SECTION 33 70 00
ELECTRICAL UTILITIES

Display hidden notes to specifier.

1.1 SECTION INCLUDES

A. Muletape WP 400, standard, flat, woven polyester tape, lubricated, for installing fiber optic, copper, and coaxial cables in underground conduit; 400 lbs (181.4 kg) tensile strength for small, short conduction runs.

B. 3-1 Premise Muletape WP 400, Bucket, standard, flat woven polyester tape, lubricated, for installing fiber optic, copper, and coaxial cables in underground conduit; 400 lbs (181.4 kg) tensile strength for small, short conduction runs.

C. Muletape WP 1250, mid-strength, flat woven polyester tape, lubricated, for installing fiber optic, copper, and coaxial cables in underground conduit; 1,250 lbs (567.0 kg) tensile strength for longer, heavier pulls.

D. Muletape WP 1800, high strength, flat, woven, polyester tape for installing fiber optic, copper, and coaxial cables in underground conduit; 1,800 lbs (816.5 kg) tensile strength for higher pull force capacity.

E. Muletape WP 2500, heavy duty, flat, woven, polyester tape for installing fiber optic, copper, and coaxial cables in underground conduit; 2,500 lbs (1,134.0 kg) tensile strength for large pulls.

F. Muletape RP 4000, reinforced, flat, woven, polyester tape for installing fiber optic, copper, and coaxial cables in underground conduit; 4,000 lbs (1,814.4 kg) tensile strength for maximum load pulling in utility construction.

G. Muletape RP 6000, heavy-duty flat, woven, polyester tape for installing fiber optic, copper, and coaxial cables in underground conduit; 4,000 lbs 1,814.4 kg) tensile strength for pulling multiple large cables.

H. Muletape DT 1250 P, detectable woven polyester tape with integrated tracer conductor; 1,250 lbs (567.0 kg) tensile strength.

I. Muletape DT 1800 P, detectable woven polyester tape with integrated tracer conductor, 1,800 lbs (816.5 kg) tensile strength.

J. Muletape DT 2500 P, detectable woven polyester tape with integrated tracer conductor, 2,500 lbs (1,134.0 kg) nominal tensile strength.

K. Trace-Safe TST600 Series Detectable Wire, dedicated, 600V-rated, water-blocking,

reinforced tracer wire; 610 lbs (276.7 kg) strength, for direct burial.

L. Trace-Safe Direct Burrial RT 18000 W, high-performance, water-blocking reinforced tracer wire; 1,800 lbs (816.5 kg) strength, for heavy direct burial applications.

M. Trace-Safe TS Pole Isolation, test access point for switchable, isolated locating connection.

N. Trace-Safe TST-BC Base Connector, polycarbonate, no strip connectors for splicing and tapping Trace Safe 10-19 AWG tracer wire.

O. Trace-Safe TS-UBC Universal Connector, polycarbonate, no strip connectors for splicing and tapping Trace-Safe and universal tracer wire.

1.2 RELATED SECTIONS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.

C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

D. Section 26 27 26 - Wiring Devices.

E. Section 33 11 10 - Water Utility Distribution Piping.

F. Section 33 51 00 - Gas Distribution Utilities.

G. Section 33 81 00 - Communications Utilities.

1.3 REFERENCES

A. ASTM International (ASTM):
1. ASTM B117-2009 - Standard Practice for Operating Salt Spray, Fog, Apparatus.
2. ASTM D426 - Standard Practice for Labeling Art Materials for Chronic Health Hazards.

B. Bell Core - Telecordia Technologies:
1. TR-NWT-001075 - Generic Requirements for Outside Plant Bonding and Grounding Systems Hardware.
2. GR-356-CORE, Section 5.3.3 - Generic Requirements for Optical Cable Innerduct, Associated Conduit, and Accessories.
3. GR-356-CORE, Section 5.3.2, Requirement CR5-1 - Impact Resistance.
4. GR-356-CORE, Section 5.3.5, Requirement CR5-1 - Crush Resistance.
5. GR-356-CORE, Section 5.3.4.1, - Flexural Modulus.

C. Conformite Europeenne (CE).

D. Underwriters Laboratories (UL):
1. UL 467-2007 - Standard for Grounding and Bonding Equipment.
2. UL 467-2013 - Standard for Grounding and Bonding Equipment.
3. UL 486-A-4860B-2003 - Standard for Safety for Wire Connectors.
4. UL 1581 - Reference Standard for Electrical Wires, Cables and Flexible Cords.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data:

1. Manufacturer's data sheets on each product to be used, including technical data sheets and maintenance instructions.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Typical installation methods.

C. Verification Samples: Two 3 ft (0.91 m) sample of each specified wire and pull tape series, clearly labeled with the product name and strength rating for Architect and Engineer's review of materials, color, and markings.

D. System Integration Drawings: Indicate connection point of tracer wire system into the physical infrastructure such as handhole-vault structure, and overall electrical grounding grid.

E. Product Compliance Certifications: Submit copies of certifications or testing reports confirming compliance with specified electrical and physical performance standards, including crush resistance, corrosion resistance, and water-blocking test results.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum of five years documented experience.

B. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.

C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

D. System Integration Mock-Up, First Article Installation: Construct first utility location system installation, including, pole isolation switch and one instance of each specified connector:
1. Locate first article installation at a utility pedestal or handhole approved by the Architect and Engineer.
2. First article installation will serve as the quality standard for workmanship, proper material application, and correct connection methodology.
3. Do not proceed with subsequent work until the Engineer has reviewed and accepted the first article installation in place.
4. Accepted first article installations may remain as part of the finished work.

1.6 PRE-INSTALLATION CONFERENCE

A. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees must include Architect, Engineer, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

B. Protect from damage due to weather, excessive temperature, and construction operations.

1.8 PROJECT CONDITIONS

A. Maintain environmental temperature, humidity and ventilation conditions within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Chase Corporation, which is located at:
375 University Ave.
Westwood, MA 02090
Tel: 781-750-0525
Fax: 781-332-0701
Email:request info (insidesales@chasecorp.com);Web:https://chasecorp.com

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with the provisions of Section 01 60 00.

2.2 SYSTEM DESCRIPTION, TRACER WIRE AND ISOLATION SYSTEM

A. Tracer Wire and Isolation System is an integrated, non-conductive utility locating network designed to facilitate the accurate and repeatable detection of all-dielectric or non-metallic underground infrastructure fiber optic cables, plastic gas or water lines. System consists of the following:
1. Tracer Wire: High-strength, water-blocking tracer wire is installed in trench or conduit alongside the protected utility. The wire provides a corrosion-resistant metallic path capable of carrying an electromagnetic signal from standard locating equipment.
2. Splicing-Connecting Hardware: Gel-filled, impact-resistant connectors are used to create durable, moisture-sealed connections between segments of tracer wire and at terminal points. These connectors ensure electrical continuity and maintain the system's integrity under direct burial conditions.
3. Isolation and Testing Component: System terminates at an accessible test point, typically an isolating ground switch-test station. Switch provides a permanent, easily accessible terminal for the locating technician to connect a transmitter to the tracer wire, bypassing permanent grounding and bonding harnesses to ensure a clean, isolated signal for maximum locating accuracy.

B. Overall system is engineered to facilitate a low-elongation, high-break strength, corrosion-resistant conductor that functions effectively at a wide range of frequencies, ensuring long-term underground detectability and operational safety.

2.3 PULLTAPE

A. Basis of Design: Muletape WP 400, as manufactured and supplied by Neptco.
1. Flat, woven, polyester tape for installing fiber optic, copper, and coaxial cables in underground conduit. Lightweight, low elongation, and lubricated for easy pulling and reduced friction. Printed with sequential footage or meter markings.
2. Performance and Design Requirements:
a. Standards Compliance:
1) ASTM D 426.
2) Bell Core-Telecordia GR-356-Core-5.3.3.
3) Bell Core-Telecordia GR-356-Core-5.3.4.1.
4) Bell Core-Telecordia GR-356-Core-5.3.5.CR5-1.
5) Bell Core-Telecordia GR-356-Core-5.3.2.CR5-1.
b. Performance Requirements:
1) Bowline Strength: 190 lbs (86.2 kg).
2) Duct Cutting: Bell Core-Telecordia GR-356-Core-5.3.2.CR5-1.
3) Elongation: Bell Core-Telecordia GR-356-Core-5.3.4.1 or ASTM D426.
4) Muleknot Strength: 300 lbs (136.1 kg).

5) Print Durability: Bell Core-Telecordia GR-356-Core-5.3.5.CR5-1.
6) Pull Strength: 400 lbs (181.4 kg).
7) Tensile Strength: Bell Core-Telecordia GR-356-Core-5.3.3.

c. Design Requirements:
1) Minimum Reel Length: 3,000 ft (914.4 m).
2) Maximum Reel Length: 100,000 ft (30,480 m).

B. Basis of Design: 3-1 Premise Muletape WP 400, Bucket, as manufactured and supplied by Neptco.
1. Flat, woven, polyester tape for installing fiber optic, copper, and coaxial cables in underground conduit. Lightweight, low elongation, and lubricated for easy pulling and reduced friction. Printed with sequential footage or meter markings.
2. Performance and Design Requirements:
a. Standards Compliance:
1) ASTM D426.
2) Bell Core-Telecordia GR-356-Core-5.3.3.
3) Bell Core-Telecordia GR-356-Core-5.3.4.1.
4) Bell Core-Telecordia GR-356-Core-5.3.5.CR5-1.
5) Bell Core-Telecordia GR-356-Core-5.3.2.CR5-1.
b. Performance Requirements:
1) Bowline Strength: 190 lbs (86.2 kg).
2) Duct Cutting: Bell Core-Telecordia GR-356-Core-5.3.2.CR5-1.
3) Elongation: Bell Core-Telecordia GR-356-Core-5.3.4.1 or ASTM D426.
4) Muleknot Strength: 300 lbs (136.1 kg).
5) Print Durability: Bell Core-Telecordia GR-356-Core-5.3.5.CR5-1.
6) Pull Strength: 400 lbs (181.4 kg).
7) Tensile Strength: Bell Core-Telecordia GR-356-Core-5.3.3.
c. Design Requirements:
1) Minimum Reel Length: 3,000 ft (914.4 m).
2) Maximum Reel Length: 100,000 ft (30,480 m).

C. Basis of Design: Muletape WP 1250, as manufactured and supplied by Neptco.
1. Flat, woven, polyester tape for installing fiber optic, copper, and coaxial cables in underground conduit. Lightweight, low elongation, and lubricated for easy pulling and reduced friction. Printed with sequential footage or meter markings.
2. Performance and Design Requirements:
a. Standards Compliance:
1) ASTM D426.
2) Bell Core-Telecordia GR-356-Core-5.3.3.
3) Bell Core-Telecordia GR-356-Core-5.3.4.1.
4) Bell Core-Telecordia GR-356-Core-5.3.5.CR5-1.
5) Bell Core-Telecordia GR-356-Core-5.3.2.CR5-1.
b. Performance Requirements:
1) Bowline Strength: 760lbs (345 kg).
2) Duct Cutting: Bell Core-Telecordia GR-356-Core-5.3.2.CR5-1.
3) Elongation: Bell Core-Telecordia GR-356-Core-5.3.4.1 or ASTM D426.
4) Muleknot Strength: 900lbs (409 kg).
5) Print Durability: Bell Core-Telecordia GR-356-Core-5.3.5.CR5-1.
6) Pull Strength: 1,250 lbs (567.0 kg).
7) Tensile Strength: Bell Core-Telecordia GR-356-Core-5.3.3.
c. Design Requirements:
1) Minimum Reel Length: 3,000 ft (914.4 m).
2) Maximum Reel Length: 70,000 ft (21,336 m).

D. Basis of Design: Muletape WP 1800, as manufactured and supplied by Neptco.
1. High strength, flat, woven, polyester tape for installing fiber optic, copper, and coaxial

cables in underground conduit. Lightweight, low elongation, and lubricated for easy pulling and reduced friction. Printed with sequential footage or meter markings.

2. Performance and Design Requirements:
    a. Standards Compliance:
        1) ASTM D426.
        2) Bell Core-Telecordia GR-356-Core-5.3.3.
        3) Bell Core-Telecordia GR-356-Core-5.3.4.1.
        4) Bell Core-Telecordia GR-356-Core-5.3.5.CR5-1.
        5) Bell Core-Telecordia GR-356-Core-5.3.2.CR5-1.
    b. Performance Requirements:
        1) Bowline Strength: 830 lbs (376.5 kg).
        2) Duct Cutting: Bell Core-Telecordia GR-356-Core-5.3.2.CR5-1.
        3) Elongation: Bell Core-Telecordia GR-356-Core-5.3.4.1 or ASTM D426.
        4) Muleknot Strength: 1,400 lbs (635.0 kg).
        5) Print Durability: Bell Core-Telecordia GR-356-Core-5.3.5.CR5-1.
        6) Pull Strength: 1,800 lbs (816.5 kg).
        7) Tensile Strength: Bell Core-Telecordia GR-356-Core-5.3.3.
    c. Design Requirements:
        1) Minimum Reel Length: 3,000 ft (914.4 m).
        2) Maximum Reel Length: 50,000 ft (15,240 m).

E. Basis of Design: Muletape WP 2500, as manufactured and supplied by Neptco.
1. Flat, woven, polyester tape for installing fiber optic, copper, and coaxial cables in underground conduit. Lightweight, low elongation, and lubricated for easy pulling and reduced friction. Printed with sequential footage or meter markings.
2. Performance and Design Requirements:
    a. Standards Compliance:
        1) ASTM D426.
        2) Bell Core-Telecordia GR-356-Core-5.3.3.
        3) Bell Core-Telecordia GR-356-Core-5.3.4.1.
        4) Bell Core-Telecordia GR-356-Core-5.3.5.CR5-1.
        5) Bell Core-Telecordia GR-356-Core-5.3.2.CR5-1.
    b. Performance Requirements:
        1) Bowline Strength: 1300 lbs (951 kg).
        2) Duct Cutting: Bell Core-Telecordia GR-356-Core-5.3.2.CR5-1.
        3) Elongation: Bell Core-Telecordia GR-356-Core-5.3.4.1 or ASTM D426.
        4) Muleknot Strength: 1800 lbs (818 kg).
        5) Print Durability: Bell Core-Telecordia GR-356-Core-5.3.5.CR5-1.
        6) Pull Strength: 2,500 lbs (1,134.0 kg).
        7) Tensile Strength: Bell Core-Telecordia GR-356-Core-5.3.3.
    c. Design Requirements:
        1) Minimum Reel Length: 3,000 ft (914.4 m).
        2) Maximum Reel Length: 25,000 ft (7,620 m).

F. Basis of Design: Muletape RP 4000, as manufactured and supplied by Neptco.
1. Flat, woven, polyester tape for installing fiber optic, copper, and coaxial cables in underground conduit. Lightweight, low elongation, and lubricated for easy pulling and reduced friction. Printed with sequential footage or meter markings.
2. Performance and Design Requirements:
    a. Standards Compliance:
        1) ASTM D426.
        2) Bell Core-Telecordia GR-356-Core-5.3.3.
        3) Bell Core-Telecordia GR-356-Core-5.3.4.1.
        4) Bell Core-Telecordia GR-356-Core-5.3.5.CR5-1.
        5) Bell Core-Telecordia GR-356-Core-5.3.2.CR5-1.
    b. Performance Requirements:

1) Bowline Strength: 2,300 lbs (1,043.3 kg).
2) Duct Cutting: Bell Core-Telecordia GR-356-Core-5.3.2.CR5-1.
3) Elongation: Bell Core-Telecordia GR-356-Core-5.3.4.1 or ASTM D426.
4) Muleknot Strength: 3,500 lbs (1,587.6 kg).
5) Print Durability: Bell Core-Telecordia GR-356-Core-5.3.5.CR5-1.
6) Pull Strength: 4,000 lbs (1,814.4 kg).
7) Tensile Strength: Bell Core-Telecordia GR-356-Core-5.3.3.

c. Design Requirements:
1) Minimum Reel Length: 1,000 ft (304.8 m).
2) Maximum Reel Length: 3,000 ft (914.4 m).

G. Basis of Design: Muletape RP 6000, as manufactured and supplied by Neptco.
1. Flat, woven, polyester tape for installing fiber optic, copper, and coaxial cables in underground conduit. Lightweight, low elongation, and lubricated for easy pulling and reduced friction. Printed with sequential footage or meter markings.
2. Performance and Design Requirements:
a. Standards Compliance:
1) ASTM D426.
2) Bell Core-Telecordia GR-356-Core-5.3.3.
3) Bell Core-Telecordia GR-356-Core-5.3.4.1.
4) Bell Core-Telecordia GR-356-Core-5.3.5.CR5-1.
5) Bell Core-Telecordia GR-356-Core-5.3.2.CR5-1.

b. Performance Requirements:
1) Bowline Strength: 3,080 lbs (1,397.1 kg).
2) Duct Cutting: Bell Core-Telecordia GR-356-Core-5.3.2.CR5-1.
3) Elongation: Bell Core-Telecordia GR-356-Core-5.3.4.1 or ASTM D426.
4) Muleknot Strength: 5,000 lbs (2,268.0 kg).
5) Print Durability: Bell Core-Telecordia GR-356-Core-5.3.5.CR5-1.
6) Pull Strength: 6,000 lbs (2,721.6 kg).
7) Tensile Strength: Bell Core-Telecordia GR-356-Core-5.3.3.

c. Design Requirements:
1) Minimum Reel Length: 1,000 ft (304.8 m).
2) Maximum Reel Length: 3,000 ft (914.4 m).

H. Basis of Design: Muletape DT1250P, as manufactured and supplied by Neptco.
1. Flat, woven, polyester tape with insulated metallic conductor enables detection of all-dielectric cables and empty conduit with 22 gauge copper wires for underground detection and location of the conduit for future cable pulling. Printed with sequential footage or meter markings.
2. Performance and Design Requirements:
a. Standards Compliance:
1) ASTM D426.
2) Bell Core-Telecordia GR-356-Core-5.3.3.
3) Bell Core-Telecordia GR-356-Core-5.3.4.1.
4) Bell Core-Telecordia GR-356-Core-5.3.5.CR5-1.
5) Bell Core-Telecordia GR-356-Core-5.3.2.CR5-1.

b. Performance Requirements:
1) AWG: 22 tin coated copper.
2) Bowline Strength: 760 lbs (344.73 kg).
3) Break Strength: 25 lbs (11.3 kg).
4) Dielectric Constant: 2.24 at 1 MHZ.
a) Dry Dielectric: 850 V MIL (33.46 kV mm).
b) Wet Dielectric: 800 V MIL (31.50 kV mm).
5) Duct Cutting: Bell Core-Telecordia GR-356-Core-5.3.2.CR5-1.
6) Elongation: 20 percent, Bell Core-Telecordia GR-356-Core-5.3.4.1 or ASTM D426.

7) Maximum Voltage: 300 V.
8) Muleknot Strength: 900 lbs (408.24 kg).
9) Print Durability: Bell Core-Telecordia GR-356-Core-5.3.5.CR5-1.
10) Pull Strength: 1,250 lbs (567.0 kg).
11) Resistivity: 16.85 ohms per Mft (55.28 ohms km).
12) Tensile Strength: 50,000 psi (344.7 MPa), Bell Core-Telecordia GR-356-Core-5.3.3.

c. Design Requirements:
1) Diameter: .0253 inch (0.64 mm).
2) Minimum Reel Length: 3,000 ft (914.4 m).
3) Maximum Reel Length: 5,000 ft (1,524 m).
4) Thickness: .008 inch (0.20 mm).
5) Type: Extrusion friendly copolymer - orange color.
6) Width: 1/2 inch (12.7 mm).

I. Basis of Design: Muletape DT1800P, as manufactured and supplied by Neptco.
1. Flat, woven, polyester tape with insulated metallic conductor enables detection of all-dielectric cables and empty conduit with 22 gauge copper wires for underground detection and location of the conduit for future cable pulling. Printed with sequential footage or meter markings.
2. Performance and Design Requirements:
a. Standards Compliance:
1) ASTM D426.
2) Bell Core-Telecordia GR-356-Core-5.3.3.
3) Bell Core-Telecordia GR-356-Core-5.3.4.1.
4) Bell Core-Telecordia GR-356-Core-5.3.5.CR5-1.
5) Bell Core-Telecordia GR-356-Core-5.3.2.CR5-1.

b. Performance Requirements:
1) AWG: 22 tin coated copper.
2) Bowline Strength: 830 lbs (376.48 kg).
3) Break Strength: 25 lbs (11.3 kg).
4) Dielectric Constant: 2.24 at 1 MHZ.
a) Dry Dielectric: 850 V MIL (33.46 kV mm).
b) Wet Dielectric: 800 V MIL (31.50 kV mm).
5) Duct Cutting: Bell Core-Telecordia GR-356-Core-5.3.2.CR5-1.
6) Elongation: 20 percent, Bell Core-Telecordia GR-356-Core-5.3.4.1 or ASTM D426.
7) Maximum Voltage: 300 V.
8) Muleknot Strength: 1,400 lbs (635.03 kg).
9) Print Durability: Bell Core-Telecordia GR-356-Core-5.3.5.CR5-1.
10) Pull Strength: 1,800 lbs (816.5 kg).
11) Resistivity: 16.85 ohms per Mft (55.28 ohms km).
12) Tensile Strength: 50,000 psi (344.7 MPa), Bell Core-Telecordia GR-356-Core-5.3.3.

c. Design Requirements:
1) Diameter: .0253 inch (0.64 mm).
2) Minimum Reel Length: 3,000 ft (914.4 m).
3) Maximum Reel Length: 5,000 ft (1,524 m).
4) Thickness: .008 inch (0.20 mm).
5) Type: Extrusion friendly copolymer - orange color.
6) Width: 5/8 inch (15.88 mm).

J. Basis of Design: Muletape DT2500P, as manufactured and supplied by Neptco.
1. Flat, woven, polyester tape with insulated metallic conductor enables detection of all-dielectric cables and empty conduit with 22 gauge copper wires for underground detection and location of conduit for future cable pulling. Printed with sequential

footage or meter markings.

2. Performance and Design Requirements:
    a. Standards Compliance:
        1) ASTM D426.
        2) Bell Core-Telecordia GR-356-Core-5.3.3.
        3) Bell Core-Telecordia GR-356-Core-5.3.4.1.
        4) Bell Core-Telecordia GR-356-Core-5.3.5.CR5-1.
        5) Bell Core-Telecordia GR-356-Core-5.3.2.CR5-1.
    b. Performance Requirements:
        1) AWG: 22 tin coated copper.
        2) Bowline Strength: 1,300 lbs (589.67 kg).
        3) Break Strength: 25 lbs (11.3 kg).
        4) Dielectric Constant: 2.24 at 1 MHZ.
            a) Dry Dielectric: 850 V MIL (33.46 kV mm).
            b) Wet Dielectric: 800 V MIL (31.50 kV mm).
        5) Duct Cutting: Bell Core-Telecordia GR-356-Core-5.3.2.CR5-1.
        6) Elongation: 20 percent, Bell Core-Telecordia GR-356-Core-5.3.4.1 or ASTM D426.
        7) Maximum Voltage: 300 V.
        8) Muleknot Strength: 1,800 lbs (816.5 kg).
        9) Print Durability: Bell Core-Telecordia GR-356-Core-5.3.5.CR5-1.
        10) Pull Strength: 2500 lbs (1,134.0 kg).
        11) Resistivity: 16.85 ohms per Mft (55.28 ohms km).
        12) Tensile Strength: 50,000 psi (344.7 MPa), Bell Core-Telecordia GR-356-Core-5.3.3.
    c. Design Requirements:
        1) Diameter: .0253 inch (0.63 mm).
        2) Minimum Reel Length: 3,000 ft (914.4 m).
        3) Maximum Reel Length: 5,000 ft (1,524 m).
        4) Thickness: .008 inch (0.20 mm).
        5) Type: Extrusion friendly copolymer - orange color.
        6) Width: 3/4 inch (19.05 mm).

2.4 MOISTURE-RESISTANT TRACER WIRE

A. Basis of Design: Trace-Safe TST600 Series Detectable Wire, as manufactured and supplied by Neptco.
    1. Water blocking reinforced tracer wire used for direct burial locating purposes in telecommunications, gas, sewer or water utilities. Double insulated tin-coated solid copper conductor enables location of plastic gas lines, sewer lines, water pipes and non-metallic dielectric fiber optic cables. Printed with sequential footage or meter markings.
        a. Performance Requirements:
            1) Conductor, General: Corrosion-resistant, wide-band frequency rated, and fully interoperable with signal processing equipment.
            2) Electrical Performance:
                a) Dielectric Constant: 2.29 at 1 MHZ.
                b) Maximum Voltage Rating, Insulated: 600 V.
                c) Resistivity: 8.015 ohms Mft (25.3 ohms km).
            3) Mechanical Performance:
                a) Elongation: Low.
                b) Tensile Strength: 610 lbs (276.7 kg).
                c) Crush Strength: 222 lbs (100 kg).
        b. Design Requirements:
            1) Conductor Diameter: .0356 inch (.90 mm).
            2) Core Material Type: Woven polyester and water blocking polyester

yarns.
3) Diameter: .145 inch (3.683 mm).
4) Insulation Type: High density polyethylene, Color: Black.
5) Insulation Thickness: .006 inch (.154 mm).
6) Outer Jacket Type: High density polyethylene.
7) Outer Jacket Thickness: .025 inch (.635 mm).
8) Minimum Reel Length: 1,000 ft (304.8 m).
9) Maximum Reel Length: 5,000 ft (1,524 m).

B. Basis of Design: Trace-Safe Direct Burial RT 1800W Series, as manufactured and supplied by Neptco.
1. Fungus resistant, water blocking reinforced tracer wire used for direct burial locating purposes in telecommunications utilities. Insulated metallic conductor enables location of all-dielectric cables, sewer lines, water pipes and gas lines. Printed with sequential footage or meter markings. Include identification tag. Color Code: Orange.
2. Performance and Design Requirements:
a. Standards Compliance:
1) CE.
2) UL 1581.
b. Performance Requirements:
1) Conductor, General: Corrosion-resistant, wide-band frequency rated, and fully interoperable with signal processing equipment.
2) Electrical Performance:
a) Dielectric Constant: 2.29 at 1 MHZ.
b) Maximum Voltage Rating: UL1581, 600V.
1) Resistivity: 16.85 ohms per Mft (55.28 ohms km).
2) Mechanical Performance:
c) Break Strength (Conductor): 38.95 lbs (17.67 kg).
d) Elongation: 30 percent.
e) Tensile Strength (Conductor): 8,500 psi (58.6 MPa).
3) Strength: 1,800 lbs (816.5 kg).
c. Design Requirements:
1) Conductor Diameter: .0358 inch (0.91 mm).
2) Core Material Type: Woven polyester and water blocking polyester yarns.
3) Diameter: .0235 inch (0.60 mm).
4) Insulation Type: Polyethylene, Color: Black.
5) Insulation Thickness: .006 inch(0.15 mm).
6) Overall Thickness, Insulated Conductor: .048 inch (1.22 mm).
7) Outer Jacket Type: High density polyethylene.
8) Minimum Reel Length: 500 ft (152.4 m).
9) Maximum Reel Length: 2,500 ft (762 m).

2.5 POLE ISOLATION SWITCH

A. Basis of Design: Trace-Safe TS Pole Isolation, as manufactured and supplied by Neptco.
1. Isolating ground switch test station for utility marker posts, pedestals, cabinets, handholes, vaults, and enclosures.
2. Performance and Design Requirements:
a. Standards Compliance:
1) Bell Core-Telcordia TR-NWT-001075.
2) UL 467-2013.
b. Performance Requirements:
1) Conductor: Direct, isolated connection point for locating transmitter clip and seamless connection to cable without removal of permanent grounding harnesses. Lever-activated re-connection completes the

ground when locating is finished.

c. Design Requirements:
   1) Material Types: Components made from tin-plated brass and engineering-grade thermoplastic.
   2) Wire Acceptance: Conductor Size Range: Accepts No. 6-No. 24 AWG wires.
   3) Models and Color Coding:
      a) TS19-IS-2: Standard with one blue, one red and one green color-coded nut.
      b) TS19-IS-5: Standard with one blue, one orange, one brown, one slate, one green, and one red color coded nut.

2.6 INSTALLATION ACCESSORIES

A. Basis of Design: Trace-Safe TST-BC Base Connector, as manufactured and supplied by Neptco.
   1. Gel filled, impact-resistant polycarbonate connectors designed for splicing Trace-Safe wire, for end-to-end or main line to lateral connections. Assembly enables accurate location of all-dielectric cables, gas lines, sewer lines, and water pipes.
   2. Performance and Design Requirements:
      a. Standards Compliance:
         1) ASTM B117.
         2) UL 467.
         3) UL 486-A-486-B.
         4) UL 1581.
      b. Performance Requirements:
         1) Electrical Performance:
            a) Resistivity: 16.85 ohms per Mft (55.28 ohms km).
            b) Maximum Voltage Rating, Insulated: 300 V.
            c) Dielectric Constant: 2.29 at 1 MHZ.
         2) Mechanical Performance:
            a) Conductor Tensile Strength: 38,500 psi (264.4 MPa).
            b) Conductor Break Strength: 38.95 lbs (17.67 kg).
            c) Elongation: 30 percent.
         3) Connector and Housing:
            a) Pull-out Resistance, Electrical Continuity: Average 70 lbs (31.8 kg) to lose electrical continuity.
            b) Crush Resistance: UL 1581, Maintains continuity after a crush test of 3,500 lbs (1,587.6 kg).
            c) Corrosion Resistance: ASTM B117, salt spray fog test standard.
      c. Design Requirements:
         1) Material Housing: Clear, UV resistant polycarbonate.
            a) Overall Dimensions: 23/32 x 23/32 x 1-7/16 inch (18.26 x 18.26 x 36.51 mm).
            b) Encapsulant: Non-Hardening Gel:
               1) Temperature range -85 degreesF to 350 degreesF (-65 degreesC to 177 degreesC).
            c) Assembly Method: No special tools required; No need to strip the wire.
            d) Visual Inspection: Clear polycarbonate housing.
            e) Identification: Color coded lanyard; Identifies use of each connector.
         2) Conductor:
            a) Material Type: Tin coated solid copper.
            b) Size: AWG 19.
            c) Diameter: .0358 inch (0.91 mm).

3) Conductor Insulation:
a) Overall Conductor Insulation Thickness: .048 inch (1.22 mm).
b) Material Type: Polyethylene.
1) Thickness: .006 inch (0.15 mm).
2) Color: Black.
c) Core Material: Composition: Woven polyester and water blocking polyester yarns.
d) Outer Jacket: Material Type: High density polyethylene.
4) Electrical Characteristics:
a) Conductor Compatibility: Conductor Size: 10 - 19 AWG.
b) Wire Type: Connectors for Trace-Safe.
c) Wire Type: Conventional tracer wires.
d. Quantity Per Package: 10 items.
e. Shipping Weight: 4 lbs (1.81 kg).

B. Basis of Design: Trace-Safe TS-UBC Universal Connector, as manufactured and supplied by Neptco.
1. Silicone-based, gel-filled, impact-resistant polycarbonate connectors designed for splicing Trace-Safe wire for end-to-end or mainline-to-lateral connections. Works with TST and RT Trace-Safe.
2. Performance and Design Requirements:
a. Standards Compliance:
1) ASTM B117.
2) UL 486-A-486-B, Tests A, B, C, D, G.
3) UL 1581.
b. Performance Requirements:
1) Electrical Performance:
a) Resistivity: 16.85 ohms per Mft (55.28 ohms km).
b) Maximum Voltage Rating, Insulated: 300 V.
c) Dielectric Constant: 2.29 at 1 MHZ.
2) Mechanical Performance:
a) Conductor Tensile Strength: 38,500 psi (265.5 MPa).
b) Conductor Break Strength: 38.95 lbs (17.67 kg).
c) Elongation: 30 percent.
3) Connector and Housing:
a) Pull-out Resistance, Electrical Continuity: Average 60 lbs (27.2 kg) to lose electrical continuity.
b) Pull-out Resistance, Mechanical, Strain Relief: RT180 x 400 lbs (181.4 kg) plus and TST60 x plus with overhand loop for strain relief. 200 lbs (90.7 kg)
c) Crush Resistance: UL 1581, Maintains continuity after a crush test of 3,500 lbs.
d) Corrosion Resistance: ASTM B117, salt spray fog test standard.
c. Design Requirements:
1) Material Housing: Clear, UV resistant polycarbonate.
a) Overall Dimensions: 0.834 x 0.736 x 2.73 inch (21.18 x 18.69 x 69.34 mm).
b) Encapsulant: Non-Hardening Gel:
1) Temperature range -40 deg F to 400 deg F (-40 deg C to 204 deg C).
c) Assembly Method: Snap closed with locking pliers. No need to strip the wire.
d) Visual Inspection, Positive Lock: Clear polycarbonate housing, Hook and window provide visual and audible indicator that connector is closed.
e) Identification: Color coded lanyard; Identifies use of each

connector.

2) Conductor:
   a) Material Type: Tin coated solid copper.
   b) Size: AWG 19.
   c) Diameter: .0358 inch (0.91 mm).
3) Conductor Insulation:
   a) Overall Conductor Insulation Thickness: .048 inch (1.22 mm).
   b) Material Type: Polyethylene.
      1) Thickness: .006 inch (0.15 mm).
      2) Color: Black.
      3) Core Material: Composition: Woven polyester and water blocking polyester yarns.
   c) Outer Jacket: Material Type: High density polyethylene.
4) Electrical Characteristics:
   a) Conductor Compatibility: Conductor Size: 6-12 AWG.
   b) Wire Type: Conventional tracer wires.
   c) Multiple Applications: Includes accessories to allow working with smaller AWG wire and plugs to prevent water ingress through unused ports.

PART 3 EXECUTION

3.1 EXAMINATION

A. Condition Verification: Do not begin the installation of tracer wire, pull tape, or the pole isolation switch until the following conditions have been verified and accepted:
   1. Conduit/Innerduct Integrity: Conduits or innerducts designated for installation of pull tape or tracer wire must be verified as clear, properly sealed, and free of defects, foreign objects, or obstructions.
   2. Access Point Readiness: Utility access points where the isolation switch and connectors will be installed must be constructed, properly secured, and ready to receive the electrical components.

B. If readiness of conduit system or utility access points is the responsibility of another Contractor, notify the Architect and Engineer in writing of any unsatisfactory conditions before proceeding with the installation of the specified materials. Do not proceed until such conditions have been corrected.

3.2 PREPARATION

A. Tracer Wire and Pull Tape Installation Preparation:
   1. Thoroughly clean all interior conduit and innerduct surfaces prior to installation of pull tape or tracer wire. Including swabbing or blowing out any dirt, debris, standing water, or foreign matter that could impede cable installation or compromise the integrity of the wire's jacket.
   2. For installation of pull tape and subsequent cable pulls, apply pulling lubricant to the conduit interior and the pull tape as required by the cable manufacturer's written recommendations and the pull tape's built-in lubrication features, ensuring minimum friction during pull.

B. Isolation Switch and Connector Installation Preparation:
   1. Clean interior surfaces of pedestal, handhole, or pole where the pole isolation switch will be mounted. Remove any loose dust, moisture, grease, or corrosion to ensure secure mechanical and electrical bonding.
   2. Prepare ends of tracer wire and any bonding conductors using only the methods recommended by the connector manufacturer for specific conductor size and jacket type. Typically involves no stripping of the tracer wire jacket for IDC type connectors.

3. Prior to splicing, ensure the wire ends and connector cavities are dry and free of excessive moisture before seating the connections and activating the gel-fill.

3.3 INSTALLATION

A. Install all components in strict accordance with the manufacturer's current published instructions, the approved submittals, and the project's coordination drawings.

B. Pull Tape Installation:
   1. Install pull tape by jetting or blowing it through the conduit or innerduct runs, ensuring the tape does not twist, kink, or abrade during placement.
   2. Verify sequential footage or metric markings on the tape accurately correspond to the measured length of the installed conduit run.
   3. Securely anchor ends of pull tape at both the pulling and feeding access points to prevent inadvertent retraction.

C. Tracer Wire Installation:
   1. Install tracer wire concurrently with or immediately adjacent to the utility cable or pipe it is intended to locate, ensuring continuous tracing capability from starting point to end of the run.
   2. Use only the specified gel-filled, impact-resistant connectors for any necessary end-to-end splices or connections to the mainline-lateral. Ensure conductor is fully seated and seal is properly activated per manufacturer instructions to maintain corrosion resistance and continuity.
   3. Test the continuity and locating signal strength of installed tracer wire system prior to backfilling or sealing the conduit to ensure full operability.

D. Pole Isolation Switch Installation:
   1. Securely mount isolation switch plate in designated utility access enclosure as detailed on the approved coordination drawings, ensuring proper access for the locating technician.
   2. Connect the tracer wire and any required bonding or grounding conductors to the color-coded terminals of the isolation switch. Use only the specified AWG range and ensure connections are tight.
   3. Verify switch's functionality by confirming that lever mechanism successfully provides an isolated connection and a grounded connection to the tracer system.

3.4 FIELD QUALITY CONTROL

A. Verify internal integrity of all conduits and innerducts prior to any pull or jetting operation, ensuring the path is clear and ready for the pull tape or wire installation pe examination requirements.

B. Installer must test installed tracer wire segments using a continuity meter or Time-Domain Reflectometer to confirm zero opens and to identify splices or faults. Testing must occur immediately following installation and splicing., and prior to backfilling or sealing access points.

C. Visually inspect all installed gel-filled connectors to confirm the wire is fully seated, the connector is properly crimped closed, and the gel is fully sealing the connection point.

D. Test pole isolation switch after final connection to ensure it provides direct, isolated connection to the tracer wire system when the lever is in the locating position, and proper grounding-bonding when the lever is in the default position.

E. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.

1. Provide the Engineer and Inspector safe access to all work areas, including open trenches and utility access points.
2. Installer must demonstrate to the Engineer and Inspector the functional testing of the completed tracer wire system using standard locating equipment, confirming the system provides a clear, traceable signal along its entire length from the pole isolation switch test point.
3. Correct any defects identified during testing or inspection, including faults, open circuits, or improper connections, immediately and retest the affected portion of the system until compliance is achieved.

F. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.

3.5 CLEANING AND PROTECTION

A. Ensure all tracer wire ends, bonding conductors, and terminal points on switch are free of dirt, oil, and moisture immediately prior to making the final electrical and mechanical connections.

B. Handle all tracer wire carefully during installation to prevent abrasion, kinking, or cutting of the external jacket. Avoid exceeding the manufacturer's maximum recommended pulling tension using the appropriate series of pull tape.

C. Protect exposed pole isolation switch, its terminal connections, and exposed tracer wire from physical damage, weather, and unauthorized access until the permanent utility enclosure is secured and locked.

D. Immediately repair or replace any damaged pull tape, tracer wire, connectors, or isolation switches before proceeding with the next phase of work. Any tracer wire or connector component found to be damaged must be fully removed and replaced with new material for the entire affected segment.

E. Coordinate with other trades to ensure the tracer system is not damaged during backfilling or subsequent site work. Clearly mark the location of the installed system as required by Division 01.

END OF SECTION