

Marmon
Utility LLC

PILC Cable Replacement

“Reducing PILC Replacement Costs”



kerite

hendrix

The Challenges You Face

The Reality



The EPA is mandating lead removal



Lack of skilled workers to perform lead wiping



PILC cable is failing due to age



Replacement of existing duct work (clay duct over 50 years old)

Major urban disruption and gridlock due to existing roads being unearthed for renovation






Declining customer satisfaction



The Challenges You Face



The IMPACT...

-  Costly unplanned outages due to cable failures
-  New replacement cable doesn't fit in the old ducts
-  New cable gets damaged beyond repair during installation (pulling)
-  Huge cost of new ducts (average cost for concrete encased duct banks is \$450/foot)
-  Angry citizens due to power outages and city access disruption



What if you could?



Keep existing ducts



Save millions of dollars per PILC replacement project



Avoid outages and city access disruptions



Replace PILC with copper cable that:

- Fits in existing PILC ducts
- **30%** lighter per foot
- Requires no lead handling skills
- Is impervious to water
- Is immune to partial discharge
- Has a LIFETIME warranty



The Risk of Standard Cable



A sizeable municipality chose a manufacturer with a standard diameter cable



During installation it was discovered that the cable was too large for the duct



The duct was damaged and had to be replaced, resulting in an

...additional \$3M to the project



The project cost the city 2x the original budget



Real Results

The nation's largest municipality owned energy utility located in the South Central region



The City was embarking on a PILC replacement project



The existing clay duct was over **50 years** old and had deterioration, which caused variances in the duct diameter



Kerite provided a reduced wall diameter cable that allowed the customer to utilize the existing duct

& save over...



25

millions



“**kerite** is the easiest cable we have ever installed

South Central Customer



A Better Approach



Material Selection
Discharge Resistant DR-EPR vs TR-XLPE or EPR



Immune to partial discharge



Impervious to water; flexible; higher temperature rating

Better Shield = Better Dielectric Performance = Reduced Diameter



Cooper Tape & Flat strap neutrals



Insulation shield thickness reduction – allowed due to minimal neutral indent

Versatility of Flat Strap Design



Various Thicknesses

&



Widths to meet specific requirements

Kerite is the Solution



Marmon
Utility LLC



Conductor
Compact copper



Conductor Shield
Kerite Permashield®



Insulation
Kerite Discharge Resistant
Ethylene Propylene Rubber
(DR-EPR)



Insulation Shield
Extruded semi-
conducting layer



Manufactured in
the USA



Single
Conductor



Jacket
Polypropylene



Metallic Shield
Flat strap neutral

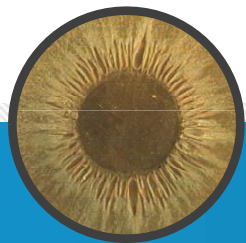
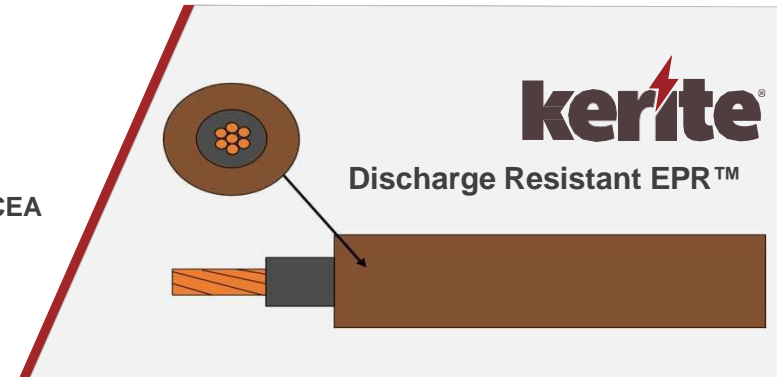


What Make Us Different From The Rest

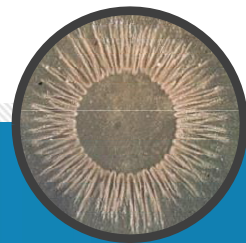
KERITE DR-EPR

(Discharge Resistant Ethylene Propylene Rubber)

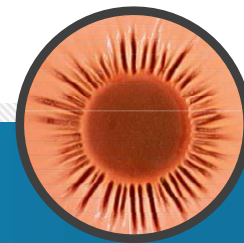
- EPR/EPDM Based Compound
- Formulated Resistance To Partial Discharge
- 100 times more resistant
- Brown in Color, High Flexibility (2x's)
- Recognized as Discharge Resistant by AEIC/ICEA
- Improved Thermal Characteristics
- Long-Term Stability In Wet Environments



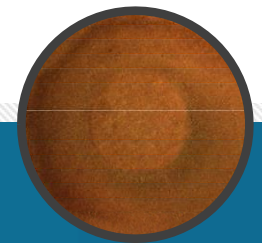
XLPE
Average 45 hours
to failure



TR - XLPE
Average 80 hours
to failure



Standard EPR
Average 200 hours
to failure



Discharge Resistant EPR™
> 250 hours without the
start of any erosion



What Make Us Different From The Rest

Permashield®.



Invented by..


kerite



in 1958



Non-Conducting Conductor Stress Control Layer

- Recognized by  /ICEA



100% Continuous In-Line Production Testing



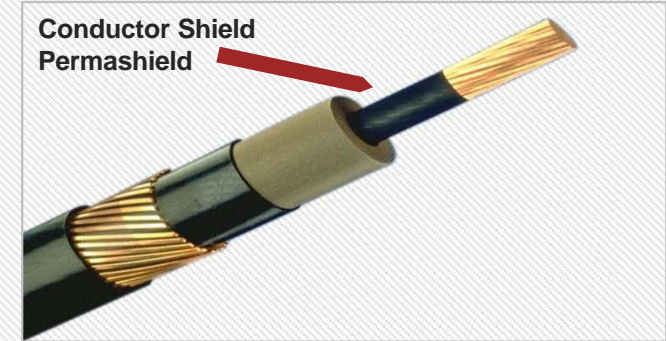
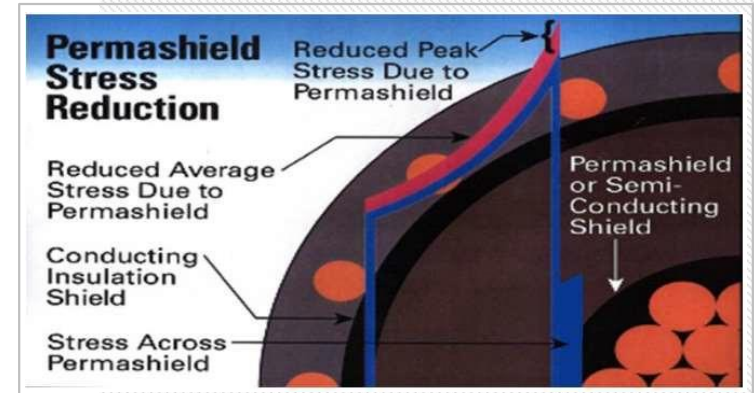
2kV DC Spark Test



Reduces

electrical stress at interface &





lowers maximum stress level

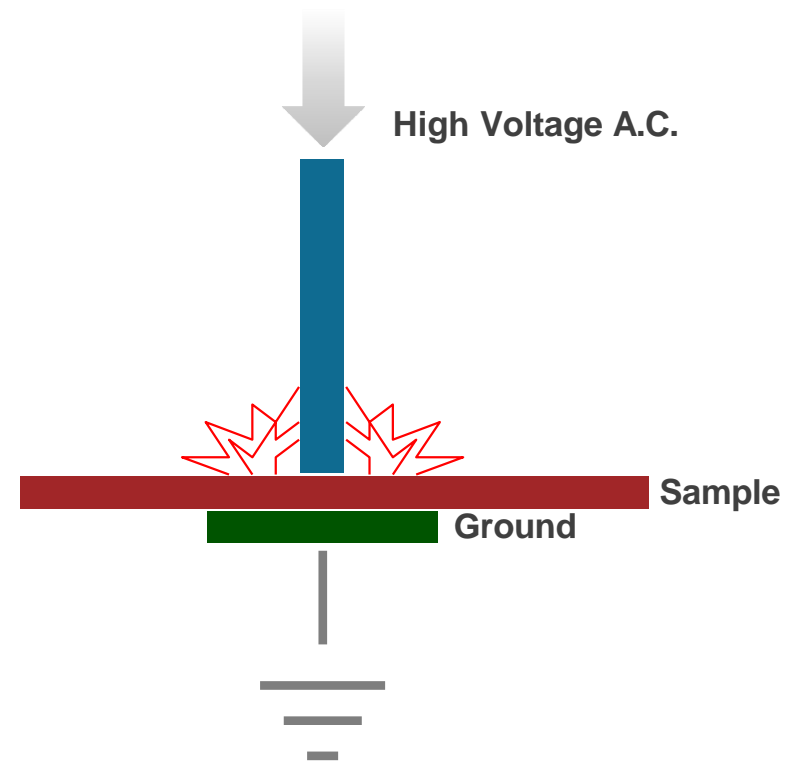


What Make Us Different From The Rest

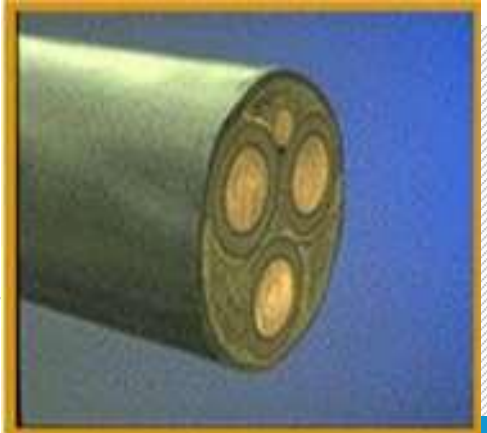
Discharge Resistant Testing



- ▶  Test Voltage = 21kV
- ▶  Sample Thickness = 60 mils
- ▶  Environment = 25°C & 20% RH
- ▶  Pass/Fail 250 Hours without Erosion



Design Alternatives



- Designs can be customized to fit the situation
- 1C or 3C
- Concentric neutrals, flat straps, copper tapes, tapes and neutrals
- Various overall jackets – PP, HDPE, MDPE, LLDPE



Metallic Shield



Flat Straps:



Minimum thickness

19 mils

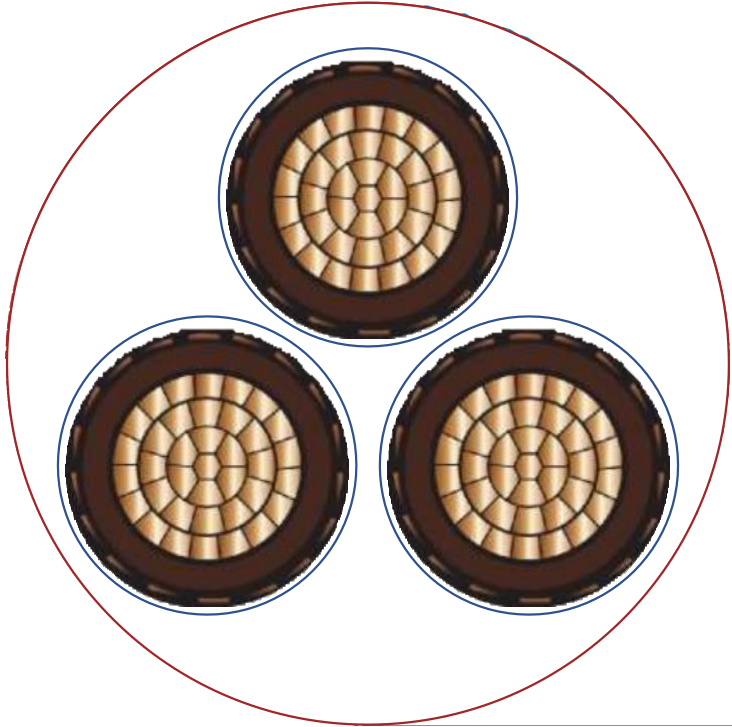


Minimum width

3 x thickness

1 circular mil = 0.7854 square mil

Reduced Diameter Power Cable Benefits





Reduced Diameter Power Cable Design Comparison





PILC vs 3-1/C Triplexed of Reduced Diameter Design and Standard URD

Kerite Solution – Benefits


 Less expensive alternative than replacing entire duct systems

 No lead sheath

 No oil used in cable

 Today's standard manufacturing and installation practices

- › No monitoring for lead in blood
- › Does not require lead wiping skills

 Increased emergency and short circuit temperature ratings

The **Kerite** solution for reduced diameter PILC cable replacement
Permashield® + Kerite DR-EPR insulation



Questions