TECHNICAL NEWS
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Small Diameter Cable Designs

Medium voltage cable constructions installed in urban underground raceway systems are predominately the traditional 3/C Compact Sector Copper, paper insulated, metallic sheath, polyethylene jacketed cable (PILC). As shown in Figure 1, these cables are diameter efficient by design and offer the highest ampacity (ampere) to duct ratio.

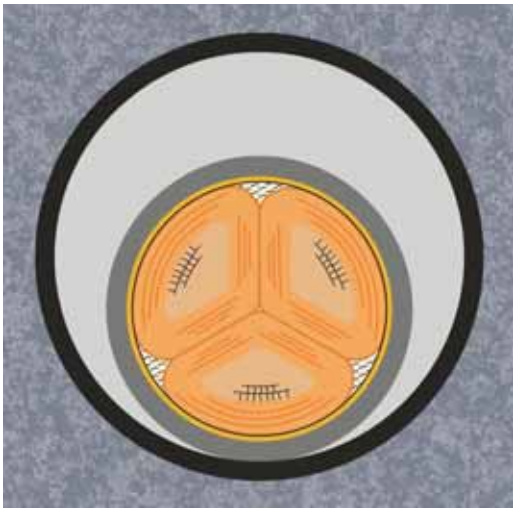

Figure 1 - 3/C PILC Cable

These PILC cable constructions remain the backbone of the urban downtown network system having an enviable long term in-service life capable of handling the aggressive thermal environment due to the heavy constant ampere loading. PILC cables continue to be manufactured today serving the heavy load applications.

The option of specifying an equivalent solid dielectric cable construction requires the use of round conductor geometry to accommodate the factory extrusion tooling of the basic cable core. The EPR (Ethylene Propylene Rubber) insulation system is the insulation of choice for these heavy duty high temperature rated operating systems. EPR offers a stable response to heat cycling from ambient to well over 140°C.

All cable components for the solid dielectric cable design must be applied to the compact round conductor with accuracy and precision needed to meet the application raceway diameter.

The cable's metallic shield also contributes to the small diameter design controls by using shaped copper. Round copper wires can be processed into rectangular shapes needed to maintain the low diameter profile. These flat copper straps are applied in a helical wrap around the basic cable core.

Flat Strap Design Options -

1. The length, width and number of straps can be selected to match the electrical conductivity of the PILC cable's metallic sheath. This tubular lead sheath has a conductivity of approximately 7.5% compared to the 100% conductivity offered by copper. Okonite's Engineering Handbook (EHB) can be referenced for the calculation technique required to equate the conductivity level of each.
2. A different option is to select the flat copper straps based on a system short circuit requirement specified by fault current amperes and a time duration of protective equipment expressed in cycles. Using the ampere level and time, an equivalent amount of copper can be calculated referencing ICEA P-45-482, Short Circuit Characteristics of Metallic Shields and Sheaths on Insulated Cable.
3. The straps can also be specified as a concentric neutral based on a percentage of the main conductor conductivity.

Okonite has the in-house processing capability to mechanically draw down and simultaneously anneal the copper wire into the required strap dimensions.

The more common individual flat copper strap sizes are:

Thickness x Width, mils	Circular Mil Area
20 x 150	3819
20 x 175	4456
20 x 225	5729
35 x 200	8911

The cable construction is completed by applying an overall encapsulating jacket of polyethylene or polypropylene depending on the physical characteristics required for the project environment. Reference Figure 2 for a detail of the completed 3 X 1/C cable assembly.

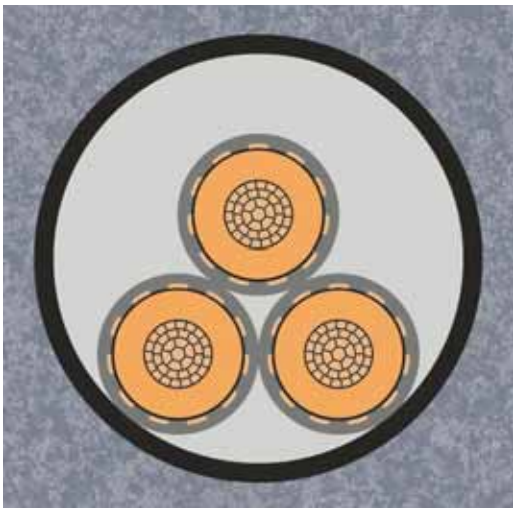

Figure 2 - 3 X 1/C EPR - Flat Strap Cable

These small diameter cable designs are usually shipped as a Triplexed configuration. The circular diameter resulting from this factory assembly fits into the existing raceway with a raceway ID to cable assembly OD of 0.50 inches of clearance.

Contact your local Okonite representative by visiting our website, www.okonite.com, and ask our Engineering staff to develop a small diameter cable construction to suit your application needs.

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