PermaLife®

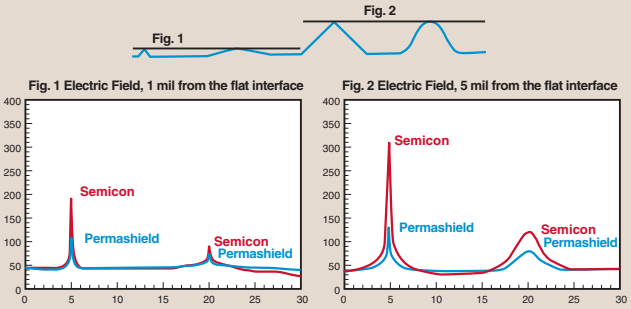
Medium Voltage Cables for Nuclear Utility Applications

RSCC®
World Class Engineered Cable

The science behind our medium voltage cables.

Permashield® non-conducting stress control layer

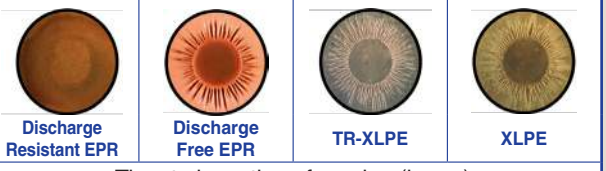
- 100% production tested in accordance with ICEA S-97-682.
- Greater than 2X reduction in electrical stress magnification caused by surface irregularities compared to semicon shields.
- 66% improvement in average AC breakdown strength over semicon. (Ref. *A.D. Little, Inc., The Physics of Permashield®, August 1983*)



Kerite® discharge resistant insulation system

- Discharge resistant insulation system formulated to prevent the degradation that occurs as a result of partial discharge per ASTM D2275.
- Only medium voltage cable with zero reported failures of the insulation system. (Ref. NEI 06-05, *Medium Voltage Underground Cable White Paper and EPRI Plant Engineering: Aging Management Program for Medium Voltage Cable systems for Nuclear Power Plants*)

Point Probe Test for Discharge Resistance



Discharge Resistant EPR	Discharge Free EPR	TR-XLPE	XLPE
Time to inception of erosion (hours)			
>250	48	Immediate	Immediate
TIME TO DIELECTRIC FAILURE (HOURS)			
>250	120	80	45

Helically applied tinned copper tape shield

- Greater flexibility, easier to handle and install, and simpler to splice and terminate than LCS shielded designs.
- Discharge resistant medium voltage cables never require partial discharge testing. Therefore, it is unnecessary to perform in-service partial discharge tests making the LCS design unnecessary for this cable.
- No adverse interaction between shield and insulation as reported for some discharge free insulations due to high coefficients of thermal expansion. (Ref. EPRI Cable Users Group Conference, August 2014, *Sixty-year Life Nuclear Cables for Gen III+ Reactor Applications*)

Performance history

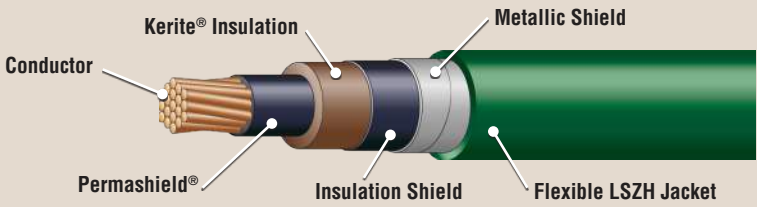
- NEI 06-05 *Medium Voltage Underground Cable White Paper* concluded that "**81 units provided information on the number of circuits in wet and dry applications**" and "**of the 20 units having brown EPR (Kerite), none had a failure of wet underground cable.**" It further went on to state that "**no wet failures of brown EPR have been identified to-date.**"
- EPRI Plant Engineering: *Aging Management Program Guidance for Medium-Voltage Cable Systems for Nuclear Power Plants*, Revision 1 concluded that "**brown EPR (Kerite) insulation, while being available to the early nuclear plants, continues to be produced. Approximately 20% of plants report its use. No water related failures have been reported in the nuclear industry to date.**"

Performance Standards

- Shielded cables are designed and tested in accordance with ICEA S-97-682 and ICEA S-93-639 or ICEA S-68-516 and AEIC CS-6
- Nonshielded cables are designed and tested in accordance with ICEA S-96-659
- Class 1E qualified in accordance with IEEE 383 and IEEE 323
  - Nuclear qualified with a minimum of 60-year thermal life expectancy at 90°C (40-year life for Motor Lead Wire designs)
  - Radiation resistance (up to 220 megarads)
- All cables pass IEEE 383-1974 as modified by NRC Reg Guide 1.131 vertical tray flame test
- Shielded cables also pass IEEE 1202 vertical tray flame test
- Quality Assurance program in accordance with 10 CFR 21 Appendix B
- Full traceability
- LSZH jacketed cable designs meet the low smoke generation requirements of UL 1685 and CSA FT4
- LSZH jacketed cable designs meet the halogen free requirements of ICEA S-93-639

PermaLife® LSZH Shielded Medium Voltage

Power Cable 5-35kV



Construction

Conductor: Bare copper (tinned copper also available), class "B" compressed strand (compact strand also available)
Conductor Shield: Permashield® conductor shield (non-conducting stress control layer)
Insulation: Proprietary Kerite® discharge resistant insulation
Insulation Shield: Thermoset semiconducting layer
Metallic Shield: 5 mil helically applied tinned copper tape with 20% overlap
Barrier Tape: Flame barrier tape(s)
Jacket: Flexible, thermoset low smoke zero halogen (LSZH) (available in black, blue, green, red, brown, and yellow)

5kV/8kV Single Conductor 115 Mil Insulation (133%/100%) and 140 Mil for 2000 kcmil and larger

Catalog No. Prefix	Size (AWG/kcmil)	Number of Strands	O.D. Over Insulation (inch)	Jacket Thickness (mil)	Jacket O.D. (inch)	Approx. Cable Weight (lb/M')
P45-0261	2/0	19	0.69	80	0.95	810
P45-0461	4/0	19	0.80	80	1.06	1,110
P45-0361	350	37	0.95	80	1.21	1,650
P45-0561	500	37	1.10	80	1.36	2,200
P45-0761	750	61	1.29	80	1.55	3,100
P45-1061	1000	61	1.44	110	1.76	4,100
P45-2061	2000	127	1.96	110	2.28	7,600

8kV Single Conductor 140 Mil Insulation (133%) and 175 Mil for 2000 kcmil and larger

Catalog No. Prefix	Size (AWG/kcmil)	Number of Strands	O.D. Over Insulation (inch)	Jacket Thickness (mil)	Jacket O.D. (inch)	Approx. Cable Weight (lb/M')
P45-0262	2/0	19	0.74	80	1.00	860
P45-0462	4/0	19	0.84	80	1.10	1,165
P45-0362	350	37	1.00	80	1.26	1,695
P45-0562	500	37	1.14	80	1.40	2,250
P45-0762	750	61	1.33	80	1.59	3,150
P45-1062	1000	61	1.48	110	1.80	4,150
P45-2062	2000	127	2.02	110	2.34	7,750

15kV Single Conductor 220 Mil Insulation (133%)

Catalog No. Prefix	Size (AWG/kcmil)	Number of Strands	O.D. Over Insulation (inch)	Jacket Thickness (mil)	Jacket O.D. (inch)	Approx. Cable Weight (lb/M')
P45-0260	2/0	19	0.88	80	1.14	1,000
P45-0460	4/0	19	0.99	80	1.25	1,325
P45-0360	350	37	1.14	80	1.40	1,865
P45-0560	500	37	1.29	80	1.55	2,450
P45-0760	750	61	1.48	110	1.80	3,500
P45-1060	1000	61	1.63	110	1.95	4,400
P45-2060	2000	127	2.10	110	2.42	7,900

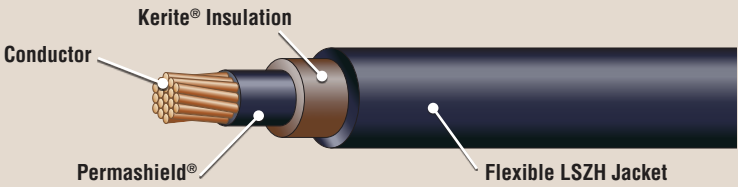
25kV Single Conductor 320 Mil Insulation (133%)

Catalog No. Prefix	Size (AWG/kcmil)	Number of Strands	O.D. Over Insulation (inch)	Jacket Thickness (mil)	Jacket O.D. (inch)	Approx. Cable Weight (lb/M')
P45-0268	2/0	19	1.10	80	1.36	1,250
P45-0468	4/0	19	1.21	80	1.47	1,625
P45-0368	350	37	1.36	80	1.62	2,175
P45-0568	500	37	1.51	110	1.83	2,900
P45-0768	750	61	1.70	110	2.02	3,900
P45-1068	1000	61	1.85	110	2.17	4,800
P45-2068	2000	127	2.32	110	2.64	8,400

Note: 100% insulation level available upon request. All gauge sizes and triplex constructions are available. Special designs are available on request. 25kV designs only qualified per IEEE 383-1974 and IEEE 323-1974.

PermaLife® Nonshielded Medium Voltage

Power Cable 5kV



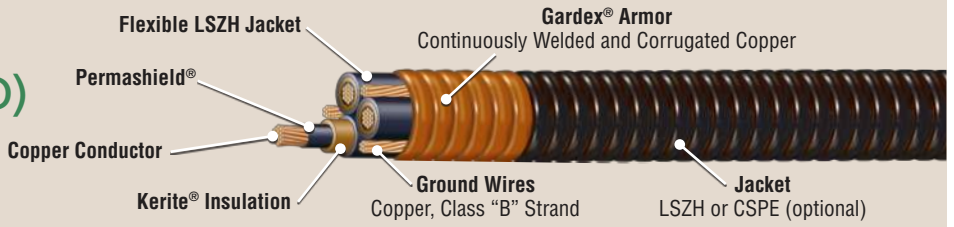
5kV Single Conductor (100%) and (133%) Insulation Level

Catalog No. Prefix	Size (AWG/kcmil)	Number of Strands	O.D. Over Insulation (inch)	Jacket Thickness (mil)	Jacket O.D. (inch)	Approx. Cable Weight (lb/M')
P45-3400	4/0	19	0.81	85	1.02	1,075
P45-3250	250	37	0.89	100	1.14	1,290
P45-3350	350	37	1.00	100	1.24	1,675
P45-3500	500	37	1.14	100	1.39	2,225
P45-3750	750	61	1.34	115	1.58	3,075
P45-3751	1000	61	1.48	115	1.72	3,925
P45-3752	2000	127	1.99	140	2.28	7,175

Note: All gauge sizes and triplex constructions are available.

PermaLife® Variable Frequency Drive (VFD) Medium Voltage

Power Cable 5kV



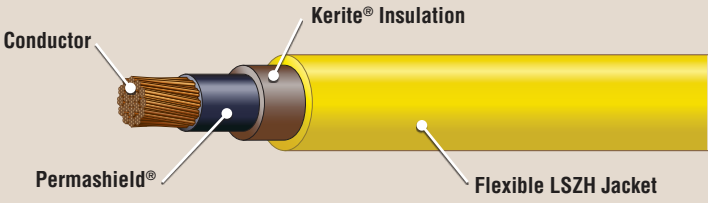
5kV Triplexed Conductors (100%) and (133%) Insulation Level

Catalog No. Prefix	Size (AWG/kcmil)	Individual Cable O.D. (inch)	Triplexed Cable O.D. (inch)	Gardex O.D. (inch)	Optional Jacket O.D. (inch)	Approx. Cable Weight (lb/M')
P45-4306	6	0.65	1.41	1.97	2.08	2,210
P45-4302	2	0.76	1.64	2.19	2.30	2,910
P45-4340	4/0	1.02	2.21	2.66	2.79	5,200
P45-4325	250	1.14	2.45	2.95	3.08	6,150
P45-4335	350	1.24	2.68	3.16	3.31	7,450
P45-4350	500	1.39	2.99	3.46	3.60	9,500
P45-4375	750	1.58	3.45	4.27	4.42	12,650

Note: Custom designs available upon request.

PermaLife® LSZH Motor Lead Wire Medium Voltage

Power Cable 7kV



7kV Single Conductor (100%) Insulation Level

Catalog No. Prefix	Size (AWG/kcmil)	Number of Strands	O.D. Over Insulation (inch)	Jacket Thickness (mil)	Jacket O.D. (inch)	Approx. Cable Weight (lb/M')
P50-0060	6	19x7	0.51	70	0.68	295
P50-0040	4	19x7	0.56	70	0.73	365
P50-0020	2	37x7	0.63	70	0.80	470
P50-0010	1	37x7	0.67	70	0.84	535
P50-0100	1/0	37x7	0.71	70	0.88	556
P50-0200	2/0	37x7	0.76	70	0.93	735
P50-0300	3/0	37x7	0.82	70	0.99	900
P50-0400	4/0	37x7	0.93	85	1.07	1,075
P50-0250	250	61x7	0.99	100	1.21	1,290
P50-0350	350	61x7	1.08	100	1.30	1,675
P50-0500	500	61x7	1.25	100	1.47	2,225

Note: All gauge sizes and triplex constructions are available.

Committed to Nuclear Utilities

RSCC Nuclear Cables

With over 100 years of history designing and making the most reliable, highest performing cables for harsh and hazardous environments, RSCC Wire & Cable is the only cable maker in the US with 40 years of continuous service to the nuclear utility industry providing low and medium voltage cables and data cables — many with 40- to 60-year life cycle, as specified.

RSCC is now partnered with its sister company, **Kerite**, among the oldest, most reliable, and most recognized producer of medium voltage power cables for the nuclear, power gen, oil & gas, and other specialty industrial markets.

Kerite Company

The Kerite company manufactures medium and high voltage EPR insulated cables. It has manufactured cables since 1854. It's products range from 5kV to 138kV.

Kerite utilizes a proprietary cable design for its utility cables. The basic design is a unique discharge-resistant insulation system that is field proven and has the longest warranty in the industry.

Kerite Cable Services

For over 30 years Kerite Cable Services (KCS) has provided medium and high voltage solutions to satisfied clients in the electric utilities industry. These installations range in size from a few hundred feet, with congested substations, to several miles of transmission circuits.

A substation turnkey package from KCS provides the customer with the cable necessary for the project along with all required accessories, labor, and warranties.

RSCC World Class Nuclear Cable

For more information:

20 Bradley Park Road, East Granby, CT 06026

Tel: 860-653-8300 • *Toll Free:* 800-327-7625

Fax: 860-653-8301

Marmon Electrical

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