

## ITEM 60

### TRACER WIRE FOR WATER & WASTEWATER NON-FERROUS PIPE

**1.0 DESCRIPTION.** The Contractor shall provide all materials, labor and equipment necessary to furnish and install a complete tracer wire system. In general, this work shall include the furnishing of a primary and duplicate/secondary tracer wire system complete utilizing a 512Hz signal as required in the construction of all non-ferrous water and sewer pressure pipe (force mains, HDD, jack & bore, pipe burst) applications as specified herein.

**2.0 SUBMITTALS.** The contractor shall submit the following information:

**A. Reference Standards.** Latest revisions:

1. Copper Clad Steel Wire (Steel Core): ASTM B227, & B1010.
2. Wire Insulation: ASTM D-1248.
3. Wire Physical, Mechanical & Electrical Properties:  
ASTM D-257, D-638, D-746, D-790/1, D-792, D-1238E, D-1525, D-1531,  
ASTMD-1693/B, D-1895, D-2240, D-2951, D-3417, D-3755, D-3895,
4. Copper: ASTM B-170 (latest version) & UNS-C10200.
5. America Public Works Association (APWA) Uniform Color Code.

**B. Shop Drawings.**

1. All shop drawings submitted electronically for review and approval shall be returned within two weeks either approved or marked up for further design.
2. After examination of such drawings by the Engineer and the return thereof, the Contractor shall make corrections to the shop drawings, as have been indicated and shall furnish the Engineer with electronic corrections.
3. Shop drawings shall be complete in details and indicate all materials as specified herein, including:
  - a. Wire selection.
  - b. Wire Gage.
  - c. Accessories; connectors, ground rods, access points at grade & above grade etc.
  - d. Color.
4. Manufacturer's catalog or general web-site information will not be sufficient to fulfill shop-drawing requirements.

**C. Calculations.** This section is not applicable.

#### **D. Certifications.**

1. Certification of Compliance:
  - a. Copper Clad Steel Wire is manufactured in the United States of America.
  - b. 5-year Corrosion Testing on copper clad steel (CCS) tracer wire results (if available).
    - i. If no corrosion study has been performed on the CCS then additional warranty will need to be provided as indicated in Section 6.0 below.
2. Certificates of Qualification:
  - a. Certification from tracer wire manufacturer that the Contractor is qualified to install the tracer wire system.

**3.0 MATERIALS.** Only materials approved by the Stark County Metropolitan Sewer District may be used for this project.

#### **A. General.**

1. All tracer wire and appurtenances shall be compatible with one another to assure complete system continuity when installed. System shall be assembled per manufacturers' directions and tested for continuity in presence of County Project Representative.
2. Testing and inspection of the tracer wire primary and secondary lines supplied under this specification shall be as set forth in referenced standards.
3. The tracer wire system for water or wastewater use shall be color coded in accordance with APWA color code standards.
4. All wire shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.
5. Uniformity shall be met as commercially practical in color, opacity, density, etc.
6. The Sanitary Engineer, at his option, may send his inspector to observe the manufacture and testing of materials supplied for this specification and, as such, the manufacturer shall give ample notice of a production run.
7. All fittings shall be molded or fabricated by the manufacturer. No Contractor fabricated fittings or grounding via clamping or welding to metal fixtures, pipes hydrants or curb boxes will be approved.
8. Approved manufacturers include:
  - a. SnakeBite™ by Copperhead Industries, LLC.
  - b. Engineering approved equal.

**B. Tracer Wire System for Water & Wastewater Applications. Non-Ferrous & Non-Ferrous Pressure Pipe Applications.** Contractor shall supply a complete tracer wire system in accordance with these specifications and all manufacturer requirements.

1. All Copper Clad Steel (CCS) tracer wire shall be manufactured within the United States of America.
2. A 5-year corrosion study is required for SCSE to validate the wire quality.
3. Open Cut and Direct Drilled Wire Applications shall be:

- a. Direct burial #12 AWG Solid (0.0808" diameter) hard drawn solid extra-high-strength copper clad steel (CCS) core conductor horizontal drill tracer wire with:
    - i. Minimum 21% Conductivity.
    - ii. Minimum 1,150 lb. break load.
    - iii. CCS conductor shall be hard drawn high carbon 1055 grade steel with solid extra strength CCS conductor rated at 30-volts.
    - iv. Minimum 45 mil HDPE insulation jacket thickness complying with ASTM D1248 and rated for direct burial at 600 volts.
    - v. Manufactured within the United States of America, SoloShot™ Extra-High Strength 1245-EHS by Copperhead or SCSE approved equal.
4. Pipe Burst Wire Application shall be:
  - a. Direct burial 7x7 Stranded CCS (3/16" OS diameter) hard drawn solid extra-high-strength copper clad steel core conductor horizontal drill tracer wire with:
    - i. Minimum 21% Conductivity.
    - ii. Minimum 4,700 lb. break load,
    - iii. CCS conductor shall be hard drawn high carbon conductor rated at 30-volts.
    - iv. Minimum 50 mil HDPE insulation jacket thickness complying with ASTM D1248 and rated for direct burial at 600 volts.
    - v. Manufactured within the United States of America, SoloShot Xtreme - PBX-50 by Copperhead or SCSE approved equal.
5. All Tracer Wire shall be hard drawn Copper Clad Steel (CCS) conductor wire, manufactured in the USA by Copperhead or SCSE approved equal.
  - a. CCS conductor must have 21% conductivity for locate purposes
  - b. THHN wire will not be approved for tracer wire.
6. Tracer wire shall be a single continuous wire from access point to access point except where approved for spliced in repairs or replacement connections.
7. Service connections, connectors and grounding. Shall be in accordance with, but not limited to the following:
  - a. Locking Connectors, Twist-on Connectors. Locking and Twist-on Connections shall be:
    - i. No cut through direct burial wire connections.
    - i. Moisture and Corrosion resistance with pre-filled dielectric silicone sealant.
    - ii. Locking connections shall have 90-degree twist-lock connections.
  - b. Mainline to Service Connections and Pipe Bursting Connections shall be:
    - i. 3- way, No cut through direct burial wire connections.
    - ii. Moisture and Corrosion resistance.
    - iii. Complete with lock down lids pre-filled with dielectric silicone sealant.
  - c. All connections shall be manufactured by Copperhead or SCSE approved equal.
  - d. Self-contained grid with access points at the system:
    - i. Start

- ii. End
- iii. Water hydrants (where applicable)
- iv. Curb Box assemblies (where applicable)
- v. In accordance with all plans, specifications and manufacturers installation requirements.
- vi. Color Coding: All components (wire, connectors, access points etc.) shall be color coded in accordance with the APWA standards for utility identification.
- vii. At grade access points: shall be SnakePit™ Access Points or SCSE approved equal.
- viii. Above Grade: shall be Cobra Access Points or SCSE approved equal.
- e. Grounding: A 1.5 lb. drive-in magnesium ground rod as manufactured by Copperhead or SCSE approved equal.
  - i. No welded or clamped grounding to existing metal pipes, fixtures, hydrants, curb boxes etc. will be permitted.
- f. Tracer wire accessories shall include but not be limited to access points at every termination of the wire. Each access point shall be as specified above and include:
  - i. SnakePit™ Access Point: Two terminal light duty switchable lids (ground switch) attached to a companion base or approved SCSE equal.
  - ii. Locking cover.
  - iii. Encapsulated magnet to facilitate detection.
  - iv. Color coded in accordance with APWA standards.
  - v. Both lid and base shall be non-corrosive.
  - vi. Ground switch when “off” may be used to ground locator transmitter.
  - vii. Set screws shall be used to secure all wire and anti-corrosion gel shall be supplied to protect all electrical connections.
- g. Grounding Rods: shall be supplied in the quantity and locations as determined by the tracer wire manufacturer, as specified above.
  - i. Grounding rod shall be capped with non-corrosive material and include at least 20 feet of approved tracer wire for grounding.
- h. Connectors: Waterproof connectors as specified above, as necessary to prevent cutting the main tracer wire.
- i. Accessory products shall be supplied by Copperhead LLC or SCSE approved tracer wire manufacturer.

**4.0 EXECUTION.** Installation of the tracer wire system shall be in accordance with all SCSE specifications, and all manufacturer requirements as indicated below.

**A. Installation.**

1. Provide and install two (2) tracer wires, one (1) primary and one (1) duplicate/secondary wire, and all necessary appurtenances, specified herein for all open cut, direct drilling, boring or pipe bursting pipe installations.
2. Tracer wires shall be located on bottom half of pipe between 3 and 9 o'clock.

3. Installation of the tracer wire shall be such that it allows for proper access for connecting tracer equipment and proper locating of wire without loss or deterioration of the low frequency (512Hz) signal for distances in excess of 1,000 linear feet, without distortion of signal caused by multiple wires installed in close proximity to one another.
4. All tracer wire appurtenances necessary for a complete, operable system including but not limited to access points, wire connectors and grounding shall be constructed in a workmanlike manner and comply with the parameters and requirements herein.

**B. Other Requirements.** Tracer wire installation shall comply with but not be limited to the following SCSE Item Specifications and manufacturers' requirements.

1. Item 13: HDPE Pipe.
2. Items 14/14W: PVC Pipe.
3. Items 15/15W: Open Cut Pipe Installation.
4. Item 17: Pipeline Casing and Carrier Pipe.
5. Items 18/18W: Horizontal Directional Drilling.
6. Item 49: Pipe Bursting Gravity Sewers.
7. All tracer wire manufactures installation requirements.

**6.0 QUALITY ASSURANCE.** The items covered under this section of the Specification are intended to be the materials described above. All material used on this project shall be new and unused unless otherwise specified and all workmanship shall be of the best quality.

**A. Material Assurance and Testing.** The work covered under this section of the Specification is intended to be the work, materials, labor and equipment required to install the tracer wire system as described above.

1. All material used on this project shall be new and unused unless otherwise specified and all workmanship shall be of the best quality. Only qualified and skilled workmen/women shall be employed for all phases of this project.
2. The contractor shall be responsible for furnishing all equipment and labor necessary to test the tracer wire system for continuity at no additional cost to the County.
3. Continuity Testing. The contractor shall be required to provide continuity testing on the entire Tracer Wire System.
  - a. The contractor shall be responsible for all repairs necessary to ensure the system successfully passes continuity testing.
  - b. The contractor shall provide the County a report indicating successful completion of Continuity testing.
4. All testing shall be scheduled and performed in the presents of a SCSE inspector.

**B. Observation.**

1. The tracer wire system will be subject to inspection and approval by the County after delivery of material to the job site. Any wiring or components found to be

unsatisfactory or otherwise damaged shall not be approved for use, returned and replaced at the Contractors' expense.

2. The Contractor shall furnish the SCSE Inspector a list of all wire and components from each shipment received. The list shall include a complete description for each component for the tracer wire system received.
  - a. If proper documentation or description of the componentry is not sufficient the Inspector will not approve said items until proper documentation is provided.

**C. Warranty.**

1. Tracer Wire System Warranty. The Contractor shall provide all material manufacture warranties utilized on this project.
2. In addition to all material warranties, the two (2) year maintenance bond and warranties described under the General Conditions, and applicable SCSE specifications, the contractor shall provide the following additional installation warranty.
  - a. Tracer Wire System with required 5-Year Corrosion Testing. The Contractor shall provide the following warranty on the tracer wire system.
    - i. The Contractor shall guarantee the installation and continuity of the tracer wire system for a minimum period of five (5) years from the project acceptance date.
    - ii. After completion of the project and for a period up to five (5) years the County may inspect portions of or the entire tracer wire system before the end of years, One (1), three (3), and five (5) for system continuity.
    - iii. In event of a continuity failure during any of the above-mentioned County inspections, the Contractor shall be required to make all repairs necessary to restore system continuity at NO cost to the County in accordance with all manufactures requirements/recommendations.
    - iv. The County defines a system failure as a loss of continuity
    - v. Warranty Clarification: The County does not require a bond, check, letter and/or line of credit, no up-front costs, or dollars, concerning the required five (5) year warranty. The County requires a written warranty letter from tracer wire installation contractor and/or tracer wire system manufacturer awarded the project, to warranty and cover the costs for any tracer wire system repairs, for the five (5) year warranty period as indicated in the requirements above.
  - b. Tracer Wire System without 5-Year Corrosion Testing. The Contractor shall provide the following warranty on the tracer wire system.
    - i. The Contractor shall guarantee the installation and continuity of the tracer wire system for a minimum period of ten (10) years from the project acceptance date.
    - ii. After completion of the project and for a period up to ten (10) years the County may inspect portions of or the entire tracer wire system before

the end of years, One (1), three (3), five (5), seven (7) and ten (10) for system continuity.

- iii. In event of a continuity failure during any of the above-mentioned County inspections, the Contractor shall be required to make all repairs necessary to restore system continuity at NO cost to the County in accordance with all manufactures requirements/recommendations.
- iv. The County defines a system failure as a loss of Continuity
- v. Warranty Clarification: The County does not require a bond, check, letter and/or line of credit, no up-front costs, or dollars, concerning the required ten (10) year warranty. The County requires a written warranty letter from tracer wire installation contractor and/or tracer wire system manufacturer awarded the project, to warranty and cover the costs for any tracer wire system repairs for the ten (10) year warranty period as indicated in the requirements above.

**7.0 MEASUREMENT.** Method of measurement for all work completed under this specification shall be as follows.

**A. Tracer Wire.** The entire amount of wiring and the operable system installed complete, shall be included and considered incidental as part of the water main and sewer system furnished.

**B. Appurtenances.** The quantity of all appurtenances necessary for the tracer wire system to operate as specified above are incidental to the water and sewer systems being installed.

**8.0 PAYMENT.** The cost for all labor, equipment, and materials necessary to provide the Tracer Wire System and any other required componentry or incidental work herein shall be included in other applicable SCSE material item specifications. No additional payments for tracer wire shall be made.

**END OF SECTION**