

HDD-CCS PE45

(DIRECTIONAL DRILLING)

Tracer Wire • Horizontal Directional Drilling Copper Clad Steel (HDD-CCS) • 21% IACS Conductivity • Corrosion Resistant High-Density, High Molecular Weight Polyethylene (HMWPE-HDPE) Insulation • Moisture, Chemical, and Oil Resistant Impact, Crush, and Abrasion Resistant • RoHS Compliant • Direct Burial Rated • 30 Volts • Made in the USA

“PRO-TRACE® HDD-CCS -- DIRECTIONAL BORING DONE RIGHT THE FIRST TIME -- EVERY TIME!”



Applications and Information

- **PRO-TRACE® HDD-CCS PE45** conductor is equal to copper in signal tracing performance for tracer wire applications not exceeding 30 Volts. Tracer wire is used to conductively locate buried utility lines for the gas, water, sewer, telecommunication, and electrical markets.
- **PRO-TRACE® HDD-CCS PE45** has almost **600%** the break load of copper, which allows 1 wire to be installed in directional boring, plow-in, or open trench applications.
- Has 3-5% elongation, providing the perfect balance between tensile strength, ductility, and decreasing brittleness.
- Considerably lower in cost and great price stability compared to copper.
- RoHS Compliant, made in the USA, and works with connectors you already use.

Standards and References

PRO-TRACE® HDD-CCS PE45 conductors meets or exceeds all applicable ASTM specifications, and requirements of the National Electrical Code.

- ASTM B869: Specification for 21% Conductivity, Hard Drawn, Copper-Clad Steel Wire
- ASTM B170: Specification for Oxygen-Free Electrolytic Copper
- ASTM D1248: Standard Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable

Construction

PRO-TRACE® HDD-CCS PE45 is a extra high-strength, copper clad steel tracer wire. A high carbon steel core, metallurgically bonded with a copper cladding, that is uniform and continuous, creating a bi-metal conductor that acts as one and is corrosion resistant. The high break load of allows only 1 conductor to be used in any tracer wire application while providing the perfect balance between break load, ductility, and decreasing brittleness. It is the best performing tracer wire on the market.

PRO-TRACE® HDD-CCS PE45 is protected with a 45 mil, high-density, high molecular weight polyethylene (HDPE) insulation. HDPE provides an excellent balance of surface smoothness, processing ease and electrical consistency. HDPE insulation provides superior strength against underground elements that help prevent accidental breaks caused by rocks in shifting soil conditions.

Specification Example

Tracer wire for directional boring installation shall be a 12 AWG solid, PRO-TRACE® HDD-CCS PE45. Conductor shall be hard-drawn, 21% IACS, copper clad steel, utilizing a AISI 1065 high carbon steel core (required to meet break load), with rated break load of 1,330 lbs (260,000 psi). Conductor shall be extruded with a 45 mil, high-density, high molecular weight polyethylene (HMW-HDPE) pursuant to ASTM D1248 standard. Tracer wire shall be PRO-TRACE® HDD-CCS PE45 as manufactured by **Pro-Line Safety Products** and made in the USA.

Specification Updated: 6.6.2012 17:18:00 CST

PRO-TRACE® is a registered trademark of Pro-Line Safety Products Co.

TABLE 1: CONDUCTOR (Physical, Mechanical and Electrical Properties)

PROPERTY	12 AWG	10 AWG	8 AWG
Conductor Type	HDD-CCS	HDD-CCS	HDD-CCS
Conductor Temper	Hard-Drawn	Hard-Drawn	Hard-Drawn
Steel Grade	AISI 1065	AISI 1065	AISI 1065
Copper Grade	UNS C10200	UNS C10200	UNS C10200
Rated Break Load	1,330 lbs	1,940 lbs	2,785 lbs
Rated Tensile Strength	260,000 psi	238,000 psi	215,000 psi
Minimum Elongation	1.0%	1.0%	1.0%
Copper Thickness (% of Diameter)	3.0%	3.0%	3.0%
Minimum Copper Weight (Per 1,000')	13.0%	13.0%	13.0%
Nominal DC Resistance	7.562 ohms	4.756 ohms	2.991 ohms

TABLE 2: INSULATION (Physical, Mechanical and Electrical Properties)

TEST DESCRIPTION	ASTM STANDARD	TYPICAL VALUES
Density @ 23°C	ASTM D792	0.945 g/cm ³
Melt Flow Rate	ASTM D1238	0.70 g/10 min
Tensile Strength	ASTM D638	3,400 psi
Tensile Strength Retention	ASTM D638	90% after 48 hours @ 100°C
Tensile Elongation	ASTM D638	500%
Tensile Elongation Retention	ASTM D638	90% after 48 hours @ 100°C
Environmental Stress Cracking	ASTM D1693	0 failures @ 48 hours
Thermal Stress Cracking	ASTM D2951	0 failures @ 96 hours
Brittleness Temperature	ASTM D746	-76° C
Melting Temperature	ASTM D3418	260°C
Oxidative Induction Time	ASTM D3895	170 min @ 200°C
Dielectric Constant	ASTM D1531	2.32 @ 1 MHz
Dissipation Factor	ASTM D1531	0.00006 @ 1 MHz
DC Volume Resistivity Test @ 23°C	ASTM D257	> 1 x 10 ¹⁵ ohm-cm

PRODUCT PART NO.	PRODUCT DESCRIPTION	RATED BREAK LOAD	RATED TENSILE STRENGTH	HDPE INSULATION THICKNESS	NOMINAL O.D.	APPROX. WEIGHT PER 1,000 FT		STANDARD PACKAGES
						COPPER WEIGHT	FINISHED WEIGHT	
WEIGHTS, MEASUREMENTS AND PACKAGING								
74642XXXX	12 SOL HDD-CCS PE45	1,330 lbs	260,000 psi	0.045"	0.171"	2.3007	27.00	500' / 1000' / 2500'
74643XXXX	10 SOL HDD-CCS PE45	1,940 lbs	238,000 psi	0.045"	0.192"	3.6592	40.00	500' / 1000' / 2500'
74644XXXX	8 SOL HDD-CCS PE45	2,785 lbs	215,000 psi	0.045"	0.219"	5.8189	58.00	500' / 1000' / 2500'

INSULATION COLOR & REEL SIZE			
COLOR	500' REEL	1000' REEL	2500' REEL
BLACK	0132	0141	0147
BLUE	0232	0241	0247
GREEN	0532	0541	0547
ORANGE	0632	0641	0647
PURPLE	0832	0841	0847
RED	0932	0941	0947
WHITE	1132	1141	1147
YELLOW	1232	1241	1247

SOME COLORS AND SIZES MAY BE SUBJECT TO MINS

REEL & PACKAGING INFORMATION					
SIZE	LENGTH	MATERIAL	REEL DIMENSION	ARBOR HOLE	PALLET QUANTITY
12 AWG	500	PLYWOOD (TREATED)	8" x 6"	1.625"	108,000 FT
	1000	PLYWOOD (TREATED)	12" x 6"	1.625"	112,000 FT
	2500	PLYWOOD (TREATED)	12" x 12"	1.625"	120,000 FT
10 AWG	500	PLYWOOD (TREATED)	8" x 9"	1.625"	72,000 FT
	1000	PLYWOOD (TREATED)	12" x 6"	1.625"	64,000 FT
	2500	PLYWOOD (TREATED)	16" x 10"	2.5"	67,500 FT
8 AWG	500	PLYWOOD (TREATED)	12" x 6"	1.625"	48,000 FT
	1000	PLYWOOD (TREATED)	12" x 9"	1.625"	48,000 FT
	2500	PLYWOOD (TREATED)	16" x 12"	2.5"	45,000 FT



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PRO-LINE SAFETY PRODUCTS COMPANY
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 TOLL FREE: 800.554.3424



HF-CCS PE30

(HIGH-FLEX / OPEN-TRENCH)

Tracer Wire • High-Flex Copper Clad Steel (HF-CCS) • 21% IACS Conductivity • Corrosion Resistant High-Density, High Molecular Weight Polyethylene (HMWPE-HDPE) Insulation • Moisture, Chemical, and Oil Resistant Impact, Crush, and Abrasion Resistant • RoHS Compliant • Direct Burial Rated • 30 Volts • Made in the USA

“PRO-TRACE® HF-CCS -- FLEXIBILITY & STRENGTH -- IT’S THE FUTURE OF TRACER WIRE”



Applications and Information

- **PRO-TRACE® HF-CCS PE30** is used for tracer wire applications not exceeding 30 Volts. Tracer wire is used to conductively locate buried utility lines for the gas, water, sewer, telecommunication, and electrical markets.
- **PRO-TRACE® HF-CCS PE30** is designed to embody the flexibility, memory, and feel of copper. It also has a 43% higher break-load, minimizing damage during installation and while in service. Equal to copper in signal tracing performance. It simply outperforms copper tracer wire. Designed for open-trench and plow-in installations using 1 wire.
- Considerably lower in cost and great price stability compared to copper.
- RoHS Compliant, made in the USA, and works with connectors you already use.

Standards and References

PRO-TRACE® HF-CCS PE30 conductors meets or exceeds all applicable ASTM specifications, and requirements of the National Electrical Code.

- ASTM B910 / B190M: Standard Specification for Annealed Copper-Clad Steel Wire
- ASTM B170: Standard Specification for Oxygen-Free Electrolytic Copper
- ASTM D1248: Standard Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable

Construction

PRO-TRACE® HF-CCS PE30 is a flexible, copper-clad steel tracer wire. A low carbon steel core, metallurgically bonded with a copper cladding, that is uniform and continuous, creating a bi-metal conductor that acts as one and is corrosion resistant. Special annealing processes are performed during the cladding process giving HF-CCS the flexibility and feel of copper, but 43% higher in strength which means less breaks than copper tracer wire.

PRO-TRACE® HF-CCS PE30 uses a 30 mil, high-density, high molecular weight polyethylene (HDPE) insulation. HDPE provides an excellent balance of surface smoothness, processing ease and electrical consistency. HDPE provides superior strength against underground elements that help prevent accidental breaks caused by rocks in shifting soil conditions.

Specification Example

Tracer wire for open-trench installation shall be a 12 AWG solid, PRO-TRACE® HF-CCS PE30. Conductor shall be soft-drawn, 21% IACS, copper clad steel, utilizing a AISI 1006 low carbon steel core (required to meet break load and flexibility), with breakload of 282 lbs (55,000 psi). Conductor shall be extruded with a 30 mil, high density, high molecular weight polyethylene (HMW-HDPE) pursuant to ASTM D1248 standard. Tracer wire shall be rated for direct burial use at 30 volts and RoHS compliant. Tracer wire shall be PRO-TRACE® HF-CCS PE30 as manufactured by **Pro-Line Safety Products** and made in the USA.

Specification Updated: 4.15.2011 08:32:00 CST

PRO-TRACE® is a registered trademark of Pro-Line Safety Products Co.

TABLE 1: CONDUCTOR (Physical, Mechanical and Electrical Properties)

PROPERTY	14 AWG	12 AWG	10 AWG	8 AWG
Conductor Type	HF-CCS	HF-CCS	HF-CCS	HF-CCS
Conductor Temper	Annealed	Annealed	Annealed	Annealed
Steel Grade	AISI 1006	AISI 1006	AISI 1006	AISI 1006
Copper Grade	UNS C10200	UNS C10200	UNS C10200	UNS C10200
Rated Break Load	177 lbs	282 lbs	448 lbs	713 lbs
Rated Tensile Strength	55,000 psi	55,000 psi	55,000 psi	55,000 psi
Elongation	20.0%	21.0%	21.0%	22.0%
Nominal Copper Thickness (% of Diameter)	3.0%	3.0%	3.0%	3.0%
Nominal Copper Weight (Per 1,000')	13.0%	13.0%	13.0%	13.0%
Nominal DC Resistance	12.024 ohms	7.562 ohms	4.756 ohms	2.991 ohms

TABLE 2: INSULATION (Physical, Mechanical and Electrical Properties)

TEST DESCRIPTION	ASTM STANDARD	TYPICAL VALUES
Density @ 23°C	ASTM D1505	0.945 g/cm ³
Melt Flow Rate	ASTM D1238	0.70 g/10 min
Tensile Strength	ASTM D638	3,400 psi
Tensile Strength Retention	ASTM D638	90% after 48 hours @ 100°C
Tensile Elongation	ASTM D638	500%
Tensile Elongation Retention	ASTM D638	90% after 48 hours @ 100°C
Environmental Stress Cracking	ASTM D1693	0 failures @ 48 hours
Thermal Stress Cracking	ASTM D2951	0 failures @ 96 hours
Brittleness Temperature	ASTM D746	-76°C
Melting Temperature	ASTM D3418	260°C
Oxidative Induction Time	ASTM D3895	170 min @ 200°C
Dielectric Constant	ASTM D1531	2.32 @ 1 MHz
Dissipation Factor	ASTM D1531	0.00006 @ 1 MHz
DC Volume Resistivity @ 23°C	ASTM D257	> 1 x 10 ¹⁵ ohm-cm

PRODUCT PART NO.	PRODUCT DESCRIPTION	RATED BREAK LOAD	RATED TENSILE STRENGTH	HDPE INSULATION THICKNESS	NOMINAL O.D.	APPROX. WEIGHT PER 1,000 FT		STANDARD PACKAGES
						COPPER WEIGHT	FINISHED WEIGHT	
WEIGHTS, MEASUREMENTS AND PACKAGING								
74411XXXX	14 SOL HF-CCS PE30	177 lbs	55,000 psi	0.030"	0.124"	1.4479	16.00	500' / 2500'
74412XXXX	12 SOL HF-CCS PE30	282 lbs	55,000 psi	0.030"	0.141"	2.3007	24.00	500' / 1000' / 2500'
74413XXXX	10 SOL HF-CCS PE30	448 lbs	55,000 psi	0.030"	0.162"	3.6592	36.00	500' / 1000' / 2500'
74414XXXX	8 SOL HF-CCS PE30	713 lbs	55,000 psi	0.030"	0.189"	5.8189	54.00	CUSTOM ORDER

INSULATION COLOR & REEL LENGTH			
COLOR	500' REEL	1000' REEL	2500' REEL
BLACK	0132	0141	0147
BLUE	0232	0241	0247
GREEN	0532	0541	0547
ORANGE	0632	0641	0647
PURPLE	0832	0841	0847
RED	0932	0941	0947
WHITE	1132	1141	1147
YELLOW	1232	1241	1247

SOME PART NUMBERS MAY BE SUBJECT TO MINS

REEL & PACKAGING INFORMATION					
SIZE	LENGTH	MATERIAL	REEL DIMENSION	ARBOR HOLE	PALLET QUANTITY
14 AWG	500	PLYWOOD (TREATED)	8" x 4"	1.625"	162,000 FT
	1000	PLYWOOD (TREATED)	8" x 9"	1.625"	180,000 FT
	2500	PLYWOOD (TREATED)	12" x 6"	1.625"	180,000 FT
12 AWG	500	PLYWOOD (TREATED)	8" x 6"	1.625"	126,000 FT
	1000	PLYWOOD (TREATED)	8" x 9"	1.625"	108,000 FT
	2500	PLYWOOD (TREATED)	12" x 9"	1.625"	120,000 FT
10 AWG	500	PLYWOOD (TREATED)	8" x 9"	1.625"	72,000 FT
	1000	PLYWOOD (TREATED)	12" x 6"	1.625"	80,000 FT
	2500	PLYWOOD (TREATED)	12" x 12"	1.625"	80,000 FT
8 AWG	500	PLYWOOD (TREATED)	8" x 9"	1.625"	54,000 FT
	1000	PLYWOOD (TREATED)	12" x 9"	1.625"	48,000 FT
	2500	PLYWOOD (TREATED)	16" x 10"	2.5"	45,000 FT



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HF-CCS PE45

(HIGH-FLEX / OPEN-TRENCH)

Tracer Wire • High-Flex Copper Clad Steel (HF-CCS) • 21% IACS Conductivity • Corrosion Resistant
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- ASTM D1248: Standard Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable

Construction

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PRO-TRACE® HF-CCS PE45 uses a 45 mil, high-density, high molecular weight polyethylene (HDPE) insulation. HDPE provides an excellent balance of surface smoothness, processing ease and electrical consistency. HDPE provides superior strength against underground elements that help prevent accidental breaks caused by rocks in shifting soil conditions.

Specification Example

Tracer wire for open-trench installation shall be a 12 AWG solid, PRO-TRACE® HF-CCS PE45. Conductor shall be soft-drawn, 21% IACS, copper clad steel, utilizing a AISI 1006 low carbon steel core (required to meet break load and flexibility), with breakload of 282 lbs (55,000 psi). Conductor shall be extruded with a 45 mil, high density, high molecular weight polyethylene (HMW-HDPE) pursuant to ASTM D1248 standard. Tracer wire shall be rated for direct burial use at 30 volts and RoHS compliant. Tracer wire shall be PRO-TRACE® HF-CCS PE45 as manufactured by **Pro-Line Safety Products** and made in the USA.

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PRO-TRACE® is a registered trademark of Pro-Line Safety Products Co.

TABLE 1: CONDUCTOR (Physical, Mechanical and Electrical Properties)

PROPERTY	14 AWG	12 AWG	10 AWG	8 AWG
Conductor Type	HF-CCS	HF-CCS	HF-CCS	HF-CCS
Conductor Temper	Annealed	Annealed	Annealed	Annealed
Steel Grade	AISI 1006	AISI 1006	AISI 1006	AISI 1006
Copper Grade	UNS C10200	UNS C10200	UNS C10200	UNS C10200
Rated Break Load	177 lbs	282 lbs	448 lbs	713 lbs
Rated Tensile Strength	55,000 psi	55,000 psi	55,000 psi	55,000 psi
Elongation	20.0%	21.0%	21.0%	22.0%
Nominal Copper Thickness (% of Diameter)	3.0%	3.0%	3.0%	3.0%
Nominal Copper Weight (Per 1,000')	13.0%	13.0%	13.0%	13.0%
Nominal DC Resistance	12.024 ohms	7.562 ohms	4.756 ohms	2.991 ohms

TABLE 2: INSULATION (Physical, Mechanical and Electrical Properties)

TEST DESCRIPTION	ASTM STANDARD	TYPICAL VALUES
Density @ 23°C	ASTM D1505	0.945 g/cm ³
Melt Flow Rate	ASTM D1238	0.70 g/10 min
Tensile Strength	ASTM D638	3,400 psi
Tensile Strength Retention	ASTM D638	90% after 48 hours @ 100°C
Tensile Elongation	ASTM D638	500%
Tensile Elongation Retention	ASTM D638	90% after 48 hours @ 100°C
Environmental Stress Cracking	ASTM D1693	0 failures @ 48 hours
Thermal Stress Cracking	ASTM D2951	0 failures @ 96 hours
Brittleness Temperature	ASTM D746	-76°C
Melting Temperature	ASTM D3418	260°C
Oxidative Induction Time	ASTM D3895	170 min @ 200°C
Dielectric Constant	ASTM D1531	2.32 @ 1 MHz
Dissipation Factor	ASTM D1531	0.00006 @ 1 MHz
DC Volume Resistivity @ 23°C	ASTM D257	> 1 x 10 ¹⁵ ohm-cm

PRODUCT PART NO.	PRODUCT DESCRIPTION	RATED BREAK LOAD	RATED TENSILE STRENGTH	HDPE INSULATION THICKNESS	NOMINAL O.D.	APPROX. WEIGHT PER 1,000 FT		STANDARD PACKAGES
						COPPER WEIGHT	FINISHED WEIGHT	
WEIGHTS, MEASUREMENTS AND PACKAGING								
74441XXXX	14 SOL HF-CCS PE45	177 lbs	55,000 psi	0.045"	0.154"	1.4479	19.00	CUSTOM ORDER
74442XXXX	12 SOL HF-CCS PE45	282 lbs	55,000 psi	0.045"	0.171"	2.3007	27.00	500' / 2500'
74443XXXX	10 SOL HF-CCS PE45	448 lbs	55,000 psi	0.045"	0.192"	3.6592	40.00	CUSTOM ORDER
74444XXXX	8 SOL HF-CCS PE45	713 lbs	55,000 psi	0.045"	0.219"	5.8189	58.00	CUSTOM ORDER

INSULATION COLOR & REEL LENGTH			
COLOR	500' REEL	1000' REEL	2500' REEL
BLACK	0132	0141	0147
BLUE	0232	0241	0247
GREEN	0532	0541	0547
ORANGE	0632	0641	0647
PURPLE	0832	0841	0847
RED	0932	0941	0947
WHITE	1132	1141	1147
YELLOW	1232	1241	1247

SOME PART NUMBERS MAY BE SUBJECT TO MINS

REEL & PACKAGING INFORMATION					
SIZE	LENGTH	MATERIAL	REEL DIMENSION	ARBOR HOLE	PALLET QUANTITY
14 AWG	500	PLYWOOD (TREATED)	8" x 6"	1.625"	144,000 FT
	1000	PLYWOOD (TREATED)	8" x 9"	1.625"	144,000 FT
	2500	PLYWOOD (TREATED)	12" x 12"	1.625"	160,000 FT
12 AWG	500	PLYWOOD (TREATED)	8" x 6"	1.625"	108,000 FT
	1000	PLYWOOD (TREATED)	12" x 6"	1.625"	112,000 FT
	2500	PLYWOOD (TREATED)	12" x 12"	1.625"	120,000 FT
10 AWG	500	PLYWOOD (TREATED)	8" x 9"	1.625"	72,000 FT
	1000	PLYWOOD (TREATED)	12" x 6"	1.625"	64,000 FT
	2500	PLYWOOD (TREATED)	16" x 10"	2.5"	67,500 FT
8 AWG	500	PLYWOOD (TREATED)	12" x 6"	1.625"	48,000 FT
	1000	PLYWOOD (TREATED)	12" x 9"	1.625"	48,000 FT
	2500	PLYWOOD (TREATED)	16" x 12"	2.5"	45,000 FT



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QUESTIONS & ANSWERS

(PRO-TRACE CCS)

1. What are the inherent advantages of Copper-Clad Steel (CCS) when used as tracer wire?

- Corrosion resistant
- Signal strength that is considered equal to copper wire
- Better durability and longevity than copper wire
- Stronger in break-strength than copper resulting in fewer wire breaks
- Considerably lower in cost without the volatility of copper
- Reduced theft-threat due to lack of after-market value
- 10% lighter in weight means reduced shipping costs and easier handling



2. What is Copper-Clad Steel (CCS) wire?

Copper-Clad Steel (CCS) is a bimetal conductor that utilizes a low or high carbon steel core, metallurgically bonded with a copper cladding, that is uniform and continuous. The result is a bimetal conductor that is corrosion resistant and performs as one metal. Copper coverage is totally uniform over the entire length of our conductor and the cold-rolling process means there is no rehardening necessary eliminating flaking, pitting, chipping, and cracking.

3. What is the history of Copper-Clad Steel (CCS) along with commercial and industrial applications uses?

Copper-Clad Steel (CCS), was first produced in Rankin, PA in 1915. Through the years it has been used in many industrial and commercial markets. Telecommunications, CATV, and utility grounding are a few of the industrial applications. Commercially it is used in goods such as, coaxial cable, ground rods and wire, catenary wire, pet containment wire, antenna wire, trolley cable, guy strand, detonation wire, chain link fencing and even revetment mats to stop erosion on riverbanks.

4. How is Copper-Clad Steel (CCS) wire manufactured?

Copper-Clad Steel (CCS) is manufactured by metallurgically bonding steel rod with copper strips. The process of manufacturing starts off utilizing a steel rod and two copper strips, bonded together by heat and pressure. The result is CCS in rod form. The CCS rod is then drawn to an intermediate size and heat treated. The intermediate size is drawn down again to its' final size. An additional heat treating process is added for annealed material. Heat and pressure, along with the drawing process ensures uniform and continuous copper thicknesses throughout the wire. The metallurgical bond of both metals make CCS perform as one metal.

5. What is the difference between PRO-TRACE HF-CCS and HDD-CCS tracer wires?

PRO-TRACE® HF-CCS (High-Flex Copper-Clad Steel)

Designed specifically for open-trench installations. This product undergoes a special annealing process that is unique to PRO-TRACE® HF-CCS. This product is designed to embody the flexibility, memory, and feel of copper wire, but is 43% higher in break-strength. There is minimal spring release (recoil) on the reels making it very user friendly. This product cost less than copper wire, and is considered equal in signal strength. We use a technologically advanced annealing process on the HF-CCS giving it the unique traits of flexibility and strength.

PRO-TRACE® HDD-CCS (Horizontal-Drilling Copper-Clad Steel)

Designed specifically for directional drilling (boring) installations. This product utilizes a special high-carbon steel core that is unique to PRO-TRACE® HDD-CCS. This product is designed with almost 600% (6X) higher breaking-strength than copper wire. Only 1 wire is needed and prevents breaks or re-bores in directional drilling installations. With copper multiple wires are needed to prevent breaks and is extremely expensive. This product cost less than using copper, and provides equal locating performance. In simple terms, HDD-CCS provides the same break-load as 5-6 copper wires.

5. What happens if a gouge, nick, or cut (holiday effect) penetrates through the PE jacket and copper cladding, and exposes the steel core? Are there any potential galvanic corrosion concerns?

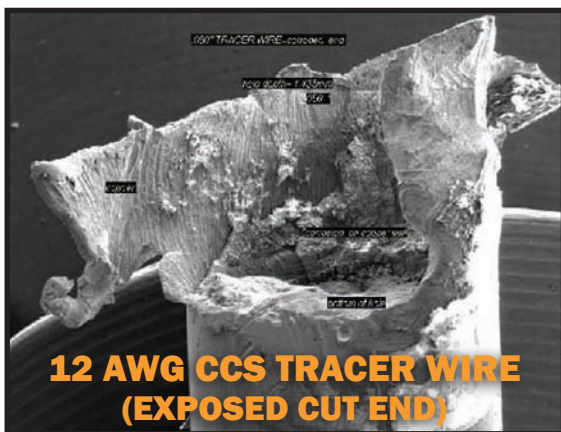
NO. The definition of galvanic corrosion can be simply stated as: *Whenever dissimilar metals are in the presence of an electrolyte, a difference in electric potential is developed between the two. One becomes the Cathode and the other becomes the Anode.* The anode will corrode while the cathode will basically remain unchanged. The key and most important point within this definition is: *“in the presence of an electrolyte”.* When metals are mechanically fastened together, there remains very small gaps between the surfaces where rain water and dissolved mineral salts can form an electrolyte. This creates an electrolytic cell and galvanic corrosion will occur based on the electromotive series. For example: Steel is above copper in this series and steel would corrode to protect the copper.

In the case of Copper Clad Steel, the copper (cathode) completely covers the entire circumference and is metallurgically bonded to the steel (anode). **Metallurgical bonding** of the copper to the steel core assures that there are no gaps between the dissimilar metals. Corrosion of the steel core requires oxygen to migrate to the anode’s surface and react. Therefore, an electrolytic cell can only form at the cut end when exposed to an electrolyte. This reaction continues until the total surface area is covered with a thin oxide (or scab), and once formed, prevents further migration and corrosion. In the case of the copper cladding becoming “breached” and exposing the steel core, the same holds true. The copper would also flow into the gouge or nick minimizing the area of exposed steel. You see this same effect when you cut the wire. In simple terms, the corrosion process stops itself.

Since the early 1900’s, Copper Clad Steel wire has been used for open telephone lines, power transmission, service drops, utility grounding, and ground rods. The majority of CATV coax has a center conductor of copper clad steel. Bare Copper Clad Steel is heavily used by electrical utilities and has stayed corrosion free for 40 plus years in very harsh environments and is still in service today.

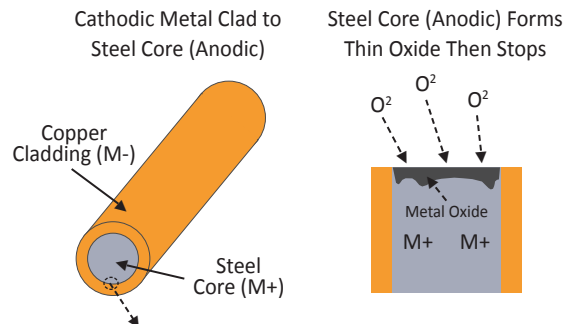
Corrosion Test Information

- **Five year corrosion study was initiated using destructive and non-destructive test along with microscopic analysis to evaluate.**
- **Samples were buried in various soil conditions with monitoring systems to check soil PH, moisture, conductivity and temperature.**

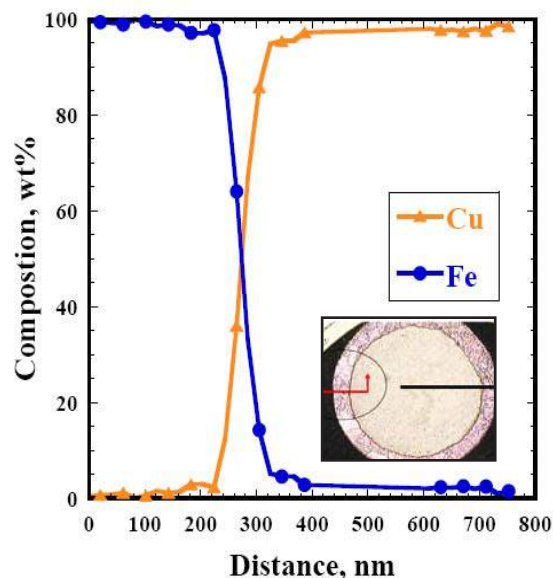


Corrosion Tests Support Our Claims

- PRO-TRACE® HF-CCS & HD-CCS are corrosion resistant tracer wires.
- Exposing the steel core does not compromise tracer wire performance.
- Depth of Corrosion = 0.056” at which point rust scabs formed sealing out moisture and effectively ceasing the corrosion process.



METALLURGICAL BOND OF CCS



STEM-HAADF-XEDS with drift correction

As tested by University of Alabama
Tuscaloosa, Alabama



Specification Updated: 10.30.2010 10:25:44 CST

PRO-LINE SAFETY PRODUCTS COMPANY
1099 ATLANTIC DRIVE, UNIT 1 • WEST CHICAGO, IL 60185
TOLL FREE: 800.554.3424



SD-CU PE30

(SOFT-DRAWN COPPER)

Copper Tracer Wire • Oxygen Free Copper • Dead Soft Annealed Copper Conductor • Corrosion Resistant High-Density, High Molecular Weight Polyethylene (HDPE) Insulation • Moisture, Chemical, and Oil Resistant Impact, Crush, and Abrasion Resistant • RoHS Compliant • Direct Burial Rated • 30 Volts • Made in the USA



Applications and Information

- **SD-CU PE30** conductors are used for tracer wire applications not exceeding 30 Volts. Tracer wire is used to conductively locate buried utility lines for the gas, water, sewer, telecommunication, and electrical markets.
- **SD-CU PE30** utilizes a 30 mil, High-Density, HMWPE insulation specifically formulated to provide excellent oxidative stability, toughness, abrasion, crush, chemical, oil, and moisture resistance. It provides superior long term aging performance while providing excellent environmental and thermal stress-cracking resistance.
- **SD-CU PE30** is suitable for use direct burial applications not locations at temperatures not to exceed 75°C.
- **SD-CU PE30** is RoHS Compliant and manufactured in the USA.

Standards and References

SD-CU PE30 tracer wire meets or exceeds all applicable ASTM standards and requirements of the National Electrical Code.

- ASTM B-3: Standard Specification for Soft or Annealed Copper Wire.
- ASTM B170: Standard Specification for Oxygen-Free Electrolytic Copper.
- ASTM D1248: Standard Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable.
- ASTM D1238: Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer.

Construction

SD-CU PE30 copper conductors are annealed copper (soft-drawn), insulated with a high-density, high molecular weight polyethylene (HDPE) insulation. HDPE provide excellent oxidative stability, toughness, abrasion, crush, chemical, oil, and moisture resistance. It provides superior long term aging performance and excellent environmental and thermal stress-cracking resistance. HDPE provides superior strength against underground elements that help prevent accidental breaks caused by rocks in shifting soil and other conditions.

Specification Example

Tracer wire shall be a 12 AWG solid, SD-CU PE30. Tracer wire shall consist of a soft-drawn, oxygen free copper conductor with a minimum break load of 197 lbf (38,500 psi). Conductor shall be extruded with a 30 mil, high density polyethylene insulation, and blue in color to meet the APWA color code of the buried utility line. Tracer wire shall be rated for direct burial use at 30 volts and RoHS compliant. Tracer wire shall be 12 AWG SOLID SD-CU PE30 as manufactured by Pro-Line Safety Products and made in the USA. If tracer wire connectors are necessary, contractor shall use a PRO-TRACE® TW Connector (Part No: 73901) rated for direct burial use filled with silicone sealant to prevent corrosion at connection points.

Specification Updated: 11.1.2010 18:15:00 CST

PRO-TRACE® is a registered trademark of Pro-Line Safety Products Co.

TABLE 1: CONDUCTOR (Physical, Mechanical and Electrical Properties)

PROPERTY	14 AWG	12 AWG	10 AWG	8 AWG
Conductor Type	Copper	Copper	Copper	Copper
Conductor Temper	Soft-Drawn	Soft-Drawn	Soft-Drawn	Soft-Drawn
Rated Break Load	124 lbs	197 lbs	313 lbs	479 lbs
Rated Tensile Strength	38,500 psi	38,500 psi	38,500 psi	37,000 psi
Elongation	3.0%	5.0%	5.0%	5.0%
Nominal DC Resistance	2.525 ohms	1.588 ohms	0.999 ohms	0.628 ohms

TABLE 2: INSULATION (Physical, Mechanical and Electrical Properties)

TEST DESCRIPTION	ASTM STANDARD	TYPICAL VALUES
Density @ 23°C	ASTM D792	0.945 g/cm ³
Melt Flow Rate	ASTM D1238	0.8 g/10 min
Tensile Strength	ASTM D638	3,400 psi
Tensile Strength Retention	ASTM D638	90% after 48 hours @ 100°C
Tensile Elongation	ASTM D638	500%
Tensile Elongation Retention	ASTM D638	90% after 48 hours @ 100°C
Environmental Stress Cracking	ASTM D1693	0 failures @ 48 hours
Thermal Stress Cracking	ASTM D2951	0 failures @ 96 hours
Brittleness Temperature / Failures	ASTM D746	0 failures @ -76° C
Melting Point	ASTM D3418	130°C
Oxidative Induction Time	ASTM D3895	170 min @ 200°C
Dielectric Constant	ASTM D1531	2.32 @ 1 MHz
Dissipation Factor	ASTM D1531	0.00006 @ 1 MHz
DC Volume Resistivity Test @ 23°C	ASTM D257	> 1 x 10 ¹⁵ ohm-cm

PRODUCT PART NO.	CONDUCTOR		RATED BREAK LOAD	RATED TENSILE STRENGTH	HDPE INSULATION THICKNESS	NOMINAL O.D.	APPROX. WEIGHT PER 1,000 FT		STANDARD PACKAGES
	AWG SIZE	STRANDS					COPPER WEIGHT	FINISHED WEIGHT	
WEIGHTS, MEASUREMENTS AND PACKAGING									
74003XXXX	14 AWG	SOLID	124 lbs	38,500 psi	0.030"	0.124"	12.437	16.00	500 / 2500
74004XXXX	12 AWG	SOLID	197 lbs	38,500 psi	0.030"	0.141"	19.763	24.00	500 / 2500
74005XXXX	10 AWG	SOLID	313 lbs	38,500 psi	0.030"	0.162"	35.949	37.00	500 / 2500
74006XXXX	8 AWG	SOLID	479 lbs	37,000 psi	0.030"	0.189"	49.975	62.00	CALL for INFO
74008XXXX	14 AWG	STRANDED	124 lbs	38,500 psi	0.030"	0.133"	12.671	17.00	CALL for INFO
74010XXXX	12 AWG	STRANDED	197 lbs	38,500 psi	0.030"	0.152"	20.180	25.00	CALL for INFO
74012XXXX	10 AWG	STRANDED	313 lbs	38,500 psi	0.030"	0.176"	32.030	39.00	CALL for INFO
74014XXXX	8 AWG	STRANDED	479 lbs	37,000 psi	0.030"	0.206"	50.984	64.00	CALL for INFO

INSULATION COLOR & REEL SIZE			
COLOR	500' REEL	1000' REEL	2500' REEL
BLACK	0132	0141	0147
BLUE	0232	0241	0247
GREEN	0532	0541	0547
ORANGE	0632	0641	0647
PURPLE	0832	0841	0847
RED	0932	0941	0947
WHITE	1132	1141	1147
YELLOW	1232	1241	1247

SOME COLORS AND SIZES MAY BE SUBJECT TO MINS

REEL & PACKAGING INFORMATION						
SIZE	LENGTH	FLANGE	TRAVERSE	MATERIAL	CARTON QTY	PALLET QTY
14 AWG	500	6.5"	5.0"	PLASTIC	BULK	90,000 FT
	2500	12.0"	10.0"	PLASTIC	BULK	90,000 FT
12 AWG	500	6.5"	5.0"	PLASTIC	BULK	90,000 FT
	2500	12.0"	10.0"	PLASTIC	BULK	90,000 FT
10 AWG	500	10.5"	6.0"	PLASTIC	BULK	30,000 FT
	2500	14.0"	11.0"	PLASTIC	BULK	45,000 FT
8 AWG	500					
	1000					
	2500					



Specification Updated: 11.1.2010 18:15:00 CST

PRO-LINE SAFETY PRODUCTS COMPANY
 1099 ATLANTIC DRIVE, UNIT 1 • WEST CHICAGO, IL 60185
 TOLL FREE: 800.554.3424



SSAC-T304 PE45

(STAINLESS STEEL)

Tracer Wire • Stainless Steel Aircraft Cable Type 304 Conductor • Directional Boring Applications • Corrosion Resistant High-Density, High Molecular Weight Polyethylene (HDPE) Insulation • Moisture, Chemical, and Oil Resistant Impact, Crush, and Abrasion Resistant • RoHS Compliant • Direct Burial Rated • 30 Volts • Made in the USA

Applications and Information

- **SSAC-T304 PE45** conductors are used for tracer wire applications not exceeding 30 Volts. Tracer wire is designed for directional boring applications and used to conductively locate buried utility lines for the gas, water, sewer, telecommunication, and electrical markets.
- **SSAC-T304 PE45** has great flexibility, memory, and much higher break load than copper, minimizing damage during installation and while in service. This product is best suited for directional boring when high strength is needed.
- **SSAC-T304 PE45** is corrosion resistant with good price stability.
- **SSAC-T304 PE45** is RoHS Compliant, made in the USA.

Standards and References

SSAC-T304 PE45 tracer wire meets or exceeds all applicable ASTM specifications, requirements of the National Electrical Code, and Federal Specifications.

- RR-W-410E: Federal Specification for Wire Rope and Stranding.
- ASTM D1248: Standard Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable

Construction

SSAC-T304 PE45 is a 7x7 stranded, stainless steel aircraft cable, type 304 conductor. Conductors is corrosion resistant is suitable for tracer wire applications only. The inherently high break load of stainless steel makes this a viable alternative to copper in directional boring applications when 1 conductor is used.

SSAC-T304 PE45 uses a 45 mil, high-density, high molecular weight polyethylene (HDPE) insulation. HDPE provides an excellent balance of surface smoothness, processing ease and electrical consistency. HDPE provides superior strength against underground elements that help prevent accidental breaks caused by rocks in shifting soil conditions.



Specification Example

Tracer wire for directional boring applications shall be a 12 AWG stranded 7x7, SSAC-T304 PE45. Tracer wire shall consist of a stainless steel aircraft cable, type 304 conductor. Conductor shall have a minimum break load of 920 lbs to ensure strength. Conductor shall be extruded with a 45 mil, high density polyethylene insulation, and blue in color to meet the APWA color code of the buried utility line. Tracer wire shall be rated for direct burial use at 30 volts and RoHS compliant. Tracer wire shall be SSAC-T304 PE45 as manufactured by **Pro-Line Safety Products** and made in the USA.

TABLE 1: CONDUCTOR (Physical, Mechanical and Electrical Properties)

PROPERTY	3/32"	7/64"	1/8"	5/32"	3/16"	7/32"	1/4"
Conductor Type	SSAC	SSAC	SSAC	SSAC	SSAC	SSAC	SSAC
Conductor Temper	Type 304	Type 304	Type 304	Type 304	Type 304	Type 304	Type 304
Rated Break Load	920 lbs	1,260 lbs	1,700 lbs	2,400 lbs	3,700 lbs	5,000 lbs	6,400 lbs
Elongation	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%

TABLE 2: INSULATION (Physical, Mechanical and Electrical Properties)

TEST DESCRIPTION	ASTM STANDARD	TYPICAL VALUES
Density @ 23°C	ASTM D1505	0.945 g/cm ³
Melt Flow Rate	ASTM D1238	0.70 g/10 min
Tensile Strength	ASTM D638	3,400 psi
Tensile Strength Retention	ASTM D638	90% after 48 hours @ 100°C
Tensile Elongation	ASTM D638	500%
Tensile Elongation Retention	ASTM D638	90% after 48 hours @ 100°C
Environmental Stress Cracking	ASTM D1693	0 failures @ 48 hours
Thermal Stress Cracking	ASTM D2951	0 failures @ 96 hours
Brittleness Temperature	ASTM D746	-76°C
Melting Temperature	ASTM D3418	260°C
Oxidative Induction Time	ASTM D3895	170 min @ 200°C
Dielectric Constant	ASTM D1531	2.32 @ 1 MHz
Dissipation Factor	ASTM D1531	0.00006 @ 1 MHz
DC Volume Resistivity @ 23°C	ASTM D257	> 1 x 10 ¹⁵ ohm-cm

PRODUCT PART NO.	CONDUCTOR		RATED BREAK LOAD	HDPE INSULATION THICKNESS	NOMINAL O.D.	APPROX. WEIGHT PER 1,000 FT		STANDARD PACKAGES
	AWG SIZE	STRANDING				STEEL WEIGHT	FINISHED WEIGHT	
WEIGHTS, MEASUREMENTS AND PACKAGING								
69102XXXX	3/32" (12 AWG)	7 x 7	920 lbs	0.045"	0.188"	16.00	28.00	500/1000/2500
69103XXXX	3/32" (10 AWG)	7 x 7	920 lbs	0.045"	0.188"	16.00	28.00	500/1000/2500
6910ZXXXX	7/64" (CUSTOM)	7 x 7	1,260 lbs	0.045"	0.203"	22.00	36.00	SPECIAL ORDER
69104XXXX	1/8" (8 AWG)	7 x 7	1,700 lbs	0.045"	0.219"	28.50	47.50	500/1000/2500
69105XXXX	5/32" (6 AWG)	7 x 7	2,400 lbs	0.045"	0.250"	43.00	62.00	500/1000/2500
69106XXXX	3/16" (5 AWG)	7 x 7	3,700 lbs	0.045"	0.282"	62.00	77.00	500/1000/2500
69107XXXX	7/32" (4 AWG)	7 x 7	5,000 lbs	0.045"	0.313"	83.00	110.00	500/1000/2500
69108XXXX	1/4" (2 AWG)	7 x 7	6,400 lbs	0.045"	0.344"	106.00	124.00	500/1000/2500

INSULATION COLOR & REEL SIZE			
COLOR	500' REEL	1000' REEL	2500' REEL
BLACK	0132	0141	0147
BLUE	0232	0241	0247
GREEN	0532	0541	0547
ORANGE	0632	0641	0647
PURPLE	0832	0841	0847
RED	0932	0941	0947
WHITE	1132	1141	1147
YELLOW	1232	1241	1247

SOME PART NUMBERS MAY BE SUBJECT TO MINS



Specification Dated: 2.22.2010 13:19:40 CST

PRO-LINE SAFETY PRODUCTS COMPANY
1099 ATLANTIC DRIVE, UNIT 1 • WEST CHICAGO, IL 60185
TOLL FREE: 800.554.3424



PRO-TRACE® DB CONNECTOR (PATENT #7335050)

Silicone Filled Tracer Wire Connector • Made from Polycarbonate • Impact and Crush Resistant • Water and Corrosion Proof
Moisture, Chemical, and Oil Resistant • Connector for use in Damp, Wet and Submersible Locations
300 Volts Max • RoHS Compliant • Direct Burial Rated

“PRO-TRACE® DB CONNECTOR -- CONFIDENCE & RELIABILITY -- IT'S FOOL PROOF INSTALLATION”



Applications and Information

- **PRO-TRACE® DB Connector** is used for underground splices or connections for tracer wire and other applications not exceeding 300 Volts. The silicone filled connector is used to splice or branch-off multiple tracer wires to maintain continuity and provides corrosion proof protection from the underground elements.
- **PRO-TRACE® DB Connector** is superior to twist-on connectors, providing better strain relief and performance along with easier installation. They are fool proof, minimizing damage and error during installation and while in service.
- **PRO-TRACE® DB Connector** is a patented technology that uses applied hand pressure to close and lock in the connections with ease and is superior to wire nuts (twist-on). With wire nuts, wires are inserted and torqued until tight. If too much torque is applied the threading inside can become “stripped”. If too little torque is applied the wires may become loose.
- **PRO-TRACE® DB Connector** is the best connector in the market specifically designed for tracer wire with a strain relief considerably stronger than DryConn or 3M Connectors.
- **PRO-TRACE® DB Connector** is designed to work with copper, copper-clad steel (CCS), and stainless steel. See table 4 for wire combinations.

Standards and References

PRO-TRACE® DB Connector meets or exceeds all applicable UL standards, and requirements of the National Electrical Code.

- Sealed Wire Connection System for use in Damp, Wet, Raintight, Watertight, Submersible and Direct Bury Locations

Construction

PRO-TRACE® DB Connector is injection molded from polycarbonate that has outstanding temperature and high-impact resistance. It is superior to breaking and cracking. The outer housing is clear in color and provides visual confidence with each installation. The rotating handle is color coded to meet the APWA color code. The inner housing features a locking mechanism made from zinc and uses applied hand pressure that securely closes and locks the wire inside with ease. A corrosion proof silicone sealant fills the inner housing and provides longevity for each installation.

Specification Example

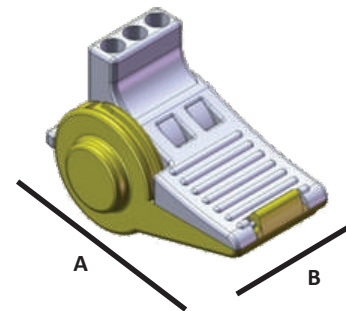
Tracer wire shall be a 12 AWG solid, PRO-TRACE® HF-CCS PE30. Tracer wire shall consist of a dead soft annealed, 21% IACS conductivity, copper clad steel conductor with a minimum break load of 282 lbf (55,000 psi) to ensure flexibility and strength. Conductor shall be extruded with a 30 mil, high density polyethylene insulation, and blue in color to meet the APWA color code of the buried utility line. Tracer wire shall be rated for direct burial use at 30 volts and RoHS compliant. Tracer wire shall be PRO-TRACE® HF-CCS PE30 as manufactured by Pro-Line Safety Products and made in the USA. If tracer wire connectors are necessary, contractor shall use a PRO-TRACE® DB Connector (Part No: 73901) rated for direct burial use filled with silicone sealant to prevent corrosion at connection points.

TABLE 1: WIRE COMBINATIONS (Conductor and Insulation Type Compatibility)

CONDUCTOR TYPES							INSULATION TYPES		
SIZE	COPPER SD/MHD/HD	HF-CCS PRO-TRACE®	HS-CCS PRO-TRACE®	HD-CCS PRO-TRACE®	HDD-CCS PRO-TRACE®	STAINLESS TYPE 304	PVC/NYLON	PVC	LDPE, HDPE, XLPE
14 AWG	1-3 WIRES	1-3 WIRES	1-3 WIRES	-----	-----	-----	THHN or THWN	TW, UF, THW, TWU	PE30, PE45, XHHW-2, USE-2
12 AWG	1-3 WIRES	1-3 WIRES	1-3 WIRES	<u>NO</u>	<u>NO</u>	1-3 WIRES	THHN or THWN	TW, UF, THW, TWU	PE30, PE45, XHHW-2, USE-2
10 AWG	1-3 WIRES	<u>NO</u>	<u>NO</u>	<u>NO</u>	<u>NO</u>	1-3 WIRES	THHN or THWN	TW, UF, THW, TWU	PE30, PE45, XHHW-2, USE-2

TABLE 2: CONNECTOR (Physical and Electrical Properties)

MEASUREMENTS	TYPICAL VALUES
Connector Size	2.375" (A) x 1.375" (B)
Maximum Voltage	300 Volts
Wire Range	Min #14 / Max #10 (See Table 1)
Temperature Rating	105°C (221°F)
Silicone Sealant Temperature	-40°F to 400°F



PRODUCT PART NO.	PRODUCT DESCRIPTION	PACKAGING		APPROX WEIGHT PER 100	STOCK
		INNER CARTON	MASTER CARTON		
WEIGHTS, MEASUREMENTS AND PACKAGING					
739010250	PRO-TRACE DB CONNECTOR MIN #14 MAX #10 300V BLUE	100/Inner	600/Master	9.862 lbs	YES
739011250	PRO-TRACE DB CONNECTOR MIN #14 MAX #10 300V YELLOW	100/Inner	600/Master	9.862 lbs	YES
***** ADDITIONAL COLORS AVAILABLE WITH MIN RUN CALL FOR DETAILS *****					

Installation Instructions

STEP #1

Open wings (handles) to 90 degrees position

STEP #2

Strip wires to 5/8". Use the strip guide molded into the connector for reference.

STEP #3

Insert striped wires into connector. The striped ends of the wires should be visible through the clear housing on the back.

STEP #4

Hold wires in place while squeezing wings (handles) together until the latch snaps shut.



Specification Dated: 10.21.2010 09:20:40 CST

PRO-LINE SAFETY PRODUCTS COMPANY
 1099 ATLANTIC DRIVE, UNIT 1 • WEST CHICAGO, IL 60185
TOLL FREE: 800.554.3424

PATENT #7335050

PRO-TRACE® DB CONNECTOR

DRYCONN®

WATERPROOF CONNECTORS

For Use with Utility Tracer Lines



Installation Instructions

For use on Solid Conductor Only

1. Strip main and tap conductor to 5/8" (width of lug).
2. Place one stripped conductor (one conductor per side) into side A or B.*
3. Using a screwdriver, tighten set screw until it comes in contact with the solid conductor. Note location of screwdriver and continue tightening the set screw as indicated below:
3/4 Turn #14-#10 Solid Copper
1/4 Turn #14-#10 Steel Core Tracer
4. Repeat steps 1 through 3 for adjacent side.
5. Remove sealant cover and discard.
6. Close housing, aligning conductors until housing lid is fully latched.
7. Do not reuse.

*Use side A for uncut main or tap conductor (Figure 1).



Figure 1

DryConn® Direct Bury Lug Aqua

Catalog #	Selling Unit
90220	Bag of 5

Product Specifications and Measurements

Max. Voltage: 50V

Connector Size: 1.138" x 1.285"

Wire Range: #14-10 Solid Copper;

#14-10 Steel Core Tracer Wire

Silicone Sealant Temperature Rating: -45°F to 400°F

Construction

Lug: Tin plated high conductivity aluminum

Screws: Zinc plated steel

Housing: High impact polypropylene

Sealant: Non-hardening viscous dielectric silicone

Weight

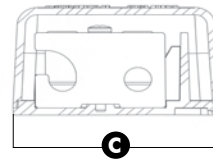
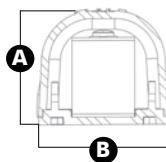
One connector: 61.5g (2.169 oz)

One bag of five: 308.5g (10.881 oz)

Measurements (Inches)

A - 1.138" B - 1.285" C - 1.929"

A - 28.9mm B - 32.6mm C - 49.0mm



C

DryConn® Direct Bury Lug Aqua

Features and Benefits

- Waterproof and corrosion proof
- Pre-filled with dielectric silicone sealant that never hardens
- One piece for easy installation
- Install service line without cutting the main line
- Installs in one minute or less
- User friendly design prevents cuts and handling discomfort
- Manufacturer approved for direct bury
- Wire Range: # 14 - #10 AWG
- Silicone sealant Temperature rating: -45°F to 400°F
- Designed for low voltage tracer splices and cathodic applications up to 50V



Weights and Measures

Shelfpack Qty.	Part #	Wt.	W	H	L	Cube	Master Qty.	Wt.	W	H	L	Cube	UPC 7-19362
1 bag	90220	0.7	8.25	9.25	2	0.0883	10	7.44	12.125	10.13	5.5	0.39	90220-3

In the chart above, width, height, and length are represented in inches. Weight is represented as pounds.

DETECTABLE TAPE (5.0 MIL)

Solid Aluminum Foil Core • Virgin Clear Polypropylene Film Laminated Top Structure
Virgin Clear Polyethylene Film Laminated Base Structure • Reverse Printed Polypropylene Structure
Acid, Alkali, Chemical, and Oil Resistant • Direct Burial Rated • Made in the USA



Applications and Information

- **Pro-Line's Detectable Marking Tape** is used for detecting, locating, identifying, and protecting buried utility lines for gas, water, sewer, telecommunication, and electrical markets. The width of tape used, is determined by the size of, and depth at which the underground utility line is buried. The depth at which detectable tape is buried, is determined by the width of the tape used.
- **DETECT:** Aluminum core is detected through means of inductive locating.
- **LOCATE:** Line is located and marked after inductive locating is performed.
- **IDENTIFY:** Utility type is identified by both the APWA color-code and utility legend printed on the marking tape.
- **PROTECT:** Detectable tape works 24 hours a day and year round, even if tape is not inductively located during excavation, the tape provides a "stop-sign" effect that is highly visible.

Standards and References

Pro-Line's Detectable Marking Tape meets or exceeds all applicable ASTM specifications.

- ASTM D2103-08: Standard Specification for Polyethylene Films and Sheeting.
- ASTM D882-09: Standard Test Method for Tensile Properties and Elongation of Thin Plastic Sheeting.
- ASTM D2578-08: Standard Test Method for Wetting Tension of Polyethylene and Polypropylene Films.
- ASTM D792-08: Standard Test Methods for Density of Plastics by Displacement.
- ASTM D671-93: Standard Test Method for Flexural Fatigue of Plastics.

Construction

Pro-Line's Detectable Marking Tape consists of a minimum 5.0 mil overall thickness. Construction is 0.8 mil clear virgin polypropylene film, reverse printed and laminated to a 0.35 mil solid aluminum foil core and then laminated to a 3.75 mil clear virgin polyethylene film. Tape is printed with our APWA Color-Coded, patented "Diagonally Striped" design with big, bold, black lettering to identify a specific buried utility line.

Specifications

DETECTABLE UNDERGROUND MARKING TAPE

Underground marking tape shall be a (2", 3", 4", 6", or 12" width), detectable marking tape, with a minimum 5.0 mil overall thickness. Tape shall be manufactured using a 0.8 mil clear virgin polypropylene film, reverse printed and laminated to a **0.35 mil solid aluminum foil core**, and then laminated to a 3.75 mil clear virgin polyethylene film. Tape shall be printed using a diagonally striped design for maximum visibility, and meet the APWA Color-Code standard for identification of buried utilities. Detectable marking tape shall be **Pro-Line Safety Products** or approved equal and made in the USA.

TABLE 1: DETECTABLE TAPE CONSTRUCTION (Polypropylene, Aluminum Foil, and Polyethylene)

PROPERTY	2" WIDTH	3" WIDTH	4" WIDTH	6" WIDTH	12" WIDTH
Nominal Overall Thickness	5.0 mil	5.0 mil	5.0 mil	5.0 mil	5.0 mil
Aluminum Foil Core Thickness	0.35 mil	0.35 mil	0.35 mil	0.35 mil	0.35 mil
Polyethylene Film Thickness	3.75 mil	3.75 mil	3.75 mil	3.75 mil	3.75 mil
Polypropylene Film Thickness	0.80 mil	0.80 mil	0.80 mil	0.80 mil	0.80 mil
Polypropylene Print Method	Reverse Printed	Reverse Printed	Reverse Printed	Reverse Printed	Reverse Printed
Print Design #1 (Patented)	Diagonal Striped	Diagonal Striped	Diagonal Striped	Diagonal Striped	Diagonal Striped
Print Design #2 (Custom)	Solid Block	Solid Block	Solid Block	Solid Block	Solid Block
Print Design #3 (Custom)	Solid Flood	Solid Flood	Solid Flood	Solid Flood	Solid Flood
Print Design Color-Code	APWA Color-Code	APWA Color-Code	APWA Color-Code	APWA Color-Code	APWA Color-Code

**Diagonal striped design is a PATENTED design of Pro-Line Safety Products that enhances tape visibility for superior protection.*
**Please note that there may be a nominal + or - 10% difference throughout the overall thickness.*

TABLE 2: TESTING SPECIFICATIONS (Physical and Mechanical Properties)

TEST DESCRIPTION	STANDARD	2" WIDTH	3" WIDTH	4" WIDTH	6" WIDTH	12" WIDTH
Aluminum Foil Core	MFG. SPECS	Virgin Grade	Virgin Grade	Virgin Grade	Virgin Grade	Virgin Grade
Polyethylene Film	MFG. SPECS	Virgin Grade	Virgin Grade	Virgin Grade	Virgin Grade	Virgin Grade
Polypropylene Film	MFG. SPECS	Virgin Grade	Virgin Grade	Virgin Grade	Virgin Grade	Virgin Grade
Adhesive Type	MFG. SPECS	AV1257/CA100	AV1257/CA100	AV1257/CA100	AV1257/CA100	AV1257/CA100
Adhesive Bond Strength	BOILING WATER	5 hrs W/O Peel	5 hrs W/O Peel	5 hrs W/O Peel	5 hrs W/O Peel	5 hrs W/O Peel
Printed Inks	MFG. SPECS	Chromabond	Chromabond	Chromabond	Chromabond	Chromabond
Print Repeat	MFG. SPECS	Varies by Legend	Varies by Legend	Varies by Legend	Varies by Legend	Varies by Legend
Coefficient Friction	ASTM D4521-96	0.247 Static	0.247 Static	0.247 Static	0.247 Static	0.247 Static
Density	ASTM D792-66	1.09 g/cm ³	1.09 g/cm ³	1.09 g/cm ³	1.09 g/cm ³	1.09 g/cm ³
Elongation (MD)	ASTM D882-80A	139%	139%	139%	139%	139%
Elongation (TD)	ASTM D882-80A	80%	80%	80%	80%	80%
Flexural Fatigue	ASTM D671-93	Pliable Hand	Pliable Hand	Pliable Hand	Pliable Hand	Pliable Hand
Printability	ASTM D2578-08	45 Dynes	45 Dynes	45 Dynes	45 Dynes	45 Dynes
Tensile Strength	ASTM D882-09	15,000 psi	15,000 psi	15,000 psi	15,000 psi	15,000 psi

WEIGHTS, MEASUREMENTS AND PACKAGING

PRODUCT PART NO.	SIZE (WIDTH)	NOMINAL OVERALL THICKNESS	NOMINAL THICKNESS OF STRUCTURAL MATERIALS			RECOMMENDED BURIAL DEPTHS FOR DETECTION	PRODUCT WEIGHT PER ROLL	STANDARD PACKAGING
			ALUMINUM FOIL THICKNESS	POLYETHYLENE THICKNESS	POLYPROPYLENE THICKNESS			
10311XXX3	2" x 1000'	5.0 MIL	0.35 MIL	3.75 MIL	0.80 MIL	6-9 inches	4.75 lbs	9 / CARTON
10312XXX3	3" x 1000'	5.0 MIL	0.35 MIL	3.75 MIL	0.80 MIL	9-12 inches	7.13 lbs	6 / CARTON
10313XXX3	4" x 1000'	5.0 MIL	0.35 MIL	3.75 MIL	0.80 MIL	12-15 inches	9.50 lbs	4 / CARTON
10314XXX3	6" x 1000'	5.0 MIL	0.35 MIL	3.75 MIL	0.80 MIL	15-18 inches	14.25 lbs	3 / CARTON
10316XXX3	12" x 1000'	5.0 MIL	0.35 MIL	3.75 MIL	0.80 MIL	18-24 inches	28.50 lbs	1 / CARTON

****FOR CUSTOM LEGENDS OR SIZES CALL 800.554.3424****

PRINT LEGEND	PART #
CAUTION BURIED CHILLED WATER LINE BELOW	103
CAUTION BURIED GEOTHERMAL LINE BELOW	128
CAUTION BURIED POTABLE WATER LINE BELOW	115
CAUTION BURIED WATER LINE BELOW	125
CAUTION BURIED FORCE MAIN BELOW	208
CAUTION BURIED FORCE MAIN BELOW	308
CAUTION BURIED SANITARY SEWER LINE BELOW	318
CAUTION BURIED SEWER LINE BELOW	319
CAUTION BURIED STORM DRAIN LINE BELOW	321
CAUTION BURIED STORM SEWER LINE BELOW	322

PRINT LEGEND	PART #
CAUTION BURIED CATV LINE BELOW	402
CAUTION BURIED COMMUNICATION LINE BELOW	404
CAUTION BURIED FIBER OPTIC CABLE BELOW	406
CAUTION BURIED TELEPHONE LINE BELOW	423
CAUTION BURIED NON-POTABLE WATER LINE	512
CAUTION BURIED RECLAIMED WATER LINE BELOW	517
CAUTION BURIED ELECTRIC LINE BELOW	605
CAUTION BURIED HIGH VOLTAGE LINE BELOW	610
CAUTION BURIED GAS LINE BELOW	809
CAUTION BURIED PIPELINE BELOW	814



PRO-LINE SAFETY PRODUCTS COMPANY
 1099 ATLANTIC DRIVE, UNIT 1 • WEST CHICAGO, IL 60185
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NON-DETECTABLE MARKING TAPE

4.0 Mil Virgin Pigmented Polyethylene Film • Rated for Direct Burial for Marking Underground Utility Lines
 APWA Color-Coded for Representation and Visibility of Buried Utility Line

DESCRIPTION

PRO-LINE® Non-Detectable Marking Tape is used primarily for marking and underground utility structures. **PRO-LINE®** Non-Detectable Marking Tape serves three simple functions: Locate, Identify, and Protect. Non-Detectable Tape is usually the last category of a utility structures design and installation...maintenance and immediate location and identification. **PRO-LINE®** Non-Detectable Marking Tape is APWA Color-Coded to identify the type of utility that is buried below. Non-Detectable Marking Tape is also printed to identify what type of utility is buried below.



“Helping to Protect Underground Investments and the General Public Since 1992!”

STANDARDS & REFERENCES

PRO-LINE® Detectable Marking Tape meets or exceeds all applicable ASTM specifications.

- ASTM D2103-05 (Standard Specification for Polyethylene Film and Sheeting)
- ASTM D882-02 (Standard Test Method for Tensile Properties of Thin Plastic Sheeting)
- ASTM D882-75B (Standard Test Method for Tensile Properties of Thin Plastic Sheeting for Elongation)
- ASTM D2578 (Standard Test Method for Wetting Tension of Polyethylene and Polypropylene Films)

CONSTRUCTION

- **PRO-LINE®** Non-Detectable Marking Tape consists of a minimum 4.0 mil overall thickness, manufactured with virgin polyethylene with color pigments added at point of film extrusion to identify underground utility structures based on the APWA Color-Code .
- **PRO-LINE®** Non-Detectable Marking Tape is printed with big, bold, black lettering to identify what type of utility line is buried below.

TEST DATA	METHOD	VALUE
Thickness	ASTM D2103-05	4.0 mil
Tensile Strength	ASTM D882-02	2,750 psi
Elongation	ASTM D882-75B	500%
Film Pigmentation	APWA Color-Coded	APWA Color-Coded
Message Repeat	Mfg. Specs.	Varies by Legend
Printed Inks	Mfg. Specs.	Flexo 9605
Printability	ASTM D2578	45 Dynes

****THIS SPEC COVERS WIDTHS OF: 2", 3", 4", 6", 12" and 24" Non-Detectable Marking Tape**

NON-DETECTABLE MARKING TAPE (6 MIL)

6.0 Mil Virgin Pigmented Polyethylene Film • Rated for Direct Burial for Marking Underground Utility Lines
 APWA Color-Coded for Representation and Visibility of Buried Utility Line

DESCRIPTION

PRO-LINE® Non-Detectable Marking Tape is used primarily for marking and underground utility structures. **PRO-LINE®** Non-Detectable Marking Tape serves three simple functions: Locate, Identify, and Protect. Non-Detectable Tape is usually the last category of a utility structures design and installation...maintenance and immediate location and identification. **PRO-LINE®** Non-Detectable Marking Tape is APWA Color-Coded to identify the type of utility that is buried below. Non-Detectable Marking Tape is also printed to identify what type of utility is buried below.



“Helping to Protect Underground Investments and the General Public Since 1992!”

STANDARDS & REFERENCES

PRO-LINE® Detectable Marking Tape meets or exceeds all applicable ASTM specifications.

- ASTM D2103-05 (Standard Specification for Polyethylene Film and Sheeting)
- ASTM D882-02 (Standard Test Method for Tensile Properties of Thin Plastic Sheeting)
- ASTM D882-75B (Standard Test Method for Tensile Properties of Thin Plastic Sheeting for Elongation)
- ASTM D2578 (Standard Test Method for Wetting Tension of Polyethylene and Polypropylene Films)

CONSTRUCTION

- **PRO-LINE®** Non-Detectable Marking Tape consists of a minimum 6.0 mil overall thickness, manufactured with virgin polyethylene with color pigments added at point of film extrusion to identify underground utility structures based on the APWA Color-Code .
- **PRO-LINE®** Non-Detectable Marking Tape is printed with big, bold, black lettering to identify what type of utility line is buried below.

TEST DATA	METHOD	VALUE
Thickness	ASTM D2103-05	6.0 mil
Tensile Strength	ASTM D882-02	4,100 psi
Elongation	ASTM D882-75B	700%
Film Pigmentation	APWA Color-Coded	APWA Color-Coded
Message Repeat	Mfg. Specs.	Varies by Legend
Printed Inks	Mfg. Specs.	Flexo 9605
Printability	ASTM D2578	45 Dynes

****THIS SPEC COVERS WIDTHS OF: 2", 3", 4", 6", 12" and 24" Non-Detectable Marking Tape**