

SECTION 13553

ATMS CONDUIT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Furnish and install conduit as shown on the plans and details. Unless otherwise specified, install conduit by trenching, boring, or plowing.
- B. Includes locate wire with associated 1 inch conduit.
- C. Includes Mule Tape, all materials, labor, workmanship, equipment, and incidental items required for a complete system of conduit.

1.2 RELATED SECTIONS

- A. Section 00725, Scope of Work
- B. Section 01721: Survey
- C. Section 02061: Select Aggregate
- D. Section 02705: Pavement Cutting
- E. Section 02741: Hot Mix Asphalt (HMA)
- F. Section 02776: Concrete Sidewalk, Median Filler, and Flatwork
- G. Section 02892: Traffic Signal
- H. Section 03575: Flowable Fill
- I. Section 13551: ATMS General Requirements
- J. Section 13554: Polymer Concrete Junction Box

1.3 REFERENCES

- A. ASTM D 2241: Standard Specification for Poly-Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
- B. American National Standards Institutes (ANSI)
- C. American Wire Gauge (AWG)
- D. American National Standards Institutes (ANSI)
- E. National Electric Code (NEC)
- F. National Electrical Manufacturers Association (NEMA)
- G. Railroad Specifications
- H. Underwriters Laboratory

PART 2 PRODUCTS

2.1 MATERIALS

- A. Conduit and Fittings:
 - 1. Schedule 40 PVC rated at 194 degrees F, as specified. NEMA TC-2, NEMA TC-3, ASTM D 2241, UL Listed
 - 2. HDPE (High Density Polyethylene) SDR11 rated, as specified. ASTM D 2241
 - 3. Rigid steel as specified (UL-6)
 - 4. Galvanized as specified (ANSI C80.1)
- B. Multi-Conduit
 - 1. New, prefabricated.
 - 2. Minimum of 4 each 2-inch conduit.
 - 3. Label: FIBER OPTIC COMMUNICATIONS, permanent ½-inch black letters, every 6 ft on the outside of each conduit.
 - 4. ATMS Conduit Types
 - a. 1D = 4-2 inch conduit
 - b. 2D = 8-2 inch conduit
 - c. 4D = 16-2 inch conduit

5. Color code each conduit or cell as follows:
 - a. 1D
Bank 1: one conduit of blue, orange, green and brown
 - b. 2D
Bank 1: one conduit of blue, orange, green, and brown
Bank 2: one conduit of slate, white, red, and black
 - c. 4D
Bank 1: one conduit of blue, orange, green, and brown
Bank 2: one conduit of slate, white, red, and black
Bank 3: same as bank 1 with a stripe of contrasting color
Bank 4: same as bank 2 with a stripe of contrasting color
- C. Provide all materials used in the installation of conduits, such as sweeps, adapters, couplings, glue, plugs and fittings, to meet or exceed all of the recommendations of the conduit manufacturer for suitable installation.
- D. Provide special termination kits from the conduit manufacturer for terminating the conduit in vaults and junction boxes. Provide kits that form a watertight seal of conduit to structure wall.
- E. Use complete conduit sections in nominal 20 ft sections; couplings and fittings to provide for watertight integrity.
- F. Use complete conduit manufactured 36 inch radius sweeps (11 1/4, 22 1/2, 45, 90 degree angles) complete with bell and spigot. Do not field bend conduit.
- G. Provide flat profile, low stretch polyester, sequential footage marked, 2500 lb. tensile strength Mule Tape or approved equal in each empty conduit or cell.
- H. Provide fiber optic and electrical buried cable marker warning tape that meets the following requirements:
 1. Material: Composite reinforced thermoplastic.
 2. Tape Color: Orange (communication) or Red (electric).
 3. Length: 5 ft minimum.
 4. Text: Caution Buried Communication Cable or Caution Buried Electric (front and back).
 5. Text Color: Black.
 6. Width: 3-inch minimum (face or diameter).
- I. Provide 1 green jacketed #14 THHN locator wire in 1 inch conduit in each trench where ATMS Conduit is installed. Place the locate wire conduit at the top of all other conduit in the trench as shown in AT series Standard Drawings.
- J. Provide locator wire connection device that meets the following requirements:
 1. Screw clamp connection type

2. Suitable for 22 to 8 AWG
 3. Rated 50 amps
 4. Rated 600 V
 5. Zinc bichromate plated steel mounting rail for locator wire connection device
- K. Backfill
1. Flowable Fill: Refer to Section 03575.
 2. Free Draining Granular Backfill Borrow: Refer to Section 02061.
 3. Native material: 96 percent compaction.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Plans depict conduit routing in schematic form only. Base final routing on actual field conditions at the time of construction, including Blue Stake markings, to prevent conflicts with existing utilities.
- B. When installing conduit that houses communication cable, do not allow conduit to deflect vertically or horizontally along its length by a ratio greater than 10:1, (e.g. no more than 4-inch deflection per 40 inch in length).
- C. When installing conduit, do not allow the sum total of the vertical and horizontal deflection of conduit between any two junction boxes exceed 270 degrees.
- D. Do not place conduit directly above parallel utilities.
- E. Locate conduit within 1 ft of existing parallel conduit run if the planned location of conduit is parallel to the existing traffic signal or ATMS conduit. Refer to Section 02892.
- F. Install all conduit bends to have a radius that is not less than 3 ft.
- G. Install conduits that cross-finished curbs and gutters, sidewalks, concrete flatwork, textured or decorative surfaces by boring, jacking, or drilling. Entirely replace any damaged section at no additional cost to the Department.
- H. Obtain appropriate permits before work commences.

- I. Conduit Stub
 - 1. Install conduit in a junction box per Section 13554 to allow for the continuation of a conduit run. Type and number of conduits as shown on details.
 - 2. Extend conduit stub to 10 feet from the junction box in line with the conduit run as shown on the Plans and Details.

- J. Proof all conduits with an approved mandrel prior to installation of cabling and Mule Tape.

- K. Record longitudinal and depth GPS coordinates (x,y,z) of conduit according to Section 01721.

- L. Install Mule Tape in all empty conduit including all cells of multi-duct conduit.
 - 1. Install plug with ¼-inch hole for Mule Tape on each end of conduit.
 - 2. Leave 2 ft of Mule Tape outside of the plug and fasten securely to plug.
 - 3. Do not splice Mule Tape in conduit.
 - a. Mule Tape is sequentially numbered
 - b. Must be continuous between junction boxes

- M. Place all conduit that is encased in a structural member per current Uniform Building Code and/or as approved by the Engineer.

- N. Secure conduit on structures with standard galvanized iron conduit clamps using at least 5/16-inch diameter concrete expansion anchors at a maximum of 5 ft spacing.

- O. Use conduit expansion fittings at structure expansion joint crossings.

- P. Fill all new and existing conduit to less than 40 percent as per NEC.

- Q. Maximum spacing between junction boxes is as follows:
 - 1. 1,000 ft for tangent surface street installations
 - 2. 3,000 ft for tangent highway installations
 - 3. Reduced maximum spacing horizontal or vertical deflection prevents the installation of cable within maximum tensile rating of the cable or location wire.

- R. Locator Wire:
 - 1. Install #14 THHN solid green locator wire continuously in 1-inch conduit and bond to grounding rods within each junction box.
 - 2. Mount locator wire connection device to the sidewall of each junction box using a mounting rail (Refer to Section 13554).
 - 3. Connect the locator wire to the terminal block and connect the terminal block to the ground rod.

3.2 TRENCH FOR ATMS CONDUIT

- A. Paved Surface (asphalt concrete):
1. Saw cut (Refer to 02705) roadway-to-roadway base on both sides of trench to provide clean, straight wall for T-patch prior to any backhoe use per Section 02705.
 2. Use flowable fill to within 3 1/2 inches to 6 inches of the existing roadway surface, depending on the existing pavement thickness.
 3. Minimum soil compaction under pavement: 96 percent.
 4. Evenly apply tack coat before final backfill.
 5. Restoration patch: match the composition, density, and elevation (1/4 inch), of the existing surface per Section 02741.
- B. Sidewalk or Decorative Pavement.
1. Use flowable fill to within 3 1/2 inches to 6 inches of the existing roadway surface, depending on the existing pavement thickness.
 2. Minimum soil compaction under pavement: 96 percent.
 3. Restore sidewalk or decorative pavement to original condition or better after work is completed per Section 02776.
- C. Unpaved Surface:
1. Use backfill that matches the composition, density, and elevation (± 0.2 inch), of the existing surface per Section 02776.
 2. Dispose of surplus material daily.
 3. Use flowable fill from bottom of trench to 3 inch above top conduit.
- D. Conduit under Railroad Right-of-Way: Refer to Section 00725 and appropriate railroad, such as Union Pacific Railroad, Standard Specifications:
1. Coordinate all work with appropriate Railroad personnel.
 2. Complete Railroad Safety Training.
- E. Minimum cover of conduit:
1. Minimum cover in sidewalks or paved surfaces: 3 ft.
 2. Minimum cover in highway right of way, greater than 20 ft from the edge of the pavement: 3 ft.
 3. Minimum cover within 20 ft of the edge of the pavement: 5 ft.
- F. Warning Tape:
1. Install orange warning tape with black legend CAUTION - BURIED COMMUNICATION CABLE in all trenches containing multi-duct conduit or conduit containing communication cables.
 2. Install red warning tape with black legend CAUTION - BURIED ELECTRIC in all other trenches.

3. Not required when flowable fill is directly overlaid with asphalt pavement or PCCP.
4. Not required when boring conduit.

3.3 ATMS CONDUIT IN TRENCH

- A. Place all conduits in the same trench whenever possible.
- B. Above ground use galvanized rigid steel; underground use PVC or HDPE. Apply corrosion protection per NEC Article 346 to any portion of galvanized rigid steel conduit buried in the ground or encased in concrete.
- C. If flowable fill is used, encapsulate conduit a minimum of 3 inches above the top conduit with flowable fill. Continue flowable fill to the wall of the junction box to seal conduit entry into junction box. Clean excess flowable fill from inside junction box.
- D. Install all conduits so the flowable fill completely surrounds all exterior surfaces of the conduit. Separate multi-duct conduits using a commercially available conduit spacer or approved equivalent.
- E. Install a bushing or adapter at ends of all nonmetallic conduit that contains a conductor per NEC Article 346, to protect the conductor from abrasion. Install rounded bushings on the ends of metal conduits per NEC Article 347.
- F. Install manufactured sweeps in the multi-conduit (11 1/4, 22 1/2, 45, 90 degree angle) with conduit compatible bell and spigot ends. Do not field bend conduit.
- G. Prior to pouring flowable fill, anchor the conduit in trench, at 16 ft intervals, to maintain the required conduit depth during pour.
- H. Minimum separation between all conduit is 1.5 inches. The separation between individual conduit within a single cluster of multi-duct conduit is permitted to be closer.
- I. Minimum separation between all conduit and the wall of the trench is 1.5 inches.
- J. Place the locator wire conduit on the plane of the uppermost conduit in the trench. The separation between the locator wire conduit and other conduit may be less than 1.5 inches.
- K. In native earth, do not place flowable fill closer than 6 inches to the finished grade.

3.4 ATMS CONDUIT IN DIRECTIONAL BORE OR PLOW

- A. Obtain approval from the Department on conduit splice connectors prior to use.
- B. Follow all requirements for ATMS Conduit in Trench per this section, Article 3.3 at all conduit splice locations not requiring junction boxes.

3.5 USE OF EXISTING OR OCCUPIED CONDUIT

- A. Maintain the physical condition and functional integrity of all cabling and wiring in existing or occupied conduit.
- B. Prior to installing fiber optic cable in an existing or occupied conduit:
 - 1. Remove any existing fiber optic cable/copper wire.
 - 2. Test the integrity and clean the conduit by successfully pulling a Department approved mandrel through the conduit prior to installing cable.
 - 3. Re-pull new and existing fiber optic cable/copper wire together.
 - 4. Perform all necessary splices and replace any impacted fiber cable, spider fan-out kits, and locate wire.
 - 5. Perform all additional necessary work needed to restore existing cable and conduit systems.

3.6 REPAIR/RESTORATION

- A. Restore all areas, including landscaping, concrete pavement, asphalt, finished curbs and gutters, box culverts, sewers, underground water mains, sprinkler systems, sidewalks, concrete flatwork, textured or decorative surfaces, that were damaged during conduit and junction box installation.
- B. Coordinate with local utilities for utility repair. Advise the Engineer of all repairs.

END OF SECTION