolerance Description	2" x 2"
Outside Tolerances at Sides at Corners[1]	± 0.008"
Wall Thickness Tolerances	+ 0.011", -0.005
Convexity and Concavity Tolerances[2]	± 0.010"
Squareness of Sides Tolerances[3]	± 0.012"
Permissible Twist in 3' Length	0.062"
Straightness Tolerances in 3' Length	1/16"
Corner Radii	5/32" ± 1/64"

Notes:

[1]Measurements from outside dimensions shall be made at least 2 inches from the end of tube.

[2]Measured in the center of the flat sides determined at the corner.

[3]A sample shall be considered to fail if its sides are not 90 degrees to each other within the squareness tolerance listed above.

(f) Holes

Holes shall be 7/16" ± 1/64" in diameter on one inch centers on all four sides down the entire length of the ground anchor. Holes shall be on centerline of each side in true alignment and opposite each other directly and diagonally. All holes shall be drilled or punched and all welds, cuts, burrs, and sharp edges are to be smoothed off before application of finish.

(g) Length

Ground anchors shall be 18" in length. One single sign post long enough to support all signs shall be installed. Two separate lengths of post joined with a sleeve to achieve the necessary post length shall not be allowed.

(h) Breakaway Performance

The breakaway base design shall meet the requirements of the National Cooperative Highway Research Program Report (NCHRP) No. 350 or Manual for Assessing Safety Hardware (MASH).

(4) Colors

The posts and bases shall be constructed of UV-stabilized polymers and colors. The color shall be solid throughout and stabilized to resist UV degradation.

(5) Locking Pins

The posts shall secure to the base unit with two rust-proof black plastic locking pins to prevent dislocation when posts are impacted and to ease replacement of old or damaged posts. The pin removal tool shall be supplied by the contractor and delivered to the City Inspector at the conclusion of the installation.

(6) Reflective Sheeting

All posts shall have retro-reflective sheeting applied and shall be at a minimum ASTM D 4956 Type II High Intensity sheeting. The minimum reflective sheeting shall be two 3-inch wide wraps of sheeting the same color as the post applied one inch down from the top of the post with a three inch gap between the two wraps. The post shall be retro-reflective for 360 degrees.

1064.3 CONSTRUCTION REQUIREMENTS

The illuminated overhead street name sign and components shall be installed in accordance with manufacturer's requirements to provide a complete and operational system.

a. Method of Installation for Flush Mounted Tubular Delineator

The method of installing the flush mounted tubular delineator shall be in accordance with the manufacturer's instructions.

(1) Installation of Base

The base shall be secured to the roadway at the proper location and alignment with pressure-sensitive synthetic butyl rubber pads, a minimum of 0.125" thick or epoxy.

(2) Installation of Post

The post shall be inserted into the base and secured with the locking pins.

b. Method of Installation for Ground Mounted Tubular Delineator

The method of installing the ground mounted tubular delineator shall be in accordance with the manufacturer's instructions.

(1) Installation of Ground Anchor

The ground anchor shall be driven into the ground with a sledge hammer or pneumatic hammer approximately 17" so that one hole is visible for affixing the post to the anchor. Care shall be taken so the top is not deformed. The ground anchor shall be oriented such that the delineator, when installed, shall have the flat front of the post facing traffic.

(2) Installation of Post

The post shall be installed with the flat front of the post facing traffic, inserted into a 2" 12 gauge steel ground anchor. The assembly is held to the anchor with a supplied quick release pin or 3/8" bolt. Insert the post into the anchor and line up the pre-drilled hole in the post. Insert a pin.

1064.4 MEASUREMENT AND PAYMENT

The Engineer will measure the tubular delineator per each for the type specified with two reflective stripes of the color indicated on the plans, with appropriate mounting base, complete-in-place and accepted.

Payment for "Tubular Delineator (Flush Mount)" or "Tubular Delineator (Ground Mount)" and specified color (White) or (Yellow) at the contract per each price bid is full compensation for the specified work.