



American Polywater's

# TechnicalTalk

A PUBLICATION FOR ENGINEERS INVOLVED IN ELECTRICAL CABLE INSTALLATION



Volume 6

## REMOVING CABLES FROM CONDUIT

Recabling is common in the refurbishment of electrical and communication systems. In such refurbishment, for both practical and economic reasons, the new cables are often installed in existing conduits. To get the "new" in, the "old" must be pulled out. Removal of "old" cable(s) from conduit is the subject of this issue.

### Run the Film Backwards

In theory, the removal of old cable from conduit is straightforward. If the cable could be pulled in to begin with, it should be possible to pull it back out.

However, the friction coefficient may be high, since the old style soap or wax lubricants will be long gone (or hardened). But, by using a reasonably high coefficient of friction (say 1.5) in the pulling calculations performed by the Pull-Planner™ 2000 Software, we could determine the tension required to move the cable. If this calculated tension *was less than the tensile strength of the conductor(s)*, we should be able to yank the cable out.

Specific sidewall pressure is not of concern since the old cable is presumably scrapped. If our calculated removal tension *was greater than the conductor tensile strength*, we could lower the coefficient of friction by *relubricating* the cable/conduit, and then pull the old cable out. It seems simple in theory. .

## Relubrication -- a Partial Solution

This approach is at least partially valid. Polywater liquid lubricants have been used for years as cable removal aids with some success. The liquids (POLYWATER® A and F) are favored since they're the easiest to disperse throughout a conduit. The POLYWATER® Lubricant functions in cable removal just as it does in cable installation. It lowers the coefficient of friction of jacket against conduit wall, which lowers the tension to remove (pull out) the cable.

However, pulling tension is *not the only* problem in removing old cable. Often, the cable is "adhered" or "cemented" to the conduit by dried wax or soap lubricant, silt, rust, or exuded bitumen. While this bonding is usually discontinuous and weak, it can still require enormous force to initially move the cable because we have to *shear* the whole length of the adhesive bond.

Analogously, it's easy to pull off masking tape when the peeling is done at 90° to the surface. However, if we try to pull that same tape from a surface in its own plane, it requires very high forces. The reason is the *shear* strength of the adhesive bond. Such adhesion can require forces many times those predicted in the pulling equations to initially break the cable loose.

## What's a "Loosener"?

POLYWATER® Lubricants are not designed to *dissolve cable binding agents*. "Something" special is needed to "break the bond" by dissolving or softening the adhesive. For lack of an existing name for these "somethings," we have called them "looseners" or "cable looseners." The first such loosener, developed by American Polywater, is trade named CableFree™. What penetrating oil is to a rusted, frozen bolt, CableFree™ Loosener is to a stuck, frozen cable.

CableFree™ Loosener is *both* a lubricant *and* a softener for cable binding agents. It comes as a slippery, white-colored, pleasant-smelling liquid. The flowable liquid properties are an advantage in application.

## Loosening Basics

The CableFree™ Loosener is spread through the conduit and allowed to sit for a period of time to soften the binding agents. Once the cable has broken free, the loosener serves as a lubricant to lower pulling tension.

A variety of techniques can be used to disperse the liquid loosener through the conduit system. One good method is to pump the CableFree™ Loosener into the conduit and then "blow" it through with compressed air. Gravity flow works on vertical conduit systems.

## Mechanical Muscle

CableFree™ Loosener doesn't eliminate the need for good mechanical methods to remove cable. It just makes them more effective.

One popular removal method is the application of continual force to the cable until the cable breaks loose, a force close to the cable's tensile strength. The tension may have to be on the cable for a day or more. A hydraulic jack works well, where the tension can just be "pumped up" as necessary. Once the cable is loose, conventional capstans or spiked bull wheels can be used to pull it out.

## Linear Shaking Methods

Some experimental cable removal equipment has been developed that "vibrates" the cable while it's under tension. This "linear shaking" helps loosen the cable and ease removal. Pulse rates of several thousand cycles per minute seem to be effective. It's believed the vibration reduces cable contact with the conduit, which lowers removal tensions.

## One at a Time

Successful removals have also been done on bundles of wire or cable. Breaking one wire free at a time sometimes works. Once the individual wires are free, the group can be removed easily.

All these mechanical methods work best when the cable has been lubricated and the adhesive bond minimized with CableFree™ Loosener.

## Additional Info

If you would like additional technical or applications information on CableFree™ Loosener, please call American Polywater Customer Service at 1-800-328-9384. Tell our representative "you're stuck," and we'll get you the literature right away.

Comments, questions, or editorial requests, please contact:

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