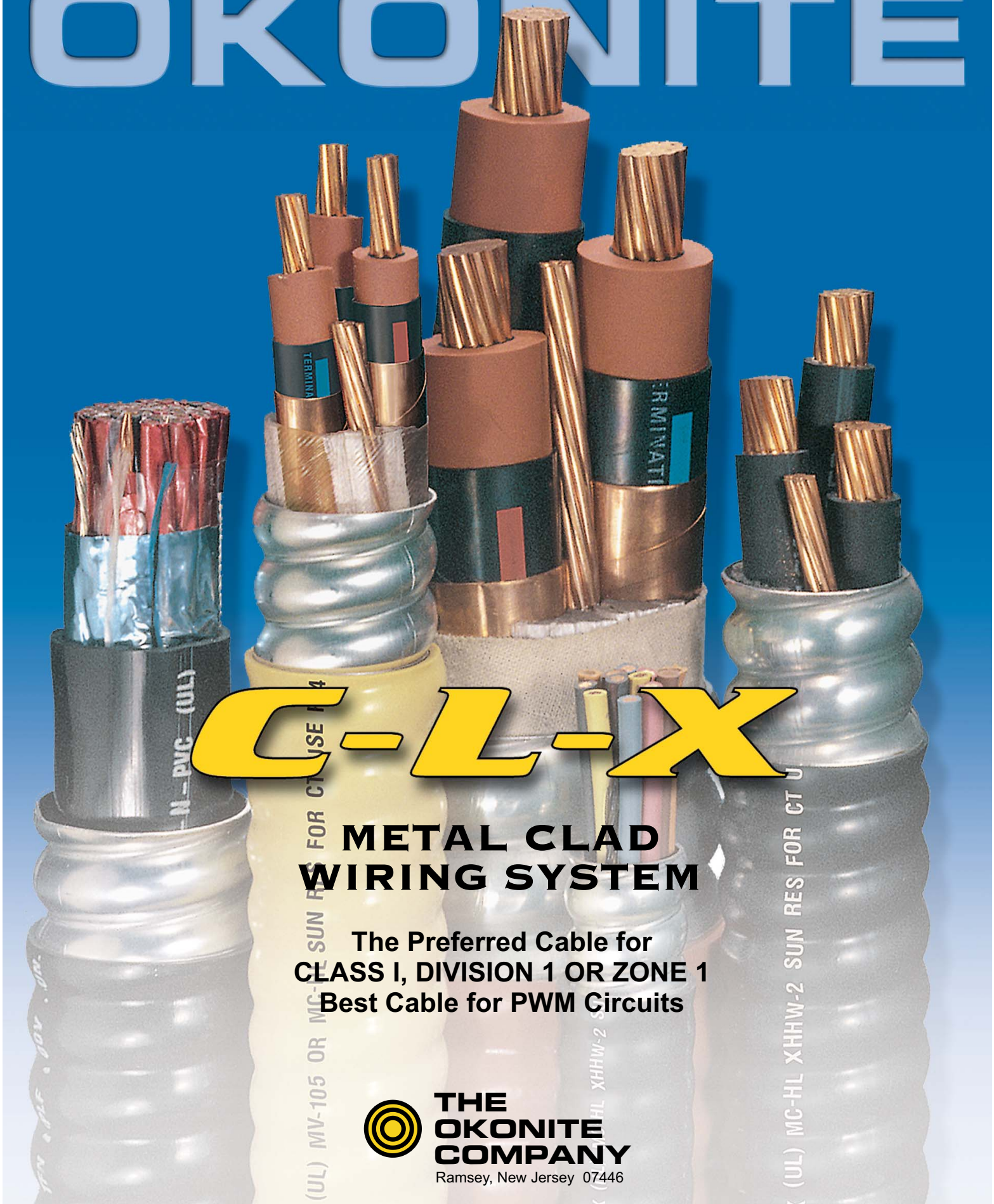
OKONITE



C-L-X

METAL CLAD WIRING SYSTEM

The Preferred Cable for
CLASS I, DIVISION 1 OR ZONE 1
Best Cable for PWM Circuits

THE OKONITE COMPANY
Ramsey, New Jersey 07446

OKONITE C-L-X CABLES

METAL CLAD WIRING SYSTEM

The Preferred Cable for CLASS I, DIVISION 1 OR ZONE 1 Best Cable for PWM Circuits

C-L-X® is The Okonite Company's welded and continuously corrugated metal clad wiring system. C-L-X offers engineers and specifiers a cable system with built-in environmental protection for all types of electrical circuit whether used for instrumentation, control, signal or power distribution. With millions of feet installed throughout the world in every type of climate, C-L-X has established a proven record of reliable performance.

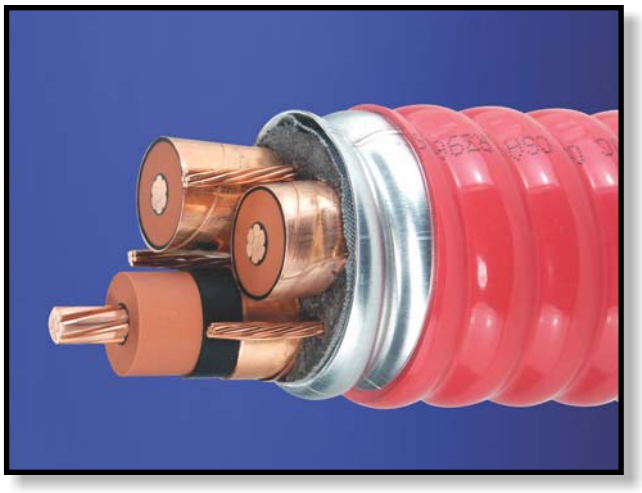
THE OKONITE COMPANY

INTRODUCTION

There are many reasons why users prefer Okonite C-L-X cables. C-L-X is the preferred cable for Class I, Division 1 or Zone 1. It's the best off-the-shelf cable for PWM drives.

C-L-X IS ITS OWN CONDUIT WIRING SYSTEM

C-L-X is a cable in conduit wiring system employing a mechanically strong yet flexible sheath of corrugated aluminum, copper, bronze or steel which can be applied over a variety of cable cores. C-L-X is a standard in many industries: Chemical, Petrochem, Pulp & Paper, High Tech, Food Plants, Metals, Mining, Transportation, Generation, etc.



C-L-X HAS A WIDE RANGE OF APPLICATIONS

C-L-X is used for instrumentation, control, low voltage and medium voltage power circuits. C-L-X is well recognized by the National Electrical Code. It is recognized in Article 330 "Metal-Clad Cable," as a factory assembly of one or more insulated circuit conductors in a corrugated metallic tube.

In accordance with Article 330, Type MC cable is permitted for the following uses:

- For PWM-VFD Drives
- For services, feeders, and branch circuits
- For power, lighting, control and signal circuits
- indoors or outdoors
- where exposed or concealed
- direct buried where identified for such use
- in cable tray, where identified for such use
- in any raceway
- as open runs of cable
- as aerial cable on a messenger
- in hazardous (classified) locations and as permitted in Articles 501, 502, 503, 504 and 505
- in wet or dry locations
- concrete encased

Article 725, “Remote Control, Signaling and Power Limited Circuits,” and Article 727 “Instrumentation Tray Cable: Type ITC” recognizes the use of a C-L-X sheath for Class 1, 2, or 3 circuits, power limited circuits as well as ITC Circuit application. C-L-X may also be used as a sheath on power limited fire alarm cable (FPL) per Article 760C “Power Limited Fire Alarm Circuits”. Per Article 501.10 (A) (1) (d) Type ITC-HL may be installed in hazardous Class I, Zone 1 or Division 1 locations.

C-L-X cables have been permitted to be used in Class I & II, Division 2 and Class III Division 1 & 2 locations for many years. The American Petroleum Institute (API) recognizes the use of C-L-X cables for Class I Division 1 locations in accordance with recommended practice 14F and Class I Zone 1 locations in accordance with recommended practice 14 FZ.

Since 1996 the NEC permits C-L-X Metal-Clad cables to be used in Class I and II Division 1 hazardous (classified) locations, provided they are listed for such use. MC-HL (Metal Clad-Hazardous Locations) cable is a permitted wiring method for Class I, Zone 1, or Division 1 hazardous locations per the 2008 NEC Article (5.05.15). Articles 501, 502 and 505 allow C-L-X sheathed cables as an alternate to costly metallic conduit or mineral insulated cable. These articles invoke specific constructional details, all of which Okonite C-L-X cables include.

NEC RECOGNIZED FOR DIVISION 1 AND ZONE 1 HAZARDOUS LOCATIONS

These details are:

1. A gas/vapor tight continuous corrugated aluminum sheath.
2. A separate grounding conductor per Article 250.118.
3. An overall polymeric jacket.

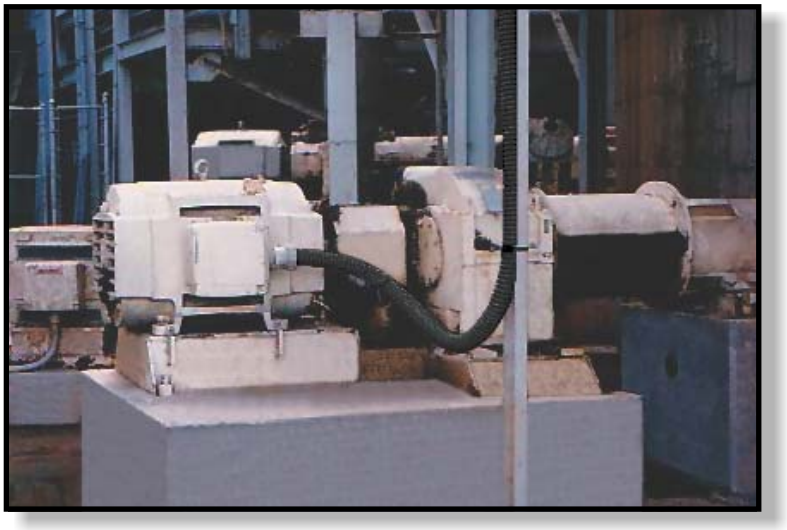
UL Standard 2225 “Standard For Metal-Clad Cable and Cable Sealing Fittings For Hazardous (Classified) Locations,” is the industry standard for this listing. This standard mandates performance tests more stringent than those required for Type MC cable. In order to be labeled for Division 1 hazardous locations (Type MC-HL) by UL the C-L-X cables must meet the following criteria:

1. a low temperature -40°C impact test.
2. a more severe room temperature impact test.
3. a more severe room temperature crush test.
4. a more severe vertical tray flame test.

C-L-X IS THE SOLUTION FOR PWM VARIABLE SPEED DRIVES

DRIVE TECHNOLOGY

The new generation of I.G.B.T. (insulated gate bipolar transistor) type high speed a.c. drives utilize increased switching rates. This advanced technology offers many benefits including smaller more economical drives, lower audible noise, enhanced performance at low speeds and reduced harmonic ripple currents which minimize motor overheating.



With these benefits have come some unanticipated challenges to the drive systems. The increased switching rate has increased the frequency of the electromagnetic noise into the Mhz range. The higher Mhz ranges cause detrimental reflected waves and EMI/harmonic effects. The problems that now arise, although intermittent, include trips and reduced cable and motor life. Drives, cables and motors must all perform together in this system. These components must be evaluated as a system to assure optimum performance and reliability.

THE OKONITE/C-L-X SOLUTION

C-L-X cable with its continuously welded and corrugated aluminum armor has become the preferred cable for use with the new ac drive technology. The exceptional shielding characteristics of the armor along with the high dielectric strength and low permativity of the proprietary insulation combined with a 3-ground wire configuration located at 120° spacing in the cable core has proven to be the right combination for this demanding application. In tests performed by the major drive manufacturers, C-L-X has been superior, providing optimum performance.

C-L-X CERTIFIED BY ABS FOR SHIPBOARD CABLE

C-L-X cables are certified by the American Bureau of Shipping as “CWCMC” cable*. This certification allows its use for power distribution, control and signal cable in classified (hazardous) and unclassified locations. With this certification, C-L-X cables may be installed on off-shore drilling units, fixed and floating production platforms and on-board vessels. These cables are also listed by UL to Standard 1309, “Marine Shipboard Cable”. Table 1 summarizes the many third party certifications for C-L-X products in the marine shipboard industry.

Table 1 - C-L-X Marine Cable Approvals

	ABS Rules (4/5C7.1)	ABS Rules (4/3.131)	API Std 14F	API Std 14EZ	CSA Std. C22.2 No. 245	IEC 60092 -350	IEEE 45	IEEE 1202	IEEE 1580	UL Type FPL	UL 13 Type PLTC	UL 1072	UL 1309 (Marine Shipboard Cable)	UL 1569 Type MC	UL 2225 Type MC	UL 22250 Type ITC	UL Type NFPL	USCG 46CFR 111.60-
300 Volt Signal and Communication Cable																		
P-OS Okoseal Okoseal CWCMC-PLTC Okoseal	X	X	X	X	X	X	X	X	X	X	X		X					X
SP-OS Okoseal Okoseal CWCMC-PLTC Okoseal	X	X	X	X	X	X	X	X	X	X	X		X					X
P-OS Okoseal Okoseal CWCMC-ITC Okoseal	X	X	X	X	X	X	X	X	X	X			X			X		X
SP-OS Okoseal Okoseal CWCMC-ITC Okoseal	X	X	X	X	X	X	X	X	X	X			X			X		X
600 Volt Distribution and Control Cable																		
Okoseal-Nylon CWCMC Okoseal	X	X	X	X	X	X	X	X	X				X	X	X		X	X
Okoseal-Nylon Okoseal CWCMC Okoseal	X	X	X	X	X	X	X	X	X				X	X	X		X	X
X-Olene CWCMC Okoseal	X	X	X	X	X	X	X	X	X				X	X	X		X	X
Medium Voltage Power Cable																		
Okoguard Non-shielded CWCMC Okoseal 2.4 kV	X	X	X	X	X	X	X	X	X			X	X	X	X			X
Okoguard Shielded CWCMC Okoseal 5-35kV	X	X	X	X	X	X	X	X	X			X	X	X	X			X

ABS+American Bureau of Shipping
Modu Rules (4/5C7.1)
Steel Vessel Rules (4/3.131)
API+American Petroleum Institute
API 14F=Fixed and Floating Platforms Divisions
API 14FZ=Fixed and Floating Platforms Zones
CSA+Canadian Standards Association
C22.2 No. 245=Marine Shipboard Cable
IEC=International Electrochemical Commission
60092-350=Cable and Cable Installation
IEEE=Institute of Electrical and Electronic Engineers
45=Recommended Practice for Installation on Ships
1580=Recommended Practice or Cables on Ships and Fixed & Floating Platforms
UL-Underwriters Laboratories
CWCMD=Corrugated aluminum sheath
FPL=Power Limited Fire Protective Signaling Cable
ITC=Instrumentation Tray Cable
MC=Metal Clad
MC-HL=Metal Clad-Hazardous Location
NFPL=Non-power Limited Fire Protective Signaling Cable
OKO-Marine=Type TC with Marine Markings
PLTC=Power Limited Tray Cable
USCG=United States Coast Guard
46CFR=Coast Guard Marine Regulations

*A formal Okonite ABS certification is available at the ABS website, www.typeapproval.org.
Go to “Product Search” and type “Okonite” for a complete list of Okonite certification by factory.

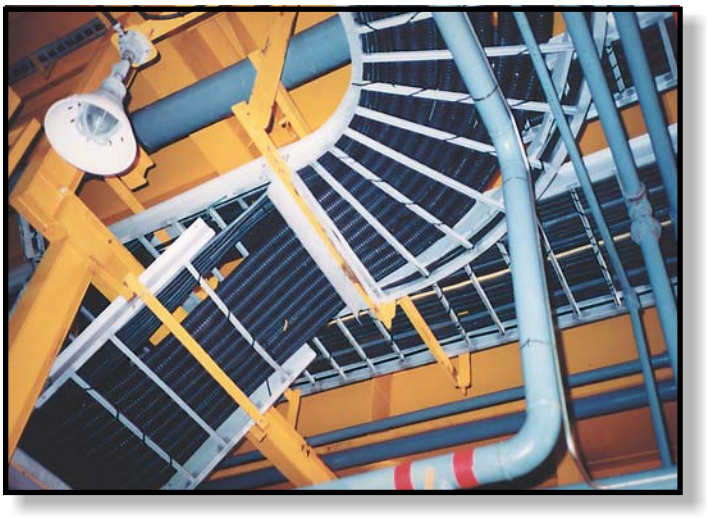
C-L-X IS MECHANICALLY STRONG

C-L-X’s mechanical strength is demonstrated by its compliance to the more severe impact and crush requirements mandated by UL Standard 2225 for Division 1 or Zone 1 Hazardous Locations. The inherent strength of the metal used is multiplied many times over by its engineered corrugations.

C-L-X IS EASY TO HANDLE AND INSTALL

C-L-X is flexible and can be easily trained on trays, ladders or other supports. The minimum bending radius for multiconductor cable is 7 times the cable diameter. As with any cable, care should be taken to avoid exceeding the bending radius, (particularly when rollers are used), or exceeding approved sidewall pressure limits.

C-L-X is easily installed, spliced and terminated. C-L-X is available in very long lengths, is light in weight and can be pulled into trays or placed on ladders using appropriate rollers and following good installation practices.



Procedures for splicing and terminating can be easily carried out with a wide range of off-the-shelf kits available from various manufacturers.

C-L-X OFFERS PROTECTION FROM THE ENVIRONMENT

The C-L-X armor is a flexible tube built with a highly engineered continuous argon gas arc weld system. C-L-X cables provide a gas and vapor-tight continuous sheath. The standard jacket is Okoseal (a low temperature, sunlight resistant, PVC material). Other jackets are available for use in specific environmental conditions.

C-L-X IS AN ECONOMICAL FACTORY BUILT CABLE

C-L-X provides its own conduit system and has excellent ampacity ratings. Low voltage power cables are suitable for 90°C wet or dry applications. Okoguard medium voltage shielded cables are rated for 105°C conductor temperatures.

C-L-X is manufactured in long continuous lengths, thus reducing scrap and is available in a wide array of sizes and voltages.

C-L-X PROVIDES EXCELLENT FLAME RESISTANCE

Standard-stock C-L-X meets all current standards for cable tray flame testing including IEEE 383, IEEE 1202, CSA FT-4, ICEA T-29-520 (210,000 BTU) and UL 1569 with or without an overall jacket. The C-L-X's continuous metal sheath provides excellent protection from flame.

C-L-X cables with an Okoclear low smoke non-halogenated jacket meet the requirements of UL 1685 and can be labeled "Limited Smoke."

C-L-X IS A LOW RESISTANCE GROUND PATH

In addition to its mechanical, moisture and flame resistance properties, C-L-X provides high attenuation shielding for instrumentation, control and signal circuits. C-L-X provides a symmetrical low impedance return path. Tests have demonstrated C-L-X to be a highly effective method of reducing common mode currents, cross talk, motor frame voltage and injected ground current - all important considerations for pulse width modulation (PWM) ac drive applications.

C-L-X PROVIDES ADDITIONAL GROUND PATH

Although the C-L-X sheath provides a more than adequate ground, per NEC Table 250.122, one or more grounding conductors are provided on low and medium voltage power cables.

MANUFACTURING

C-L-X offers a complete, versatile wiring system for instrumentation, control, signal or power circuits.

C-L-X Instrumentation Cable comes in many different core constructions, including twisted pairs, triads and quads in sizes from #20 to #16 AWG. In addition to the standard aluminum polyester tape shield over the components or overall, other shields including copper braids and tape are also available. The C-L-X sheath substantially increases the shielding effectiveness of the cable system.

C-L-X Control Cable is manufactured in sizes 14, 12 and 10 AWG using colored compounds for individual conductor identifications. The insulation is rated XHHW-2 90°C, wet or dry.

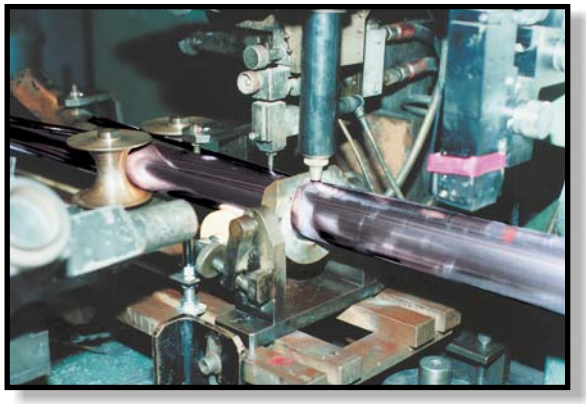
C-L-X Low Voltage Power Cable, sizes #8 AWG and larger, provides phase identification via colored compounds or printed numbers on the surface of the insulation. Although the NEC permits the C-L-X sheath to act as a ground, for added safety, Okonite includes one or more copper ground conductors inside the cable construction. The insulation is rated XHHW-2, 90°C wet or dry.

Composite constructions of control and power conductors can be provided under the C-L-X sheath.

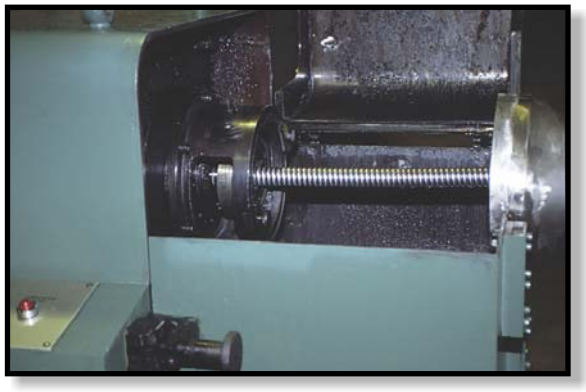
A 2.4kV non-shielded construction is available for those applications where termination space is limited. Printed colors are used for phase identification.

All individual conductors are thoroughly tested prior to being encapsulated within the C-L-X sheath. Insulated conductors must also pass the test requirements set forth by the applicable standards of UL, ICEA, IEEE, CSA, AEIC and IEC.

Metal sheath being applied to a low voltage power cable

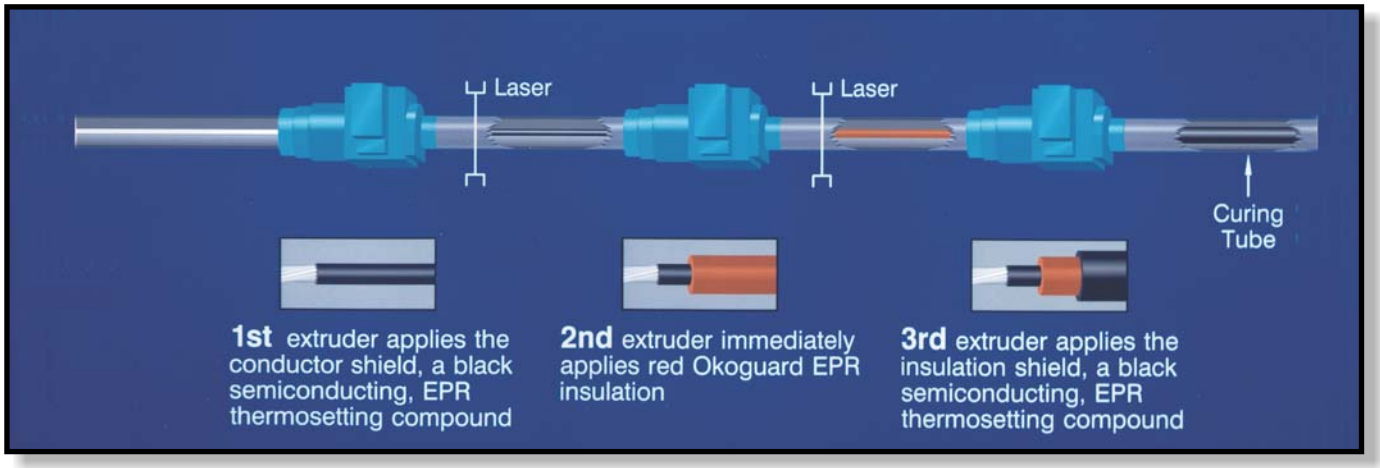


Continuous welding of metal sheath



C-L-X corrugation operation

OKONITE'S OKOGUARD TRIPLE TANDEM EXTRUSION PROCESS



Shielded power cables from 5 to 69kV utilize the unique Okoguard all EPR insulation system. Inner and outer semi-conducting layers, as well as Okoguard insulation, all are made with Okonite's EPR based compounds.

Prior to shipping, each reel of finished cable receives final electrical tests in accordance with the applicable standards to assure continuity and insulation integrity.

Corona test on single conductor prior to cabling

Extra long length of C-L-X

Okonite can produce and ship extra long lengths that eliminiate the need for splicing and reduce the amount of scrap generated in the field. Okonite Service Centers and the Manufacturing Plants can cut cable to specific lengths upon request.

SHEATHS & COVERINGS

C-L-X stock cables are manufactured with an aluminum continuously welded corrugated sheath and covered with an overall low temperature, flame retardant Okoseal jacket. Its design, which meets the ICEA and UL requirements, is an economical wiring choice for most applications.

In some cases, it may be desirable to order C-L-X cables with other metals or jackets for special installation and operational needs. Tables 2 and 3 have been prepared to assist in evaluating these combinations for improved features.

AVAILABLE C-L-X SHEATH & JACKET PROPERTIES

Table 2 - Sheaths

Metal Sheath	Conductivity	Shielding Capability	Mechanical Strength	Flexibility	Flame Resistance	Chemical Resistance	Corrosion
Aluminum [1]	Good	Good	Good	Excellent	Fair	Fair	Fair
Copper [2]	Excellent	Excellent	Good	Excellent	Good	Good	Excellent
Steel [3]	Fair	Fair	Excellent	Good	Excellent	Fair	Fair
Stainless Steel [4]	Poor	Poor	Excellent	Good	Excellent	Excellent	Excellent

[1] Aluminum is the standard construction.
[2] Copper sheath provides excellent electrostatic and good electromagnetic shielding effectiveness.
[3] Steel sheath provides excellent electromagnetic shielding effectiveness.
[4] Provides best chemical resistance.

Table 3 - Jackets

Jacket Material	Oil resistance	Flame Resistance	Mechanical Strength	Moisture Resistance	Smoke & Corrositivity	Color Stability	Low Temperature
Okoseal PVC	Good	Good	Good	Good	Poor	Excellent	Excellent
Okolene Polyethylene	Excellent	Poor	Excellent	Excellent	Good	Excellent	Excellent
Okolon CSPE	Excellent	Excellent	Good	Good	Fair	Good	Good
Okoclear Low Smoke	Good	Fair	Fair	Good	Excellent	Good	Good
Okosheath CPE	Fair	Good	Good	Good	Good	Good	Excellent

* Special compound of Okoprene is available for Arctic applications

C-L-X SHEATH AS A GROUNDING CONDUCTOR

This table provides the copper or aluminum grounding conductor equivalent and the 10 cycle fault current (Amps) for C-L-X aluminum sheath (not including the bare copper ground wire in the interstices of power cable). This table applies to all aluminum C-L-X cable types.

CLX OD inches	Aluminum Cross-Sectional Area (kcmil)	Equivalent Grounding Conductor Copper	Aluminum	CLX 10 Cycle Fault Capability* (kA)
0.38	27.24	10	6	2.75
0.43	31.24	9	6	3.16
0.49	35.24	8	5	3.56
0.53	39.03	8	5	3.95
0.58	43.08	8	4	4.36
0.62	46.68	7	4	4.72
0.67	50.29	7	4	5.09
0.71	53.99	7	3	5.46
0.75	57.60	6	3	5.83
0.80	61.42	6	3	6.21
0.84	65.34	6	3	6.61
0.89	68.95	5	2	6.97
0.93	72.60	5	2	7.34
0.97	76.21	5	2	7.71
1.02	80.04	5	2	8.10
1.06	84.04	5	1	8.50
1.11	87.65	4	1	8.87
1.15	91.34	4	1	9.24
1.19	136.8	3	1/0	13.84
1.24	142.1	2	2/0	14.37
1.29	148.5	2	2/0	15.02
1.34	154.1	2	2/0	15.59
1.37	159.0	2	2/0	16.08
1.42	164.5	2	2/0	16.64
1.47	169.9	1	3/0	17.18
1.51	175.9	1	3/0	17.80
1.56	181.2	1	3/0	18.33
1.60	186.5	1	3/0	18.86
1.64	191.8	1	3/0	19.40
1.69	197.1	1	3/0	19.93
1.74	203.4	1	3/0	20.57
1.78	208.6	1	3/0	21.10
1.83	213.8	1	4/0	21.62
1.87	219.2	1	4/0	22.17
1.92	224.7	1/0	4/0	22.73
1.96	230.4	1/0	4/0	23.30
2.01	236.7	1/0	4/0	23.94
2.06	242.0	1/0	4/0	24.48
2.10	247.3	1/0	4/0	25.01
2.15	252.8	1/0	250	25.57
2.19	257.9	1/0	250	26.09
2.23	263.2	1/0	250	26.62
2.28	268.7	1/0	250	27.18
2.32	273.8	1/0	250	27.69
2.36	279.0	2/0	250	28.22
2.40	284.7	2/0	250	28.79
2.45	290.0	2/0	250	29.34
2.49	295.3	2/0	250	29.87
2.53	300.5	2/0	300	30.40
2.58	305.9	2/0	300	30.94
2.62	311.4	2/0	300	31.50
2.67	316.7	2/0	300	32.03
2.71	371.6	3/0	350	37.58
2.75	377.7	3/0	350	38.20
2.80	383.8	3/0	350	38.83
2.85	391.4	3/0	350	39.59
2.89	397.2	3/0	350	40.18
2.93	403.2	3/0	400	40.79
2.98	409.7	3/0	400	41.44
3.03	414.8	3/0	400	41.95
3.07	420.8	3/0	400	42.57
3.11	519.2	4/0	500	52.52
3.16	526.8	4/0	500	53.28
3.24	538.9	4/0	500	54.51
3.32	553.2	4/0	550	55.96
3.41	566.3	4/0	550	57.28
3.45	701.0	300	700	70.91
3.63	737.0	350	700	74.55
3.67	746.0	350	700	75.46
3.76	764.3	350	750	77.31
3.80	773.4	350	750	78.23
4.02	819.5	350	800	82.89
4.10	837.9	400	800	84.75
4.19	856.1	400	850	86.60
4.32	882.5	400	850	89.27
4.45	908.8	400	900	91.93
4.71	964.0	450	950	97.51
5.18	1,256.5	600	1250	127.09

* Short Circuit Capacity based on ICEA P-45-482

INSTALLATION

As with any wiring system, the installer must follow the recommended installation practices for C-L-X, demonstrating normal care and the use of good installation practices in order for the cable to provide the reliability of service for which it was purchased.

Aerial C-L-X Cable Installation

Here are some general guidelines that should be followed:

1. Minimum bending radius during installation: It is essential that proper size rollers or other guides be used. The minimum bending radius for multiconductor C-L-X is 7 times the cable OD. Using smaller rollers than recommended can either kink or otherwise damage electrical cables. Roller assemblies must develop a smooth regular bending radius in the cable.
2. Pulling tension: Pulling eyes/bolts or basket grips should be used to pull the cable. Maximum pulling tensions are calculated for C-L-X cables in the same manner as non C-L-X cables.
3. Sidewall pressure should not exceed 500 pounds/foot of radius.
4. When bending C-L-X at angles of 90° or less, quadrant roller assemblies with a minimum of 5 rollers in the frame should be used for installation guides.
5. Termination fittings are supplied by several manufacturers. Okonite can provide advice on the proper design.
6. For special installations, such as long vertical riser shafts, consult with an Okonite representative.

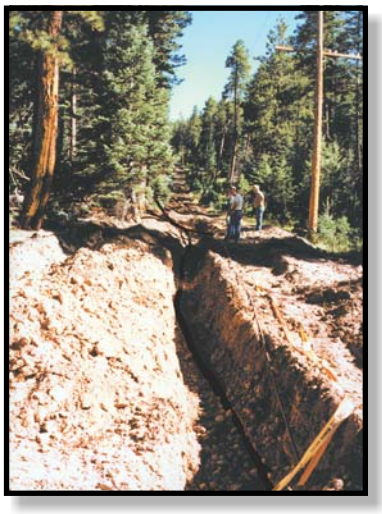
TYPICAL INDUSTRY APPLICATIONS

C-L-X has been used extensively for a variety of applications involving the distribution of power, control and instrumentation circuits in petrochemical plants; oil refineries and oil producing facilities, including onshore and offshore oil rigs; pulp and paper plants; high tech and many other heavy industrial manufacturing facilities. C-L-X cable has been used in all climates from the Tropics to the Arctic. Various structures may be used to provide mechanical support for the cables.

Bronze C-L-X Cable

C-L-X “Mountain Cable”

Other applications include underwater submarine cables, shipboard circuits, underground subway feeders and mountain cable. C-L-X “Mountain Cable” was installed on Mount Lemon outside Tucson, Arizona using a 25kV, C-L-X Okoguard insulated cable (3 single conductors) to provide power to a 9000 foot elevation mountain top ski resort serving a year round population of 350 residents.



Installation of C-L-X “Mountain Cable”

PRODUCT PERFORMANCE SUMMARY

The continuously corrugated and welded aluminum C-L-X sheath is a metal clad cable assembly and offers superior functional characteristics compared to cable assemblies using non-metallic sheath multiple polymeric layers for the outer coverings.

Available since THE EARLY 1970'S, the C-L-X sheath is a mature cable assembly and is part of cable systems rated from instrumentation to 46kV medium voltage. The C-L-X sheath has achieved specific recognition in the National Electrical Code for use in severe hazardous locations.

A summary of product features is:

- (UL) type MC approved cable type, many carry the "-HL" designation for use in Class I, Division 1 and Zone 1 hazardous locations.
- C-L-X MC is a factory assembly of cable in conduit, providing flexibility for cable tray and underground burial and raceway installations.
- C-L-X MC cable is installed using simple installation equipment and established installation techniques.
- C-L-X MC is weight and diameter efficient for cable tray installation.
- C-L-X MC is accepted for all uses and applications in various process industries.
- C-L-X MC is the technically recognized cable type for variable frequency drives.
- C-L-X MC sheath is a recognized grounding conductor.
- C-L-X MC is a recognized voltage separation barrier in cable tray systems.
- C-L-X MC provides a safe 360 degree low resistance path to ground for fast system protection.
- C-L-X MC cable constructions are supported by accessory manufacturers.
- C-L-X MC is flexible and suitable for cable tray installation.
- C-L-X MC passes all known flame propagation tests.
- C-L-X MC is the overwhelming cable of choice for open wire installations.
- C-L-X MC is an established cable construction for over 35 years and continues to provide uninterrupted service.

C-L-X ARMOR REMOVAL PROCEDURES

USING THE KETT MODEL #KS-226 CABLE SAW

The procedure listed below details Okonite's recommended method for removing C-L-X armor from large and small diameter cables. These procedures apply to all types of C-L-X armor - aluminum, copper, bronze and stainless steel. These procedures do not apply to LOX (interlocked armor).

The C-L-X armor will be removed with the Kett Cable Saw that utilizes a motor driven rotating blade. Safe working practices are to be observed, e.g., safety glasses and work gloves. Local electrical codes are to be observed. Practice sessions are recommended to familiarize all concerned with the procedures and equipment.

SPLICING & TERMINATING

Removal of C-L-X

1. Using a knife or other tool, cut the jacket to a point where there will be sufficient length of conductors exposed within the enclosure once the C-L-X is removed.

2. Remove the jacket by peeling it along the cut away from the corrugated sheath underneath.

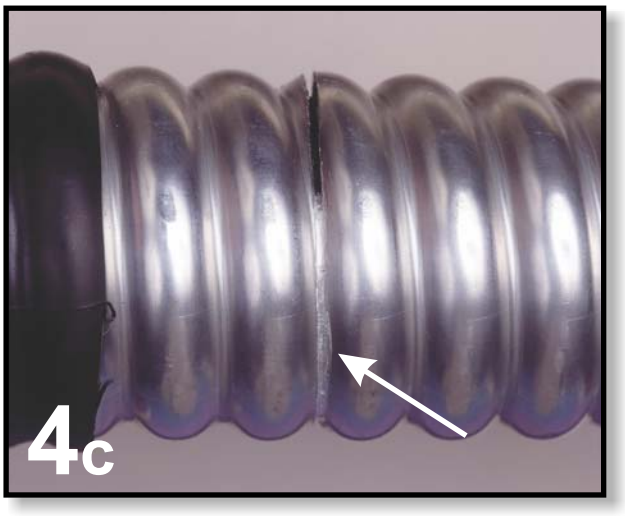
3. Refer to the C-L-X fitting instructions for the length of C-L-X armor to be exposed beyond the end of the jacket and mark the C-L-X armor at the top of the crown nearest to the point.

FOR C-L-X DIAMETERS 1 5/8" & SMALLER, SEE STEPS 9 - 11

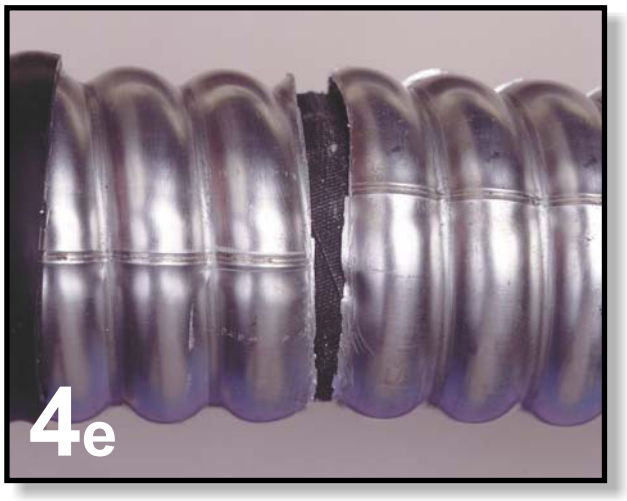
FOR C-L-X DIAMETERS GREATER THAN 1 5/8" FOLLOW STEPS 4 - 8

4a. Using a hacksaw blade, (note the Kett saw tool kit is supplied with a hacksaw blade and blade holder) cut through and across the crown (high point) of the C-L-X at an angle so as to connect (or bridge) the valleys (low points) on both sides of the crown.

4b,c. Again using a hacksaw blade, make a circumferential score in the valleys adjacent to the cut crown connecting both sides of the crown cut to the valleys. (see arrow)



4d,e. Holding the score area rigid, flex the cable by moving the free end so as to break the score around the circumference of the cable.



5. Next the C-L-X will be longitudinally cut by performing the following:

Note on the Kett Saw:

The longitudinal cut is made with the Kett saw, which has an adjustable positive depth stop that can be set so the saw blade cuts through the crowns and partially cuts through the valleys (see figure 1). A proper saw depth is achieved when 80 to 95% of the metal in the valley is removed. Use an extra piece of the cable being terminated to adjust the blade depth and practice.

If it is necessary to stop cutting or if a portion of the cut is to be repeated, use caution when reinserting the blade as kickback may occur. With cable secured, start at the free end of the cable and advance the Kett saw, making sure to use slight downward pressure to maintain the depth of cut along the cable, to the ring cut. When advancing the saw, be sure to maintain a straight line by cutting along the high point of the cable; this effects the cut depth also. See below.

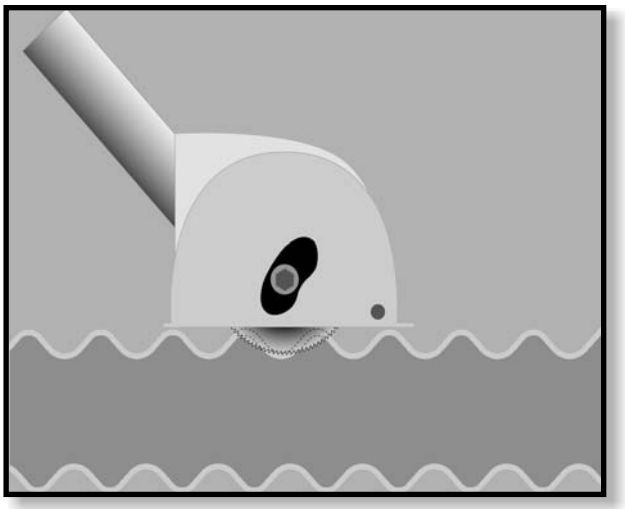
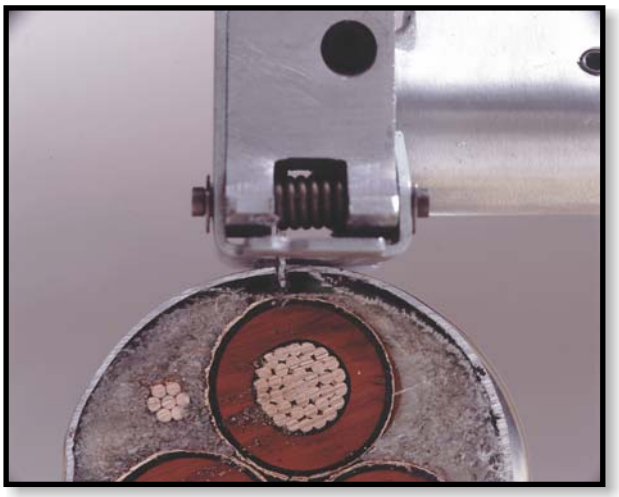
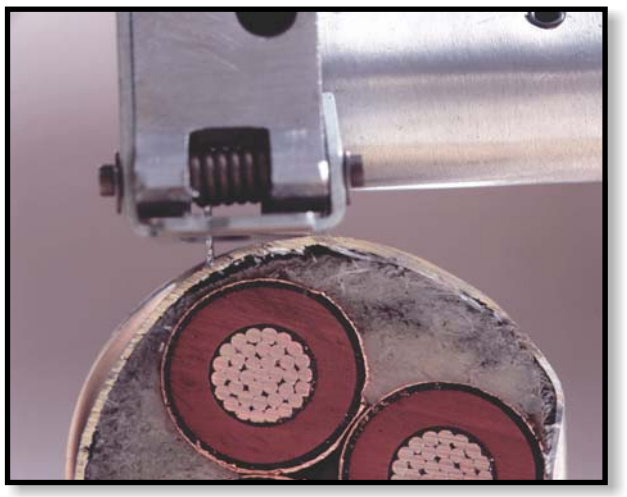


Fig. 1 Set blade to remove 80 to 95% of the metal thickness in the valley

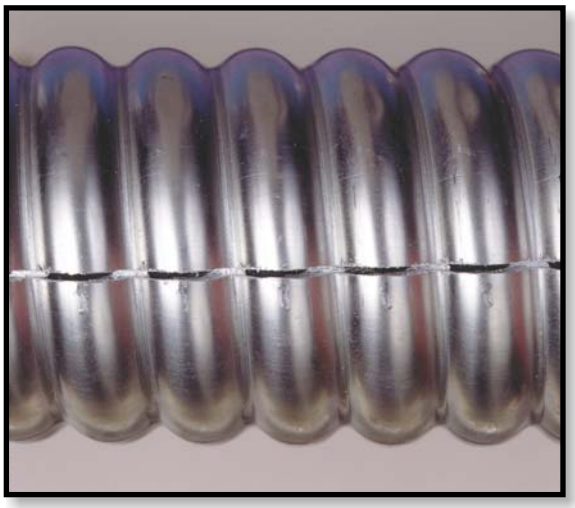
Maintain Saw on Top of Cable



CORRECT



INCORRECT



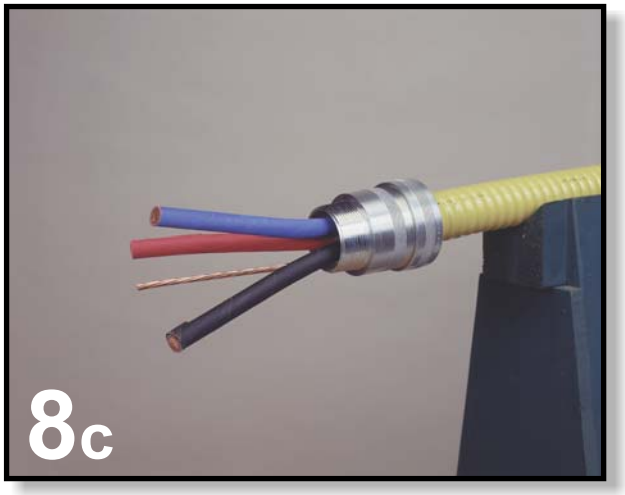
Completed cut at proper depth.

Proper saw blade depth.

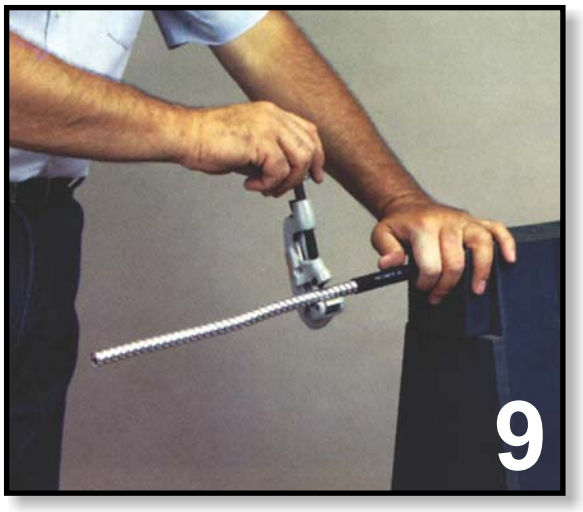
6a,b,c. At the completion of the longitudinal cut, starting at the free end, insert a wide blade screwdriver into the cut and twist. Repeat until the ring cut is reached. This will cause the remaining metal in the valleys to break open and the armor to loosen on the cable. Do not drive the screwdriver into the cut with excessive force as this may damage the underlying conductors.

7. Slide the armor off the cable. In the event that the armor is tight around the cable, pliers may be used to grab the armor at the split and pull it away from the cable. For large diameter cables, where long lengths of armor are to be removed, two cuts spaced 180° apart are recommended so that the armor may be removed in two pieces.

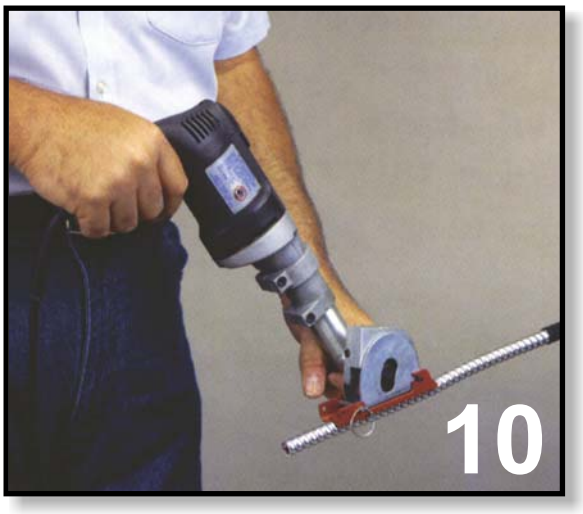
8a,b,c. Remove the cable fillers and marker tape. Install the armor connector onto the cable core end according to the manufacturer's instructions. The C-L-X sheath is now ready to terminate into the enclosure or to splice.



FOR C-L-X DIAMETERS 1 5/8" & SMALLER, SEE STEPS 9 - 11

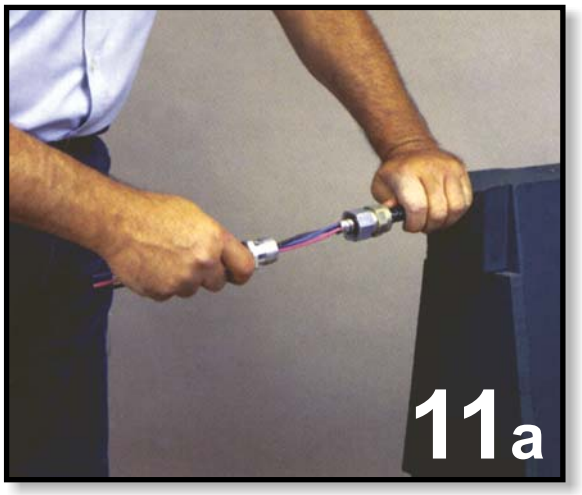


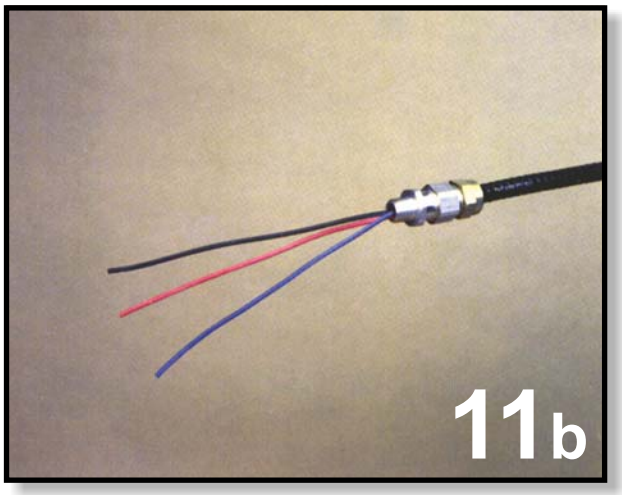
9. For C-L-X diameters 1 5/8" and smaller use a hacksaw blade or tubing cutter to circumferentially score the C-L-X armor. Grip the cable in both hands with the score centered between hands, and flex the cable at the score line until it opens. Slide the sheath off the cable.



10. For C-L-X cables with an inner jacket or cable constructions where the C-L-X armor is tight fitting around the insulated conductors, the Kett saw should be used with the optional red colored cable guide. This guide assists in centering the saw on small diameter cable. The procedures and precautions of steps 3 to 10 apply here

11a,b. Remove the cable fillers and marker tape and install the C-L-X fitting as per manufacturer's instructions. The cable is now ready to terminate into the enclosure.





C-L-X REMOVAL TOOL KIT

Armor cable fittings, termination and splice kits are available from several sources. Contact your Okonite representative if assistance is needed.

Okonite offers a complete C-L-X Removal Tool Kit (Catalog Sheet #6:5) to assist in the installation of C-L-X cable.