



# PRODUCT SPECIFICATION

**PRODUCT:**

Copperhead® SoloShot Extra-High Strength Tracer Wire

**TRACER WIRE - COPPERHEAD COPPER CLAD STEEL**

CODE	PRODUCT DESCRIPTION	BREAK STRENGTH	SIZE	UNIT MEASURE	UNIT WEIGHT
WT1509	Tracer wire SoloShot 2mm x 760m Yellow	522 kg	2mm x 760m	reel	27 kg
WT1509B	Tracer wire SoloShot 2mm x 760m Blue	522 kg	2mm x 760m	reel	27 kg
WT1507C	Tracer wire SoloShot 2mm x 760m Cream	522 kg	2mm x 760m	reel	27kg

## PRODUCT DESCRIPTION

Tracer wire for directional drilling/boring shall be Copperhead® SoloShot™ #12 AWG (0.0808" diameter) hard drawn, **high carbon 1055 grade steel**, solid extra-high-strength copper-clad steel conductor (EHS-CCS) rated at 30 volts, insulated with a 45 mil, high-density, high molecular weight polyethylene (HDPE) insulation rated for direct burial use at 600 volts. **EHS-CCS conductor must be at 21% conductivity for locate purposes. Break Strength of 522 kg.** HDPE insulation shall be RoHS compliant and utilize virgin grade material. Insulation color shall meet the APWA color code standard for identification of buried utilities. Manufacturers supplying copper-clad steel tracer wire must have available detailed performance data including 5 years of underground testing in terms of durability related to damage of protective insulation and effects of potential corrosion of the specific copper-clad steel used. Origin of copper-clad steel manufacturer is required and steel core must be manufactured in the United States. **If manufacturer has not completed 5-year corrosion testing, a 5-year warranty must be provided.** Tracer wire shall be **Copperhead® SoloShot™** EHS-CCS HDPE 45 mil and made in the USA.

## CONDUCTOR

This specification describes the properties of the conductor to be used in the fabrication of Extra-High Strength tracer wire.

1. **Material Description:** Copperhead® copper-clad steel wire as manufactured by Copperweld® is composed of a steel core with a uniform and continuous copper cladding thoroughly bonded to the steel throughout. Wire must conform to ASTM B1010 and ASTM B227.
  - a. **Cladding:** The steel and copper interface must have a metallurgical bond achieved through a high heat and pressure bonding process. Established process for porosity-free material.
  - b. **Steel:** High strength with 0.54 carbon or greater. Verified to meet required mechanical properties.
  - c. **Copper:** UNS-C10200; OF Copper according to ASTM B-170 (latest revision). High conductivity, oxygen free copper to achieve optimal signal performance.

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- Surface Condition:** Wire surface shall be free of any defects, including flakes, grooves, pits, and voids. Wire surface shall be smooth, bright and shiny, and free of excessive copper dust and residual drawing lubricants.
- Physical, Mechanical, and Electrical Properties:** The wire shall conform to the properties listed in Table 1.

**TABLE 1: Physical, Mechanical, and Electrical Properties**

#12 CCS High Carbon 1055 Grade Steel 21% Conductivity	CCS Conductor
<b>Conductor Size</b>	12 AWG
<b>Conductor Type</b>	Copper Clad Steel (CCS)
<b>Temper</b>	Hard Drawn (HD)
<b>Average Break Strength</b>	522 kg
<b>Minimum Tensile Strength</b>	230,000 psi
<b>Minimum Elongation</b>	1%
<b>Nominal Copper Thickness (% of Diameter)</b>	3%
<b>Nominal Copper Weight</b>	13%
<b>Nominal DC Resistance (ohms/1000 ft.)</b>	7.5648
* Diameter tolerances: ± 1%	

## INSULATION

This specification describes the properties of the material to be used in the insulating of Extra-High Strength tracer wire.

- Material Description:** Insulation is comprised of a co-polymer high molecular weight natural high density polyethylene (HDPE) designed specifically for high-speed copper wire insulating. It contains the required levels and types of primary antioxidant and metal deactivator additives to satisfy most Wire and Cable industry requirements. HDPE material will be produced with an excellent balance of surface smoothness, processing ease, tensile and elongation properties, abrasion toughness, environmental stress crack, thermal stress crack resistance, and electrical consistency. Insulation must conform to ASTM D1248.

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2. Physical, Mechanical, and Electrical Properties: the wire shall conform to the properties listed in Table 2.

**TABLE 2: Physical, Mechanical, and Electrical Properties**

High Density Polyethylene Insulator	Value
Density (ASTM D 792)	0.943 g/cc
Bulk Density (ASTM D 1895)	0.58 g/cc
Melt Index (ASTM D 1238/E)	0.70 dg/min
Tensile-Yield (ASTM D 638)	4300 psi
Tensile-Ultimate (ASTM D 638)	2900 psi
Tensile-Elongation (ASTM D 638)	850%
Flexural Modulus (ASTM D 790/1)	120,000 psi
Hardness (ASTM D 2240)	63 Shore D
Environmental Stress-Crack (ASTM D 1693/B)	F <sub>20</sub> > 48 h
Thermal Stress-Crack (ASTM D2951)	F <sub>0</sub> > 1000 h
Brittleness Temperature (ASTM D 746)	< -95° F
Melting Point (DSC) (ASTM D 3417)	262° F
Softening Point (Vicat) (ASTM D 1525)	250° F
Oxidative Induction Time (ASTM D 3895)	>50 min. @ 200° C
Dielectric Constant (ASTM D 1531)	2.34 @ 1MHz
Dissipation Factor (ASTM D 1531)	0.00007 @ 1 MHz
Volume Resistivity (ASTM D 257)	5 x 10 <sup>17</sup> ohm-cm
Dielectric Strength (ASTM D 3755)	1000 volts @ 20 mils

## QUALITY ASSURANCE

- Copperhead<sup>®</sup> products are manufactured under a quality control system that ensures products are free of defects and meet performance requirements.

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