

# Special Specification 6384

## Telecommunication System



### 1. DESCRIPTION

Furnish and install telecommunication systems including directional bores that will house Utility Owner's ducts as detailed on the plans. Contractors working on the Utility Owner's portion of work must comply with the Utility Owner guidelines and manuals.

#### 1.1. Definitions.

1.1.1. **Conduit.** Pipe used to encase telecommunication facilities such as fiber, cable, and inner duct.

1.1.2. **Casing.** Pipe used to protect conduit by fully encasing conduit piping; casing can be also described as the pipe that is used to protect conduit in trenchless construction methods. This refers to the outer pipe. Pipe used to house inner duct is not to be considered as casing.

1.1.3. **Conduit Structure (Duct Bank).** Groups of conduit arranged in tiers and encased as specified on the plans.

1.1.4. **Contractor.** A contractor that is a telecommunications expert per industry standards and is on the Utility Owner's approved list.

1.1.5. **Utility Owner.** Utility companies as stated on the plans.

1.1.6. **Department.** Texas Department of Transportation (TxDOT).

### 2. MATERIALS

2.1. **Telecommunication System.** Supply permanent telecommunication system structure materials such as pipe, innerducts, handholes, manholes, fittings, mule tape, duct terminators and plugs, electronic markers, etc. Obtain approval for any deviations from the following.

2.1.1. **Steel Casing.** Provide Grade B steel pipe manufactured in accordance with ASTM A53. When shown on the plans, supply a 16 in. steel casing with a minimum wall thickness of 0.25 in. When shown on the plans, supply an 18 in. steel casing with a minimum wall thickness of 0.25 in. When shown on the plans, supply a 36 in. steel casing with a minimum wall thickness of 0.47 in. Provide steel casing that complies with "Buy America" standards.

#### 2.1.2. Conduit.

2.1.2.1. **Bore-Gard.** Provide conduit for the joint directional bore wherever specified on the plans, that is Schedule 40 Bore-Gard, 4.5 in. O.D., with a minimum wall thickness of 0.50 in.

2.1.2.2. **C-PVC.** Provide 4.5 in. O.D. Chlorinated Polyvinyl Chloride (CPVC) Schedule 40 IPS pressure pipe manufactured in accordance with ASTM F441 for installations requiring the use of 4 in. C-PVC. Split C-PVC should be used around existing cables and purchased with pre-manufactured grooves from an authorized Utility Owner Supplier.

2.1.3. **Handholes and Manholes.** When the use of handholes and manholes are specified on the plans, provide handholes and manholes that comply with the requirements shown on the plans.

- 2.1.3.1. **Pre-cast Handholes and Manholes.** Pre-cast handholes and manholes will be obtained by contractor from an approved Utility Owner supplier as well as all associated items including but not limited to racks, ladders, frame, and cover.
- 2.1.3.2. **Cast-In-Place Handholes and Manholes.** Materials used for cast-in-place handholes and manholes will conform to Bellcore Practices Section 622-505-210. Use Hydraulic cement with a nominal compressive strength of 4000 psi in conformance with ASTM C150. Provide rebar that are deformed steel bars with a 60,000 psi yield strength conforming to ASTM A615. Contractor to obtain all associated items including but not limited to racks, ladders, frame, and cover. These items are included. Contractor will not pour concrete until steel is inspected by the Utility Owner. Contact the Utility Owner Representatives as shown on the plans.
- 2.1.4. **Miscellaneous Materials, Tools, and Equipment.** Furnish non-telecommunication system materials, backfill, cement stabilized sand, mortar, tools, supplies, equipment, etc. required to properly complete the work that meets TxDOT and Utility Owner's minimum requirements.
- 2.2. **Procurement of Fiber Optic Cables.** The Utility Owner will provide the Fiber Optic Cable within the project limits. Contact the Utility Owner Representatives as shown on the plans, 60 days before the required delivery date.
- 2.3. **Backfill.** Furnish backfill in accordance with Item 400, "Excavation and Backfill for Structures."
- 2.3.1. **Bedding.** Provide cement stabilized sand for bedding beginning 2 in. below the bottom of the duct bank and extending to 12 in. above top of the duct bank as shown on the plans.
- 2.3.2. **Original Material Backfill (Type A).** Provide material that is equivalent to original material or better, free of debris, and compacted to 90%-95% standard proctor density in 8 in. lifts.
- 2.3.3. **Cement Stabilized Backfill.** Provide cement-stabilized backfill in accordance with Item 400, "Excavation and Backfill for Structures."
- 2.4. **Concrete Encasement.** Provide concrete encasement material in accordance with Item 421, "Hydraulic Cement Concrete," Class A. Where conduit bends are less than 80-ft. radii, encase in concrete.
- 2.5. **Miscellaneous Other Material.** Assume responsibility for providing other customary material not listed on the plans or within this specification to properly complete the project including, but not limited to, the following:
- long radius bends;
  - handhole ground tree;
  - fencing, permanent or temporary;
  - resin, fusing materials, and equipment;
  - sand bags and silt fencing;
  - drilling fluids;
  - water to conduct bore procedure;
  - contractor's temporary buildings and latrines;
  - timbers or other materials; and
  - mandrel.
- 2.6. **Defective or Damaged Material.** Inspect materials for defects before lowering them into the trench. Repair or replace as directed any defective, damaged, or unsound material. Should damaged materials be placed, furnish at no expense to the Department, labor and materials required for removing and replacing the

defective material. Should the Contractor damage the materials after installation, the Engineer may permit the damaged section to be cut from the length, unless it is the opinion of the Engineer that the entire length was damaged. The cost and replacement of broken materials is at the expense of the Contractor.

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### 3. CONSTRUCTION

- 3.1. **Contractor.** Construction including, but not limited to, excavations, installations, mandrelling, proving, and boring operations must be performed by a Department approved Contractor. The Utility Owner Subcontractor that installs the underground telecommunication system must be an approved Utility Owner Contractor in good standing with the Utility Owner.
- 3.2.
- 3.2. **As-Built Documentation.** Redline drawings in both plan and profile should be submitted to the Department for approval in advance of any field changes or variations from the plans, as provided. If approved, any field changes should be documented, and an as-built drawing should be provided to the Utility Owner. Requests for field changes, for contractor convenience, typically will not be approved.
- 3.3. **Trench Excavation.** Perform trench excavation in accordance with Item 400, "Excavation and Backfill for Structures," as outlined herein, as shown on the plans, and as directed.
- 3.3.1. **Trenches for Conduit and Conduit Structures.**
- 3.3.1.1. **Width of Trenches.** Construct trenches that are adequate to accommodate working room needed to place conduit. When placing conduit, allow a minimum of 2 in. on each side of the duct structure for encasement as shown on the plans and notes. Backfill in accordance with Item 400, Article 3.3. When shoring or sheeting is used, measure the trench width from the inside surfaces of the uprights or sheeting.
- 3.3.1.2. **Depth of Trench.** Minimum trench depth is the height of the duct structure plus 24 in. This height includes any top protection when the trench is in an area under live load or traffic. The depth of excavation will be determined by the lines and grades as established on the plans, and notes, or as directed.
- 3.3.2. **Handhole and Manhole Excavations.** The width and depth of excavation for handholes and manholes will be determined by the lines and grades as established on the plans, and notes, dimensions of the handholes and manholes, and as directed.
- 3.3.3. **Excavation Below Grade.** Correct any part of the bottom of the trench excavated below the limits specified in Section 3.3.1.2., "Depth of Trench" with approved material and compacted in a manner as described in Article 400.3 of Item 400, "Excavation and Backfill for Structures," and as directed.
- 3.3.4. **Working at Driveways.** Except where otherwise noted, maintain access to driveways at all times. A flotation ditch must be installed across a driveway wherever noted on the plans, as directed, and when necessary to facilitate the movement of traffic. Open cut and restore driveways in half segments to maintain flow of traffic where possible. If a driveway must be closed, ensure there is an alternate access point to the property or construct a temporary driveway. The Contractor will be responsible for the means, methods, and equipment used to construct the flotation ditch or temporary driveway.
- 3.4. **Backfill.** Provide backfill and perform backfill operations in accordance with Item 400, "Excavation and Backfill for Structures," as described herein and as directed.
- 3.5. **Pavement.** Remove pavement and surfaces as part of the trench excavation in accordance with Item 400, "Excavation and Backfill for Structures." The removal and restoration of pavement and surfaces will be based upon the minimum trench width as described in Section 3.3.1.2., plus 2 in. on each side of the trench.
- 3.6. **Boring.** Install casing pipe or conduit, by bore, in conformance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box." Install bore spacer in accordance with the manufacturer's guidelines.

- 3.6.1. **Directional Boring.** Install casing pipe or conduit by horizontal directional drill in conformance with the North American Society of Trenchless Technology (NASTT), "Mini-Horizontal Directional Drilling Manual" (1995), or ASTM F 1962 "Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit under Obstacles including River Crossings."
- 3.7. **Handholes and Manholes.** Handholes and manholes will be of the size and type as shown on the plans. Set manholes to the lines and grades as shown on the plans. Manholes will have a minimum 60 in. cover from finished grade to the top of the manhole box unless specified otherwise on the plans or as directed by the Utility Owner. Place handholes in line with final grade except where noted otherwise on the plans or as directed by the Utility Owner.
- 3.7.1. **Pre-cast Handholes and Manholes.** Install pre-cast handholes and manholes according to Bellcore Practices, Section 622-506-200, "Precast Concrete Manholes, 38Y Types, Installation."
- 3.7.2. **Cast-In-Place Handholes and Manholes.** Construct cast-in-place materials in accordance with Bellcore Practices Section 622-505-210, "Concrete Manholes, Cast-In-Place Construction." Contractor will not pour concrete until steel is inspected by the Utility Owner Inspector. Contact the Utility Owner Representatives as shown on the plans.
- 3.8. **Manholes.** Install manholes in accordance with the plans. Notify the appropriate contact person a minimum of 10 days before placing manholes, to ensure compliance with this requirement.
- 3.9. **Handholes.** Install ground tree with handhole placement.
- 3.10. **Removing Existing Facilities.** Remove abandoned telephone facilities, including manholes and conduit in accordance with Item 496, "Removing Structures." Before removing telephone facilities, contact the Utility Owner Representatives as shown on the plans. A Utility Owner approved contractor is not required to perform Utility Owner removals once the existing facility is confirmed abandoned in place.
- 3.11. **Proofing and Mandrelling.** After the duct has been installed, pass a mandrel through the duct in the presence of the Engineer and after observing the 10-day notification to Utility Owners. If the mandrel fails to pass through the duct being tested, either the duct is obstructed, misaligned, or the curve has too small a radius. Correct defective ducts. After the ducts are repaired, repeat the mandrel test in that section of duct. Mandrels are constructed in various sizes, depending upon the use and nature of the section being tested (e.g., duct size.) The OD of a test mandrel is normally 80% of the ID of nominal size of the duct. The length of the mandrel will vary depending upon the manufacturer and mandrel type (testing conduit or removing debris.)
- 3.12. **Protective Concrete Cap.** Construct concrete caps above conduit structures, as detailed on the plans, in conformance with Item 421, "Hydraulic Cement Concrete."

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#### 4. MEASUREMENT

- 4.1. **Directional Bore.** This item will be measured by the foot of the type and size shown on the plans for "Directional Bore (Comm)." This is a plans quantity measurement item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.
- 4.2. **Conventional Bore.** This item will be measured by foot of the type and size shown on the plans for "Conventional Bore (Comm)." Steel casings will not be measured directly but are subsidiary to the conventional bore installation. This is a plans quantity measurement item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.
- 4.3. **Proofing and Mandrelling.** This item will not be measured directly for payment but is subsidiary to the item being proofed.

- 4.4. **Trench Excavation and Backfill.** This item is measured by the cubic yard for "Trench (Comm)." Bends and appurtenances for conduit will not be measured for payment but are subsidiary to the duct bank measurement. This is a plans quantity measurement item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.
- 4.5. **Pavement.** Cutting and restoring pavement will be not measured directly but is subsidiary to the structure installed in the trench.
- 4.6. **Handholes.** Handholes will be measured by each handhole installed, complete in place for "Handhole (Comm)." Necks and covers will not be measured for payment but are incidental to the item installed. Handholes installed over existing telecommunication facilities will be measured for payment as described herewith. Any adjustment or removal of the existing structures necessary for the placement of the proposed handholes will not be measured directly but is incidental to the item installed.
- 4.7. **Manholes.** Manholes will be measured by each manhole installed, complete in place for "Manhole (Comm)." Necks and covers will not be measured for payment, are incidental to the item installed. Manholes installed over existing telecommunication facilities will be measured for payment as described herewith. Any adjustment or removal of the existing structures necessary for the placement of the proposed manholes will not be measured directly but is incidental to the item installed.
- 4.8. **Conduit.** Conduit will be measured by the foot, as shown on the plans, of the type and size specified within the trench or bore for "Conduit (Comm)." This is a plans quantity measurement item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.
- 4.9. **Innerduct.** This item will be measured by the foot for "Innerduct (Comm)" of the type and size specified on the plans within the trench or bore. This is a plans quantity measurement item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.
- 4.10. **Casing.** Casing will be measured by the foot for "Casing (Comm)" of the type and size specified on the plans. This is a plans quantity measurement item limited to casing used in directional bore. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required. Casing used for conventional bores will not be measured directly but is subsidiary to the bore.
- 4.11. **Protective Concrete Cap.** This item will not be measured for payment but is subsidiary to the structure installed.
- 4.12. **Concrete Removal and Restoration.** This item will not be measured for payment but is subsidiary to the structures installed.
- 4.13. **Remove Existing Facilities.**
- 4.13.1. **Conduit.** Removal of existing conduit, as indicated on the plans, will be measured by the foot for "Remove (Comm)." This is a plans quantity measurement item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.
- 4.13.2. **Handhole and Manholes.** Handholes or manholes removed will be measured by each removed item as shown on the plans for "Remove Structure (Comm)." This is a plans quantity measurement item. The quantity to be paid is the quantity shown in the proposal, unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

- 4.13.3. **Poles.** Existing poles removed will be measured by each item specified for removal on the plans for "Remove Structure (Comm)." This is a plans quantity measurement item. The quantity shown in the proposal, unless modified by Article 9.2, "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantity are required.

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## 5. PAYMENT

- 5.1. **Directional Bore.** 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 for "Directional Bore (Comm)" of the length specified on the plans. This price is full compensation for installing outer casing, conduit and innerduct, mobilization, pilot hole, fusing materials, drilling fluid, sand bags, silt fencing; and, for labor, tools, equipment, and incidentals.
- 5.2. **Conventional Bore.** The work performed and materials furnished in accordance with this Item and measured, as provided under "Measurement," will be paid at the unit price of "Conventional Bore (Comm)" of the length specified on the plans. This price is full compensation for installing outer casing, conduit and innerduct, mobilization, pilot hole, fusing materials, drilling fluid, sand bags, silt fencing; and, for labor, tools, equipment, and incidentals.
- 5.3. **Proofing and Mandrelling.** This item will not be paid for directly but will be subsidiary to the pipe installed.
- 5.4. **Trench Excavation and Backfill.** 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 for "Trench (Comm)." This price is full compensation for installing conduit and inner duct; excavating, furnishing and placing backfill, replacing pavement structure, sod, riprap, curbs, or other surface; for furnishing and installing fittings, bends, adaptors, lubrication access fittings, expansion joints, concrete, and underground mylar conduit marking tape; and for labor, tools, equipment, and incidentals.
- 5.5. **Pavement.** Pavement will not be paid for directly but will be subsidiary to the pipe installed.
- 5.6. **Handholes.** 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 for "Handhole (Comm)" of the size specified on the plans complete in place. This price is full compensation for bonding, rings, frames, covers, ground tree, and joint sealing compound as detailed on the plans.
- 5.7. **Manholes.** 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 for "Manhole (Comm)" of the size specified on the plans complete in place. This price is full compensation for bonding, rings, frames, covers, racks, ladders, terminators, plugs, etc., and joint sealing compound as detailed on the plans.
- 5.8. **Conduit.** The work performed, in accordance with this Item and measured as provided under "Measurement," will be paid for at the unit price for "Conduit (Comm)" of the size and type specified on the plans. This price is full compensation for only the material cost; construction costs associated with the installation of this item are considered incidental to the trench or bore in which they are installed.
- 5.9. **Innerduct.** The work performed, in accordance with this Item and measured as provided under "Measurement," will be paid for at the unit price for "Innerduct (Comm)" of the size and type specified on the plans. This price is full compensation for only the material cost; construction costs associated with the installation of this item are considered incidental to the trench or bore in which they are installed.
- 5.10. **Casing.** The work performed, in accordance with this Item and measured as provided under "Measurement," will be paid for at the unit price for "Casing (Comm)" of the size and type specified on the plans. This price is full compensation for only the material cost; construction costs associated with the installation of this item are considered incidental to the trench or directional bore in which they are installed. Casing material used for conventional bores will not be paid for directly but will be considered incidental to the conventional bore installed.

- 5.11. **Protective Concrete Cap.** This item will not be paid for directly but will be subsidiary to the structures installed.
- 5.12. **Concrete Removal and Restoration.** This item will not be paid for directly but will be subsidiary to the pipe installed.
- 5.13. **Remove Existing Facilities.**
- 5.13.1. **Conduit.** 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 for "Remove (Comm)." This price is full compensation for removal and disposal of existing facilities as shown on the plans.
- 5.13.2. **Handhole and Manholes.** 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 for "Remove Structure (Comm)." This price is full compensation for removal and disposal of existing facilities as shown on the plans.
- 5.13.3. **Poles.** 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 for "Remove Structure (Comm)." This price is full compensation for removal and disposal of existing facilities as shown on the plans. Other above ground appurtenances will be subsidiary to the conduit removal.