American Polywater® Corporation

Electronic Catalog

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ADHESIVES | CLEANERS | LUBRICANTS | SEALANTS

Cable Lubricants

American Polywater® Corporation

11222 60th Street North
Stillwater, Minnesota 55082 U.S.A.

Telephone: 1-651-430-2270
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www.polywater.com
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TO: Consulting Electrical Engineers

SUBJ: Cable Pulling Lubricant Specification

WHY SPECIFY A CABLE LUBRICANT?

Why specify something that is not a functioning part of an electrical system, such as a cable pulling lubricant? "All cable lubricants are the same!" ***Or, are they?***

LUBRICANT'S SIGNIFICANCE!

The **differences** between lubricant types can affect both cable life and the safety of the projects you engineer.

- *Wax emulsions can damage certain types of insulation and high voltage shields.*
- *The residue from wax emulsions is combustible and can propagate flame.*
- *The residue left after a wax emulsion dries can hinder future cable removal or pulls.*

American Polywater Corporation is the recognized leader in the technology of polymeric cable lubricants. Our premier, high-performance electrical cable lubricant**, Polywater® LZ** is a safe, water-based product without the drawbacks of a wax emulsion**. Polywater® LZ** has been specified and used extensively in construction, based on its proven effectiveness, compatibility, safety, and application properties.

POOR INSTALLATION CAUSES FAULTS!

Cable manufacturers agree that **most cable faults** occur because of mechanical stress on the cable jacket during installation. **Polywater® LZ** has a low friction coefficient, which will minimize such mechanical stress.

ADDITIONAL INFORMATION?

In addition to the technical data in this catalog, we have available a formal presentation and video covering "Cable Installation Engineering." Topics covered are:

1. *Friction theory and its effect on cable installation tension.*
2. *Accurate coefficient of friction determination and its use in planning conduit systems.*
3. *Use of a personal computer with the Pull-Planner™ 3000 Software Program to easily design conduit systems.*
4. *Lubricant performance differences.*

A pre-written model lube specification is available online at
http://www.polywater.com/modelspc.html

To schedule a presentation on this subject, go to:
www.polywater.com/seminar.pdf

For additional technical information, please call us toll free at 1-800-328-9384.

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Recommended Lubricant Quantity

Our recommendation on the amount of Polywater® Cable Lubricant to use is dependent only on the size and length of the conduit system. Our research indicates that the following equation predicts a satisfactory quantity of Polywater® Lubricant for an average cable pull.

$$Q = .0015 \times L \times D$$

Where: Q = Quantity needed in gallons
L = Length of conduit in feet
D = nominal ID of conduit in inches

The appropriate quantity for use on any given pull can vary from this recommendation by 50%, depending on the complexity of the pull. Consider the following factors:

- **Cable weight and jacket hardness**
  (Increase quantities for stiff, heavy cable)
- **Conduit Type and Condition**
  (Increase quantities for old, dirty, or rough conduits)
- **Conduit Fill**
  (Increase quantities for high percent conduit fill)
- **Number of Bends**
  (Increase quantities for pulls with several bends)
- **Pulling Environment (heat, water, etc)**
  (Increase quantities for high temperatures)

The following chart indicates approximate pulling lubricant requirements for various cable pulls, based on the formula above.

Lubricant Quantities in Gallons

		Conduit ID in Inches			
		1”	**2”**	**3”**	**4”**
Pull Length in Feet	200	.3	.6	.9	1.2
	400	.6	1.2	1.8	2.4
	600	.9	1.8	2.7	3.6
	800	1.2	2.4	3.6	4.8
	1000	1.5	3.0	4.5	6.0

For cable pulling tips and research, visit our Engineer’s Corner online at http:www.polywater.com/engineer.asp

Polywater® Pull-Planner™ 4.0

CABLE PULLING SOFTWARE

Pull-Planner 4.0 Report

Pull Description: Pull Example
Pull Filename: Pull-Planner Flyer Printout 10-11-17.xpll

Conduit ID: 4 Inch(es) Conduit Fill: 27%

Total of 3 cable(s) of 1 different type(s) being pulled.

Type #1 3 Cable(s) O.D. of 1.2 inch(es) weight of 1.105 lbs/ft

Total cable weight: 3.315 lbs/ft
Calculated weight correction factor: 1.24

Configuration: Cradled

Jam/Clearance Analysis: Jamming Not Probable

Polywater® LZ with Jacket: LLDPE and Conduit: Rigid Steel

Pull Detail Summary

Total (Cumulative) Bend: 315 degrees
Total Length Including Bends: 824 feet
Conduit Fill 27 %
Total Cable Weight: 3.3 lbs per foot
Conduit Condition: Poor

Recommended Quantity : 9 Gallons
Lubricant Notes

Lubricant Best COF Value: 0.100
Un-Lubricated COF Value: 0.450

* Additional lubricant in recommended quantity based on long pull length.
* Additional lubricant in recommended quantity based on total degree of bend.
* Additional lubricant in recommended quantity based on conduit condition.

Incoming Tension: 300 lbs Pull COF: 0.1

Seg #	Straight Section Slope (°)	Slope Direction	Straight Section Length (ft)	Straight Section COF	Tension (lbs)	Bend Type	Bend Direction	Bend Radius (ft)	Bend Angle (°)	Bend Length (ft)	Bend COF	Tension (lbs)	Sidewall Pressure (lbs/ft)
1	90.0	Down	8.0	0.1	273.48	Vertical Up	Down	3.00	90.0	4.7	0.1	320.00	61.00
2	—	—	200.00	0.1	402.21	Horizontal	—	3.00	45.0	2.4	0.1	443.00	85.00
3	—	—	500.00	0.1	648.53	Horizontal	—	3.00	90.0	4.7	0.1	788.00	151.00
4	—	—	100.00	0.1	829.11	Vertical Up	Up	3.00	90.0	4.7	0.1	1017.00	194.00

Conduit design printout from the Pull-Planner 4.0

Program for Cable Pulling Tension Calculation and Conduit System Design

PRODUCT BENEFITS

- **Intuitive Operation:** User-friendly menus and control buttons.
- **Customized Database**: Unlimited number of cables can be put in easy-to-use database.
- **Flexible:** Push/pull, variable friction, rollers, pull reverse, back calculation, and more.
- **Operates on Standard Windows®:** Allows data transfer for word processing, printing, and saving.
- **Universal:** Runs metric or English units.

Achieve Longer Pulls by Keeping Tension Low

Pull-Planner™ 4.0 for Windows® calculates cable pulling tension and sidewall pressure around bends using the pulling equations. The Pull-Planner 4.0 also utilizes industry standards to calculate maximum pulling tension and conduit fill. Plan conduit systems prior to the pull.

Cable tension gauges

Large cable pulling machine

polywater.com | 651-430-2270

American Polywater® Corporation

Amp-type tensiometer

Portable heavy-duty cable puller

Pulling Wire and Cables the Right Way is Critical

Make the right decision on cable pull direction. The Pull-Planner 4.0 easily shows optimal pull direction. It helps eliminate splices, plan for future system upgrades, and reduce the chances of cable damage. An excellent tool for cable system specification.

POLYWATER PULL-PLANNER 4.0

Catalog #	Package Description	Units/Case
PP-40	Internet Download	1

SPECIFICATIONS AND APPLICATIONS:

- **System Requirements:** Pull-Planner 4.0 for Windows is available exclusively as an Internet download. It runs on numerous Windows operating systems. Total installation consumes 30 megabytes of hard drive space.
- **Previous Versions:** Accepts pull and cable data saved under the previous Pull-Planner software versions.
- **Training:** On-site seminars and webinars are available. Video tutorial is located on the Pull-Planner 4.0 web page. Please call us to set up an engineering seminar for your company.

CONTACT US

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Polywater® LZ

UNIVERSAL CABLE PULLING LUBE

Effectively coats cable during long pulls

Low-Smoke Zero-Halogen, CPE and CSPE Cable Compatible

PRODUCT BENEFITS

- **Low Friction Coefficient:** Maximum tension reduction on all types of cable jackets.
- **Universal:** Suitable for all types of jackets and cable.
- **Specification Grade:** Meets the performance requirements of power and petrochemical plants, mass transit systems, airports, and high-occupancy buildings.
- **Compatible:** Tested on LSZH/LSHF thermoplastic and thermoset jackets.
- **Safe:** Suitable for use on CSPE fire-retardant cable jackets.

Can be Used on All Types of Cable Jackets

Polywater® LZ offers proven cable compatibility, superior combustion resistance, and an inherently low coefficient of friction. Polywater LZ should be specified for installations of LSZH/LSHF cable in ducts and where fire propagation is a concern.

Available in Front End Pack™

Easily hand applied

polywater.com | 651-430-2270

American Polywater® Corporation

Quarts are perfect for smaller conduits


Polywater LZ package options

One Lubricant for All Types of Cable and Conditions

Polywater LZ comes in two grades: Regular Grade LZ and Winter Grade WLZ (for cold weather use in temperatures as low as -20°F/-30°C). Specify Polywater LZ to ensure that cable installers use a universally compatible lubricant.

POLYWATER LZ

Catalog #	Package Description	Units/Case
LZ-35 / WLZ-35	1-qt. bottle (0.95 liter)	12
LZ-55 / WLZ-55	½-gal. Front End Pack in a carton (0.95 liter)	6
LZ-110 / WLZ-110	½-gal. Front End Pack in a 5-gal. pail (1.9 liters)	10
LZ-128 / WLZ-128	1-gal. pail (3.8 liters)	4
LZ-640 / WLZ-640	5-gal. pail (18.9 liters)	1
LZ-DRUM / WLZ-DRUM	55-gal. drum (208 liters)	1

*W in the catalog number indicates Winter Grade version.

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatibility:** Passes IEEE 1210 physical and electrical testing on a wide variety of cable materials. It does not stress crack polyethylene. Refer to the technical bulletin for details.
- **Friction Testing:** Shows excellent lubricity on a variety of cable jacket types. The following COFs were measured using Rigid Steel conduit: LSZH .15, CPE .13, CSPE .21, LLDPE .10; FRP conduit: LSZH .17, CPE .17, CSPE .24, LLDPE .11; PVC conduit: LSZH .07, CPE .10, CSPE .16, LLDPE .05.
- **Physical Properties:** Dries slippery. It leaves little residue and won't cement cables into conduit. Contains no wax, or grease.

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POLYWATER® LZ PERFORMANCE LUBRICANT

DESCRIPTION

Polywater® LZ Lubricant is a high-performance, cable pulling lubricant. Polywater LZ is compatible with a broad variety of LSZH/LSHF compounds. Polywater LZ is also compatible with other high-performance cable jackets. It provides excellent tension reduction and is recommended for all types of cable pulling.

Polywater LZ is slow drying and leaves a thin, slippery film that retains its lubricity for months after use. Polywater LZ does not sustain flame when used with fire-retardant cables and systems. Its dried residue is nonconductive and noncombustible.

Polywater LZ is a stringy gel. It can be applied by hand or using Polywater's LP-D5 Pump. It is also available in the unique Front End Pack™ prelubrication bags.

FRICTION TESTING

Lubricity: Polywater LZ shows superior friction reduction on a variety of jacket types. Typical friction coefficients at 200 lbs/ft (2.91 kN/m) normal pressure are shown. Test results are based on the method described in the white paper, "Coefficient of Friction Measurement on Polywater's Friction Table, 2007" (polywater.com/FTable.pdf). Values are averages based on cable jacket and conduit materials from multiple manufacturers.

CABLE JACKET	CONDUIT TYPE				
	STEEL	FRP	HDPE	PVC	EMT
LSZH	.16	.17	.07	.08	.21
CSPE	.21	.24	.12	.16	.24
CPE	.15	.19	.09	.10	.17
XLPE	.13	.12	.06	.06	.12
LLDPE	.10	.11	.05	.06	.13

Coefficient of friction data on additional or specific cable jackets or conduits can be obtained from American Polywater Corporation.

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Polywater LZ is a specification grade lubricant

PRODUCT FEATURES

- **Low Friction Coefficient**: Maximum tension reduction on all types of cable jackets.
- **Universal**: Suitable for all types of jackets and cable, including power, control, and instrumentation cable.
- **Low-Smoke Zero Halogen (LSZH/LSHF) Compatible:** Extensively tested on LSZH/LSHF thermoplastic and thermoset jackets.

END USE

Polywater LZ is a specification grade lubricant that meets the performance requirements of:

- Nuclear and other generation plants
- Mass transit systems and airports
- Oil and petrochemical

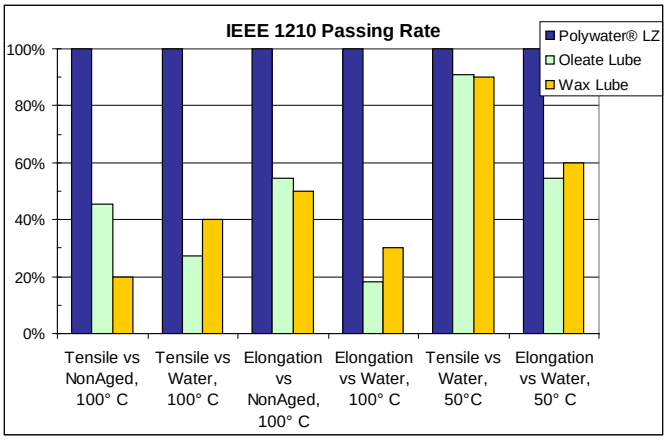
OFFICIAL APPROVALS

UL Listed
UL Listed to Canadian safety standards

CABLE COMPATIBILITY

Tensile and Elongation:
LSZH, CSPE, LLDPE, XLPE, CPE, and PVC cable jacket materials aged in Polywater Lubricant LZ per IEEE Standard 1210[1] meet the tensile and elongation retention requirements of that standard.

Modern LSZH jackets are numerous and vary significantly in formulation. Polywater LZ shows broad compatibility with this jacket technology. As shown in the graph below, the common cable pulling lubricants available through local supply houses show significant and sometimes devastating effects on LSZH cable jackets.



Polyethylene Stress Cracking:
Polywater LZ shows no stress cracking on LDPE, MDPE, or HDPE cable jackets when tested per IEEE Standard 1210[1].

Volume Resistivity:
There are no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when volume resistivity is tested according to IEEE Standard 1210[1].

Building Wire Testing:
THHN and XLPE building wire meet UL tensile, elongation, and voltage withstand requirements after exposure to Polywater LZ as tested by UL requirements[2].

Cable Approvals:
Polywater LZ is approved by many cable manufacturers. Contact American Polywater for details.

[1] IEEE Std 1210-2004; IEEE Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable.

[2] UL Subject 267, Investigation for Wire-Pulling Compounds.

PHYSICAL PROPERTIES

PROPERTY	RESULT
Appearance	White, stringy gel
% Nonvolatile solids (weight)	4.0
VOC content	0 gms/L 200 gms/L (Winter Grade)
Viscosity (Brookfield)	35,000–50,000 cps @10 rpm
pH	6.5–7.5

PERFORMANCE PROPERTIES

Cling Factor:
Cling factor is a measure of the ability to apply the lubricant and have it stay on the jacket while the cable enters the conduit.

A six-inch length (152 mm) of a one-inch (25 mm) diameter cable will hold at least 35 grams of Polywater LZ for one minute when held vertically at 70°F (21°C).

Coatability:
Coatability is a measure of the lubricant's ability to coat the jacket as a thin film for continued lubricity on longer pulls.

Polywater LZ will wet out evenly on cable jacket surfaces. It will not bead up or rub off the jacket sample. A one-inch (25 mm) diameter XLPE cable dipped six inches (152 mm) into Polywater LZ, then withdrawn and held vertically, will retain at least 25 grams of Polywater LZ for one minute at 70°F (21°C).

Combustibility:
Combustibility is a measure of combustion properties of the lubricant residue in a fire situation (with an impinging heat flux).

Polywater LZ has no flash point and its dried residue will not support combustion and spread flame. A 15-gram sample of the Polywater LZ, when placed in a one-foot, split, metal conduit and fully dried for 24 hours at 105°C, will not ignite and spread a flame more than three inches beyond the point of ignition when subjected to a continuous heat flux of 85 kW/m^2. The total test time was 30 minutes.

Test method described in "Fire Parameters and Combustion Properties of Cable Pulling Compound Residues," presented to the International Wire & Cable Symposium, 1987.

APPLICATION PROPERTIES

Application Systems:
Polywater LZ has a stringy gel consistency that makes it easy to lift, carry, and hand apply.

Polywater LZ can also be pumped directly into the conduit or onto the cable using the Polywater LP-D5 specialty lubricant pump. This allows hands-free transfer and consistent application of lubricant. Polywater's low-shear pump will not change the gel character of Polywater LZ. The LP-D5 pump applies lubricant at a rate of 1–2 gallons (4–8 liters) per minute.

Polywater LZ Front End Packs are bag packages that "prelubricate" the head end of the cable during the pull. The Front End Pack attaches to the winch line and prelubricates as it goes through the conduit. Two sizes are available to fit 2" and larger conduits.

Pull-Planner™ Tension Calculation Software is available from Polywater. Pulling tension estimations can ensure the use of appropriate pulling equipment and that the cable is installed within safe limits.

Polywater LZ is also available in a special-order, pourable version (lower viscosity) called Polywater PLZ.

Temperature Use Range:
Polywater LZ:
20°F to 120°F (-5°C to 50°C).
Polywater WLZ (Winter Grade version):
-20°F to 120°F (-30°C to 50°C)

Temperature Stability:
Polywater LZ will not phase-out or separate after five freeze/thaw cycles or 5-day exposure at 120°F (50°C).

Cleanup:
Polywater LZ is nonstaining. Complete cleanup is possible with water.

Storage and Shelf Life:
Store Polywater LZ in a tightly sealed container away from direct sunlight. Lubricant shelf life is 24 months.

DIRECTIONS FOR USE

Polywater LZ can be hand applied or pumped onto the cable as it enters the conduit.

For long pulls, place approximately two-thirds of the recommended quantity of lubricant into the conduit using the Front End Packs or by pumping.

For Front End Packs use, attach the packs of Polywater LZ to the winch line or pulling rope in front of the cable by using tape or cable ties. Start the pull and slit open the entire length of the pack(s) with a sharp knife as it enters the conduit.

Supplement with direct jacket lubrication as the cable enters the conduit.

Clean up by wiping off any excess lubricant with a rag.

Recommended Lubricant Quantity:

$$Q = k \times L \times D$$

Where:

Q = quantity in gallons (liters)

L = length of conduit run in feet (meters)

D = ID of the conduit in inches (mm)

k = 0.0015 (0.0008 if metric units)

The quantity that is appropriate for any given pull can vary from this recommendation by 50%, depending on the complexity of the pull. Consider the following factors:

Cable weight and stiffness
(Increase quantity for stiff, heavy cable)

Conduit condition
(Increase quantity for old, dirty, or rough conduits)

Conduit fill
(Increase quantity for high percent conduit fill)

Number of bends
(Increase quantity for pulls with several bends)

Pulling environment
(Increase quantity for high temperatures)

MODEL SPECIFICATION

The statement below may be inserted into a specific job specification to help maintain engineering standards and ensure project integrity.

The cable pulling lubricant shall be Polywater® LZ Lubricant. The cable pulling lubricant shall provide excellent friction reduction with good cling and wetting through long pulls and multiple bends. The lubricant shall leave minimal, noncombustible residue. It shall be compatible with most cable jacket materials and be extensively tested on a broad variety of low smoke, halogen-free cable jacket materials.

Cable jacket compatibility shall be tested with the specific LSZH jacket material used on the cable. Test data shall be provided by the cable manufacturer or the lubricant manufacturer. It shall not stress crack polyethylene per ASTM Standard 1693. There shall be no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when the lubricant's effect on volume resistivity is tested according to IEEE Standard 1210.

A 15-gram sample of the lubricant, when placed in a one-foot, split metal conduit and fully dried for 24 hours at 105 degrees C, shall not spread a flame more than three inches beyond a point of ignition at a continued heat flux of 85 kW/meter^2. Total time of test shall be 30 minutes.

ORDER INFORMATION

CAT #	PACKAGE DESCRIPTION
LZ-55	½-gal. bag in a box (1.9 liters) 6/case
LZ-110	½-gal. bag in a pail (1.9 liters) 10/pail
LZ-35	1-qt. squeeze bottle (.95 liter) 12/case
LZ-128	1-gal. pail (3.78 liter) 4/case
LZ-640	5-gal. pail (18.9 liter)
LZ-DRUM	55-gal. drum (208 liter)
	Winter Grade
WLZ-55	½-gal. bag in a box (1.9 liters) 6/case
WLZ-110	½-gal. bag in a pail (1.9 liters) 10/pail
WLZ-35	1-qt. squeeze bottle (.95 liter) 12/case
WLZ-128	1-gal. pail (3.78 liter) 4/case
WLZ-640	5-gal. pail (18.9 liter)

CONTACT US

1-800-328-9384 Toll Free | 1-651-430-2270 Main | 1-651-430-3634 Fax | email: support@polywater.com

Polywater® J

CABLE PULLING LUBRICANT

Polywater J is easily applied by the LP-D5 pump

Proven High-Performance Cable Lubricant for Heavy Cable Installations

PRODUCT BENEFITS

- **Maximum Friction Reduction:** For low cable pulling tension.
- **Clean and Non-Staining:** Minimizes clean-up time.
- **Field-Friendly Application:** Can be pumped, hand applied, or distributed by Front End Pack™.
- **Temperature Stable**: No ruined lubricant from freeze/thaw or high-temperature exposure.
- **High Cling Factor:** Stays on cable jacket during application.

The Most Used and Specified Cable Lubricant

Specification-grade Polywater® Lubricant J is a high-performance, clean, slow-drying, water-based gel lubricant. Lubricant J provides maximum tension reduction in all types of cable pulling. It is recommended for long pulls, multiple-bend pulls, and pulls in a hot environment.


Easily applied by hand


Front End Pack prelubricates conduit

polywater.com | 651-430-2270

American Polywater® Corporation

Quarts are handy for smaller conduits


Packaged for all installation types

Package Options for All Applications

Polywater J comes in two grades: Regular Grade J and Winter Grade WJ (for cold weather use in temperatures as low as -20˚F (-30˚C)). A pourable version (Polywater PJ) is also available. The Front End Pack is a conduit-sized polyethylene bag of lubricant that travels through the conduit on the winch line or pull rope, prelubricating the conduit ahead of the cable being pulled. Lubricant J dries to form a thin lubricating film that retains its lubricity for months after use.

POLYWATER J

Catalog #	Package Description	Units/Case
J-35 / WJ-35	1-qt. bottle (0.95 liter)	12
J-27 / WJ-27	1-qt. Front End Pack in a carton (0.95 liter)	12
J-99 / WJ-99	1-qt. Front End Pack in a 5-gal. pail (0.95 liter)	16
J-55 / WJ-55	½-gal. Front End Pack in a carton (1.9 liters)	6
J-110 / WJ-110	½-gal. Front End Pack in a 5-gal. pail (1.9 liters)	10
J-128 / WJ-128	1-gal. pail (3.8 liters)	4
J-640 / WJ-640	5-gal. pail (18.9 liters)	1
J-DRUM / WJ-DRUM	55-gal. drum (208 liters)	1

*W in the catalog number indicates Winter Grade version.

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatibility:** Passes IEEE 1210 physical and electrical testing on a wide variety of cable materials. It does not stress crack polyethylene. Refer to the technical bulletin for details.
- **Friction Testing:** Shows excellent lubricity on a variety of cable jacket types. Using PVC conduit, the following COFs were measured: PVC .11, XLPE .11, LLDPE .11, HDPE .09, THHN .13, XHHW .11. Method described in “Coefficient of Friction Measurement on Polywater’s Friction Table, 2007”. Typical values determined using 200 lbs/ft normal force.
- **Formula:** Contains no wax, grease, or silicone.
- **Temperature Range:** Has a wide temperature use range: 20˚F to 120˚F (-5˚C to 50˚C); Winter Grade Polywater® WJ: -20˚F to 120˚F (-30˚C to 50˚C).

CONTACT US

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email: support@polywater.com

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American Polywater® Corporation

POLYWATER® J LUBRICANT

DESCRIPTION

Polywater® J Lubricant is a high-performance cable pulling lubricant proven in the installation of millions of feet (meters) of cable over the last 30 years. Polywater J provides excellent tension reduction in underground and industrial cable pulls. It is recommended for both communications and electrical cable. Polywater J has excellent shear resistance for effective lubrication under high cable sidewall pressure in conduit bends.

The residue from Polywater J does not propagate flame when used with fire-retardant cable systems. Polywater J is slow drying. The residue is a thin, slippery film that retains its lubricity for months after use. Its dried residue is nonconductive and noncombustible.

Polywater J is a stringy gel. It can be applied by hand or by using Polywater's LP-D5 Pump. It is also available in the unique Front End Pack™ prelubrication bags.

FRICTION TESTING

Lubricity: Polywater J Lubricant shows superior friction reduction on a variety of jacket types. Typical friction coefficients at 200 lbs/ft (2.91 kN/m) normal pressure are shown. Test results are based on the method described in the white paper, "Coefficient of Friction Measurement on Polywater's Friction Table, 2007" (polywater.com/FTable.pdf). Values are averages based on cable jacket and conduit materials from multiple manufacturers.

CABLE JACKET	CONDUIT TYPE				
	HDPE	PVC	STEEL	FRP	EMT
XLPE	.14	.11	.13	.16	.21
LLDPE	.10	.11	.16	.13	.13
PVC	.11	.11	.13	.16	.11
CPE	.14	.11	.21	.24	.08
HDPE	.05	.09	.13	.13	.13

Coefficient of friction data on additional or specific cable jackets or conduits can be obtained from American Polywater Corporation.

Polywater J is recommended for multiple-bend pulls.

PRODUCT FEATURES

- **Maximum Friction Reduction**: Lower cable pulling tension.
- **Clean and Nonstaining**: Minimize cleanup time.
- **Noncombustible Residue**: Suitable for fire-critical cables and installations.
- **Field-Friendly Application:** Pump, hand apply, or distribute by Front End Pack.
- **Temperature Stable**: No ruined lubricant from freeze/thaw or high-temperature exposure.
- **High Cling Factor**: Stays on cable jacket during application.

END USE

Suitable for many types of cable installations, including:

- Heavy, underground installations
- Multiple-bend pulls; long pulls
- High conduit fill situations

OFFICIAL APPROVALS

UL Listed.
CSA Listed

CABLE COMPATIBILITY

Polyethylene Stress Cracking:
Polywater J shows no stress cracking on LDPE, LLDPE, MDPE, or HDPE cable jacket when tested per IEEE Standard 1210[1].

Tensile and Elongation Effects:
LLDPE, XLPE, CPE, PVC and EPR cable jacket materials aged in Polywater J per IEEE Standard 1210[1] meet the tensile and elongation retention requirements of that standard.

Volume Resistivity:
There are no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when volume resistivity is tested according to IEEE Standard 1210[1].

Building Wire Testing:
THHN and XHHW building wire meet UL tensile, elongation, and voltage withstand requirements after exposure to Polywater J as tested by UL requirements[2].

Nuclear Approval:
Polywater J does not contain halogenated compounds, sulfur compounds, or low melting point metals.[3]

Cable Approvals:
Polywater J is approved by most cable manufacturers. Contact American Polywater for details.

[1] *IEEE Std 1210-2004; IEEE Standard Tests for Determining Compatibility of Cable Pulling Lubricants with Wire and Cable.*

[2] *UL Subject 267, Investigation for Wire-Pulling Compounds.*

[3] *Nuclear Test Methodology: Leachable Chlorides (ASTM D 512-88), Water Leachable Bromides (ASTM D 1246-88) Halogenated Compounds (ASTM D 808-87) Water Leachable Iodides (ASTM D 1246-88) Sulfur (ASTM D 129-78) Water Leachable Fluorides (ASTM D 1179-88)*

PHYSICAL PROPERTIES

PROPERTY	RESULT
Appearance	Cream-colored, stringy gel
Wax, grease, and silicone content	None
Percent nonvolatile solids	4.3
VOC content	10 gms/liter 200 gms/liter (Winter Grade)
Viscosity	25,000–40,000 cps @10rpm
pH	7.5–9.0

PERFORMANCE PROPERTIES

Cling Factor:
Cling factor is a measure of the ability to apply the lubricant and have it stay on the jacket while the cable enters the conduit.

A 6-inch length (152 mm) of a 1-inch (25 mm) diameter cable will hold at least 50 grams of Polywater J for one minute when held vertically at 70°F (21°C).

Coatability:
Coatability is a measure of the lubricant's ability to coat the cable jacket as a thin film for continued lubricity on longer pulls.

Polywater J will wet out evenly on cable jacket surfaces. It will not bead up or rub off the jacket sample. A 1-inch (25 mm) diameter XLPE cable dipped 6 inches (152 mm) into Polywater J, then withdrawn and held vertically, will retain at least 30 grams of Polywater Lubricant J for one minute at 70°F (21°C).

Combustibility:
Combustibility is a measure of combustion properties of the lubricant residue in a fire situation (with an impinging heat flux).

Polywater J has no flash point and its dried residue will not support combustion and spread flame. A 200-gram sample of the J Lubricant, when placed in a 1-foot, split metal conduit and fully dried for 24 hours at 105°C, will not ignite and spread a flame more than 3 inches beyond a point of ignition when subjected to a continuous heat flux of 40 kW/m^2. The total test time was one-half hour.

Test method described in "Fire Parameters and Combustion Properties of Cable Pulling Compound Residues," presented to the International Wire & Cable Symposium, 1987.

APPLICATION PROPERTIES

Application Systems:
Polywater J has a stringy gel consistency that makes it easy to lift, carry, and hand apply.

Polywater J can also be pumped directly into the conduit or onto a cable using the drill-powered Polywater LP-D5 pump. Polywater's low-shear pump will not change the gel character of Polywater J. The LP-D5 allows hands-free transfer and consistent application of lubricant. It supports a lubricant application rate of 1–2 gallons (4–8 liters) per minute.

Polywater J Front End Packs are bag packages that "prelubricate" the head end of the cable during the pull. The Front End Pack attaches to the winch line and prelubricates as it goes through the conduit. Two sizes are available to fit 2" and larger conduits.

Pull-Planner™ Tension Calculation Software is available from Polywater. Pulling tension estimations can ensure the use of appropriate pulling equipment and that the cable is installed within safe limits.

Polywater J is also available in a pourable version (lower viscosity) called Polywater PJ. Polywater PJ is primarily for use in underground work where pouring the lubricant into a cable feeder tube is a convenience.

Temperature Use Range:
Polywater J:
20°F to 120°F (-5°C to 50°C).
Polywater WJ (Winter Grade version):
-20°F to 120°F (-30°C to 50°C).

Temperature Stability:
Polywater J will not phase out or separate after five freeze/thaw cycles or 5-day exposure at 120°F (50°C).

Cleanup:
Polywater J is nonstaining. Complete cleanup is possible with water.

Storage and Shelf Life:
Store Polywater J in a tightly sealed container away from direct sunlight. Lubricant shelf life is 18 months.

DIRECTIONS FOR USE

Polywater J Lubricant can be hand applied or pumped onto the cable as it enters the conduit. Polywater PJ is a thinner gel and can be poured.

For long pulls, place approximately two-thirds of the recommended quantity of lubricant into the conduit using the Front End Packs or by pumping.

For Front End Pack use, attach the packs of Polywater J to the winch line or pulling rope in front of the cable using tape or cable ties. Start the pull and slit open the entire length of the pack(s) with a sharp knife as it enters the conduit.

Supplement with direct jacket lubrication as the cable enters the conduit.

Clean up by wiping off any excess lubricant with a rag.

Recommended Lubricant Quantity:

$$Q = k \times L \times D$$

Where:

Q = quantity in gallons (liters)
L = length of conduit run in feet (meters)
D = ID of the conduit in inches (mm)
k = 0.0015 (0.0008 if metric units)

The quantity that is appropriate for any given pull can vary from this recommendation by 50%, depending on the complexity of the pull. Consider the following factors:

Cable weight and stiffness
(Increase quantity for stiff, heavy cable)

Conduit condition
(Increase quantity for old, dirty, or rough conduits)

Conduit fill
(Increase quantity for high percent conduit fill)

Number of bends
(Increase quantity for pulls with several bends)

Pulling environment
(Increase quantity for high temperatures)

MODEL SPECIFICATION

The statement below may be inserted into a specific job specification to help maintain engineering standards and ensure project integrity.

The cable pulling lubricant shall be Polywater® J Lubricant. The lubricant shall be UL (or CSA) listed. The lubricant shall contain **no** waxes, greases, silicones, or polyalkylene glycol oils. Lubricant manufacturer must provide cable manufacturer approvals upon request.

Cable jacket compatibility shall be tested by the IEEE 1210, Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable. It shall pass physical compatibility tests on LLDPE, XLPE, PVC, and EPR cable jacket or sheath materials. It shall not stress crack polyethylene per ASTM Standard 1693. There shall be no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when the lubricant's effect on volume resistivity is tested according to IEEE Standard 1210.

A 200-gram sample of the lubricant, when placed in a 1-foot, split metal conduit and fully dried for 24 hours at 105 degrees C, shall not spread a flame more than three inches beyond a point of ignition at a continued heat flux of 40 kW / meter^2. Total time of test shall be one-half hour.

ORDER INFORMATION

CAT #	PACKAGE DESCRIPTION
	Regular
J-35	1-qt. squeeze bottle (0.95 liter) 12/case
J-128	1-gal. pail (3.78 liter) 4/case
J-640	5-gal. pail (18.9 liter)
J-27	1-qt. bag (0.95 liter) 12/case
J-99	1-qt. bag (0.95 liter) in a pail 16/pail
J-55	½-gal. bag (1.9 liter) 6/case
J-110	½-gal. bag (1.9 liter) in a pail 10/pail
J-Drum	55-gal. drum (208 liter)
	Pourable
PJ-128	1-gal. pail (3.78 liter) 4/case
PJ-320	2½-gal. jug (9.6 liter) 2/case
PJ-640	5-gal. pail (18.9 liter)
PJ-Drum	55-gal. drum (208 liter)
***Winter Grade version Polywater PJ available (WPJ)*	
	Winter Grade
WJ-35	1-qt. squeeze bottle (0.95 liter) 12/case
WJ-128	1-gal. pail (3.78 liter) 4/case
WJ-640	5-gal. pail (18.9 liter)
WJ-55	½-gal. bag (1.9 liter) 6/case
WJ-110	½-gal. bag (1.9 liter) in a pail 10/pail
WJ-Drum	55-gal. drum (208 liter)

CONTACT US

1-800-328-9384 Toll Free | 1-651-430-2270 Main | 1-651-430-3634 Fax | email: support@polywater.com

Polywater®

FRONT END PACK™

CABLE LUBRICATING SYSTEM

Polywater® Front End Packs™ lubricate ahead of the cable during the pull. They eliminate the need for hand lubrication in many pulls. Proper Front End Pack™ use lubricates far down the conduit where normal lubrication is inadequate.

Sizes

Two different sizes; a 1-quart pack (J-27/J-99) and a 1/2-gallon pack (J-55/J-110) are available.

- The 1-quart pack is 1¾" in diameter by 24" long and is used in 2" and 3" conduit.
- The 1/2 -gallon pack is 3" in diameter by 14" long and is used in 3½" and larger conduit.

Package Size	Polywater® J Product #	Winter Grade Product #	Units/Case
1/2 –Gal Pack (bag)	J-110	WJ-110	10 Packs in a 5-gal Pail
1/2-Gal Pack (bag)	J-55	WJ-55	6 Packs in a Carton
1-Qt Pack (bag)	J-99	WJ-99	16 Packs in a 5-Gal Pail
1-Qt Pack (bag)	J-27	WJ-27	12 Pack in a Carton

Quantity Formula

When only Front End Packs™ are used for a pull, the number of packs recommended for a pull is:

N = 0.003 x T x L x D

N = Number of packs required

T = (1) for J-55/J-110 packs or (2) for J-27/J-99 packs

L = Length of pull in feet

D = Nominal I.D. of conduit in inches

The quantity appropriate for a difficult pull may be up to +50% above this average, depending on conduit fill, conduit type and condition, number of bends, and pulling environment.

To view technical information on our website go to:
Lubricant Application Videos: **www.polywater.com/videoslube.asp**
Written Instructions: **www.polywater.com/frontend.html**

American Polywater® Corporation
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LIT-FEPFLYER/REV001

Polywater® PJ

HIGH-PERFORMANCE CABLE LUBE

Polywater PJ being poured into a feeder tube

Pourable Cable Pulling Lubricant

PRODUCT BENEFITS

- **No Mess**: Pour or pump lubricant directly into the duct.
- **Low Viscosity:** Makes pouring lubricant cleaner, faster, and easier.
- **Easy to Pump:** Ensures proper lubrication during longer pulls.
- **Cold Weather Formula:** Lubricant can be used for year-round cable installations.
- **Quantity:** Use one gallon of lubricant per 100 feet of cable installed.

Pourable PJ is Perfect for Conduit Stub-Ups

Polywater® PJ offers the same high-performance factors as heavy duty Polywater® J. Polywater PJ matches Polywater J's high lubricity and lower cable tensions. Polywater PJ is the best choice for installations where pouring or pumping are more efficient methods of lubricant application.

Easy-to-handle gallon jugs

PJ is great for pumping

polywater.com | 651-430-2270

American Polywater® Corporation

Easy-pour package design

Field-Friendly Packaging—No More Handling the Lubricant

Polywater PJ can also be pumped using the LP-D5 drill-powered pump. Polywater PJ comes in two grades: Regular Grade (PJ) and Winter Grade (WPJ), for cold weather use in temperatures as low as -20°F (-30°C).

POLYWATER PJ

Catalog #	Package Description	Units/Case
PJ-128 / WPJ-128	1-gal. jug (3.8 liters)	4
PJ-320 / WPJ-320	2½-gal. jug (9.6 liters)	2
PJ-640 / WPJ-640	5-gal. pail (18.9 liters)	1
PJ-DRUM / WPJ-DRUM	55-gal. drum (208 liters)	1

*W in the catalog number indicates Winter Grade version.

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatibility:** Passes IEEE 1210 physical and electrical testing on a wide variety of cable materials. It does not stress crack polyethylene. Refer to the technical bulletin for details.
- **Friction Testing:** Shows excellent lubricity on a variety of cable jacket types. Using PVC conduit, the following COFs were measured: PVC .11, XLPE .11, LLDPE .11.
- **Physical Properties:** Dries slippery. It leaves little residue and won't cement cables into conduit.
- **Temperature Stability:** PJ is stable and will not separate after exposure to high heat or freezing.

CONTACT US

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American Polywater® Corporation

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Polywater® LP-D5

DRILL-POWERED LUBRICANT PUMP

Pumping lubricant coats cables evenly

For Pumping Polywater Cable Pulling Lubricant from Pails and Drums

PRODUCT BENEFITS

- **Pumps All Polywater Lubricants:** Provides consistent lubrication with less effort.
- **Variable Pumping Rate:** Adjustable-speed drill can pump at appropriate rate based on cable size and pulling speed.
- **Clean:** Eliminates hand application and cleanup.
- **Versatile:** Lubricants can be pumped into vertical or horizontal conduits.
- **Durable & Corrosion Resistant:** Solid brass body with stainless steel shaft is not affected by water-based lubricants.

Pull Longer with Less Friction

Polywater® Lubricant LP-D5 pump is a ½-inch drill-operated, self-priming gear pump. All Polywater cable pulling lubricants can be pumped directly into the conduit or onto the cable during cable installations at rates exceeding 1.5 gallons per minute.

Easily pumps thicker lubes

Consistent application technique

polywater.com | 651-430-2270

American Polywater® Corporation

Catalog # LP-D5

Pump Makes Cable Lubrication Easy

The LP-D5 pump includes two hands-free applicators (small for 1½- to 3-inch conduits, and large for 3- to 6-inch conduits). The applicators also help guide the cable(s) into conduits, reducing the possibility of cables scraping the conduit entrance. The LP-D5 pump sets directly onto a 5-gallon pail or 55-gallon drum. The package contains the pump and tube, 10-foot discharge hose, an additional extension tube for 55-gallon drums, and the two lubricant applicators.

POLYWATER LP-D5

Catalog #	Package Description	Units/Case
LP-D5	Drill-powered lubricant pump **Drill not included*	1

SPECIFICATIONS AND APPLICATIONS:

- **Operation:** For use on 55-gallon drum and 5-gallon pail, open pail or drum. With drum, untie and open liner, then replace drum cover. Set LP-D5 pump in 5-gallon pail or into the 2-inch bung hole of a 55-gallon drum. Attach variable-speed drill to LP-D5. Insert free end of hose into conduit opening, pail, or jug. Set drill to OPERATE IN FORWARD. Start drill to pump lubricant until it is visible at hose end. If installing cable, start pulling cable and start variable-speed ½-inch drill to pump lubricant at desired flow rate.
- **Cleaning:** Pump clean tap water through LP-D5 pump until water discharge is clear. Let pump sit for 15 minutes. Run pump again with clean tap water to remove any remaining lubricant. Repeat the process as necessary. Wipe off pump and applicator. Protect from dirt with bag or other cover.

CONTACT US

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American Polywater® Corporation

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Polywater® + Silicone™

CABLE PULLING LUBRICANT

Polywater + Silicone lubes are easily pumped

For Installing Transmission Cable, Pulling Through Water, and Lubricating HDPE Conduit Systems

PRODUCT BENEFITS

- **Heavy Pulls:** Preferred lubricant for URD and underground transmission cable installations.
- **Water Resistant:** Does not wash off. Reduces tension even when pulling through water.
- **Very Low Friction:** Consistently low friction and tension when pulling through HDPE and PVC pipe.
- **Non-Freezing Formula:** Polywater WNN and WNB can be used for cold weather (sub-freezing) pulling.
- **Roller Option Available:** Polywater NB contains small, friction-reducing roller balls.

The Longest Cable Pulls Made Simple

Polywater® + Silicone™ Types NN and NB are specification-grade cable pulling lubricants that demonstrate superior performance, particularly friction reduction in HDPE conduits and conduits containing water. These lubricants provide continuous lubrication on long pulls.

Easy-to-pour 2.5-gallon jugs

Great for residential URD installations

polywater.com | 651-430-2270

American Polywater® Corporation

Pouring lube into a conduit stub-up

Packaging designed to be poured

Numerous Package and Application Options

Polywater + Silicone is available with or without small plastic rollers in the lubricant. Type NB has the rollers and Type NN does not. In both Type NN and NB, a Regular Grade and Winter Grade (for cold weather use in temperatures as low as -20°F (-30°C)) are available. Polywater + Silicone can be pumped using the LP-D5 drill-powered pump, making it ideal for long-distance cable installations.

POLYWATER + SILICONE

Catalog #	Package Description	Units/Case
NN-128 / WNN-128	1-gal. jug (3.8 liters)	4
NN-320 / NA	2½-gal. jug (9.5 liters)	2
NN-640 / WNN-640	5-gal. pail (18.9 liters)	1
NN-DRUM / WNN-DRUM	55-gal. drum (208 liters)	1
NB-35 / WNB-35	1-qt. bottle (0.95 liter)	12
NB-128 / WNB-128	1-gal. jug (3.8 liters)	4
NB-320 / NA	2½-gal. jug (9.5 liters)	2
NB-640 / WNB-640	5-gal. pail (18.9 liters)	1
NB-DRUM / NA	55-gal. drum (208 liters)	1

*W in the catalog number indicates Winter Grade version.

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatibility:** Passes IEEE 1210 physical and electrical testing on a wide variety of cable materials. Cable manufacturer approvals available upon request.
- **Friction Testing:** Shows excellent lubricity on a variety of cable jacket types. Using HDPE conduit, the following COFs were measured: LLDPE .05, PVC .08, XLPE .07, CPE .08, PP .07. Method described in “Coefficient of Friction Measurement on Polywater’s Friction Table, 2007.” Typical values determined using 200 lbs./ft. normal force.
- **Coatability:** Polywater + Silicone NN will wet out evenly on cable jacket surfaces. Using the Telcordia test procedure TR-TSY-00356 Sections 4.1.3 and 4.1.4, a cable was subjected to 5 separate pulling cycles through a water-filled duct and the COF was measured showing excellent friction reduction and lubricant adherence to the cable.
- **Temperature Range:** Has a wide temperature use range: 20˚F to 120˚F (-5°C to 50°C). Polywater WNN/WNB (Winter Grade): -20°F to 120°F (-30°C to 50°C).

CONTACT US

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American Polywater® Corporation

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American Polywater® Corporation

POLYWATER® + SILICONE™ LUBRICANT

DESCRIPTION

Polywater® + Silicone™ NN and NB Lubricants provide superior tension reduction and are suitable for all types of cable pulling. The lubricants are used for long pulls of heavy cable. In this type of pulling, the superior tension reduction and continued lubrication while pulling through water are well documented.

Polywater NN and NB come as pourable, gel lubricants. While either can be applied by hand, it is best to pour or pump the lubricant into the duct system.

Polywater NN and NB are suitable for use with factory lubricated duct. They continue to lubricate under high sidewall pressure forces in conduit bends. Polywater NN and NB are slow drying. The residue is a thin, slippery film that retains its slip for months after use.

Polywater + Silicone lubricant is easy to pump or pour into conduit

FRICTION TESTING

Lubricity: Polywater NN and NB Lubricants show superior friction reduction on a variety of jacket types. Typical friction coefficients at 200 lbs/ft (2.91 kN/m) normal pressure are shown. Test results are based on the method described in the white paper, “Coefficient of Friction Measurement on Polywater’s Friction Table, 2007” (polywater.com/FTable.pdf). Values are averages based on cable jacket and conduit materials from multiple manufacturers.

CABLE JACKET	CONDUIT TYPE			
	HDPE	PVC	STEEL	FRP
LLDPE	.05	.11	.13	.14
PVC	.08	.09	.13	.14
CPE	.08	.10	.20	.16
XLPE	.07	.08	.13	.07
PP	.07	.05	.17	.10

Coefficient of friction data on additional or specific cable jackets or conduits can be obtained from American Polywater Corporation.

PRODUCT FEATURES

- **Heavy Pulls:** Preferred lubricant for URD and underground transmission cable installations.
- **Water Resistant:** Does not wash off. Reduces tension even when pulling through water.
- **Very Low Friction:** Consistently low friction and tension when pulling through HDPE and PVC pipe.
- **Nonfreezing Formula:** Polywater WNN and WNB can be used for cold weather (subfreezing) pulling. All lubricants are freeze/thaw stable.
- **Roller Option Available:** Polywater NB contains small, friction-reducing roller balls for lightweight cable. Other than the roller balls, Polywater NB has the same formula and physical properties as Polywater NN.

CABLE COMPATIBILITY

Tensile and Elongation:
LLDPE, HDPE, PP, XLPE, CPE, and PVC cable jacket materials aged in Polywater NN per IEEE Standard 1210[1] meet the tensile and elongation retention requirements of that standard.

Polyethylene Stress Cracking:
Polywater NN shows no stress cracking on LLDPE, MDPE, or HDPE cable jacket when tested per IEEE Standard 1210[1].

Volume Resistivity:
There are no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when volume resistivity is tested according to IEEE Standard 1210[1].

Cable Approvals:
Polywater NN and NB are approved and used by many cable manufacturers. Contact American Polywater for further information.

Field Data:
Polywater NN and NB have been specified and used on many long, heavy cable installations. Side-by-side comparison pull tension data is available. Contact American Polywater for details.

[1]IEEE Std 1210-2004; IEEE Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable.

PHYSICAL PROPERTIES

PROPERTY	RESULT
Appearance	Cream-colored, pourable gel
Wax and grease content	None
Non-Volatile solids (%)	3.5
VOC content	10 gm/L 200 gm/L (Winter Grade)
Viscosity	13,000–20,000 cps @10rpm
pH	7.5–9.0

PERFORMANCE PROPERTIES

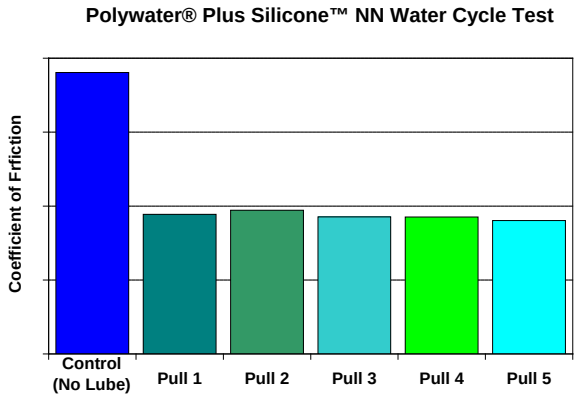
Coatability:
Coatability is a measure of the lubricant's ability to coat the jacket as a thin film for continued lubricity on longer pulls.

Polywater NN will wet out evenly on cable jacket surfaces. It will not bead up or rub off the jacket sample. A 1-inch (25 mm) diameter XLPE cable dipped 6 inches (152 mm) into the Polywater Polywater NN, then withdrawn and held vertically, will retain at least 15 grams of Polywater NN for one minute at 70° F (21°C).

Friction Reduction through Water:
Friction Reduction through Water is a measure of a lubricant's function through water.

Polywater NN will not show a significant increase in friction coefficient when tested with five water change cycles as described below.

A cable coated with Polywater NN was pulled through a water-filled HDPE duct wrapped 420° around a 3-foot diameter cylinder[2]. For this test, 25 lbs. of back tension was used. Measured tension was used to calculate friction coefficient as described in the Telcordia test procedure[2]. After each pull (cycle), the conduit was rinsed, cleaned, and fresh tap water was added. The same cable was pulled again, and tension measured. The cable was not relubricated between cycles.



Actual data from the test (above) shows no change in friction coefficient through five water change cycles.

[2] Telcordia Standard GR-356-CORE, Section 4.2.5; Generic Requirements for Optical Cable Innerduct, Associated Conduit, and Accessories. (Issue 2, June 2009).

APPLICATION PROPERTIES

Application Systems:
Polywater NN and NB lubricants have a thin gel consistency and can be poured directly into the conduit. Polywater NN can be pumped into the conduit or onto the cable using the Polywater LP-D5 specialty lubricant pump. Use of a pump allows hands-free transfer and consistent application of lubricant. This low-shear pump will not change the gel character of Polywater NN. The LP-D5 pump supports lubricant application rates of 1–2 gallons (4–8 liters) per minute.

Pull-Planner™ Tension Calculation Software is available from Polywater. Pulling tension estimations can ensure the use of appropriate pulling equipment and that the cable is installed within safe limits.

A Winter Grade version (WNN or WNB) *is also available for use during installation work below freezing.*

Temperature Use Range:
Polywater NN and NB:
20°F to 120°F (-5°C to 50°C).
Polywater WNN and WNB (Winter Grade versions):
-20°F to 120°F (-30°C to 50°C)

Temperature Stability:
Polywater NN, NB, WNN, or WNB will not phase-out after five freeze/thaw cycles or 5-day exposure at 120°F (50°C).

Cleanup:
Polywater NN, NB, WNN, or WNB are nonstaining. Complete cleanup possible with water.

Storage and Shelf Life:
Store Polywater NN (NB, WNN, or WNB) in a tightly sealed container away from direct sunlight. Lubricant shelf life is 18 months.

DIRECTIONS FOR USE

Lubricants NN, NB, WNN, and WNB can be poured or pumped directly onto the cable as it enters the conduit.

To prelubricate for long or difficult pulls, pour Polywater NN NB, WNN, or WNB into the conduit before the pull begins and spread with a mandrel or a swab on the winch line during the pull. For long horizontal pulls, place as much as two-thirds of the recommended quantity of lubricant into the conduit for prelubrication.

Directly lubricate the cable jacket as it enters the conduit for the entire length of the pull.

Clean up by wiping off any excess lubricant with a rag.

Recommended Lubricant Quantity:

$$Q = K \times L \times D$$

Where:

Q = quantity in gallons (liters)
L = length of conduit run in feet (meters)
D = ID of the conduit in inches (mm)
K = 0.0015 (0.0008 if metric units)

The quantity that is appropriate for any given pull can vary from this recommendation by 50%, depending on the complexity of the pull. Consider the following factors:

Cable weight and jacket hardness
(Increase quantity for stiff, heavy cable)

Conduit type and conditions
(Increase quantity for old, dirty, or rough conduits)

Conduit fill
(Increase quantity for high percent conduit fill)

Number of bends
(Increase quantity for pulls with several bends)

Pulling environment
(Increase quantity for high temperatures)

MODEL SPECIFICATION

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The cable pulling lubricant shall be Polywater® + Silicone™ NN Lubricant. The cable pulling lubricant shall provide a low coefficient of friction on a wide variety of cable jacket materials. The lubricant shall leave a low solids residue of less than 4.0%.

The lubricant shall be compatible with the cable jacket material. Cable jacket compatibility shall be tested by the IEEE 1210, Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable. The lubricant shall not stress crack polyethylene per ASTM Standard 1693. There shall be no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when the lubricant's effect on volume resistivity is tested according to IEEE Standard 1210.

The lubricant shall not show a significant increase in friction coefficient over five water change cycles when tested through a water-filled duct via Telcordia test standard GR-356-CORE, Section 4.2.5. The cable shall not be relubricated during the test.

ORDER INFORMATION

CAT #	PACKAGE DESCRIPTION
NN-128	1-gal. pail (3.78 liter) 4/case
NB-128	1-gal. pail (3.78 liter) 4/case
NN-320	2½-gal. jug (9.6 liter) 2/case
NB-320	2½-gal. jug (9.6 liter) 2/case
NN-640	5-gal. pail (18.9 liter)
NB-640	5-gal. pail (18.9 liter)
	Winter Grade
WNN-128	1-gal. pail (3.78 liter) 4/case
WNB-128	1-gal. pail (3.78 liter) 4/case
WNN-640	5-gal. pail (18.9 liter)
WNB-640	5-gal. pail (18.9 liter)

CONTACT US

1-800-328-9384 Toll Free | 1-651-430-2270 Main | 1-651-430-3634 Fax | email: support@polywater.com

Polywater® SPY™

SPRAYABLE CABLE PULLING LUBRICANT

Spraying SPY lubricant into a stub-up

Sprayable Liquid Lubricant for Cable Pulling or Pushing

PRODUCT BENEFITS

- **Zero Mess:** Thin film lubricant technology allows for spraying or using wipes to apply lube.
- **Thin Film Technology:** Formulated to cling onto cables and wires during long pulls.
- **Lubricates:** Reduces friction to lower pulling tension on all types of cable.
- **Easy to Apply:** Can be sprayed from pressurized sprayer or hand-trigger sprayer.
- **UL Listed:** Meets US and Canadian safety standards.

Application Made Easier

Polywater® SPY™ Spray Lubricant is a concentrated lubricant that reduces pulling tension using thin film technology. Excellent for underground cable installations where automated or spray application is preferred. Use SPY for a quick and easy application with zero mess.

Applying SPY lube to THHN

Using presaturated SPY lube wipes

EMT conduit application

SPY lubricant packaging

Thin Film Technology Coats Wires and Cables Lightly

Polywater SPY lubricant is packaged to make application easier for the most common types of cable and wire installations. Whether pulling into ½-inch conduits or installing URD cables into 4-inch conduits and greater, SPY does the job. It applies easily onto wires and cables from the one-quart spray bottle or a larger pump sprayer. The thin film lubricant technology evenly coats wire and cable throughout the pull, reducing ending tensions and cleanup time.

POLYWATER SPY

Catalog #	Package Description	Units/Case
SPY-D20/ WSPY-D20	20-count saturated wipe dispenser	12
SPY-35LR/ WSPY-35LR	1-qt. bottle (.95 liters)	12
SPY-128	1-gal. jug (3.8 liters)	4
SPY-640/ WSPY-640	5-gal. pail (18.9 liters)	1

*W in the catalog number indicates Winter Grade version.

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatibility:** Passes IEEE 1210 physical and electrical testing on a wide variety of cable materials. It does not stress crack polyethylene. Refer to the technical bulletin for details.
- **Friction Testing:** Shows excellent lubricity on a variety of cable jacket types. Using PVC conduit, the following COFs were measured: PVC .11, XLPE .06, LLDPE .07, THHN .08, XHHW .06. Method described in "Coefficient of Friction Measurement on Polywater's Friction Table, 2007". Typical values determined using 200 lbs/ft normal force.
- **Formula:** Contains no waxes or greases.
- **Temperature Use Range:** Polywater SPY: 20˚F to 120˚F (-5˚C to 50˚C). Polywater WSPY (Winter Grade version): -20˚F to 120˚F (-30˚C to 50˚C)

CONTACT US

1-800-328-9384 Toll Free
1-651-430-2270 Main
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email: support@polywater.com

American Polywater® Corporation

11222 60th Street N | Stillwater, MN 55082 USA

American Polywater® Corporation

POLYWATER® SPY CABLE LUBRICANT

DESCRIPTION

Polywater® SPY is based on unique lubricant chemistry and technology. Much like a paint, the lubricant thins as it is sprayed or wiped. Once on the cable or conduit surface, it thickens to stay coated. Polywater SPY works even after it has dried. The residue is a thin, slippery film that retains lubricity for months after use.

Polywater SPY Spray Lubricant can be sprayed into the duct or wiped on the cable for thin film lubrication. Polywater SPY is highly concentrated and effective without a thick coating.

Polywater SPY is recommended for spray or wipe lubrication with no mess. The lubricant is suitable for all types of cable installations.

Polywater SPY can be sprayed directly into ducts or onto cables

FRICTION TESTING

Lubricity:
Polywater SPY shows superior friction reduction on a variety of jacket types. Typical friction coefficients at 200 lbs/ft (2.91 kN/m) normal pressure are shown. Test results are based on the method described in the white paper, “Coefficient of Friction Measurement on Polywater’s Friction Table, 2007” (http://www.polywater.com/ftable/). Values are averages based on cable jacket and conduit materials from multiple manufacturers.

CABLE JACKET	CONDUIT TYPE		
	PVC	STEEL	EMT
LLDPE	.07	.07	.12
Nylon (THHN)	.08	.09	.16
PVC (THWN)	.11	.11	.21
XLPE (XHHW)	.06	.14	.17

Coefficient of friction data on additional or specific cable jackets or conduits can be obtained from American Polywater Corporation.

PRODUCT FEATURES

- **Lubricates with a Thin Film:** Efficiently reduces friction on wire/cable.
- **Zero Mess:** Dries quickly and cleanly, continues to lubricate after it is dried.
- **Versatile Application:** Can be sprayed into conduit or wiped onto cable jacket.
- **Compatible with Most Cable Jackets:** Suitable for use with a broad variety of cables and building wires.

END USES

Effective for general construction. Lowers tension on traditional building wire. Effectively reduces friction for cable pushing. May be sprayed or poured for no-mess underground cable installation.

APPROVALS

UL Listed
UL Listed to Canadian safety standards

CABLE COMPATIBILITY

Polyethylene Stress Cracking:
Polywater SPY shows no stress cracking on LLDPE cable jacket when tested per IEEE Standard 1210[1].

Tensile and Elongation Effects:
LLDPE, XLPE, and PVC cable jacket materials aged in Polywater SPY per IEEE Standard 1210[1] meet the tensile and elongation retention requirements of that standard.

Volume Resistivity:
There are no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when volume resistivity is tested according to IEEE Standard 1210[1].

Building Wire Testing:
THHN and XLPE building wire meet UL tensile, elongation, and voltage withstand requirements after exposure to Polywater SPY as tested by UL requirements[2].

Corrosivity: Lubricant is non-corrosive to steel, copper, or aluminum. Passes UL 267[2] corrosion testing on zinc-coated EMT.

[1] *IEEE Std 1210-2004; IEEE Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable.*

[2] *UL Subject 267, Investigation for Wire-Pulling Compounds.*

PHYSICAL PROPERTIES

Polywater SPY is a thin, concentrated liquid lubricant.

PROPERTY	RESULT
Appearance	Slightly thickened, white liquid
Percent nonvolatile solids	4%
VOC content	0 gms/liter
Viscosity	250–750 cps @10rpm
pH	7.5–9.

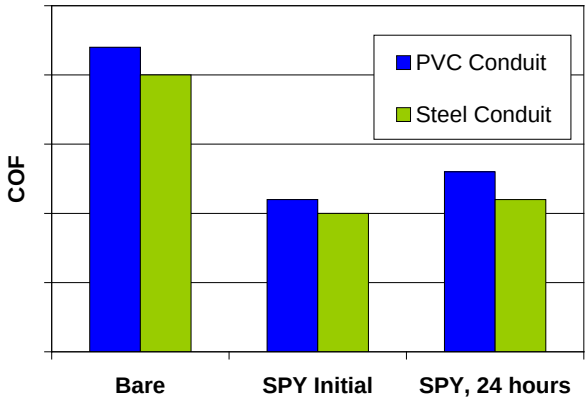
Temperature Use Range:
Polywater SPY:
20°F to 120°F (-5°C to 50°C).
Polywater WSPY (Winter Grade version):
-20°F to 120°F (-30°C to 50°C)

Temperature Stability:
No phase-out after five freeze/thaw cycles or 5-day exposure at 120°F (50°C). *Will not phase out or separate during the shelf life of lubricant.*

PERFORMANCE PROPERTIES

Dry Lubrication:
Dry lubrication measurements indicate the capability of thin-film lubricants to continue to lubricate when dry.

Polywater SPY Lubricant continues to work even after it dries. Coefficient of friction values measured on cable coated and then dried for 24 hours are within 20% of the initial "wet" value. Measurements were done using the Friction Table Method described in the white paper, "Coefficient of Friction Measurement on Polywater's Friction Table, 2007." (http://www.polywater.com/ftable/)



Improves Enhanced Cable Performance:
Polywater SPY further lowers friction on enhanced (treated) cables. Coefficient of friction is tested using the Friction Table Method. Results show lower tension by 40%–70%. (Lubricating enhanced THHN)

Wetting—Continuous Coat:
Wetting is a measure of the lubricant's ability to coat the jacket as a thin film for continued lubricity on longer pulls.

Polywater SPY Lubricant will wet out evenly on cable surfaces. It will not bead up or rub off the cable jacket. Lubricant will completely coat a 1-inch diameter THHN or PVC-jacketed cable dipped 6 inches (152 mm) into the lubricant and then withdrawn after 10 seconds. The lubricant coating shall cover 100% of the immersed cable jacket without dripping off, nonwetting, or drawing back from the edges as the cable is held horizontally for one minute at 70°F (21°C).

Combustibility:
Lubricant has no flash point and dried residue is nonflammable.

APPLICATION PROPERTIES

Polywater SPY is a thin, concentrated liquid that can be sprayed into the duct or wiped on the cable. Industrial sprayers are available for automatic spraying application. Polywater SPY has been successfully tested for a variety of uses:

- Lubricating fiberglass rods for easier and longer insertions during fishing.
- Spraying holes in wood studs to reduce tension in hand-pulled Romex wire.
- Eliminating need to fish by allowing shorter runs of wire to be pushed.
- Lowering tension on traditional building wire pulling into EMT or PVC conduits.
- Pressurized spraying for no-mess underground cable installation.

Application Systems:
Polywater SPY Lubricant can be applied in several unique and innovative ways. This thin liquid can be sprayed or wiped directly on the cable jacket. Shorter cable runs can be pushed once the cable is coated with Polywater SPY. The slightly gelled character of Lubricant SPY helps it to coat and wet the cable for more difficult and complex cable pulls as well.

Spraying Characteristics:
Low viscosity lubricant allows product to flow through airless spray heads. Lubricant will not clog valves or atomizers on the sprayer.

Trigger Spray Bottle:
Use the trigger sprayer on the SPY-35LR bottle to spray Polywater SPY directly on the cable or into the conduit. The bottle can be refilled for multiple uses.

Wipe Application:
For small cables, use the SPY-D20 towelette to wipe the lubricant on the cable jacket. This presaturated wipe lays down a thin, even coat of lubricant. The towel material will release the lubricant without a mess.

Cleanup:
Nonstaining. Complete cleanup is possible with water.

Storage and Shelf Life:
Store Polywater SPY in a tightly sealed container away from direct sunlight. Lubricant shelf life is 18 months.

DIRECTIONS FOR USE

Polywater SPY can be sprayed or wiped directly onto the cable as it enters the conduit. Coat the entire cable jacket for best friction reduction.

Polywater SPY is effective at lower quantity than traditional cable pulling lubricants. For short runs, spray or pour an appropriate amount of Polywater SPY into the conduit before the pull, so the cable will pick up the lubricant as it is pulled.

Polywater SPY leaves a light, clean residue. Any remaining residue will evaporate quickly.

Recommended Lubricant Quantity:
$Q = k \times L \times D$

Where:

Q = quantity in gallons (liters)
L = length of conduit run in feet (meters)
D = ID of the conduit in inches (mm)
k = 0.0005 (0.00027 if metric units)

The appropriate quantity for use on any given pull varies, depending on the complexity of the pull. Factors that may increase difficulty are heavy cables, poor conduit condition, high number of bends, and extreme temperature conditions.

Lubricant Wipe Guidelines:
Polywater SPY wipe package (SPY-D20) is a convenient way to apply lubricant for shorter cable runs. Each wipe coats and lubricates 50 to 100 feet (15 to 30 meters) of cable. Use additional wipes as needed for longer, larger, or more difficult pulls. A light coating of Polywater SPY facilitates cable pushing or pulling.

Wipe application with Polywater SPY-D20

MODEL SPECIFICATION

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The cable pulling lubricant shall be Polywater® SPY Lubricant. Lubricant has a sprayable viscosity and will not clog valves or applicators. It shall coat and cling to the cable. It shall be nonstaining.

Lubricant shall produce a low coefficient of friction on a wide variety of cable jacket materials and shall lubricate at low coating thickness. Lubricant shall continue to reduce friction after it has dried. It shall conform to the physical and electrical requirements of IEEE 1210. It shall not contain solvents and shall not have a flash point.

No substitutions are permitted without certification from an officer of the manufacturer that the substitute product meets all the requirements of this specification.

ORDER INFORMATION

CAT #	PACKAGE DESCRIPTION
SPY-D20	20-count wipe canister 12/case
SPY-35LR	1-qt. spray bottle (0.95 liter) 12/case
SPY-128	1-gal. pail (3.78 liter) 4/cases
SPY-640	5-gal. pail (18.9 liter)
	Winter Grade
WSPY-35LR	1-qt. spray bottle (.95 liter) 12/case
WSPY-640	5-gal. pail (18.9 liter)

CONTACT US

1-800-328-9384 Toll Free | 1-651-430-2270 Main | 1-651-430-3634 Fax | email: support@polywater.com

American Polywater® Corporation

Polywater® CLR

CLEAR CABLE PULLING LUBRICANT

Quarts make application easy

Clear Lubricant for Electrical Applications

PRODUCT BENEFITS

- **Clean:** Wipes off easily so wire markers stick.
- **Water-Based Lubricant:** Non-staining—won't stain clothing, carpet, or sheetrock.
- **Reduces Friction:** Lowers tension on cable pulls.
- **Clings to Cable:** Easy to hand apply or squeeze out of bottles.
- **UL and ULC Listed:** Meets testing criteria.

Clear Lubricant for Everyday Cable Pulling

Polywater® CLR Clear Cable Pulling Lubricant is a clear, colorless, clean, slow-drying, easy-to-apply gel lubricant. This thick gel lubricant was developed to avoid drippage for easy handling and application.

Excellent cling factor

EMT, GRS, or PVC applications

polywater.com | 651-430-2270

American Polywater® Corporation

CLR packaging (drum not pictured)

Suitable for All Types of Cable Installations

Polywater CLR is a versatile lubricant for all types of wire and cable installations. From electrical service work to pulling in feeder cables, it provides a clean and easy way to finish projects.

POLYWATER CLR

Catalog #	Package Description	Units/Case
CLR-35	1-qt. bottle (0.95 liter)	12
CLR-128	1-gal. pail (3.8 liters)	4
CLR-640	5-gal. pail (18.9 liters)	1
CLR-DRUM	55-gal. drum (208 liters)	1

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatibility:** Passes IEEE 1210 physical and electrical testing on a wide variety of cable materials. It does not stress crack polyethylene.
- **Physical Properties:** Dries slippery. Unlike wax lubes, it leaves little residue and will not cement cables to conduit. Contains no wax, grease, or silicone.
- **Temperature Use Range:** 20°F to 120°F (-5°C to 50°C).
- **Temperature Stability:** No phase-out after five freeze/thaw cycles or 5-day exposure at 120°F (50°C).

CONTACT US

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email: support@polywater.com

American Polywater® Corporation

11222 60th Street N | Stillwater, MN 55082 USA

 LIT-CLRFLYER/REV002

American Polywater® Corporation

Polywater® CLR Clear Lubricant

DESCRIPTION

Polywater® CLR Clear Cable Pulling Lubricant is a clear, colorless, clean, slow-drying, easy-to-apply gel lubricant. This thick gel lubricant was developed with “clingability” for easy handling and application. Polywater CLR is a good lubricant for everyday cable pulling of both electrical and communication cable.

Polywater CLR is popular for small cable installation in a commercial environment because it is nonstaining and easy to clean up.

The dried residue of Polywater CLR is nonconductive and noncombustible. Polywater CLR is harmless to humans, environmentally safe, compatible with cable jacket materials, and easy to use.

FRICTION TESTING

Lubricity: Polywater CLR shows good friction reduction across a broad class of jacket types. Typical values at 200 lbs/ft (2.91 kN/m) normal pressure are shown. Test results are based on the method described in the white paper, “Coefficient of Friction Measurement on Polywater’s Friction Table, 2007” (polywater.com/FTable.pdf). Values are compiled from testing on multiple cable jacket and conduit materials.

CABLE JACKET	CONDUIT TYPE		
	EMT	PVC	STEEL
XLPE	.14	.11	.13
PVC	.11	.11	.13

Coefficient of friction data on additional or specific cable jackets or conduits can be obtained from American Polywater Corporation.

Clear gel lubricant is easy to use and does not stain

PRODUCT FEATURES

- **Reduces Friction**: Easier, lower-tension cable pulls.
- **Clean, Non-Staining**: Quick clean up.
- **Water-Based Lubricant:** Safe to use and biodegradable.
- **Clings to Cable**: Easy hand application
- **Compatible with Cable Jackets:** Suitable for a broad variety of wire and cable.

END USE

Use for all types of cable installations, including:

- General electrical or communication use
- Smaller wiring upgrades
- Indoor or building construction

APPROVALS

UL Listed
UL Listed to Canadian safety standards

PHYSICAL PROPERTIES

PROPERTY	RESULT
Appearance	Clear, colorless gel
Wax, grease and silicone content	None
Nonvolatile solids (%):	5%
VOC content	20 g/L
Viscosity	40,000 – 60,000 cps @10rpm
pH	6.5 – 8.0

CABLE COMPATIBILITY

Polyethylene Stress Cracking:
Polywater CLR shows no stress cracking on LLDPE cable jacket when tested per IEEE Standard 1210[1].

Tensile and Elongation Effects:
PVC, LLDPE, and XLPE cable jacket materials aged in Polywater Lubricant CLR per IEEE Standard 1210[1] meet the tensile and elongation retention requirements of that standard.

Volume Resistivity:
There are no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when volume resistivity is tested according to IEEE Standard 1210[1].

Building Wire Testing:
THHN and XLPE building wire meet UL tensile, elongation, and voltage withstand requirements after exposure to Polywater CLR Lubricant as tested by UL requirements[2].

Corrosivity:
Lubricant is noncorrosive to steel, copper, or aluminum. Passes UL 267[2] corrosion testing on zinc-coated EMT.

[1] *IEEE Std 1210-2004; IEEE Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable.*

[2] *UL Subject 267, Investigation for Wire-Pulling Compounds.*

PERFORMANCE PROPERTIES

Cling Factor:
Cling factor is a measure of the ability to apply the lubricant and have it stay on the jacket while the cable enters the conduit.

A six-inch length (152 mm) of a one-inch (25 mm) diameter cable will hold at least 70 grams of Polywater Lubricant CLR for one minute when held vertically at 70°F (21°C).

Coatability:
Coatability is a measure of the lubricant's ability to coat the jacket as a thin film for continued lubricity on longer pulls.

Material will wet out evenly on all surfaces. It will not bead up or rub off cable jacket. A one-inch (25 mm) diameter XLPE cable dipped six inches (152 mm) into the Polywater Lubricant CLR, then withdrawn and held vertically, will retain at least 20 grams of Polywater Lubricant CLR for one minute at 70° F (21° C).

Residue:
Residue is the percent solids remaining when the lubricant dries. A high residue can "cement" cables in place to prevent future removal or adjustment.

Polywater CLR Lubricant has a low residue, less than 5% solids. The residue dries clear with no powders or discoloration. As Lubricant CLR dries, the product retains its lubricity.

Combustibility:
Lubricant has no flash point and dried residue is non-flammable.

Clarity:
Polywater CLR Lubricant is completely clear and non-staining. All components are water soluble.

APPLICATION PROPERTIES

Application Systems:
Polywater CLR has a thick gel consistency that makes it easy to hand apply. The product will cling to the cable through vertical and long pulls.

The clear character of the lubricant and the low solids content make Polywater CLR an ideal lube for installations where cleanliness is a concern.

Pull-Planner™ Cable Tension Calculation Software is available from Polywater. Pulling tension estimations can ensure the use of appropriate pulling equipment and that the cable is installed within safe limits.

Temperature Use Range:
20°F to 120°F (-5°C to 50°C).

Temperature Stability:
No phase-out after five freeze/thaw cycles or 5-day exposure at 140°F (60°C).

Cleanup:
Polywater CLR is non-staining. Complete cleanup is possible with water.

Storage and Shelf Life:
Store Polywater CLR in a tightly sealed container away from direct sunlight. Lubricant shelf life is two (2) years.

DIRECTIONS FOR USE

Pumped or hand applied directly onto the wire or cable. The conduit should be clean and continuous.

To prelubricate for long or difficult pulls, squirt a liberal amount of Polywater CLR Lubricant into the conduit before the pull begins and use a mandrel or a swab on the winch line to spread the lubricant during the pull.

Clean-up by wiping off excess lubricant with a rag.

Recommended Lubricant Quantity:

$Q = k \times L \times D$

Where:

Q = quantity in gallons (liters)
L = length of conduit in feet (meters)
D = ID of the conduit in inches (mm)
k = 0.0015 (0.0008 if metric units)

The quantity that is appropriate for any given pull can vary from this recommendation by 50%, depending on the complexity of the pull. Consider the following factors:

Cable weight and jacket hardness
(Increase quantity for stiff, heavy cable)

Conduit type and conditions
(Increase quantity for old, dirty or rough conduits)

Conduit fill
(Increase quantity for high percent conduit fill)

Number of bends
(Increase quantity for pulls with several bends)

Pulling environment
(Increase quantity for high temperatures)

MODEL SPECIFICATION

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The cable pulling lubricant shall be Polywater CLR Lubricant. The lubricant shall be a clear, colorless thick gel that can be hand applied without dripping. The lubricant shall contain **no** waxes, greases, or silicones.

Cable jacket compatibility shall be tested by the IEEE 1210, Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable. It shall pass physical compatibility tests on PVC, LLDPE and XLPE cable jacket or sheath materials. It shall not stress crack polyethylene per ASTM Standard 1693. There shall be no significant changes in the conductive properties of XLPE semi-conducting compounds when the lubricant's effect on volume resistivity is tested according to IEEE Standard 1210.

ORDER INFORMATION

CAT #	PACKAGE DESCRIPTION
CLR-35	1-qt. squeeze bottle (0.95 liter) 12/case
CLR-128	1-gal. pail (3.78 liter) 4/case
CLR-640	5-gal. pail (18.9 liter)

CONTACT US

1-800-328-9384 Toll Free | 1-651-430-2270 Main | 1-651-430-3634 Fax | email: support@polywater.com

Polywater® Dyna-Blue®

CABLE PULLING LUBRICANT

Dyna-Blue is easy to hand apply

Thick Gel Lubricant
Best for Hand Application

PRODUCT BENEFITS

- **Clean:** Non-staining gel lubricant. Won't stain clothing, carpet, or sheetrock.
- **Easy:** Can be applied by hand.
- **High Cling Factor:** Stays on wires during application. Will not cold flow.
- **Temperature Stable:** No ruined lubricant from freeze/thaw exposure.
- **Wipes Clean and Dry:** Wire markers stick to cable jackets.

Terrific for Vertical-Up Applications—Won't Cold Flow

Dyna-Blue® Lubricant is clean, dries slippery, and won't separate out. The thick gel is compatible with common electrical cables and has "clingability" for easy handling and application. It is a good lubricant for everyday use when installing THHN, XHHW, and fire alarm cables.

EMT, GRS, or IMC applications

Excellent choice for service work

polywater.com | 651-430-2270

American Polywater® Corporation

Dyna-Blue packaging (drum not pictured)

Packages to Meet Wire Installation Needs

Whether the pull is short or long, Dyna-Blue offers a package needed to get the job done. Polywater® Dyna-Blue Lubricant can also be pumped using the LP-D5 drill-powered pump.

POLYWATER DYNA-BLUE

Catalog #	Package Description	Units/Case
D-35	1-qt. bottle (0.95 liter)	12
D-128	1-gal. pail (3.8 liters)	4
D-640	5-gal. pail (18.9 liters)	1
D-DRUM	55-gal. drum (208 liters)	1

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatibility:** Passes IEEE 1210 physical and electrical testing on a wide variety of cable materials. It does not stress crack polyethylene.
- **Physical Properties:** Dries slippery. Unlike wax lubes, it leaves little residue and will not cement cables to conduit. Contains no wax, grease, or silicone.
- **Temperature Use Range:** 20° F to 120° F (-5° C to 50° C).
- **Temperature Stability:** No phase-out after five freeze/thaw cycles or 5-day exposure at 120° F (50° C).

CONTACT US

1-800-328-9384 Toll Free
1-651-430-2270 Main
1-651-430-3634 Fax

email: support@polywater.com

American Polywater® Corporation

11222 60th Street N | Stillwater, MN 55082 USA

American Polywater® Corporation

Dyna-Blue® Heavy Duty Cable Lubricant

DESCRIPTION

Dyna-Blue® Cable Pulling Lubricant is a clean, slow-drying, easy-to-apply gel lubricant. It has "clingability" for easy handling and hand application. Dyna-Blue is a good lubricant for everyday use in general electrical and communication applications.

Dyna-Blue Lubricant is popular for commercial and institutional pulling because it is non-staining and easy to clean up in these environments.

Dyna-Blue Cable Pulling Lubricant is slow drying. It effectively reduces friction and continues to lubricate for the full length of the pull. Its dried residue is non-conductive and non-combustible.

Dyna-Blue Cable Pulling Lubricant is harmless to humans, environmentally safe, compatible with cable jacket materials and easy to handle.

FRICTION TESTING

Lubricity: Dyna-Blue shows good friction reduction across a broad class of jacket types. Typical values at 200 lbs/ft (2.91 kN/m) normal pressure are shown. Test results are based on the method described in the white paper, "Coefficient of Friction Measurement on Polywater's Friction Table, 2007" (polywater.com/FTable.pdf). Values are compiled from testing on multiple cable jacket and conduit materials.

CABLE JACKET	CONDUIT TYPE		
	EMT	PVC	STEEL
XLPE	.18	.08	.18
LLDPE	.14	.11	.17
PVC	.11	.11	.19
CPE	.23	.21	.24
THHN	.23	.09	.21

Coefficient of friction data on additional or specific cable jackets or conduits can be obtained from American Polywater Corporation.

Dyna-Blue Lubricant clings without dripping

PRODUCT FEATURES

- **Clean:** Non-staining gel lubricant.
- **Easy:** Can be applied by hand.
- **High Cling Factor:** Stays on wires during application.
- **Temperature Stable:** No ruined lubricant from freeze/thaw exposure.
- **Wipes Clean and Dry:** Wire markers stick to cable jackets.

END USE

Use for all types of cable installations, including:

- General electrical or communication use
- Overhead and vertical installations
- Indoor or building construction

APPROVALS

UL Listed
UL Listed to Canadian safety standards

CABLE COMPATIBILITY

Tensile and Elongation Effects:
XLPE, LLDPE, VLDPE, PVC, CPE, and CSPE cable jacket materials aged in Dyna-Blue Lubricant per IEEE Standard 1210[1] meet the tensile and elongation retention requirements of that standard.

Polyethylene Stress Cracking:
Dyna-Blue Lubricant shows no stress cracking on LLDPE, MDPE, or HDPE cable jacket when tested per IEEE Standard 1210[1].

Volume Resistivity:
There are no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when volume resistivity is tested according to IEEE Standard 1210[1].

Building Wire Testing:
THHN and XLPE building wire meet UL tensile, elongation, and voltage withstand requirements after exposure to Dyna-Blue Lubricant as tested by UL requirements[2].

Cable Approvals:
Dyna-Blue Lubricant is approved by most cable manufacturers. Contact American Polywater for further information.

[1] *IEEE Std 1210-2004; IEEE Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable.*

[2] *UL Subject 267, Investigation for Wire-Pulling Compounds.*

PHYSICAL PROPERTIES

PROPERTY	RESULT
Appearance	Thick, light blue gel
Wax, Grease and Silicone Content	None
Non-Volatile Solids (%)	3.0%
VOC Content	0 g/L
Viscosity	70,000 – 110,000 cps @10rpm
pH	6.5 – 8.5

PERFORMANCE PROPERTIES

Cling Factor:
Cling factor is a measure of the ability to apply the lubricant and have it stay on the jacket while the cable enters the conduit.

A six-inch length (152 mm) of a one-inch (25 mm) diameter cable will hold at least 75 grams of Dyna-Blue Lubricant for one minute when held vertically at 70°F (21°C).

Coatability:
Coatability is a measure of the lubricant's ability to coat the jacket as a thin film for continued lubricity on longer pulls.

Dyna-Blue Lubricant will wet out evenly on cable jacket surfaces. It will not bead up or rub off of the jacket sample. A one-inch (25 mm) diameter XLPE cable dipped six inches (152 mm) into the Dyna-Blue, then withdrawn and held vertically, will retain at least 25 grams of Dyna-Blue Lubricant for one minute at 70°F (21°C).

Combustibility:
Lubricant has no flash point and dried residue is non-flammable.

APPLICATION PROPERTIES

Application Systems:
Dyna-Blue Lubricant has a thick gel consistency that makes it easy to hand apply.

Dyna-Blue Lubricant can also be pumped directly into the conduit or onto the cable using the Polywater LP-D5 specialty lubricant pumps. Pumps allow hands-free transfer and consistent application of lubricant. However, the thick gel consistency limits the length of the discharge hose and the pumping rate. The LP-D5 supports Dyna-Blue Lubricant application rates of 1 to 2 gallon (4 to 8 liters) per minute.

Pull-Planner™ Tension Calculation Software is available from Polywater. Pulling tension estimations can ensure the use of appropriate pulling equipment and that the cable is installed within safe limits.

Temperature Use Range:
20°F to 120°F (-5°C to 50°C).

Temperature Stability:
No phase-out after five freeze/thaw cycles or 5-day exposure at 120°F (50°C).

Cleanup:
Dyna-Blue Lubricant is non-staining. Complete cleanup is possible with water.

Storage and Shelf Life:
Store Dyna-Blue Lubricant in a tightly sealed container away from direct sunlight. Lubricant shelf life is two years.

DIRECTIONS FOR USE

Dyna-Blue Lubricant can be squeezed, pumped or hand applied directly onto the wire or cable. The thick clingy gel character allows Dyna-Blue to be applied to vertical installations. Conduit should be clean and continuous.

To prelubricate for long or difficult pulls, squirt a liberal amount of Dyna-Blue Lubricant into the conduit before the pull begins and use a mandrel or a swab on the winch line to spread the lubricant during the pull.

Clean-up by wiping off any excess lubricant with a rag.

Recommended Lubricant Quantity:

$Q = k \times L \times D$

Where:

Q = quantity in gallons (liters)
L = length of conduit in feet (meters)
D = ID of the conduit in inches (mm)
k = 0.0015 (0.0008 if metric units)

The quantity that is appropriate for any given pull can vary from this recommendation by 50%, depending on the complexity of the pull. Consider the following factors:

Cable weight and jacket hardness
(Increase quantity for stiff, heavy cable)

Conduit type and conditions
(Increase quantity for old, dirty or rough conduits)

Conduit fill
(Increase quantity for high percent conduit fill)

Number of bends
(Increase quantity for pulls with several bends)

Pulling environment
(Increase quantity for high temperatures)

MODEL SPECIFICATION

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The cable pulling lubricant shall be Dyna-Blue® Lubricant. The cable pulling lubricant shall produce a low coefficient of friction on a wide variety of cable jacket materials. The lubricant shall be UL listed. It shall be easy to handle and adhere well to the cable.

The lubricant shall pass the IEEE 1210, Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable. It shall pass physical compatibility tests on LLDPE, XLPE, CPE, and PVC cable jacket or sheath materials. It shall not stress crack polyethylene per ASTM Standard 1693. There shall be no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when the lubricant's effect on volume resistivity is tested according to IEEE Standard 1210.

ORDER INFORMATION

CAT #	PACKAGE DESCRIPTION
D-35	1-qt. squeeze bottle (0.95 liter) 12/case
D-128	1-gal. pail (3.78 liter) 4/case
D-640	5-gal. pail (18.9 liter)
D-Drum	55-gal. drum (208 liter)

CONTACT US

1-800-328-9384 Toll Free | 1-651-430-2270 Main | 1-651-430-3634 Fax | email: support@polywater.com

Polywater® CableFree® Loosener

CABLE REMOVAL AID

Pouring CableFree Loosener into the conduit

Specialty Lubricant for Removing Stuck Wires and Cables from Conduits

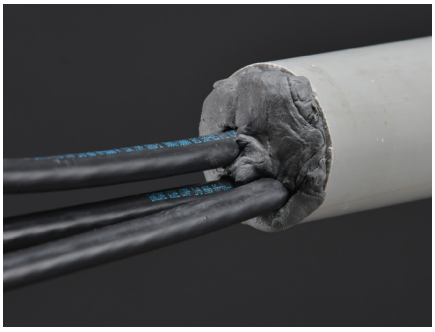
PRODUCT BENEFITS

- **Stuck Wire Removal:** Softens binding agents.
- **Lubricates:** Minimizes the force required to remove the cable.
- **Conduit is Reusable:** Leaves empty conduit undamaged and ready for reuse after cleaning and drying.
- **Economical:** Lowers duct reclamation costs.
- **Limits Liability:** Meets NEC Codes for Removal of Abandoned Cable: Articles 800.2, 800.52(1), & 770.2.

Reclaims Conduit Raceways

CableFree® Loosener is designed to remove "cemented" wires and cables from conduit systems caused by yellow wax-based or old soap-based pulling lubricant residues; cloth-jacketed wires; "bird nesting" of wires; and rust, mud, or bitumen deposits.

Blowing CableFree through conduits



Damming prevents leaking

CableFree Loosener packaging

Quantity Calculation Made Simple

As a rule of thumb, one quart of CableFree Loosener should be used for every 50 feet of 1” conduit (1 liter per 15 m of 2.5-cm conduit). For larger conduits, the following equation provides a starting estimate of the amount of loosener for a particular cable removal.

Q = .02 x L x D
Metric Formula: Q = .024 x L x D
Q = quantity required in quarts (liters for metric)
L = length of the conduit in feet (meters for metric)
D = diameter of the conduit in inches (centimeters for metric)

POLYWATER CABLEFREE LOOSENER

Catalog #	Package Description	Units/Case
CF-35	1-qt. bottle (0.95 liter)	12
CF-128	1-gal. jug (3.8 liters)	4
CF-640	5-gal. pail (18.9 liters)	1

SPECIFICATIONS AND APPLICATIONS:

- All circuits should be de-energized for safe operation. Do not work with liquid chemicals around live circuits.
- **NOTE:** Caution should be exercised when working with these liquid materials. Consult the SDS sheet.
- Pour, pump, or use air pressure to “blow” through the system.
- Objective is to get the CableFree Loosener to all points of the conduit so it can dissolve the binding materials.
- Allow CableFree to sit in system for at least 2 hours, preferably 24 hours. Older systems will require longer wait times.
- If the cable fails to move, attach a hydraulic jack or try pulling from the opposite end.
- Once the cable is removed, pull a water-soaked rag through the conduit, then pull a drying swab back and forth until conduit is dry.
- **Do not reuse wires or cables pulled out of conduit!**

CONTACT US

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email: support@polywater.com

American Polywater® Corporation

11222 60th Street N | Stillwater, MN 55082 USA

Communications Cable Lubricants

Polywater® CPL

CABLE PULLING LUBRICANT

Pouring Polywater CPL lubricant into a conduit

Pourable Universal Lubricant for Fiber Optic, Copper, Coax, and Power Supply Cables

PRODUCT BENEFITS

- **Superior Friction Reduction:** For lower tension cable pulls.
- **Easy to Apply:** Pours easily into innerducts and feeder tubes.
- **Compatible with Cable Jackets:** No cable jacket weakening or cracking issues.
- **Meets California CCR 22 Fathead Minnow Screen:** No disposal issues. Not a CA hazardous waste.
- **Wets Out and Covers PE Jackets:** Provides thorough lubrication on long pulls.

For Maximum Friction Reduction on Cable Pulls

Polywater® CPL is a high-performance, pourable cable pulling lubricant formulated specifically for the communications industry. It is recommended for long fiber optic, copper-paired, or coaxial cable pulls. CPL leaves a lubricating film after its water base has evaporated.

CPL-128 (1 gallon) poured into conduit

CPL applied using the LP-D5 pump

polywater.com | 651-430-2270

American Polywater® Corporation

CPL family

WCPL family (Winter Grade)

Packages Designed for Pouring

Polywater CPL is available in two grades: Regular Grade CPL (*photo 1*) and Winter Grade WCPL (*photo 2*) for cold weather use in temperatures as low as -20°F (-30°C). The packages are all designed to allow the lubricant to be poured into upturned innerduct or a feeder tube.

POLYWATER CPL

Catalog #	Package Description	Units/Case
NA / WCPL-35	1-qt. (0.95-liter) bottle	12
CPL-128 / WCPL-128	1-gal. (3.8-liter) jug	4
CPL-320 / WCPL-320	2½-gal. (9.6-liter) jug	2
CPL-640 / WCPL-640	5-gal. (18.9-liter) pail	1

*W in the catalog number indicates Winter Grade version.

SPECIFICATIONS AND APPLICATIONS:

- **Lubricity:** LDPE-, MDPE-, and HDPE-jacketed cable on HDPE and PVC innerduct at 200 lbs./ft. (2.91 kN/m) sidewall force, coefficient of kinetic friction < 0.12.
- **Percent Non-Volatile Solids:** 4.5% to 5.5%.
- **Appearance:** Opaque-white stringy liquid. Pourable viscosity (1,000-3,000 cps @ 10 rpm).
- **pH:** Neutral (6.5-7.5).
- **Cable Compatibility:** No deleterious effects on physical or electrical properties of cable jackets.
- **Polyethylene Stress Cracking:** No stress cracking on LDPE cable jackets when tested by ASTM D1693.

CONTACT US

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American Polywater® Corporation

Polywater® CPL Communications Lubricant

DESCRIPTION

Polywater® CPL Lubricant is a pourable, high-performance pulling lubricant formulated for the communications industry. Use it for long fiber optic, copper, or coaxial cable pulls.

Polywater CPL provides maximum friction reduction between cable and conduit under both low and high sidewall bearing pressures. It is slow drying and leaves a lubricating film after its water base has evaporated. Polywater CPL is suitable for use on polyethylene communication cables. It coats evenly and clings well to cable.

Polywater CPL is safe for the aquatic environment. It meets California regulation CCR 22.

FRICTION TESTING

Friction is measured using a standard Telcordia test procedure[1]. HDPE duct is wrapped 420° around a three-foot-diameter (0.9 m) cylinder. In this study, a variable weight is attached to the cable. Pulling force is measured as the cable is pulled at 65 ft/min (19.8 m/min) through the wrapped duct. Friction coefficient is calculated from the pulling force/back tension ratio. Results below are typical values.

COEFFICIENT OF FRICTION FOR MDPE JACKET CABLE INTO HDPE SMOOTHWALL INNDERDUCT			
BACK TENSION	CONDITION		
	NO LUBE	INITIAL	DRY
14 lb	>0.30	0.10	0.12
25 lb	>0.30	0.09	0.11

For the dry test, continuous, warm air was run through the conduit until the lubricant volatiles had evaporated (~1 hour). Polywater CPL shows good friction reduction even after drying. Dry coefficient of friction values are within 30% of initial value.

[1] *Telcordia Standard GR-356-CORE, Section 4.2.5; Generic Requirements for Optical Cable Innerduct, Associated Conduit, and Accessories. (Issue 2, June 2009).*

Polywater CPL is a thick liquid that can be poured directly into the duct system

PRODUCT FEATURES

- Superior friction reduction
- Easy to apply
- Compatible with communications cable jackets
- Meets California CCR 22 Fathead Minnow Screen
- Wets out and covers polyethylene cables
- Slow drying with lubricious residue
- Available in winter grade formula

END USE

Use for all types of communications cable installations, including:

- Network cabling
- Silicone-lined and prelubricated ducts
- Lightweight cable, underground installation
- Heavy cable

CABLE COMPATIBILITY

Polyethylene Stress Cracking:
Polywater CPL does not stress crack polyethylene jackets commonly used on communications cables. Untreated polyethylene (Union Carbide DYNK) and MDPE jacket material were both tested according to ASTM standard method.[1] After 168 hours of exposure none of the test specimens showed failures.

Polycarbonate Stress Cracking:
Polywater CPL will not stress crack polycarbonate. Polycarbonate bars are bent to a defined strain and exposed to lubricant as described in the Telcordia standard[2], Section 8.2, Stress Cracking of Polycarbonate. After 48 hours, none of the test specimens showed signs of crazing or cracking.

[1] ASTM Test Method D1693, Environmental Stress-Cracking of Ethylene Plastics.

[2] Telcordia Standard TR-NWT-002811; Generic Requirements for Cable Placing Lubricants.

PHYSICAL PROPERTIES

PROPERTY	RESULT
Appearance	Opaque white, stringy liquid
Percent nonvolatile solids	2.0%
VOC content	0 g/L 300 gms/liter (Winter Grade)
Viscosity	1,000–3,000 cps @10 rpm

PERFORMANCE PROPERTIES

Specialty pulling lubricants are required for the long installation lengths and significant time duration of the fiber optic pulls. The lubricant must coat the cable jacket and stay evenly coated since lightweight cable can rub on the top as well as the bottom of the conduit. The lubricant must remain slippery over time, and not dry to a higher-friction residue.

Wetting—Continuous Coat:
Wetting is a measure of the lubricant's ability to completely coat the jacket for continued lubricity on longer pulls.

Polywater CPL will wet out evenly on cable jacket surfaces. It will not bead up or rub off the cable jacket. Lubricant will completely coat a 1-inch diameter PE-jacketed cable dipped 6 inches into the lubricant; then withdrawn within 10 seconds. The lubricant coating shall cover 80% of the cable jacket without dripping off, beading up, or pulling away from the edges as it is held horizontally for one minute at 70°F (21°C).

Stringy Rheology:
Polywater CPL *shows a strong, cohesive "string" character. Lubricant will follow and stay with cable over long distances.*

A ¼-inch fiber cable (MDPE jacket) dipped 2 inches into the lubricant and pulled out (40 inches per minute) will produce a continuous, nonsupported, lubricant string length greater than 6 inches (150 mm).

Pourability:
A 5-gallon pail of Polywater CPL will empty from a Reike® spout without an air relief hole in lid in less than 90 seconds and with an air relief hole in lid in less than 60 seconds.

Combustibility:
Lubricant has no flash point and dried residue is nonflammable.

APPLICATION PROPERTIES

Temperature Use Range:
Polywater CPL:
20°F to 120°F (-5°C to 50°C).

Polywater WCPL (Winter Grade version):
-20°F to 140°F (-30°C to 60°C).

Temperature Stability:
No more than a 20% change in Brookfield viscosity from 40°F to 100°F (5°C to 40°C). No phase-out after five freeze/thaw cycles or 5-day exposure at 120°F (50°C). *Will not phase out or separate during the shelf life of lubricant.*

Environmental Testing:
Polywater CPL is safe in the aquatic environment and passes CCR Title 22 Fathead Minnow Hazardous Waste Screen Bioassay.

PRODUCT	RESULT
Polywater CPL	PASS (LC_{50} > 750 mg/L

Cleanup:
Nonstaining. Complete cleanup with water.

Storage and Shelf Life:
Store tightly sealed, away from direct sunlight. Lubricant shelf life is 24 months past the date of manufacture.

DIRECTIONS FOR USE

Polywater CPL can be poured directly into the conduit. Directly lubricate the cable or wire during the entire portion of the pull. It is best to coat the entire cable or wire as it enters the conduit.

Polywater CPL may be gravity fed or pumped into conduit using the LP-D5 automatic pump, allowing the lubricant to fully coat the outside of the cable.

For cleanup, use a rag to squeegee the end of the cable, tightly gripping the cable with a rag. The remaining residue will evaporate quickly.

Recommended Lubricant Quantity

$$Q = k \times L \times D$$

Where:

Q = quantity in gallons (liters)
L = length of conduit run in feet (meters)
D = ID of the conduit in inches (mm)
k = 0.0015 (0.0008 if metric units)

The quantity that is appropriate for any given pull can vary from this recommendation by 50%, depending on the complexity of the pull. Consider the following factors:

Cable weight and stiffness
(Increase quantity for stiff, heavy cable)

Conduit condition
(Increase quantity for old, dirty, or rough conduits)

Conduit fill
(Increase quantity for high percent conduit fill)

Number of bends
(Increase quantity for pulls with several bends)

Pulling environment
(Increase quantity for high temperatures

MODEL SPECIFICATION

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The cable pulling lubricant shall be Polywater CPL. The lubricant shall be a high performance, silicone-enhanced liquid with excellent tension reduction properties.

It shall conform to the physical and performance requirements of Telcordia Standard GR-356-CORE, “Generic Requirements for Optical Cable Innerduct, Associated Conduit and Accessories”. It shall produce a typical friction coefficient less than 0.10 using MDPE-jacketed cable and HDPE innerduct. When lubricant is dried with continuous warm air flow for one hour, it shall have a friction coefficient less than 0.12.

The lubricant shall be safe for the environment and conform to California CCR 22 Fathead Minnow Screen. The lubricant shall not stress crack polyethylene when tested by ASTM 1693. The lubricant shall have a neutral pH and shall be nontoxic, non-sensitizing. It shall be nonstaining.

No substitutions are permitted without certification from an officer of the manufacturer that the substitute product meets all the requirements of this specification.

ORDER INFORMATION

CAT #	PACKAGE DESCRIPTION
CPL-128	1-gal. pail (3.78 liter) 4/case
CPL-320	2½-gal. pail (9.6 liter) 2/case
CPL-640	5-gal. pail (18.9 liter)
	Winter Grade
WCPL-35	1-gal. pail (3.78 liter) 12/case
WCPL-128	1-gal. pail (3.78 liter) 4/case
WCPL-320	2½-gal. pail (9.6 liter) 2/case
WCPL-640	5-gal. pail (18.9 liter)

CONTACT US

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Polywater® FTTx

CABLE PULLING LUBRICANT

Polywater FTTx applied into conduit

Quick-Drying Lubricant that Lowers Tension in Fiber Drops and Data Cable Pulls

PRODUCT BENEFITS

- **Superior Performance:** Reduces friction with ultra-thin coating levels.
- **Zero Mess:** Dries quickly and leaves no mess on the receiving side of the cable pull, unlike traditional wax or gel lubricants.
- **Low-Friction Residue:** Even lubricates when dry.
- **Spray or Wipe Application:** Efficient and easy to use.
- **Compatible with Cable Jackets:** Suitable for a variety of cable jacket types.

"Zero Mess" Friction Reduction on Cable Pulls

Polywater® FTTx Lubricant is a high-performance, silicone-based, liquid lubricant designed specifically for communication cable installations. When dried, FTTx leaves a thin, lubricating film on cables. There is no mess on the receiving end of pulls, which helps maintain a clean workspace.

FTTx-D20 dispenser with saturated wipes

FTTx applied to duct with a sprayer pump

Saturated FTTx wipe applied to cable

FTTx family

Sprayable Cable Lubricant

Polywater FTTx is a thin, sprayable liquid, available in several unique packages. The FTTx-35LR is a refillable quart bottle with a spray trigger, ideal for shorter cable installations. The FTTx-D20 contains lubricant-saturated towels that easily coat cable as it is pulled. For larger applications, FTTx can be sprayed with an air-pressurized industrial sprayer. FTTx is also available in a Winter Grade formula for cold weather use in temperatures as low as -20°F (-30°C).

POLYWATER FTTx

Catalog #	Package Description	Units/Case
FTTx-D20	20-count saturated wipe dispenser	12
FTTx-35LR/WFTTx-35LR	1-qt. (0.95-liter) bottle with sprayer	12
FTTx-128	1-gal. (3.8-liter) jug	4
FTTx-640	5-gal. (18.9-liter) pail	1

*W in the catalog number indicates Winter Grade version.

SPECIFICATIONS AND APPLICATIONS:

- **Viscosity:** 250-750 cps @ 10 rpm.
- **Combustibility:** FTTx has no flash point and dried residue is non-flammable.
- **Wetting—Continuous Coat:** FTTx will wet out evenly on cable jacket surfaces. It will not bead up or rub off the cable jacket.
- **High-Performance Data Cables:** FTTx has a minimal effect on the data-carrying capacity of high-speed Cat. 5E, 6, and 6A copper cable. As a “thin-film” lubricant, FTTx has no effect on cable signal attenuation.
- **Cable Compatibility:** Conforms to the physical and performance requirements of Telcordia Standard TR-NWT-002811, generic requirements for cable pulling lubricants.

CONTACT US

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American Polywater® Corporation

POLYWATER® FTTx SPRAY LUBRICANT

DESCRIPTION

Polywater® FTTx Lubricant is a high-performance, liquid cable pulling lubricant designed specifically for communication cable installations. Polywater FTTx is highly concentrated and works with only a thin coating. It can be sprayed or wiped for easy application or poured into innerduct for long pulls. It has excellent cling and wetting, evenly coating the entire cable jacket surface. Polwyater FTTx works even after it has dried. The residue is a thin, slippery film that retains lubricity for months after use.

Polywater FTTx is recommended for quick and easy lubrication with no mess. The lubricant is suitable for all types of communication cable installations.

FRICTION TESTING

Friction is determined using a standard Telcordia test procedure[1]. The duct is wrapped 420° around a three-foot diameter (0.9 m) cylinder. In this test, a variable incoming weight is attached to the cable as it is pulled at a set rate of 65 ft/min (19.8 m/min). A load cell takes pulling tension data which is used to determine a "dynamic" friction coefficient.

FRICTION COEFFICIENT MDPE-JACKETED CABLE ON HDPE INNERDUCT		
BACK TENSION	WIPE APPLICATION	SPRAY APLICATION
8 lbf	.09	.09
25 lbf	.08	.07

Polywater FTTx does not increase the coefficient of friction of prelubricated duct.

[1] Telcordia Standard GR-356-CORE, Section 4.2.5; Generic Requirements for Optical Cable Innerduct, Associated Conduit, and Accessories. (Issue 2, June 2009).

Meets MS-5/20xx Model Specification for HDPE Solid Wall Conduit for Power and Communications Applications.

Polywater FTTx can be sprayed into small conduits

PRODUCT FEATURES

- **Superior Performance:** Reduces friction with ultra-thin coating levels.
- **Zero Mess:** Dries quickly, without mess.
- **Low-Friction Residue:** Compatible with prelubricated ducts. Continues to lubricate dry.
- **Spray or Wipe Application:** Efficient and easy to use.
- **Effective on High-Performance Data Cables:** Minimal effect on cable signal attenuation.
- **Compatible with Cable Jackets:** Suitable for a variety of cable jacket types.

END USE

- Fiber optic drops (FTTx)
- High performance data cable
- Textile innerduct
- Long fiber pulls
- Long copper pulls

CABLE COMPATIBILITY

Polyethylene Stress Cracking:
Polywater FTTx does not cause environmental stress cracking of polyethylene jackets commonly found on communications cables. Untreated polyethylene (Union Carbide DYNK) and MDPE jacket material were both tested according to ASTM standard method.[1] After 168 hours exposure none of the test specimens showed failures.

Polycarbonate Stress Cracking:
Polywater FTTx will not stress crack polycarbonate. Polycarbonate bars are bent to a defined strain and exposed to lubricant as described in the Telcordia standard[2], Section 8.2, Stress Cracking of Polycarbonate. After 48 hours, none of the test specimens showed signs of crazing or cracking.

Corrosion of Copper and Steel:
Polywater FTTx will not corrode copper after 24-hour exposure as described in the Telcordia standard[2], Section 8.3, Copper Mirror Test.

[1] ASTM Test Method D1693, Environmental Stress-Cracking of Ethylene Plastics.

[2] Telcordia Standard TR-NWT-002811; Generic Requirements for Cable Placing Lubricants.

DIRECTIONS FOR USE

Polywater FTTx Lubricant can be sprayed or wiped directly onto the cable as it enters the conduit. It may also be poured directly into the duct.

For normal cable pulls, prelube the conduit by spraying 5–10 squirts of pulling lubricant into the conduit before pulling. Saturate a wipe by spraying with lubricant and lightly wipe lubricant on jacket to fully coat the cable as it enters the conduit.

For lowest coefficient of friction, completely prelubricate the conduit. Squirt or pour appropriate amount of lubricant into the conduit and pull through a sponge or lubricant spreader to coat the interior of the entire length. Wipe lubricant on cables as they enter the conduit as described above.

High efficiency spray pulling lubricants are effective with very thin coats in the range of 1–5 mg/cm^2 of jacket surface. See product usage section for lubricant quantity formulas.

PHYSICAL PROPERTIES

PROPERTY	RESULT
Appearance	Slightly thickened, white liquid
Percent non-volatile solids	3%
VOC content	0 gms/liter
Viscosity	250–750 cps @10rpm
pH	6.5–8.0

PERFORMANCE PROPERTIES

Wetting—Continuous Coat:
Wetting is a measure of the lubricant's ability to coat the jacket as a thin film for continued lubricity on longer pulls.

Polywater FTTx Lubricant will wet out evenly on all surfaces. It will not bead up or rub off the cable jacket. Lubricant will completely coat a 1-inch diameter PVC-jacketed cable dipped 6 inches into the lubricant; then withdrawn within 10 seconds. The lubricant coating shall cover 100% of the cable jacket without dripping off or pulling away from the edges as it is held horizontally for 1 minute (at 70°F).

Combustibility:
Lubricant has no flash point and dried residue is nonflammable.

Sprayability:
Low viscosity lubricant allows product to flow through spray head. Lubricant will not clog valves or atomizers.

USE AND STORAGE CONDITIONS

Temperature Use Range:
20°F to 140°F (-5°C to 60°C).

Temperature Stability:
Polywater FTTx is freeze/thaw stable.

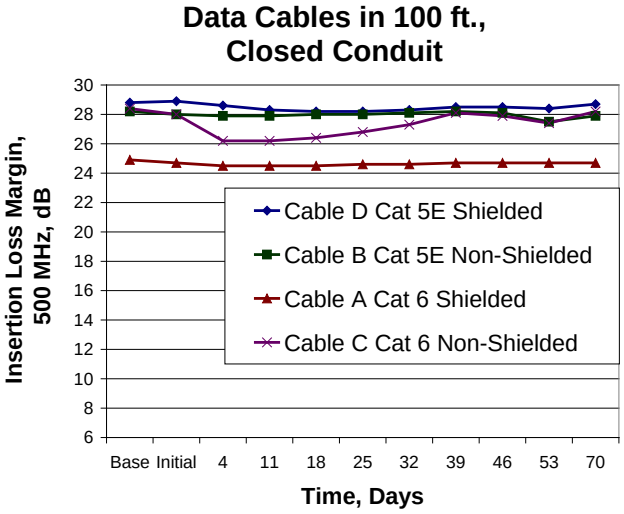
Cleanup:
Polywater FTTx is nonstaining. Complete cleanup is possible with water.

Storage and Shelf Life:
Store Polywater FTTx in a tightly sealed container away from direct sunlight. Lubricant shelf life is 24 months.

APPLICATION PROPERTIES

Polywater FTTx is innovative and easy to use in multiple types of cable installations. It is a very thin liquid that can be sprayed or wiped directly onto the cable jacket. Polywater FTTx can be used to facilitate cable pushing for shorter installations. It can be poured or sprayed into conduit for longer, outside plant installations.

High Performance Data Cables:
Polywater FTTx is recommended for high-performance data cables. It has a minimal effect on the data carrying capacity of high speed, Cat. 5E, 6, and 6A copper cable. As a "thin-film" lubricant, FTTx has a limited effect on cable signal attenuation.



Polywater FTTx shows dramatic friction reduction in data cable installations. Data cable pulled through EMT conduit with two 90° bends and a back tension of 14 lbs.

COEFFICIENT OF FRICTION DATA CABLE IN EMT CONDUIT	
Unlubricated	.33
Polywater FTTx	.10

Polywater FTTx reduces friction by 70%.

For more information and full test results, please see *TIA Paper TR42.7, PN SP-3-0177, "The Effect of Lubricants on High Frequency Data Cables."*

The lubricant may be sprayed on a towel or an FTTx-D20 wipe can be used to efficiently apply the lubricant to the cable jacket. The presaturated wipe lays down a thin, even coat of lubricant. The towel material is specifically formulated to release lubricant without mess.

Textile Innerduct:

Proven to reduce friction on these specialty fabrics, Polywater FTTx is perfect for use with textile innerducts. Polywater FTTx is directly applied to cable, dramatically lowering friction.

Friction is determined using a modification of Telcordia test procedure[1]. In this test, a fabric inner duct is placed inside a continuous HDPE conduit. The MDPE-jacketed cable is lubricated with Polywater FTTx and pulled through a fabric cell.

COEFFICIENT OF FRICTION IN MAXCELL™ FABRIC INNERDUCT	
Back Tension	Polywater FTTx Wipe
25 lb_f	.08

[1] Telcordia Standard GR-356-CORE, Section 4.2.5; Generic Requirements for Optical Cable Innerduct, Associated Conduit, and Accessories.

MaxCell is a trademark of The MaxCell Group, Wadsworth, OH.

Polywater FTTx doesn't leak or squeeze into neighboring cells, causing them to seal shut. Use of a "thin-film" lubricant such as FTTx is ideal for this end use.

Prelubricated Duct:

Polywater FTTx is compatible with prelubricated duct.

Traditional Outside Plant Cable Installation:

Polywater FTTx is effective at lower quantity than traditional cable lubricants. It can be pumped, poured, or sprayed into the innerduct.

Quantity Formula for Fiber Cable Installation

Q = K x L x D

Where: Q = Quantity of lubricant gallons (liters)
L = Length of conduit in feet (meters)
D = Cable diameter in inches (mm)
K = .0003 (.0002 if metric)

Appropriate quantity for use on any given pull can vary from this recommendation by 50%, depending on complexity. Adjust the volume of pulling lubricant based on cable stiffness, conduit type and condition, conduit fill, and pulling environment.

MODEL SPECIFICATION

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The cable pulling lubricant shall be Polywater FTTx. Lubricant has a low viscosity that may be sprayed without clogging valves or applicators. It shall coat and cling to the cable. It shall be nonstaining. Lubricant shall produce a low coefficient of friction on communication cable jacket materials and shall lubricate at low coating thickness. Lubricant shall continue to reduce friction after it has dried. It shall conform to the physical and performance requirements of Telcordia Standard, GR-356-CORE, Generic Requirements for Optical Cable Innerduct, Associated Conduit, and Accessories. It shall have a limited effect on data cable signal attenuation. It shall not contain solvents and shall not have a flash point.

No substitutions are permitted without certification from an officer of the manufacturer that the substitute product meets all the requirements of this specification.

ORDER INFORMATION

CAT #	PACKAGE DESCRIPTION
FTTx-D20	20-ct wipe canister 12/case
FTTx-35LR	1-qt. spray bottle (.95 liter) 12/case
FTTx-128	1-gal. pail (3.7 liter) 4/case
FTTx-640	5-gal. pail (18.9 liter)
	Winter Grade
WFTTx-35LR	1-qt. spray bottle (.95 liter) 12/case

CONTACT US

1-800-328-9384 Toll Free | 1-651-430-2270 Main | 1-651-430-3634 Fax | email: support@polywater.com

Polywater® CGL

CABLE PULLING LUBRICANT

Hand applying Polywater CGL lubricant

Universal Pulling Lubricant for Fiber Optic, Copper, Coax, and Power Supply Cables

PRODUCT BENEFITS

- **UL and CSA Listed:** Can be used where inspection is required.
- **Superior Friction Reduction:** Maximum tension reduction on all types of cable jackets.
- **High Cling Factor:** Clings to jacket for better lubrication on long runs.
- **Meets California CCR 22 Fathead Minnow Screen:** No disposal issues. Not a CA hazardous waste.
- **Compatible with Cable Jackets:** Compatible with PE and low-smoke zero-halogen (LSZH) communication cable jackets.

For Maximum Friction Reduction on Cable Pulls

Polywater® CGL is a high-performance, gel cable pulling lubricant formulated specifically for the communications industry. CGL is recommended for long fiber optic, copper-paired, or coaxial cable pulls. CGL provides maximum friction reduction between cable and conduit.

CGL-55 Front End Pack

CGL pumped into duct using an LP-D5 pump

polywater.com | 651-430-2270

American Polywater® Corporation

CGL-35 applied to cable


CGL family

Universal Gel Lubricant

Polywater CGL is available in two grades: Regular Grade CGL and Winter Grade WCGL for cold weather use in temperatures as low as -20°F (-30°C). Polywater CGL can be hand applied, pumped into conduit using the LP-D5 drill-powered pump, or applied with Polywater's Front End Pack™. These lubricant bags are pulled through a conduit at the "front end" of a cable pull to prelubricate the cables.

POLYWATER CGL

Catalog #	Package Description	Units/Case
CGL-35 / WCGL-35	1-qt. (0.95-liter) bottle	12
CGL-128 / WCGL-128	1-gal. (3.8-liter) jug	4
CGL-640 / WCGL-640	5-gal. (18.9-liter) pail	1
CGL-27	1-qt. (0.95-liter) Front End Pack in a carton	12
CGL-99	1-qt. (0.95-liter) Front End Pack in a 5-gal. pail	16
CGL-55	½-gal. (1.9-liter) Front End Pack in a carton	6
CGL-110	½-gal. (1.9-liter) Front End Pack in a 5-gal. pail	10

*W in the catalog number indicates Winter Grade version.

SPECIFICATIONS AND APPLICATIONS:

- **Appearance:** Opaque-white stringy gel. Light gel viscosity (35,000-50,000 cps @ 10 rpm).
- **Combustibility:** CGL has no flash point and dried residue is non-flammable.
- **Coatability:** CGL will wet out evenly on cable jacket surfaces. It will not bead up or rub off the cable jacket. A 1-inch diameter XLPE cable dipped 6 inches into CGL and then withdrawn and held vertically will retain at least 25 grams of CGL for 1 minute at 70°F.
- **Cable Compatibility:** No deleterious effects on physical or electrical properties of cable jackets.
- **Polyethylene Stress Cracking:** No stress cracking on LDPE cable jackets when tested by ASTM D1693.

CONTACT US

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American Polywater® Corporation

11222 60th Street N | Stillwater, MN 55082 USA

Polywater® Communication Gel Lubricant Type CGL

POLYWATER® Lubricant CGL is a high performance, **gel** cable pulling lubricant formulated specifically for the communications industry. It is recommended for fiber optic, copper or coaxial cable pulls.

POLYWATER® Lubricant CGL provides maximum friction reduction between cable and conduit under both low and high sidewall bearing pressures. It is slow-drying and leaves a lubricating film after its water base has evaporated. Polywater® CGL is a gel material and can be applied by hand or using Polywater's LP Pumps.

POLYWATER® Lubricant CGL meets California regulation CCR 22. Polywater® CGL is suitable for use on PE and low-smoke zero-halogen (LSZH) communication cable jackets.

Product Benefits

- Superior friction reduction
- Effective lubrication when dry
- High cling factor
- Compatible with cable jackets—including fire-rated, plenum
- Clean and non-staining

Friction Testing

Friction is measured using the method described in the white paper, "Coefficient of Friction Measurement on Polywater's Friction Table, 2007" (polywater.com/FTable.pdf). Values are averages based on cable jacket and conduit materials from multiple manufacturers. Typical friction coefficients at 200 lbs/ft (2.91 kN/m) normal pressure are shown.

Coefficient of Friction for POLYETHYLENE Jacket Cable

Conduit Type	Typical Value
HDPE	.04
PVC	.05

Environmental Testing

POLYWATER® Lubricant CGL is safe in the aquatic environment and passes CCR Title 22 Fathead Minnow Hazardous Waste Screen Bioassay.

Product	Result
POLYWATER® Lubricant CGL:	PASS (LC_{50} > 750 mg/L)

Compatibility

Polyethylene Stress Cracking:
POLYWATER® Lubricant CGL does not stress crack polyethylene jackets commonly used on communications cables. MDPE and HDPE jacket materials were tested according to ASTM standard method[2]. After 168 hours exposure none of the test specimens showed failures.

[2] *ASTM Test Method D1693, Environmental Stress-Cracking of Ethylene Plastics.*

Properties

Appearance:
Opaque-white stringy gel. Light gel viscosity (35,000 -50,000 cps @ 10rpm). Neutral pH (6.5 – 7.5).

Coatability:

Coatability is a measure of the lubricant's ability to coat the jacket as a thin film for continued lubricity on longer pulls.

POLYWATER® Lubricant CGL will wet out evenly on cable jacket surfaces. It will not bead up or rub off of the jacket sample. A one-inch (25 mm) diameter XLPE cable dipped six inches (152 mm) into Polywater® Lubricant LZ, then withdrawn and held vertically, will retain at least 25 grams of Polywater® Lubricant LZ for one minute at 70° F (21° C).

Combustibility:
Lubricant has no flash point and dried residue is non-flammable.

Temperature Use Range:

Communication Gel Lubricant CGL:	Wintergrade Lubricant, WCGL
20°F to 120°F (-5°C to 50°C)	-20°F to 120°F (-30°C to 50°C)

Temperature Stability:
No phase-out after five freeze/thaw cycles or 5-day exposure at 120°F (50°C). *Will not phase out or separate during the shelf life of lubricant.*

Clean-Up:
Non-staining. Complete clean-up with water.

Storage and Shelf Life:
Store tightly sealed, away from direct sunlight. Lubricant shelf life is one year past the date of manufacture.

Order Information

Cat #	Package Description
CGL-27	1-quart bag (0.95 liter)
CGL-35	1-quart squeeze bottle (0.95 liter)
CGL-55	½-gallon bag (1.9 liter)
CGL-128	1-gallon pail (3.78 Liter) 4/case
CGL-640	5-gallon pail (18.9 Liter)
	Wintergrade
WCGL-128	1-gallon pail (3.78 Liter) 4/case

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11222 60th St N, Stillwater, MN 55082, U.S.A

Polywater® F

FIBER OPTIC CABLE PULLING LUBRICANT

Polywater F poured into conduit

For Pulling Fiber Optic and Other Communications Cable

PRODUCT BENEFITS

- **Superior Friction Reduction:** For lower tension and/or longer cable pulls.
- **Wets Out and Coats PE Jackets:** Lubricates at all points of cable rub on long pulls.
- **Pourable:** Can be poured into innerducts and feeder tubes.
- **Compatible with Cable Jackets:** Avoid weakened or cracked cable jackets.
- **Slow Drying:** Leaves a lubricious residue for lasting lubrication.

Pourable Lubricant Reduces Friction on Cable Pulls

Polywater® F Lubricant is a high-performance, pourable liquid ideal for pulling underground fiber optic cable. It is also suitable for pulling coaxial and copper-pair cable. Polywater F wets and clings to cable jackets while evenly coating the surface. Dries slowly while leaving a lubricating film.

F-320 2½-gallon jug

F applied to duct with an LP-D5 pump

polywater.com | 651-430-2270

American Polywater® Corporation

F-128 (1 gallon jug) poured in conduit

WF (Winter Grade) family

A Lubricant that is Packaged to Pour

Polywater F is available in two grades: Regular Grade F and Winter Grade WF (*photo 2*) for cold weather use in temperatures as low as -20°F (-30°C). Polywater F can be hand poured or pumped into conduit using the LP-D5 drill-powered pump. The packages (with the exception of the 55-gallon drum) are designed to be poured into upturned innerduct or a feeder tube.

POLYWATER F

Catalog #	Package Description	Units/Case
F-35 / WF-35	1-qt. (0.95-liter) bottle	12
F-128 / WF-128	1-gal. (3.8-liter) jug	4
F-320 / WF-320	2½-gal. (9.6-liter) jug	2
F-640 / WF-640	5-gal. (18.9-liter) pail	1
F-DRUM / WF-DRUM	55-gal. (208-liter) drum	1

*W in the catalog number indicates Winter Grade version.

SPECIFICATIONS AND APPLICATIONS:

- **Lubricity:** LDPE-, MDPE-, and HDPE-jacketed cable on HDPE and PVC innerduct at 200 lbs./ft (2.91 kN/m) sidewall force, coefficient of kinetic friction <0.12.
- **Appearance:** Transparent to slightly opaque, orange-colored, stringy liquid material.
- **Temperature Stability:** No more than a 20% change in Brookfield viscosity from 40°F to 100°F (5°C to 40°C). No phase-out after five freeze/thaw cycles or 5-day exposure at 140°F (60°C).
- **Cable Compatibility:** No deleterious effects on physical or electrical properties of cable jackets.
- **Polyethylene Stress Cracking:** No stress cracking on LDPE cable jackets when tested by ASTM D1693.
- **Flammability:** Lubricant has no flash point and dried residue is not combustible.

CONTACT US

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American Polywater® Corporation

POLYWATER® F COMMUNICATIONS LUBRICANT

DESCRIPTION

Polywater® F Lubricant is a high-performance, pourable, liquid, cable pulling lubricant recommended for pulling underground fiber optic cable. Polywater F is also suitable for pulling coaxial and copper-pair cable.

Polywater F wets and clings to cable jacket and evenly coats the jacket surface. It continues to lubricate by leaving a lubricating film after its water base has evaporated. Lubricant F is compatible with a broad range of cable jackets, including polyethylene. It is compatible with prelubricated innerducts.

Polywater F is a stringy liquid that is applied by pouring or pumping the lubricant into the duct system. Polywater F is a popular lubricant that is used in the pulling of over 50,000 miles (80,000 km) of fiber optic cable into duct.

FRICTION TESTING

Friction is measured using a standard Telcordia test procedure[1]. HDPE duct is wrapped 420° around a 3-foot diameter (0.9 m) cylinder. A 15 lb. (6.8 Kg) weight is attached to the back of the test cable. Pulling force is measured as the cable is pulled at 65 ft/min (19.8 m/min) through the wrapped duct. Friction coefficient is calculated from the pulling force/back tension ratio. Results below are typical values.

Coefficient of Friction for Communication Cable Pulled into HDPE Smoothwall Innerduct:

CABLE JACKET	
MDPE	PVDF
.10	.10

Polywater F Lubricant shows good friction reduction for these common cable jackets at both high and low bend shear.

[1] Telcordia Standard GR-356-CORE, Section 4.2.5; Generic Requirements for Optical Cable Innerduct, Associated Conduit, and Accessories. (Issue 2, June 2009).

Polywater F Lubricant is pourable

PRODUCT FEATURES

- **Superior Friction Reduction:** For lower tension and/or longer pulls.
- **Wets Out and Coats PE Jackets:** Lubricates at all points of cable rub on long pulls.
- **Pourable**: Can be poured into innerducts and feeder tubes.
- **Compatible with Cable Jackets**: Avoid weakened or cracked cable jackets.
- **Slow Drying**: Leaves a lubricious residue for lasting lubrication.

END USE

Use for all types of cable installations, including:

- Outside plant cable pulls
- Underground cable installation
- Lightweight cable, long-haul installation

CABLE COMPATIBILITY

Polyethylene Stress Cracking:
Polywater F does not cause stress cracking of polyethylene jackets commonly used on communications cables.

Polyethylene cable jacket blends were tested according to ASTM ESCR standard method.[1]

DFDA 0588 Low density polyethylene
DFDA 6049 Linear low density polyethylene
DHDA 6497 Medium density polyethylene
DGDJ 3479 High density polyethylene
MDPE Stripped Cable Jacket

After 500 hours immersion in Polywater F none of the specimens showed failure.

Polycarbonate Stress Cracking:
Polywater F does not stress crack polycarbonate. Polycarbonate bars were bent to a defined stress and exposed to Polywater F lubricant as described in the Telcordia standard[2], Section 8.2, Stress Cracking of Polycarbonate". After 48 hours, none of the test specimens showed crazing or cracking.

[1] ASTM Test Method D1693, Environmental Stress-Cracking of Ethylene Plastics.
[2] Telcordia Standard TR-NWT-002811; Generic Requirements for Cable Placing Lubricants.

PHYSICAL PROPERTIES

Polywater F is a pourable liquid recommended for pulling communication cable.

PROPERTY	RESULT
Appearance	Orange-colored, stringy liquid
Percent nonvolatile solids	< 5 %
VOC content	60 gms/liter 260 gms/liter (Winter Grade)
Viscosity	1,000 – 3,000 cps @10rpm
pH	8.0–9.5

PERFORMANCE PROPERTIES

For fiber pulling, special pulling lubricants are required for the long lengths and significant duration of the pulls. Lightweight fiber cable can rub on both the top and bottom of the duct, so the lubricant must completely coat the cable jacket and stay evenly coated. The lubricant must remain slippery over time, and not dry to a hard or sticky residue.

Wetting—Continuous Coat:
Wetting is a measure of the lubricant's ability to coat the jacket for continued lubricity on longer pulls.

Polywater F Lubricant will wet and coat evenly on jacket surfaces. A ½-inch (13 mm) diameter PE-jacketed cable shall be dipped 6 inches (152 mm) into Polywater F Lubricant for 10 seconds and then removed. The lubricant coating shall cover 100% of the cable jacket without dripping off, beading up, or pulling away from the edges as the cable is held horizontally for one minute at 70°F (21°C).

Stringy Rheology:
"String" character is a measure of the lubricant's pituity and its ability to adhere, follow and stay with cable over long distances.

A ¼-inch (6 mm) fiber cable (MDPE jacket) dipped 2 inches (50 mm) into Polywater F Lubricant and then pulled out at a 40 inches/minute rate (100 cm/min) will produce a nonsupported, lubricant string length greater than 8 inches (20 cm).

Pourability:
Pourability is a measure of the lubricant's ease of pouring.

Five gallons (18.9 l) of Polywater F Lubricant will empty from a Reike® spouted 5-gallon pail in less than 90 seconds (no air relief) and in less than 60 seconds with air relief.

Combustibility:
Polywater F Lubricant has no flash point and its dried residue is not flammable.

APPLICATION PROPERTIES

Temperature Use Range:
Polywater F:
20°F to 140°F (-5°C to 60°C).
Polywater WF (Winter Grade version):
-20°F to 140°F (-30°C to 60°C).

Temperature Stability:
Polywater F will not show more than a 20% change in Brookfield viscosity from 40°F to 100°F (5°C to 40°C). Polywater F will not phase-out after five freeze/thaw cycles or 5-day exposure at 120°F (50°C). Polywater F will not phase out or separate over the shelf life of the lubricant.

Cleanup:
Polywater F is nonstaining. Complete cleanup is possible with water.

Storage and Shelf Life:
Store Polywater F in a tightly sealed container away from direct sunlight. Lubricant shelf life is 18 months.

DIRECTIONS FOR USE

Polywater F can be poured or pumped directly into the conduit before and during the pull. Coat the entire cable as it enters the conduit.

Polywater F can be pumped with the Polywater LP-D5 specialty lubricant pump. Pumping allows hands-free transfer and consistent application of lubricant.

Clean up by wiping off any excess lubricant with a rag.

Recommended Lubricant Quantity:

$$Q = k \times L \times D$$

Where:

Q = quantity in gallons (liters)
L = length of conduit run in feet (meters)
D = ID of the conduit in inches (mm)
k = 0.0015 (0.0008 if metric units)

The quantity that is appropriate for any given pull can vary from this recommendation by 50%, depending on the complexity of the pull. Consider the following factors:

Cable weight and stiffness
(Increase quantity for stiff, heavy cable)

Conduit condition
(Increase quantity for old, dirty, or rough conduits)

Conduit fill
(Increase quantity for high percent conduit fill)

Number of bends
(Increase quantity for pulls with several bends)

Pulling environment
(Increase quantity for high temperatures)

MODEL SPECIFICATION

The statement below may be inserted into a specific job specification to help maintain engineering standards and ensure project integrity.

The cable pulling lubricant shall be Polywater Lubricant F. The lubricant shall contain no waxes, greases, or silicones.

The lubricant shall be a pourable liquid with good wetting (coating) properties. It shall have a friction coefficient less than 0.15 using MDPE-jacketed cable and HDPE innerduct.

The lubricant shall conform to the physical and performance requirements of Telcordia Standard, GR-356-CORE, “Generic Requirements for Optical Cable Innerduct, Associated Conduit and Accessories”. It shall not stress crack polyethylene when tested by ASTM 1693.

No substitutions are permitted without certification from an officer of the manufacturer that the substitute product meets all the requirements of this specification.

ORDER INFORMATION

CAT #	PACKAGE DESCRIPTION
	Regular
F-35	1-qt. squeeze bottle (0.95 liter) 12/case
F-128	1-gal. jug (3.78 liter) 4/case
F-320	2½-gal. jug (9.5 liter) 2/case
F-640	5-gal. pail (18.9 liter)
	Winter Grade
WF-35	1-qt. squeeze bottle (0.95 liter) 12/case
WF-128	1-gal. jug (3.78 liter) 4/case
WF-320	2½-gal. jug (9.5 liter) 2/case
WF-640	5-gal. pail (18.9 liter)

CONTACT US

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Polywater® Prelube

CABLE BLOWING LUBRICANT

Prelubricating conduit prior to blowing fiber optic

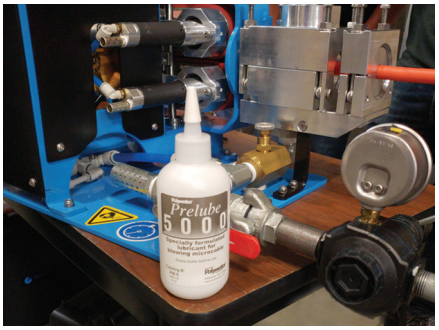
Increases Installation Distance when Blowing Fiber Optic Cable

PRODUCT BENEFITS

- **Low Friction:** Increases blowing distance.
- **Easy to Use:** Simply squeeze into duct before blowing fiber optic cable.
- **Tested and Approved:** Recommended by most blowing equipment manufacturers.
- **Winter Grade Available:** For use in sub-freezing temperatures.
- **Compatible with Cable Jackets:** Avoid weakened or cracked fiber optic jackets.

Blowing Lubricant for Air-Assisted Installation of Fiber

Polywater® Prelube 2000™ reduces frictional drag during the blowing of outside plant fiber optic cable into duct. It increases the distance cable can be installed in a continuous length. Use Prelube 5000™ for blowing small diameter fiber optic microcable into microtube duct.



Prelube 5000 for microcables

Prelube 2000 with a fiber blowing machine

polywater.com | 651-430-2270

American Polywater® Corporation

Prelube 2000 family

PM-8

Long Distance Fiber Optic Cable Installation

Blowing (jetting) uses two forces to move the cable through duct: a pushing force generated by a cable pusher at the start of the installation, and an air drag force that acts along the length of the cable to lift and move the cable through the duct. Prelube 2000 reduces the friction generated by both these forces to maximize installation distances. Longer installations reduce the number of equipment setups and the associated labor, minimizing the cost per meter of installed cable.

Catalog #	Package Description	Units/Case
P-35 / WP-35	1-qt. (0.95-liter) bottle	12
P-128 / WP-128	1-gal. (3.8-liter) jug	4
P-640 / WP-640	5-gal. (18.9-liter) pail	1
PM-8	8-fl oz (240-mL) squeeze bottle	6

*W in the catalog number indicates Winter Grade version.

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatibility:** Passes all compatibility tests for PE jacketed cables.
- **Cost Effectiveness:** Prelube 2000 offers significant cost savings over "factory-lubricated" duct. In high-quality HDPE duct, it lubricates efficiently at coating levels of 0.5 mg/cm^2 of duct surface. At these levels, the lubricant cost for 1.25" (3.2 cm) duct is approximately $2 per 1,000 feet ($6 per kilometer), much lower than the additional cost for the factory-lubricated duct.
  Prelube 5000 is also extremely efficient and cost effective. It lubricates at coating levels as low as 0.05 mg/cm^2 of the tubing's interior surface. At these levels, the lubricant cost is $0.20 to $0.75 per 1,000 feet ($0.60 to $2.20 per kilometer), depending on microtube size.
- **Safe:** Prelube is non-hazardous.

CONTACT US

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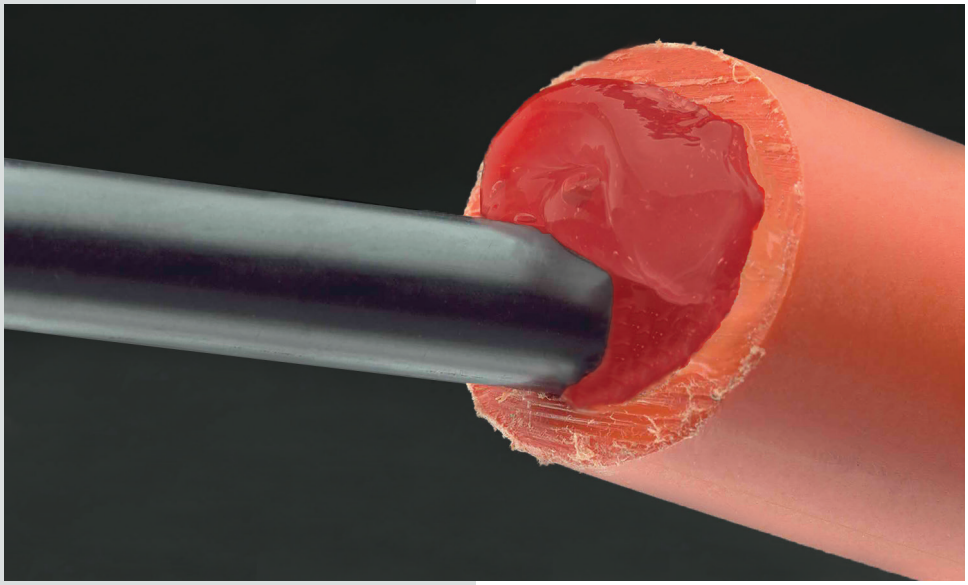
Polywater® IceFree™

TOTAL CONDUIT ENCAPSULATING ANTIFREEZE GEL



IceFree protects fiber optic cables

Non-Freezing Gel Used in Conduits to Prevent Water Ingress and Subsequent Ice Formation

PRODUCT BENEFITS

- **Total Conduit Encapsulation:** Prevents water ingress and ice formation in innerducts and conduits.
- **Prevents System Downtime:** Protects fiber optic cable from ice-pressure-induced microbends.
- **Reenterable:** Soft gel allows for cable removal for repair or upgrade.
- **Long-Term:** Installs once for multi-year protection.
- **System Integrity:** Ensures reliable signal performance on high-priority comm/data and control/monitoring cables.

Minimize Performance Loss of Infrastructure Assets

Polywater® IceFree™ protects infrastructure from water intrusion and ice formation. When ice forms inside ducts, functionality is compromised. Ice pressure induces signal attenuation in fiber optic cables and prevents mechanical valves from opening.

IceFree large field installation

IceFree applied with an LP-D5 drill pump

polywater.com | 651-430-2270

American Polywater® Corporation

WS-640 (18.9-liter pail)

Chemical duct block WB-8

Patented System Protects Infrastructure Assets

Polywater IceFree is a specialty, non-freezing gel pumped into ducts containing fiber optic cables susceptible to ice-induced pressure. Such pressure creates microbends that increase signal attenuation and potential fiber optic cable damage at bridge crossings or vehicle overpasses. IceFree is also used to prevent freezing of mechanical valves used in fire suppression or critical infrastructure fire protection systems. IceFree is available in field friendly packaging.

POLYWATER WS

Catalog #	Package Description	Units/Case
WS-640	5-gal. (18.9-liter) pail	1
WS-DRUM	55-gal. (208-liter) drum	1
WB-8	1 - chemical duct block	12
WH-1	48” gel insertion hose & valve assembly	1

SPECIFICATIONS AND APPLICATIONS:

- **Prevent Signal Outages:** The IceFree system has protected fiber optic cable in thousands of bridges, highway crossings, and other vulnerable areas exposed to freezing temperatures.
- **Patented:** IceFree is a patented system comprised of both antifreeze gel and chemical duct block. The chemical duct block is employed in the fiber optic duct system to contain antifreeze gel within the entire length of the duct for long-term network protection.
- **Concentrated:** Formulated to perform long term even when diluted over time.
- **Resources Available:** Installation video and informational literature available.

CONTACT US

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Adhesives

Polywater® BonDuit®

PE CONDUIT ADHESIVE

Joining HDPE to PVC conduit

Strong, Watertight, and Airtight Adhesive for HDPE Conduit

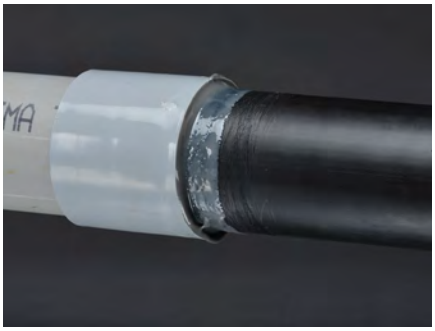
PRODUCT BENEFITS

- **Versatile:** Bonds HDPE to PVC, rigid steel, and fiberglass conduits and fittings.
- **Superior:** Stronger pullout strength than mechanical couplings.
- **Durable:** Bonds with high strength within an hour.
- **Easy to Use:** Requires no special training.
- **Convenient Kits:** Contains all application components required for a quick installation.

Creates Strong, Long-Lasting Bonds

BonDuit® Conduit Adhesive creates a watertight and airtight conduit connection within an hour after application. The strong bond withstands movement and vibration, ideal for installation along roadsides or near electrical equipment such as transformers or switchgear.

Fiberglass pipe connection



Completed PE to PVC joint

polywater.com | 651-430-2270

American Polywater® Corporation

PE to PVC conduit connections

Catalog # BT-KITG

Multi-Use Cartridge Creates Numerous Connections

BonDuit Conduit Adhesive is a two-part curing adhesive supplied in a side-by-side cartridge. BonDuit requires a ratcheted dispensing tool and nozzle to mix and apply quickly and easily. Several connections can be made from a cartridge. The cartridge can be recapped for later use with a new nozzle.

POLYWATER BONDUIT

Catalog #	Package Description	Units/Case
BT-KIT	2 - adhesive cartridges; 8 - mixing nozzles; 1 - strip of sanding cloth; 8 - Type RP™ cleaning wipes (cat #RP-1)	1
BT-KITG	Same as kit above; includes TOOL-50-11	1
BT-KITB6	12 - adhesive cartridges; 48 - mixing nozzles; 6 - strips of sanding cloth; 48 - Type RP cleaning wipes (cat# RP-1). Dispensing tool not included.	1
BT-KITB6G	Same as kit above; includes TOOL-50-11	1
BT-CART12PK	12 - adhesive cartridges 36 - mixing nozzles	1
TOOL-50-11	1 - dispensing tool	1
MXR-12T-10	10-pack of mixing nozzles	1

SPECIFICATIONS AND APPLICATIONS:

- **The NEC Code:** Requires PVC or galvanized rigid steel pipe to be used for the transition from underground HDPE pipe to above ground connections. PVC pipe cement doesn't bond HDPE.
- **Adhesive Shear Strength:** Typical bond strengths were measured by joining two pieces of HDPE conduit with a PVC coupling and BonDuit Adhesive. The force required to pull apart the joint after 24 hours at 70° F (21° C) was measured. Conduit diameter pullout force 1½" = 1233 lbs./sq. ft.; 2" = 2,025 lbs./sq. ft.; 4" = 5,333 lbs./sq. ft.

CONTACT US

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email: support@polywater.com

American Polywater® Corporation

11222 60th Street N | Stillwater, MN 55082 USA

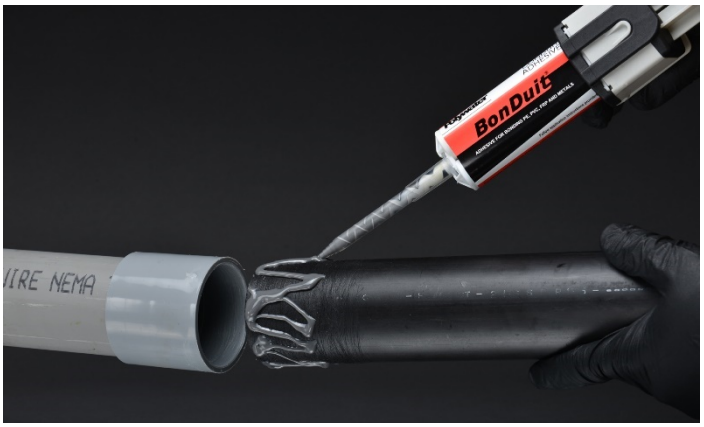
American Polywater® Corporation

POLYWATER® BonDuit® Conduit Adhesive

DESCRIPTION

BonDuit® Conduit Adhesive joins polyethylene duct to PVC, fiberglass, and metal duct using standard PVC couplings. This rapid-cure, two-part resin adhesive forms a durable bond for a strong, permanent joint. It creates a watertight, airtight seal.

BonDuit is a versatile, field-friendly conduit joining solution. It works for multiple conduit types and sizes. It is easy to use and requires no special training.



BonDuit mixes as it is applied to create permanent joints.

ADHESIVE SHEAR STRENGTH

BonDuit was used to join two pieces HDPE conduit with a PVC coupling. Typical bond strengths were measured as the force required to pull apart the joint after 24 hours at 70°F (21°C).

CONDUIT DIAMETER	PULLOUT FORCE
1 inch (2.5 cm)	724 lb_f (3.22 kN)
1½ inch (4 cm)	1,233 lb_f (5.48 kN)
2 inch (5 cm)	2,025 lb_f (9.01 kN)
4 inch (10 cm)	5,333 lb_f (23.72 kN)

Results based on third-party laboratory testing.

HYDROSTATIC (PRESSURE) TESTING

BonDuit forms a watertight joint. HDPE duct was joined to PVC duct with a PVC coupling and the adhesive. The ducts were filled with water, sealed, pressurized to 120 psi (8.3 bar), and observed over time for leakage. The joint was then subjected to a short duration, high pressure test.

TEST DURATION	RESULT
1,000 Hours	No Leaks

Continuous pressure test based on ASTM D1598, "Time to Failure of Plastic Pipe Under Constant Internal Pressure."

SHORT-TIME HIGH PRESSURE (BURST TEST)	
MAXIMUM PRESSURE	RESULT
>250 psi (>17 bar)	No Leaks

Burst test based on ASTM D1599, "Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing and Fittings (Burst Test)."

PRODUCT FEATURES

- Versatile—Bonds different materials, multiple sizes
- Superior—Stronger pullout strength than mechanical couplings
- Durable—Bonds with high strength within an hour
- Easy to Use—Requires no special training
- Convenient—Contains required components for quick installation.

END USE

BonDuit bonds polyethylene to:

- PVC couplings
- Concrete vaults
- Transition couplings
- Above ground conduits
- Steel sweeps and elbows
- Fiberglass and composite connections
- PEX, CPVC, ABS, Polypropylene

COMPONENT PHYSICAL PROPERTIES

BonDuit is a 2-part resin. Both parts are thin pastes packaged in a mixing cartridge.

PROPERTY	PART A	PART B
Color	Dark Grey/ Black	White/ Light Yellow
Form	Paste	Paste
Odor	No Odor	Slight Sulfur Odor
VOC	0 g/L	0 g/L
Specific Gravity	1.2	1.2

CURED RESIN PROPERTIES

BonDuit cures to form a solid, durable resin seal.

PROPERTY (7 DAY CURE, 70°F)	RESULT
Color	Grey
Peak Exotherm @ 70ºF (21°C)	<200ºF (<95°C)
Hardness (Shore D Durometer)	70–80
Flexibility (ASTM D790)	> 2%
Dielectric Strength (ASTM D149)	450 Volts/Mil (Nonconductive)
Airtight (continuous)	120 psi (8.3 bar)

TYPICAL ADHESIVE SHEAR STRENGTH

BonDuit will bond to dissimilar surfaces. Bond strength will be the same or greater than the weaker substrate when two different materials are joined.

SUBSTRATE	RESULT
HDPE	105 psi (0.72 N/mm^2)
PVC	185 psi (1.28 N/mm^2)
Fiberglass	2000 psi (13.8 N/mm^2)
Steel	2300 psi (15.9 N/mm^2)
Aluminum	860 psi (5.93 N/mm^2)
Copper	3500 psi (24.1 N/mm^2)

Tested using ASTM D1002. Samples sanded, cleaned and cured for 24 hours.

TYPICAL IMPACT RESISTANCE

SUBSTRATE	RESULT
HDPE	24.8 in-lb (2.8 N·m)
PVC	37.2 in-lb (4.2 N·m)
Fiberglass	22.3 in-lb (2.5 N·m)
Galvanized Steel	37.2 in-lb (4.2 N·m)

Tested using ASTM G14. Samples are sanded, cleaned and allowed to cure for 24 hours.

BONDING MATERIALS

BonDuit adheres to:

- Polyethylene
- PVC, CPVC
- Composite
- PEX
- ABS
- Polypropylene
- Fiberglass
- Concrete
- Porcelain
- Steel
- Aluminum
- Copper

ENVIRONMENTAL RESISTANCE

BonDuit can withstand the typical rigors of the conduit environment.

OPERATING TEMPERATURE
-60°F to 250°F (-50°C to 120°C)

Temperature Cycle Testing: 10 cycles from 0ºF to 130ºF (18°C to 55°C) showed no significant change in adhesion.

BonDuit, if applied and frozen before cure, shows no significant change in adhesion when warmed and allowed to cure after temperature is raised.

BonDuit withstands ultraviolet and direct sunlight exposure with no decrease in functionality.

CHEMICAL RESISTANCE

The chemical resistance of a polyethylene to PVC bond (joined with BonDuit Adhesive) is tested by measuring shear strength after exposure to the reagent compared to a non-exposed control. The joint cured for 7 days, immersed in the reagent, and then aged at ambient temperature for 3 months.

CHEMICAL EXPOSURE	% CONTROL
Salt Water (4%)	85% (Pass)
Alkaline Soap Solution (pH 12)	100% (Pass)
Odorless Mineral Spirits	>100% (Pass)

The BonDuit Adhesive bond shows good resistance to salt water, alkaline solutions, and odorless mineral spirits (paraffinic solvent). A 6-month water & oil soak test also shows no significant change in adhesion compared to a control.

APPLICATION

BonDuit Adhesive is easy to use. For full installation information, please see BonDuit Usage Instructions. *(www.polywater.com/BTinstructions.pdf)*

One 50-ml cartridge will produce a ¼-inch (6 mm) bead of mixed adhesive approximately 42 inches (1.1 meter) long.

Preparation:
Proper surface preparation ensures a strong, long-lasting, airtight and watertight bond. For best adhesion, surface should be sanded and cleaned with Type RP™ Cleaner Wipe to remove oils and displace any remaining water. Comparison of preparation technique is below:

SURFACE PREPARATION	BOND STRENGTH (% CONTROL)
No Preparation	100% (Control)
Cleaner Only	120%
Sanding Only	410%
Cleaner and Sanding	480%

Adhesion between HDPE and PVC substrates tested using ASTM D1002 (lap shear) with different preparation methods.

Application Temperature

Keep BonDuit above freezing during application.

WORKING TEMPERATURE
40°F to 120°F (4°C to 50°C)

General Installation:
Joints made with BonDuit can be placed into position once the connection is made. Adhesive cures underwater or underground. Conduits can be put into service once full cure is reached.

Cool Weather Application
In cool weather (below 60°F, 16°C) keep BonDuit and couplings warm before using, above 60°F (16°C). It may be necessary to heat the transition joint to force adhesive cure. Below 40ºF (4°C), the joint should be heated to cure the adhesive.

Warm Weather Application
In warm weather (above 85°F, 29°C), keep BonDuit cool, below 70°F (21°C). This will help keep the adhesive from curing before coupling is attached. If possible, use during cooler mornings and out of direct sunlight to slow down cure rate.

Underwater Application
BonDuit will retain its strength when cured underwater. Surface should be abraded and cleaned per standard instructions. Joint can be placed underwater within 5 minutes of application.

CURE RATE

BonDuit develops a strong bond, allowing movement or burial quickly.

TEMPERATURE	WORK TIME	SET TIME
35°F (2°C)	40 min	7 hrs
52°F (11°C)	20 min	3 ½ hrs
60°F (16°C)	10 min	1 ½ hrs
70°F (21°C)	6 min	60 min
88°F (31°C)	4 min	40 min

After one hour at 70°F (21°C), the BonDuit resin will reach approximately 50% of its cure strength and will “set”. It will continue to cure and will reach maximum bond strength after approximately 24 hours at 70°F (21°C).

Once cured, conduit joints made with BonDuit Adhesive will hold adequate air pressure for cable blowing operations.

CURE TIME, 70°F (21°C)	AIR PRESSURE	RESULT
90 Minutes	150 psi (10.3 bar)	Pass
120 Minutes	200 psi (13.8 bar)	Pass

The prepared conduit system holds the above pressure for 10 minutes.

SAFETY

BonDuit has a low level of toxicity. Good industrial hygiene practice and appropriate precautions should be employed during use. Provide appropriate ventilation/respiratory protection against decomposition products during welding/flame operations (i.e., torches used to install heat shrink products) on or near cured product. See SDS for specific details.

STORAGE AND HANDLING

Keep cartridge tightly closed in a cool, dark, dry location. Reseal cartridge after use. Keep away from sources of ignition and protect from freezing. All cartridges should be disposed of in an environmentally safe manner and in accordance with government regulations.

Unopened product has a shelf life of 18 months.

MODEL SPECIFICATION

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

Approved conduit joining system is BonDuit Conduit Adhesive. The conduit adhesive shall come in a multiple-use cartridge to bond various conduit connections without special fitting or positioning jigs. The packaging shall automatically mix and meter the adhesive. The cure rate for the adhesive shall be fast, reaching 50% of final strength in one hour (@ 75°F, 24°C), and 80% of final strength in two hours (@ 75°F, 24°C). The peak exotherm temperature of mixed product shall not exceed 200°F, 93°C (20-gram sample.) Product shall be suitable for use on various duct materials, multiple duct sizes and connection types.

Once cured, the adhesive seal shall be airtight and watertight. A one-inch, PVC coupling sealed to a polyethylene duct with the adhesive shall hold 120 psi (8.3 bar) air pressure after curing one hour at 75°F (24°C). The pull-out strength of a 2-inch (5 cm) polyethylene duct sealed to a PVC coupling shall be at least 910 lbs force (4.05 kN) after curing one hour at 75°F (24°C) and at least 1820 lbs force (8.10 kN) after curing for 24 hours. The adhesive shall have a minimum flexural strain of 2% as measured by ASTM D790.

The cured adhesive shall be resistant to water, salt water, oils, and UV degradation. The cured bond shall withstand temperature extremes from -60°F (-50°C) to 250°F (120°C). It shall withstand multiple freeze-thaw cycles. The cured product shall be non-conductive with a minimum dielectric strength of 450 Volts/Mil as measured by ASTM D149.

ORDER INFORMATION

CAT #	PACKAGE DESCRIPTION
BT-KITG	Kit contains: 2 50-ml BonDuit Adhesive Cartridges 8 Mixing Nozzles 1 Strip of Sanding Cloth 8 RP-1 Cleaning Wipes 1 Instruction Sheet 1 Dispensing Tool
BT-KIT	Kit contains: 2 50-ml BonDuit Adhesive Cartridges 8 Mixing Nozzles 1 Strip of Sanding Cloth 8 RP-1 Cleaning Wipes 1 Instruction Sheet (Dispensing tool not included.)
BT-KITB6G	Bulk kit contains 6 Individual Kits, BT-KIT 1 Dispensing Tool Included
BT-KITB6	Bulk kit contains 6 Individual Kits, BT-KIT (Dispensing tool not included.)
TOOL-50-11	1 Dispensing Tool
MXR-12T-10	10 Mixing Nozzles
BT-CART12PK	12 50-ml BonDuit® Adhesive Cartridges in a Package

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Polywater® Pad N Pole™

UTILITY ENCLOSURE REPAIR SYSTEM

Finished Pad N Pole repair

For Field Repair of Utility Enclosures, Poles, and Pedestals

PRODUCT BENEFITS

- **Protects:** Seals defects from unwanted entry.
- **Prevents:** Helps stop outages and costly changeouts.
- **Durable:** Withstands environmental extremes. Sunlight (UV) resistant.
- **Versatile:** Repairs damage of various shapes and sizes.
- **Easy to Use:** Kit contains materials to complete repair in a single visit,

Restores System Integrity

Polywater® Pad N Pole™ (BRK™) fixes and restores damaged utility enclosures to prevent human, water, and pest intrusion. Polywater Pad N Pole two-part adhesive bonds to fiberglass, steel, polyethylene, metal, concrete, and composites. The resin repair system provides a durable, long-lasting repair.

Clean and sand before applying BRK

Wet the fabric with BRK

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American Polywater® Corporation

Kit components

Painted BRK repair

Multi-Use Cartridge Creates Numerous Repairs

Polywater Pad N Pole Repair is supplied in kits that contain everything needed to performmultiple repairs. A standard high-ratio caulking gun can be used to dispense product.

POLYWATER PAD N POLE

Catalog #	Package Description	Units/Case
BRK-250KIT1	1 - 250mL Pad N Pole Repair adhesive cartridge; 6 - mixing nozzles; 1 - strip of sanding cloth; 6 - Type HP™ wet/dry wipes (cat #HP-P158ID); 6 - pairs of gloves; 6 - foam brushes; 1 - 72" x 6" fabric; 1 - instruction sheet. Dispensing tool not included.	1
BRK-250KITB6	Contains 6 BRK-250KIT1	1
TOOL-250	Dispensing tool	1

SPECIFICATIONS AND APPLICATIONS:

- Pad N Pole is perfect for repairing electrical enclosures, transformer pads, fiberglass light poles, PVC and fiberglass conduit, and riser poles. The material in the kits can be custom cut to cover and mold to various types of damage.
- Pad N Pole fixes a wide variety of defects, from small cracks to large holes. Multiple layers can be applied for increased strength over large areas.
- Pad N Pole Repair is quick and easy to install. Pad N Pole mixed resin has 30 minutes working time. It can be painted immediately after application, eliminating the need for a return visit. Repairs reach full strength in 12 hours.
- Repairs made with Pad N Pole Repair withstand exposure to extreme outdoor temperatures, from -60˚F to 180˚F.

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Polywater®

Pad N Pole™ Repair

American Polywater® Corporation

TECHNICAL DATA SHEET

Description:

The Polywater® Pad N Pole™ Repair system repairs and restores damaged utility enclosures, preventing human, water, pest, or debris entry through the repaired defect.

Pad N Pole two-part clear adhesive bonds to fiberglass, polyethylene, metal, concrete, and composites. The resin repair system provides structural integrity for a durable, long lasting repair.

Pad N Pole Repair comes in a convenient, field-ready kit. The resin is easy to dispense with a standard high-ratio caulking tool, and quickly wets the repair cloth. Each kit can repair up to 3 square feet. Fabric can be layered as necessary to create a thicker and stronger structure. Repairs are quick and easy, and can be done in the field with a single visit with little or no training.

Performance:

Repairs made with Polywater Pad N Pole Repair withstand exposure to extreme outdoor temperatures, from -60°F to 180°F.

Polywater Pad N Pole Repair is versatile. It repairs a wide variety of defects from small cracks to large holes. System will repair corners, rounded surfaces, and with optional use of single or multiple layers of fabric. Multiple layers are appropriate for increased strength over larger defects.

Polywater Pad N Pole Repair is quick. Defects can be repaired in as little as 3 minutes. However, the Polywater Pad N Pole mixed resin allows at least 30 minutes working time. Repairs reach full strength about 12 hours after application, but can be painted immediately after application so no return visit is needed.

Fabric saturated with the high-strength, two-part resin creates a permanent Pad N Pole Repair.

Product Benefits:

- **Protects**—Seals defects from unwanted entry.
- **Prevents**—Helps stop outages.
- **Durable**—Withstands environmental extremes. Sunlight (UV) resistant.
- **Versatile**—Repairs various sizes and shapes of damage.
- **Easy to Use**—Kit contains materials to complete repair in a single visit.

Typical Applications:

Polywater Pad N Pole Repair may be used on a variety of outdoor enclosures including:

- Transformer pads & enclosures
- Lighting pedestals & poles
- Telecom junction enclosures
- Above ground conduits

Component Physical Properties:

The Polywater Pad N Pole Adhesive is a two-part thixotropic paste packaged in a cartridge applicator. The supplied mixing nozzles ensure proper mixing as the product is extruded from the cartridge.

Property	Part A (Resin)	Part B (Curing Agent)
Color	Clear	Clear
Form	600 cps	53,000 cps
Odor	No odor	No odor
Specific Gravity (water = 1)	1.13	1.09

Typical Properties:

Polywater Pad N Pole Adhesive cures to form a solid, durable seal.

Property	Typical Value
Color	Clear
Peak Exotherm @ 70ºF	< 110ºF
Hardness 7 Days @ 70ºF (Shore A Durometer)	45
Flexibility 7 Days @ 70ºF	Excellent
Adhesive Shear Strength* (ASTM D1002):	
PVC	450 lbs/in^2
HDPE	100 lbs/in^2
Polystyrene	100 lbs/in^2
Fiberglass	1650 lbs/in^2
Galvanized Steel	875 lbs/in^2
Copper	800 lbs/in^2
Aluminum	1050 lbs/in^2
**Samples sanded, cleaned, and cured for 24 hours.*	
Impact Resistance (ASTM F 14):	
On Fiberglass	>100 in-lbs
On Galvanized Steel	>100 in-lbs
On Polyethylene	>100 in-lbs

Materials:

Pad N Pole Repair has excellent adhesion to most surfaces:

- Fiberglass
- Steel
- Composites
- PVC
- Polyethylene
- Concrete
- Steel

Environmental Resistance:

Pad N Pole Repair can withstand the typical rigors of the conduit environment.

Temperature Cycle Testing: 10 cycles from 0ºF to 130ºF showed no significant change in adhesion.

Pad N Pole Adhesive withstands ultraviolet and direct sunlight exposure with no decrease in functionality.

Chemical Resistance:

Pad N Pole Repair shows good resistance to salt water, alkaline soap solutions, and mineral spirits (paraffinic solvent).

Penetration Test

Pad N Pole resists puncture and tearing. Resistance to penetration from a standard screwdriver was tested. Pad N Pole was applied to 4-inch square PVC sheet covering a 1-inch hole with standard procedure. After curing for 24 hours, a #2 Phillips screwdriver head was forced through the Pad N Pole repair and the maximum force was recorded.

Fabric Layers	Resistance to Penetration
1	50 lb_f
2	120 lb_f
3	180 lb_f

Application:

Polywater Pad N Pole Repair is easy to use.

If necessary, dig out sod and soil to reveal at least 2 inches of undamaged surface around the defect. Abrade the area to be repaired for approximately 1½ inch around the damage using the abrasive cloth included in the kit. Clean and dry the abraded area with the Type HP™ Tandem Pack (HP-P158ID), removing all dirt and other contaminants. As in any repair involving adhesive application, starting with a clean surface is very important.

Cut the fabric to overlap the damage by approximately 1 inch all the way around. Generously apply the two-part Pad N Pole Adhesive Resin to the cleaned surface around the damaged area and brush to cover repair area. Lay the fabric over the coated damaged area, pressing the fabric into the Pad N Pole Resin. Smooth and press down with the foam brush. The fabric will cling to the adhesive covered area.

Generously apply additional Pad N Pole Resin to the top of the fabric (including the cloth over the hole) and smooth with the brush until the cloth is fully saturated. Brush the Pad N Pole Resin ½ inch past the edges of the cloth, feathering the resin and ensuring that the edges of the cloth are well adhered to the surface. Pad N Pole Adhesive Resin will set in about 30 minutes and reach full strength in about 12 hours.

Larger repairs (> 2") will benefit by adding additional layers of cloth material. Additional layers can be added at any time, before or after the first layer has cured.

The repair area may be spray painted immediately (before full cure), and soil may be replaced at this time, enabling even a complex repair to be done in a single visit.

For additional installation information, please see the Pad N Pole Usage Instructions at: Pad N Pole Instruction Link

Cure Rate:

Polywater Pad N Pole Adhesive Resin has a working time of 30 minutes at 70° F, allowing ample time to perform repairs with care and precision. After thickening beyond the point that it can be spread, the product continues to cure, reaching maximum strength in 12 hours at 70° F.

Working and set time variation with temperature is shown below.

Temp.	Working Time	Set Time
40°F (4°C)	90 Minutes	24 Hours
52°F (11°C)	70 Minutes	20 Hours
60°F (16°C)	40 Minutes	16 Hours
70°F (21°C)	30 Minutes	12 Hours
88°F (31°C)	20 Minutes	8 Hours

Storage and Handling:

Keep cartridge tightly closed in a cool, dark, dry location. Reseal cartridge after use. All cartridges should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Unopened product has a shelf life of 18 months.

Safety:

Polywater Pad N Pole Repair has a low level of toxicity. Use good industrial hygiene practice and follow any precautions during use. Avoid personal contact with the uncured product. See SDS for specific details.

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The approved enclosure repair system is Polywater Pad N Pole Repair. The repair system shall come in a multiple-use kit that will provide the materials needed for the repair.

The packaging shall automatically mix and meter the two-part repair adhesive. The application tool must be a standard high ratio caulking gun. The cure rate of the adhesive shall allow 30 minutes of working time (at 70°F) to apply and smooth the repair. The repair shall be spray paintable immediately after application with no reduction in ultimate strength. Product shall be suitable for use on various enclosure materials, including fiberglass, HDPE, concrete, steel, aluminum, and composites.

Once cured, the repair shall be watertight. The bond shall be strong enough to withstand an impact of over 100 in-lbs on the fabric as measured by ASTM G14.

The cured product shall be resistant to water, salt water, oils, and ultraviolet degradation. The cured bond shall withstand temperature extremes from -60°F to 180°F. It shall withstand multiple freeze-thaw cycles.

Order Information:

Cat #	Package Description
BRK-250KIT1 (1 unit/case)	Kit contains: 1 Polywater Pad N Pole Repair adhesive 250 mL cartridge 6 mixing nozzles 1 strip of sanding cloth 6 HP Tandem cleaning and drying wipes (HP-P158ID) 6 foam brushes 1 fabric 72 in. by 6 in. 1 instruction sheet
BRK-250KITB6 (1 unit/case)	Bulk kit contains 6 individual kits, BRK-250KIT1
TOOL-250 (1 unit/case)	1 Dispensing tool

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ Software

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Sealants

Polywater® FST™

FOAM DUCT SEALANT

Installation of Polywater FST-250

For Sealing Conduits and Risers from Moisture, Gases, and Rodents

PRODUCT BENEFITS

- **Meets NEC Code Requirements**: 2011 NEC Articles 225.27, 230.8, 300.5(G), 300.7 (A) on Raceway Seals, and 501.15 (B)(2).
- **Reliable:** Holds 22 feet (6.7 m) of water head pressure and up to 90-foot (27 m) surges.
- **Seals Multiple Conduits:** Can seal conduits of all sizes and is reenterable.
- **Compatible:** Use with a wide range of cable jacket and conduit materials.
- **Solves Critical Application:** Class 1, Div 2 locations and areas subject to temperature variations.

Protects Conduit and Raceway Systems

FST™ closed-cell sealant provides superior pressure-blocking in the toughest environments. It stops water, methane, and other gases to keep electrical systems intact. FST Duct Sealant is durable and easy to install. FST is chemically resistant and has excellent adhesion to conduits.

Installation of Polywater® FST MINI

Riser seal application

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FST works in all types of conduits

FST-250KIT contents

Multi-Use Cartridge Creates Numerous Seals

FST kits contain everything needed for an effective seal. Polywater FST-250 can be dispensed with a standard high-ratio caulking gun. Polywater FST MINI kits are available with or without a dispensing tool.

POLYWATER FST

Catalog #	Package Description	Units/Case
FST-250KIT1	1 - 8.5-oz two-part FST Foam Sealant caulking tube (cat# FST-250); 3 - mixing nozzles; 4 - 24" foam damming strips (cat# FST-DAM); 1 - 12" sanding cloth; 1 - pair of gloves; 1 - positioning rod for foam dam; 1 - pre-treating wipe (cat# HP-P158ID); 1 - resealing cap; 1 - instruction sheet. TOOL-250 NOT INCLUDED - SOLD SEPARATELY	1
FST-250KIT	Same as kit above in a box of 6	6
FST-250	1 - 8.5-oz two-part FST Foam Sealant caulking tube; 1 - mixing nozzle; 1 - resealing cap	12
MXR-30T-10	10-pack of mixing nozzles for FST-250	1
TOOL-250	1 - high-ratio caulking gun	1
FST-DAM	1 - 24" foam damming strip	24
FST-MINI-1	1 - 50-mL cartridge; 2 - mixing nozzles; 6 - foam discs; 2 - pairs of gloves; 1 - instruction sheet	1
FST-MINI-1G	Same as above; includes TOOL-50-11	1
FST-MINI-B6	6 - FST-MINI-1	1
FST-MINI-B6G	Same as above; includes TOOL-50-11	1
TOOL-50-11	1 - dispensing tool for FST MINI	1
MXR-20T-10	10-pack of mixing nozzles for FST MINI	1

SPECIFICATIONS AND APPLICATIONS:

- **Application:** FST-250 is recommended for 2-inch (50 mm) or larger conduits. It comes in a multi-use single-plunger caulking tube that uses a standard high-ratio caulking tool (TOOL-250). FST MINI is recommended for conduits less than 1.5 inches (40 mm).
- **Adhesion:** Bonds to PVC, GRS, EMT, IMC, fiberglass, and PE conduits. Ducts can be reentered.
- **Attention:** Due to varying interpretations of the NEC code, please consult the AHJ before use in Class 1, Div 2 hazardous locations.

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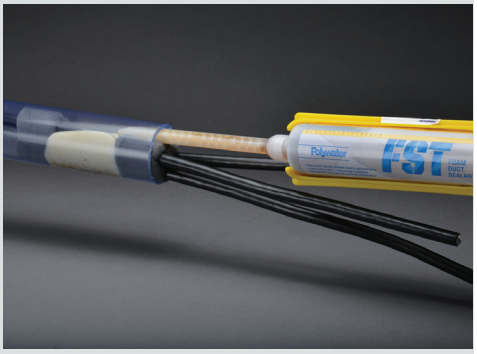
Polywater® FST™ NEC Codes

FOAM DUCT SEALANT



- **Reenterable:** Cured foam is semi-permanent and can be removed.
- **Stops Gases**: Stops methane and other gases to keep electrical systems intact.
- **Reliable:** Holds 22 feet of water head pressure continuously.
- **Compatible:** Use with a wide range of cable jacket and conduit materials.
- **Tested:** No residue, non-conductive, non-corrosive, exceeds IEEE 1493 standards.

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Meets and Exceeds NEC Codes for Raceway Seals

Polywater® FST™ Foam Duct Sealant meets and exceeds the NEC code requirements; 2014 NEC Articles 225.27, 230.8, 300.5 (G), 300.7 (a) on Raceway Seals, and 501.15 (B) (2). FST is superior to both duct putty and aerosol cans of foam because it has been tested for cable compatibility.

FST Meets the Following from the NFPA 70® National Electrical Code® 2008, 2011, 2014 Editions

NEC 225.27 Raceway Seal. Where a raceway enters a building or structure from outside, it shall be sealed. Spare or unused raceways shall also be sealed. Sealants shall be identified for use with cable insulation, conductor insulation, bare conductor, shield, or other components.

NEC 230.8 Raceway Seal. Where a service raceway enters a building or structure from an underground distribution system, it shall be sealed in accordance with 300.5(G). Spare or unused raceways shall also be sealed. Sealants shall be identified for use with the cable insulation, shield, or other components.

NEC 300.5 (G) Raceway Seals. Conduits or raceways through which moisture may contact live parts shall be sealed or plugged at either or both ends. Spare or unused raceways shall also be sealed. Sealants shall be identified for use with the cable insulation, conductor insulation, bare conductor, shield, or other components.

Informational Note: Presence of hazardous gases or vapors may also necessitate sealing of underground conduits or raceways entering buildings.

NEC 300.7 (A) Sealing. Where portions of a raceway or sleeve are known to be subjected to different temperatures, and where condensation is known to be a problem, as in cold storage areas of buildings or where passing from the interior to the exterior of a building, the raceway or sleeve shall be filled with an approved material to prevent the circulation of warm air to a colder section of the raceway or sleeve. An explosion proof seal shall not be required for this purpose.

NEC 501.15 (B)(2) Conduit Seals, Class 1 Division 2: A conduit seal shall be required in each conduit run leaving a Class 1, Division 2 location... and it shall be designed and installed to minimize the amount of gas or vapor within the portion of the conduit installed in the Division 2 location... Such seals shall not be required to be explosion proof..."

* *As always with the NEC code it is prudent to check with and get approval from the AHJ before installing any product in a hazardous location area due to varying interpretations.*

American Polywater® Corporation

11222 60th Street N | Stillwater, MN 55082 USA

American Polywater's

Foam Sealant (FST) Quantity Calculation

Page

This page will estimate the quantity of FST Foam Sealant needed and the correct sized package to seal different sized conduits.

http://www.polywater.com/calculators/fstcalculator.asp

Polywater® FST™ MINI

FOAM DUCT SEALANT

Meets the NEC codes for conduit sealing

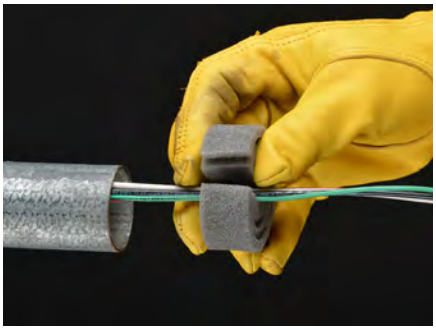
Foam Duct-Sealing System for Conduit Sizes ¾” up to 2”

PRODUCT BENEFITS

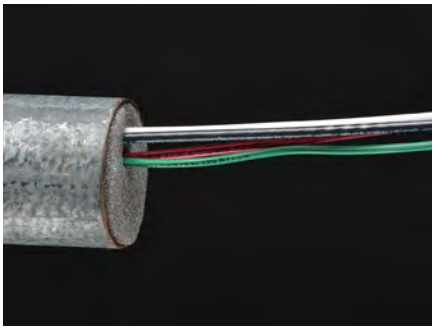
- **Strong:** Holds up to 22 ft/7 m of water head pressure.
- **Compatible:** PVC, rigid steel, EMT, fiberglass, and cable jackets.
- **Easy:** Two-part foam is mixed in nozzle as it is injected into duct.
- **Quick:** Foam expands and cures quickly even when water is present.
- **Multi-Use:** Packages are resealable.

Effectively Seals Small Conduits and Innerducts

Polywater® FST™ MINI is an expanding, quick-setting, “closed-cell" foam that is injected into a conduit to provide a watertight seal. The seal is superior to pliable duct putties and “open-cell” aerosol canned foams. Recommended for small conduits (less than 1.5 inches (38 mm)).



Positioning the wires



Foam dam strip inserted

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American Polywater® Corporation

Insert nozzle past the first dam

Catalog # FST-MINI-1G

For Small Conduits and Innerduct Applications

One Polywater FST MINI cartridge seals approximately ten 1-inch ducts (25.4 mm). Polywater FST MINI meets and exceeds all NEC code requirements for sealing conduits: 2011 NEC Articles 225.27, 230.8, 300.5 (G), 300.7 (A) on Raceway Seals, and 501.15 (B)(2). It's perfect for cold storage electrical raceway entrances, with an approximate R-Value of 6.5 per inch.

POLYWATER FST MINI

Catalog #	Package Description	Units/Case
FST-MINI-1	1 - 50-mL cartridge 2 - mixing nozzles 6 - foam discs 1 - pair of gloves 1 - instruction sheet	1
FST-MINI-1G	Same as kit above; includes TOOL-50-11	1
FST-MINI-B6	6 - FST-MINI-1	1
FST-MINI-B6G	Same as kit above; includes TOOL-50-11	1
TOOL-50-11	Dispensing tool for FST-MINI-1	1
MXR-20T-10	10-pack mixing nozzles	1

SPECIFICATIONS AND APPLICATIONS:

- **Water Blockage:** Holds 22 feet water head pressure continuous: 70 feet water head intermittent.
- **Seal Strength:** Sealant can seal out manhole gases, such as methane.
- **Chemical Resistance:** Chemically resistant to gasoline, oils, dilute acids and bases, and most unsaturated hydrocarbons.

CONTACT US

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American Polywater® Corporation

POLYWATER® FST™ FOAM SEALANT

DESCRIPTION

FST™ closed-cell sealant provides superior pressure-blocking in the toughest environments. It stops water, methane, and other gases to protect electrical systems. FST Sealant is durable and easy to install.

FST expands and hardens to a semi-permanent, but removable, seal. The foam wets and adheres to metals, plastics, and concrete. It conforms around complex cable fill configurations to keep out moisture, gases, dust, insects, and rodents. FST is a proven solution used to protect switchgear, panels, riser poles, combiner boxes, and meters.

Convenient FST package creates a reliable seal.

HYDROSTATIC (PRESSURE) TESTING

FST Sealant is an excellent water block. To test water blocking performance, it is installed into a conduit according to standard procedures, forming a 3-inch plug. Water is added to the system and then pressurized to create a “water head”. Seal passes if there is no leakage observed.

CONDUIT	TEST CONDITION	RESULT
2” PVC	3 cables, *bent* 45° two directions, then *pulled* 15 lb (6.8 Kg) axial force 40 psi (2.7 bar), 15 min	Pass
2” PVC	12 polyethylene wires, 40 psi (2.7 bar), 7 months	Pass
2” Fiberglass	30 psi (2.0 bar), 7 days	Pass
2” HDPE	30 psi (2.0 bar), 7 days	Pass
3” Steel	4 copper cables, 40 psi (2.7 bar), 7 days	Pass
4” Steel	30 psi (2.0 bar), 24 hours	Pass
4” HDPE	(4) 12AWG THHN Wires 30 psi (2.0 bar), 7 days	Pass
5” PVC	25 psi (1.7 bar), 7 days	Pass

PRODUCT FEATURES

- Reliable—Holds 22 feet (6.7 m) water head pressure continuous; 90-foot (27 m) surges
- Versatile—Seals multiple conduits with different sizes and cable fill configurations
- Compatible—Use with a wide range of cable and conduit materials
- Reenterable—Cured foam is semi-permanent and can be removed

STANDARDS

- Complies with 2011 NEC Articles 225.27, 230.8, 300.5(G) and 300.7(A) on Raceway Seals
- Minimizes gas and vapor passage for boundary seals described in NEC Article 501.15(B)(2) for Class 1, Div 2
- Complies with TIA-758-B Standard 5.1.1.2.8, 5.4.2.3 and 7.4.2.8.1

APPROVALS

UL Recognized
Passes UL94
Class HBF fire retardant rating

COMPONENT PHYSICAL PROPERTIES

FST Sealant is a two-part, urethane foam. The liquid Part A and B are formulated to be mixed at a 1/1 ratio using the two-part coaxial caulking tube and mixing nozzle, provided.

PROPERTY	PART A	PART B
Color	Amber	Clear
Form, Viscosity	Liquid, 250 cps	Liquid, 650 cps
VOC	0 g/L	0 g/L
Specific Gravity	1.2	1.1

CURED RESIN PROPERTIES

FST Sealant cures to solid, closed-cell foam.

PROPERTY	RESULT
Appearance	Light yellow color with small, even cells
Closed Cell Percent	98%
Density	6 lb/ft^3 (0.1 g/cm^3)
Moisture Absorption (ASTM D2842)	<4%
Compressive Strength (ASTM D1621)	145 psi (1.00 N/mm^2)
Tensile Strength (ASTM D1623)	120 psi (0.83 N/mm^2)
Seal Strength – Water	90 ft (27 m) intermittent 22 ft (6.7 m) continuous
Seal Strength – Air	>5 psi (>0.3 bar)

SEAL STRENGTH, AIR AND GAS

FST Sealant seals out manhole gases. Seal strength was tested by installing FST per standard directions. Conduit was then pressurized with both air and helium. Helium represents methane as it is less than half the molecular size.

CONDITION	RESULT
Air, 10 psi (0.7 bar), 168 hrs	Pass (Holds Seal)
Helium, 5 psi (0.3 bar), 72 hrs	Pass (Holds Seal)

CABLE REMOVAL TESTING

FST acts as a theft deterrent by sealing cables into conduit.

CABLE TYPE	AVERAGE PULL OUT TENSION
2 AWG THHN	171 lb$_f$ (77.6 Kg$_f$)
4/0 XHHW	320 lb$_f$ (145 Kg$_f$)

A standard application of FST is used to seal 3 cables into conduit. Force to pull out each cable is measured.

FST seals in the cables, making removal by hand very difficult.

CABLE COMPATIBILITY

FST Sealant is compatible with common cable jacket materials. The cured foam is an inert solid that does not affect cable components. It does not change physical or electrical property of cable, based on tensile - elongation and volume resistivity testing.

SEMI-CONDUCTING MATERIAL	VOLUME RESISTIVITY (42 DAY EXPOSURE)
TR-XLPE	Pass (Shows stability)
EPR	Pass (Shows stability)

CABLE JACKET	TENSILE	ELONGATION
PVC	>99% control	>93% control
XLPE	>96% control	>91% control

Testing based on IEEE 1210. Full report available upon request.

ENVIRONMENTAL RESISTANCE

FST Sealant withstands the rigors of the conduit exposure environment.

In Service Temperature Use Range

-20°F to 200°F (-30°C to 95°C) Continuous
-40°F to 250°F (-40°C to 120°C) Peak

FST Sealant does not lose function in direct sunlight. Reacted foam that is exposed to UV will yellow. This discoloration does not affect performance, the foam seal retains its hardness and continues to act as a duct block.

The foam sealant can be protected with a weather proofing paint. Both urethane and epoxy-based products have been tested with good results and excellent adhesion to the foam.

CHEMICAL RESISTANCE

FST Sealant is chemically resistant to gasoline, oils, dilute acids and bases, and most unsaturated hydrocarbons.

Cured FST was soaked in chemical for 45 days following ASTM C267. Weight change is noted.

CHEMICAL EXPOSURE	Δ% WEIGHT	RESULT
Sodium Hydroxide (1N)	0.80	Resistant
Hydrochloric Acid (1N)	1.88	Resistant
Sulfuric Acid (1N)	1.00	Resistant
Hydrogen Peroxide (30%)	1.57	Resistant
Dielectric Oil	0.48	Resistant
Mineral Oil	0.35	Resistant
Gasoline	0.18	Resistant

APPLICATION

Field-Ready Kit
The FST Sealant kit includes all materials required to install a finished duct block.

Seal Length (Depth)
It is most important to make a seal of adequate length by using and properly spacing the damming strips. A 3-inch plug will meet performance guidelines.

Application Temperature
Working temperature for Polywater FST Sealant is 40°F to 95°F (4° C to 35°C).

Water in Duct
FST Sealant will cure and seal duct with small amounts of water present. The water should not be flowing, and should be relatively clean. FST foam will incorporate water into its cure. However, excessive water will weaken the seal.

For full installation information, please see FST use instructions. *(www.polywater.com/FST-INSTRUCTIONS.pdf)*

CURE RATE

The FST Sealant can be used in temperatures down to 40°F (4°C). At low temperatures, the reaction is slower, but the sealant will completely foam and cure with time. At cold temperatures, the sealant components become more viscous and flow through the mixing nozzle at a slower rate. Cure times are as follows:

REACTION TIME	40°F (4°C)	70°F (21°C)
Foaming expansion complete	8-9 minutes	4-5 minutes
Hard, non-sticky skin formation	15-18 minutes	7-9 minutes

To decrease cure time in cold temperatures, warm FST Sealant cartridges prior to use.

CLEAN-UP

Any unreacted material may be cleaned from surfaces with a solvent wipe such as Polywater's Type HP™ Cleaner/Degreaser. The part A amber resin will react with water if surfaces are washed with a soap and water solution. Once reacted, the foam has strong adhesion, and may be scraped or cut from surface.

REENTERABLITY AND REMOVAL

FST Sealant can be mechanically removed with some effort. Use a long screwdriver to puncture holes throughout the seal. With a hammer, punch the screwdriver through the foam, twist it to enlarge the cavity, and pull out. Once the foam is weakened, it can be chipped away, and the cable should break free.

TROUBLE-SHOOTING

Once a skin has formed, the foam may be visually inspected to determine whether the seal has completely filled the void. After the sealant has cured, the positioning rod or a screwdriver can be used to check for voids in the finished seal.

STORAGE AND HANDLING

Keep containers cool, dry and away from sunlight. Leave cartridges in the protective foil pouch until ready to use/reuse.

Product shelf life is 15 months. Cartridge can be used for one month after the product is opened.

SAFETY

FST Sealant is a two-part urethane foam containing reactive chemicals. Polyurethanes are common in the construction industry and have been used for many years. Some individuals may become sensitized to components in the unreacted resin. Precautions must be observed during use and handling of these materials.

The use of FST in the prepackaged cartridge controls and reduces exposure. A monitoring study using OSHA Sampling Method 47 MOD shows that exposure is well under limits set by this agency. Full paper can be found on our website: *Urethane MDI Monitoring White Paper.*

Once reacted, the foam is solid, closed-cell polyurethane. The finished product is non-toxic. See SDS for more information.

Combustion of Cured Foam

Irritating and toxic smoke and vapors may form during combustion of cured FST Foam Sealant. If burning the sealant material cannot be avoided, provide appropriate ventilation/respiratory protection against decomposition products during flame cutting operations.

MODEL SPECIFICATION

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

Duct sealant shall be Polywater FST Foam Sealant. Duct sealant shall be a 2-part, 98% closed-cell urethane foam that reacts to set in 5-10 minutes at 70°F (21°C). It shall be reusable and capable of sealing up to 12-inch (30-cm) conduits with multiple cable configurations. Duct sealant shall be reenterable. It shall be capable of withstanding temperatures from -20°F to 200°F (-30°C to 95°C); and be chemically resistant to gasoline, oils, dilute acids and bases. Duct sealant shall not affect the physical or electrical properties of wire and cable.

Duct sealant shall have good adhesion to duct and cable jacket surfaces with good structural strength. It shall have 145-lb compressive strength (ASTM D1621). Duct sealant shall be capable of holding 22 ft (6.7 m) water head pressure continuous or 90 ft (27 m) water head pressure short-term. It shall block up to 5 psi (0.3 bar) gas or vapor continuous. It shall meet NEC codes for raceway seals and meet UL 94 fire rating HBF to be UL recognized.

ORDER INFORMATION

CAT #	PACKAGE DESCRIPTION
FST-250KIT1	1 - FST Foam Sealant two-part caulking tube 3 - mixing nozzles 4 - 24-inch foam damming strips 1 - 12-inch abrasive strip 1 - pair disposable gloves 1 - positioning rod for foam dam 1 - pre-treating wipe 1 - resealing cap 1 - instruction sheet TOOL-250 NOT INCLUDED
FST-250KIT	Same as FST-250KIT1 in a case of 6
FST-250	1 - FST Foam Sealant two-part caulking tube 1 - mixing nozzle 1 - resealing cap
TOOL-250	1 - high-ratio dispensing tool
MXR-30T-10	10-pack mixing nozzles for FST-250
FST-DAM	1 – 24-inch foam damming strip

CONTACT US

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American Polywater® Corporation

Polywater® AFT™

AEROSOL FOAM SEALANT

Installation of Polywater AFT-16

For Sealing Conduits and Risers from Moisture, Gases, and Rodents

PRODUCT BENEFITS

- **Quick Installation**: 2-minute application time or less.
- **Multiple-Use Can**: Creates numerous seals in all types of ducts.
- **Reliable:** Holds 10 feet of continuous water head pressure.
- **Durable**: Withstands cold temperature applications.
- **Removable:** Product can easily be removed to replace cable.

Protects Conduit and Raceway Systems

AFT™ closed-cell sealant provides 10 feet of water-blocking performance in electrical and telecommunication environments. The two-part, closed-cell AFT Sealant is durable and easy to install. AFT has excellent adhesion to a variety of conduits.

Steel conduit installation

Completed AFT-16 installation

Catalog # AFT-16

Provides Quick and Easy Installation

AFT seals conduits with quicker installation and higher performance compared to duct putty or single-part insulating hardware store foams. The two-part aerosol foam seals any size void and cures without exposure to air. AFT expands and cures to a rigid, closed-cell structure in minutes. AFT creates an airtight, watertight seal. AFT can be used to seal service entrances, conduit stub-ups, innerducts, inverters and combiners for solar installations, and riser poles for the electrical grid. AFT protects against insects, rodents, moisture, dust, and gases. The package is reusable, and the fire-retardant seal is self-extinguishing.

POLYWATER AFT

Catalog #	Package Description	Units/Case
AFT-16P4	1 - 16 oz. can; 2 – actuators	4
AFT-16	1 - 16 oz. can; 2 – actuators	15
AFT-SAE10	10-pack of actuators with standard extension tube	1
AFT-FAE10	10-pack of actuators with flexible extension tube	1

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatibility:** AFT two-part foam sealant is compatible with common cable jacket materials. It does not change physical or electrical properties of cable, based on tensile/elongation and volume resistivity testing. The cured foam is an inert solid that does not affect cable components.
- **Approvals:** AFT is a UL recognized component and passed UL94 with a Class HBF fire retardant rating.
- **Cure Rate:** AFT two-part foam sealant can be used at temperatures down to 45˚F (7˚C). At lower temperatures the reaction slows, but the sealant will completely foam and cure with time. AFT foam expands two times its volume as it is dispensed. Full expansion is complete in under 2 minutes at 70˚F (21˚C). It will take 3 to 5 minutes to be tack free. During this time do not move cables or touch foam.
- **Application:** Shake can for 60 seconds to mix. Lift hinge and insert dispensing nozzle into top orifices so that the arrow lines up with the dispensing nozzle. Invert aerosol can. Insert nozzle all the way into the seal space and fully squeeze the hinge to spray sealant into the conduit.

CONTACT US

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American Polywater® Corporation

POLYWATER® AFT™ Aerosol Foam Sealant

DESCRIPTION

Polywater® AFT™ seals conduits with quick, easy installation. The two-part, self-supporting aerosol foam seals any size void and cures without additional moisture or exposure to air. AFT expands and cures to a rigid, closed-cell structure in minutes creating an airtight, watertight seal. AFT protects from insects, rodents, moisture, dust, and gases. The package is reusable and the seal is fire retardant.

COMPONENT PROPERTIES

	PART A	PART B
Chemical Description	polymeric MDI	polyether polyol
Appearance	brown liquid	dark purple liquid
Shelf Life	1 year	1 year

TYPICAL PHYSICAL PROPERTIES

	METHOD	VALUE
Density	ASTM D1622	2.25 lb/ft^3 (0.036 g/cc)
Compressive Strength	ASTM D1621	25 lb/in^2 (17 N/cm^2)
% Porosity	ASTM D2856	~95% closed cell
Tensile Strength	ASTM D638	97 lb/in^2 (67 N/cm^2)
Flexural Strength	ASTM D790	20 lb/in^2 (14 N/cm^2)
Water Absorption	ASTM D2842	3.5%

PERFORMANCE

	WATER PRESSURE	TEST TIME
Watertight, PVC Conduit	11 feet (3 meter)	24 hours
Watertight, Rigid Steel Conduit	6 feet (2 meter)	24 hours

CABLE COMPATIBILITY

AFT Two-Part Foam Sealant is compatible with common cable jacket materials. It does not change physical or electrical property of cable, based on tensile/elongation and volume resistivity testing. The cured foam is an inert solid that does not affect cable components.

OFFICIAL APPROVALS

UL Recognized

Passes UL94
Class HBF fire retardant rating

CURE RATE

AFT Two-Part Foam Sealant can be used at temperatures down to 45°F (7°C). At lower temperatures, the reaction slows, but the sealant will completely foam and cure with time.

AFT foam expands to twice its volume as it is dispensed. Full expansion is complete in under 2 minutes at 70°F (21°C). It will take 3 to 5 minutes to be tack free. During this time do not move cables or touch foam.

	VALUE
Density	2.25 lb/ft^3 (0.036 g/cc)
Rise Time	~2 minutes
Tack-Free Time	~5 minutes
Mixed Color	uniform light purple
Foam Volume/Can	450 in^3 (7400 cm^3)
Time to Dispense Can	35 seconds

APPLICATION

1. Insert a dam of crumpled paper, foam strip pieces, or white oakum about 6 inches into the conduit.
2. Shake can for 60 seconds to mix.
3. Lift hinge and insert dispensing nozzle into top orifices so that the arrow lines up with the dispensing nozzle.
4. Invert aerosol can. Insert nozzle all the way into the seal space and fully squeeze the hinge to spray sealant into the conduit between cables.
   It is important to hold the can upside down and fully depress the hinge to spray. The foam should be a uniform color.

   Fill chart for 6-inch plug depth:

CONDUIT SIZE	FILL TIME	SEALS PER CAN
2-inch (5 cm)	2 seconds	15 seals
4-inch (10 cm)	7 seconds	5 seals
5-inch (13 cm)	11 seconds	3 seals
6-inch (15 cm)	16 seconds	2 seals
8-inch (20 cm)	28 seconds	1 seal

5. Each nozzle can be used for up to 45 seconds between sprays. For longer time between applications, remove spent nozzle immediately. Replace with fresh nozzle for future applications.

STORAGE AND HANDLING

Do not expose to temperatures exceeding 122°F (50°C). Protect from freezing.
Product shelf life is one year.

CONTACT US

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American Polywater® Corporation

ZipSeal™

Duct Sealant

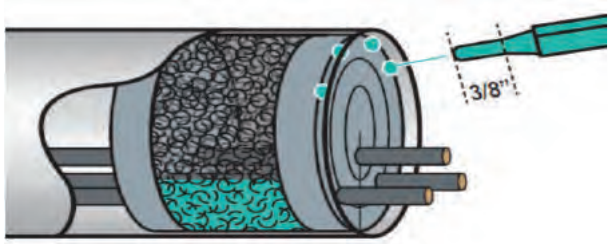
- Seals out Water, Sewer Gases, and Rodents From Conduits
- Installs in 45 Seconds
- Easy to Re-Enter
- Holds up to 10’ of Water-Head Pressure
- One Kit Seals Six 2” (50mm) Conduits
- Compatible with Cables and Conduits
- Complies with TIA-758-B Standard 5.1.1.2.8, 5.4.2.3 and 7.4.2.8.1 Sealing Ducts

Open-Celled Canned Foams & Duct Putty

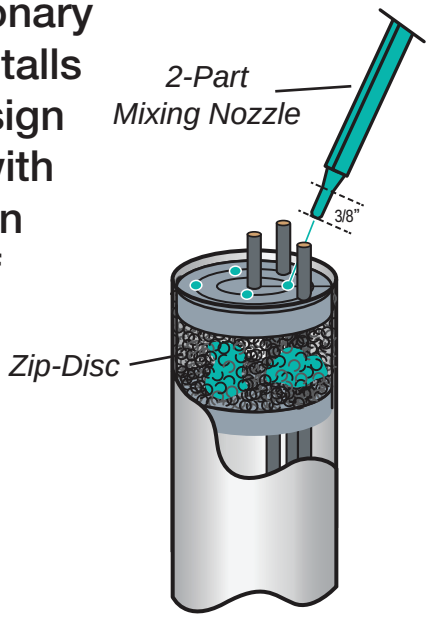
- Do Not Hold Water-Head Pressure
- Do Not Fully Cure in Conduits
- Sag and Dry Out Over Time

Polywater® ZipSeal™ Duct Sealant

ZipSeal™ Duct Sealant is a practical and efficient way to seal innerducts and conduits. The revolutionary Zip-Disc insert and unique two-part foam installs quickly and effectively. This innovative design allows for horizontal and vertical installation with minimal drippage. The foam can be removed in just minutes. ZipSeal™ can hold up to 10 feet of water-head pressure.



Horizontal application



Vertical application

Cat. No.	Package Components	Case Qty
ZIP-50KIT1	1 50mL two-part foam sealant cartridge w/ resealing cap, 2 static mixing nozzles, 2 pairs disposable gloves 5 2" Zip-Discs	1
ZIP-50KIT1G	ZIP-50KIT1 w/ dispensing tool	1
ZIP-KITB6	6 ZIP-50KIT1	6
TOOL-50-11	Dispensing tool	1
MXR-20T-10	Mixing nozzles	10

To view technical information on our website, go to

www.polywater.com/zipseal.html

For application videos

www.polywater.com/videos.asp

American Polywater® Corporation

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ADHESIVES | CLEANERS | LUBRICANTS | **SEALANTS** WWW.POLYWATER.COM

Polywater® PowerPatch®

TRANSFORMER LEAK REPAIR

Transformer radiator fin repair

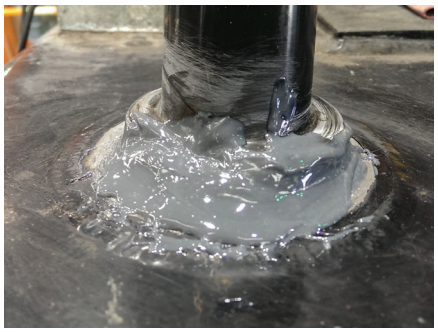
Repair System for SF6 Gas- and Oil-Insulated Transformers

PRODUCT BENEFITS

- **Fast Repair:** Stops active leaks without shutting down equipment.
- **Convenient:** Seals active leaks in minutes. Also eliminates "bagging" of transformers during transit.
- **Resilient:** Seal is UV and weather resistant for long-term durability.
- **High Adhesion:** Adheres to numerous types of metals, porcelain, and rubber materials.
- **Chemically Inert:** Will not affect oils, solid insulation, or other equipment.

PowerPatch® quickly makes durable repairs of transformer oil and SF6 gas leaks as an economical and effective means to protect essential electrical grid assets. PowerPatch field repairs reduce costly unplanned outages and risks to the environment.

Pad-mounted transformer repair



Sealed bushing leak

"PILC" lead cable repair

Catalog # EPCT-KIT1G

Multi-Use Kits Make Diverse Repairs Easier

Polywater® PowerPatch Transformer Leak Repair permanently repairs oil and gas leaks commonly found in bushing and portal gaskets, nut and bolt fastenings, welding defects, and valve and meter connections.

POLYWATER POWERPATCH

Catalog #	Package Description	Units/Case
EPCT-KIT1	2 - PowerPatch 2-part cartridges; 4 - mixing nozzles; 2 - 1-oz putty sticks (1.75 in/4.4 cm); 8 - Type RP™ cleaning wipes (cat # RP-1); 1 - sanding cloth (24 in/61 cm); 4 - application sticks; 1 - instruction sheet. Multi-use kit. TOOL-50-11 must be purchased separately.	1
EPCT-KIT1G	Same as kit above; includes TOOL-50-11	1
EPCT-KITB6	A box with 6 EPCT-KIT1	1
EPCT-KITB6G	Same as kit above; includes TOOL-50-11	1
TOOL-50-11	1 - dispensing tool	1
EP-KIT11	1 - sealed plastic bag with 2-part sealant (part A & B); 1 - 1-oz putty stick (1.75 in/4.4 cm); 2 - Type RP cleaning wipes (cat # RP-1); 1 - sanding cloth (24 in/61 cm); 2 - mixing sticks; 1 - pair of gloves; 1 - instruction sheet	1
EP-KITB6	6 - EP-KIT11	1
EP-KITB12	12 - EP-KIT11	1
EP-KIT51	6 - 2-part sealant sets (part A & B); 1 - 4-oz putty stick (7 in/17.8 cm); 12 - Type RP cleaning wipes (cat # RP-1); 6 - sanding cloths (24 in/61 cm); 12 - mixing sticks; 6 - pairs of gloves; 1 - instruction sheet	1
EP-STICK4	12 - 4-oz putty stick (7 in/17.8 cm)	1

SPECIFICATIONS AND APPLICATIONS:

- **Electrical Reliability:** Moisture can damage transformers. Sealing leaks quickly as they occur is the key to keeping moisture from entering transformers and causing premature or catastrophic failure.
- **Chemical Resistance:** Sealant chemically resists dielectric fluids, SF6 gas, ultraviolet light, water, and oil.
- **Leak Sealing Performance:** Sealant shows good adhesion to numerous metals, ceramics, and rubbers; and no leakage under high pressure (up to 100 PSI) with both air and polybutene oil.
- **Electrical Testing:** Sealant is non-conductive. Dielectric strength is 43 kV using ASTM D149, Method A. Platen samples are cast and fully cured.

CONTACT US

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American Polywater® Corporation

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American Polywater

powerpatch®

Leak Repair System
For
PILC (Paper Insulated Lead Cables)

Before ***After***

Features

Eliminate Hazardous Alternative Methods - Kit will eliminate lead wiping and heat sources in manhole.

Convenient - Kit contains all materials needed to fix leak while in the field.

Quick plugging action - Fast cure putty stops oil seepage.

Permanent seal - A quick curing 2-part paste overcoat forms a permanent seal.

Durable - Finished seal is impervious to water, oil and weather.

Fast - System can plug and seal active leaks in minutes.

PowerPatch® System

System contains necessary cable prep material for cleaning and sealing of cable. Use the PowerPatch® System's 2-part putty stick to block oil leaks. Then make a permanent patch with the fast cure, 2-part paste overcoat. Optimal mix and performance is ensured with pre-measured packaging.

Seals cracks and punctures in hard to reach areas. Fixes leaks fast. At 70°F, the putty and sealant harden in about 10 minutes. Repairs made at temperatures as low as 40° F have a slower cure. The finished patch is resistant to transformer oil and water and has held oil pressures in excess of 20 psi on lead.

Preparation is important, and the kit approach provides everything needed to do the job. Read detailed application instructions before using.

PowerPatch® Sealant Physical Properties

Color: Dark Grey
Viscosity: No-Sag, Thick Paste
Pot Life: 5 minutes @ 70°F/ 21°C
Dielectric Strength: 41 KV (ASTM D 149)
Cured Hardness: 75 (Shore D)
Durability: Resistant to UV, water, and oil
Adhesion to Metals: Good
Adhesion to Ceramic: Excellent

PowerPatch® Kit

The PowerPatch® Sealant is provided in a kit containing the preparation and patching materials necessary to repair oil leaks in transformers, lead-sheathed cables, potheads and other oil-filled, electrical equipment. Kits can be customized to end-user requirements.

Product Code	Description
EP-Kit11	**Contains**: 2 Part Sealant (Part A & B), Putty Stick (3-1/2"), 2 RP™ Cleaning and Preparation Wipes, 24" Sandpaper Strip, 2 Mixing Sticks, 1 Pair of Gloves, and Instructions. Single Use.
EP-Kit51	**Contains:** 6 sets 2 part Sealant (Part A&B), Putty Stick (7"), 12 RP™ Cleaning and Preparation Wipes, 6 Strips Sandpaper (24"), 12 Mixing Sticks, 6 Pairs of Gloves, and Instructions. Seals multiple leaks.
EP-KITB12	**Contains:** Twelve sealed plastic bags, each with 2-part sealant (part A & B), putty stick (~2"), 2 Type RP™ Cleaning and Preparation Wipes, 12' sandpaper strip, 2 mixing sticks,1 pair gloves, and instructions. Box of 12 Single-use kits
EP-KIT51	**Contains:** 6 sets 2 part Sealant (Part A & B), Putty Stick (~7"), 12 RP™ Cleaning and Preparation Wipes, 6 Strips Sandpaper (24"), 12 Mixing Sticks, 6 Pairs of Gloves, and Instructions. Seals multiple leaks.

LIT-POWERPATPILC/REV000

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Leak Repair

TECHNICAL DATA SHEET

Description:

The PowerPatch® Leak Repair System provides fast and effective “in-field” leak repair for transformers, PILC cables, and other oil and gas insulated electrical equipment.

Once a leak has been temporarily stopped using the two-part Putty, the Sealant is applied and cures to form a strong, durable patch. The PowerPatch® Sealant is the functioning patching material.

PowerPatch® System is supplied with all the materials required to seal electrical insulating oil and gas leaks. The sealant bonds to polyethylene, lead, aluminum, ceramic and steel.

Leak Sealing Performance:

To test gas pressure sealing, a 1/16-inch hole was patched. The surface was prepared and sealant applied and cured according to the instructions. The repair was then subjected to continuous air pressure for 24 hours.

Surface	Pressure	Result
Steel	200 psi	No Leaking
HDPE (cable jacket)	80 psi	No Leaking
Lead	50 psi	No Leaking

To evaluate oil leak sealing, a seeping oil leak from a 1/8-inch hole in a galvanized pipe was repaired using standard procedures. The oil pressure in the pipe was then increased and held at 100 psi.

Continuous Pressure	One Month Aging With Polybutene Oil
100 psi	No Leaking

PowerPatch® Sealant shows good adhesion and no leakage under high pressure with both air and polybutene oil.

The PowerPatch® Leak Repair System provides a fast and easy in-field leak repair system.

Product Benefits:

- Quick plugging action
- Easy to use, fast repair time
- Long-lasting seal
- Durable- withstands environmental extremes
- Resistant to oils, water, and uv
- Prevents water entry into oil-filled equipment
- No bagging necessary to catch oil
- Convenient, field-ready kit

Typical Applications:

PowerPatch® Sealant repairs oil and SF_6 filled systems and restores electrical integrity to:

- Transformers
- Switchgear
- Terminations
- PILC Cables

Component Physical Properties:

PowerPatch® is a 2-part sealant, ready to mix for field use.

Property	Part A (Resin)	Part B (Curing Agent)
Color	Black	White
Form: *Cups*	Thick Paste	Thick Paste
Cartridge	Thick Gel	Thick Gel
VOC Content	0 g/L	0 g/L
Specific Gravity	1.7	1.4

Cured Properties:

PowerPatch® Sealant cures to form a solid patch. Pre-measured packaging contains enough material to seal one typical leak, ~ 6 in^2 at ¼-inch thickness.

Property	Typical Result
Color	Dark Grey
Peak Exotherm @ 70° F	< 200°F
Hardness 7 Days @ 70° F (Shore D Durometer)	75
Flexural Stress (ASTM D790)	6,925 lb_f/in^2
Flexural Strain (ASTM D790)	1.43 X 10^{-2} in/in

Typical Peel Strength:

Substrate	Result
Galvanized Steel (180°)	>100 pli
Aluminum (180°)	>100 pli
Lead (180°)	16.5 pli
Copper (180°)	>100 pli
Stainless Steel (180°)	>100 pli
HDPE (90°)	49 pli
PVC (90°)	46 pli
Ceramic (90°)	> 100 pli

Tested using ASTM C794. Samples are sanded, cleaned and allowed to cure for 24 hours.

Typical Shear Strength:

Substrate	Result
Steel	> 1,000 lbs/in^2
Aluminum	> 1,000 lbs/in^2
Polyethylene	114 lbs/in^2
PVC	148 lbs/in^2

Tested using ASTM D1002. Samples are sanded, cleaned and allowed to cure for 24 hours.

Typical Impact Resistance:

Substrate	Result
HDPE	55 in-lbs
Lead	65 in-lbs
Steel	95 in-lbs

Tested using ASTM G14. Samples are sanded, cleaned and allowed to cure for 24 hours.

Electrical Testing:

PowerPatch® Sealant is non-conductive. Dielectric strength was tested using a 2,000 volts/second rate of rise and type 3 circular electrodes with a 0.25-inch diameter. All tests were performed in insulating oil to prevent discharges and flashovers. Results are the average of 10 trials.

Sample Thickness	Breakdown Voltage	Dielectric Strength
0.0916 Inch	43 kV	469 Volts/Mil

Tested using ASTM D149, Method A. Platen samples are cast and fully cured.

Chemical Resistance:

PowerPatch® Sealant chemically resists dielectric fluids, SF_6 gas, ultraviolet light, water, and oil.

ASTM D1002 was used to test the shear adhesive strength of the PowerPatch® Sealant on steel after exposure to the reagent. The sample was allowed to cure 7 days, then was immersed in the reagent and aged at 50°C for 6 months. Shear adhesion was compared to a control that was air aged.

Fluid*	Appearance (6 months)	Comparison to Control
Mineral Oil	No Change	100% (Pass)
Polybutene Fluid	No Change	100% (Pass)
Hydrocarbon Fluid	No Change	100% (Pass)
Silicone Oil	No Change	100% (Pass)

**Mineral Oil (Holland 70), Polybutene (Duddek PLIC), Hydrocarbon Fluid (Bio Temp), Silicone Oil (GE Silicone SF 96-100)*

Application:

PowerPatch® Sealant is easy to use. For full installation information, please see PowerPatch® Instructions: Cartridge Application or Mixing Cup Use. *(See www.polywater.com/powerpatch.asp)*

In cold weather, materials should be kept as warm as possible. Store materials in a warm vehicle and use chemical warming pad to increase the temperature of the repair area.

Cure Rate:

Recommended application temperature is 40° F to 120° F. Cure rate depends on temperature.

Temperature	Working Time	Functional Cure
35° F	40 Minutes	7 Hours
52° F	20 Minutes	3½ Hours
60° F	10 Minutes	1½ Hours
70° F	6 Minutes	60 Minutes
88° F	4 Minutes	40 Minutes

PowerPatch® Sealant is available in a slower-cure rate for larger applications that require more work time. (Product Code EPSC)

An oil pressure test was used to determine effective seal time under ambient conditions.

Aging Condition	Result
Ambient (70° F)	Holds 20 psi oil pressure after 15 minutes

Seal sets in less than 10 minutes at this temp.

Vertical Sag:

PowerPatch® Sealant clings to vertical surfaces and other non-horizontal angles common in field repairs. Once applied, it stays in place.

In this test, the PowerPatch® Sealant is mixed and applied to a vertical metal platen. Displacement is measured and recorded.

Temperature	Displacement from Center
60°F	0 inches
75°F	1/16 inch
95°F	3/32 inch
110°F	3/16 inch

PowerPatch® Paste shows minimal sag within a large temperature range.

Paint Adherence:

PowerPatch® Sealant can be painted 15 minutes after application. In this test, the paste is applied, painted and the paint is allowed to dry for 24 hrs. Then, a cross-cut tape test is run.

Paint Type	Results
Enamel Paint	0% Paint Removed
Alkyd Paint	0% Paint Removed

Tested using ASTM D3359, Test Method B.

Both paints adhere well to the PowerPatch® Sealant.

Environmental Resistance:

Temperature Range:

Application: 40° F to 120° F
In Use: -40°F to 400°F

Temperature Cycle Testing:

Ten cycles at -22° F to 203° F showed no significant change in adhesion as shown below.

Material	Adhesion Compared to Non-Aged Control
Galvanized Steel	100 % (Pass)
Aluminum	100 % (Pass)
Ceramic	100 % (Pass)
Copper	100 % (Pass)
Stainless Steel	100 % (Pass)
Lead	100 % (Pass)

PowerPatch® Sealant is resistant to ultraviolet exposure and withstands direct sunlight with no decrease in functionality.

PowerPatch® Sealant has been outside aged for over five years with a temperature range from -25° F to 110° F. Conditions include rain, snow and sleet as well as exposure to direct sunlight. PowerPatch® shows no deterioration and cannot be physically pried from the surface. It shows only slight discoloration (<1/16" thickness).

Safety:

PowerPatch® Sealant has a low level of toxicity. Follow good industrial hygiene practice during use. Avoid vapor inhalation and personal contact with the product. Use ventilation or respiratory protection against decomposition products during welding/flame operations on or near cured product (e.g., torches used to install heat shrink products). See SDS for specific details.

Storage and Handling:

Keep containers cool, dry and away from sunlight. Keep containers tightly closed.

Product shelf life is 15 months.

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

Approved electrical repair compound is PowerPatch® Sealant. The electrical repair compound shall come in a system that contains everything needed for the repairs. The system shall contain an oil block to allow repairs on an active oil leak. The sealant shall not sag during cure so that it may be applied to the bottom side of leaking surfaces without running or dripping.

The adhesive repair patch shall have excellent adhesion to a variety of substrates with minimum peel strength of 100 pli on stainless steel, copper, and ceramic; and 40 pli on polyethylene when measured by ASTM C 794. The adhesive repair patch will retain 100% of peel strength adhesion after 5 freeze/thaw cycles and shall withstand in-use temperatures from -50°F to 250°F.

The adhesive repair patch shall seal mineral oil and polybutene dielectric fluid at up to 200 psi oil pressure without leakage. The cured repair patch shall be impervious to water, salt water, oils, and dilute acids and bases. It shall have a minimum flexural strain of 1.1 in/in as measured by ASTM D790.

The adhesive patch shall not contain any metals and shall not corrode. It shall be non-conductive with a minimum dielectric breakdown voltage of 40 kV as measured by ASTM D 149.

Order Information:

Cat #	Package Description
EPCT-KIT1 Multi-Use Cartridge Kit	2 PowerPatch® Sealant 2-part Cartridges 4 Static Mixers 2 Putty Sticks (1-3/4" ea) 8 Type RP Cleaning and Preparation Wipes 24" Strip Sanding Cloth 4 Application Sticks 1 Instruction sheet
EPCT-KIT1G	EPCT-KIT 1 with Application Tool
EPCT-KITB6	Contains: 6 EPCT-KIT1
EPCT-KITB6G	Contains: 6 EPCT-KIT1 with application tool TOOL-50-11
TOOL-50-11	Application Tool to dispense cartridge package, EPCT
EP-KIT11 Single-Use Kit	2-Part PowerPatch® Sealant(parts A and B) 1-3/4" Putty Stick 2 Type RP Cleaning and Preparation Wipes 12" Strip Sanding Cloth 2 Mixing Sticks 1 Pair disposable gloves 1 Instruction sheet
EP-KITB6	Box of 6 Single-Use Kits, EP-KIT11
EP-KITB12	Box of 12 Single-Use Kits, EP-KIT11
EP-KIT51	6 sets Part A and B PowerPatch® Sealant 7" Putty Stick 12 Type RP Cleaning and Preparation Wipes 6 24" Strips Sanding Cloth 12 Mixing Sticks 6 Pairs disposable gloves 1 Instruction sheet
***Custom kits available. Call factory for details.*	
***Slower curing version PowerPatch® Sealant available (EPSC). Call factory for details.*	

LIT-EPSPEC/REV001

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ Software

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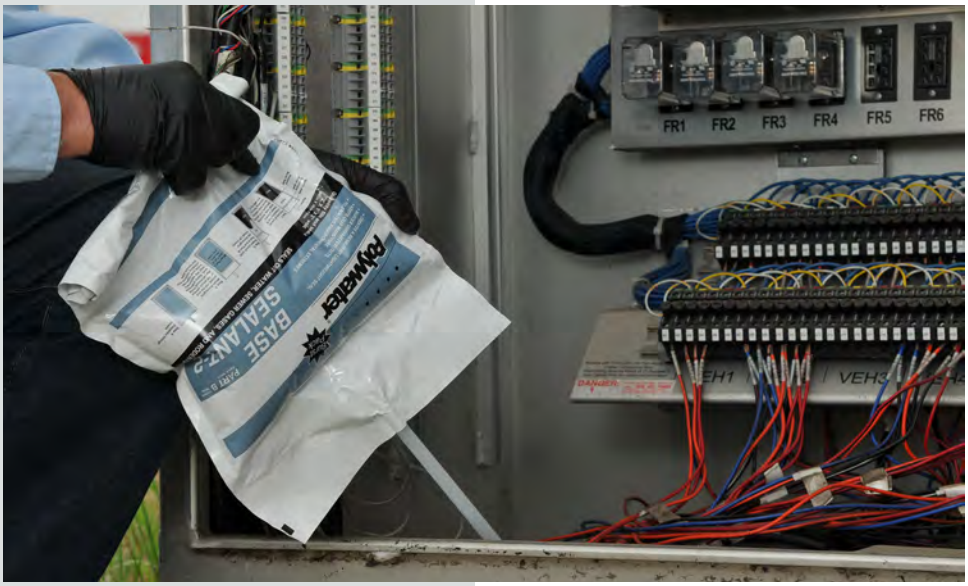
Polywater® InstaGrout™

UTILITY PAD SEALANT BARRIER



Deploying InstaGrout using the burst pack

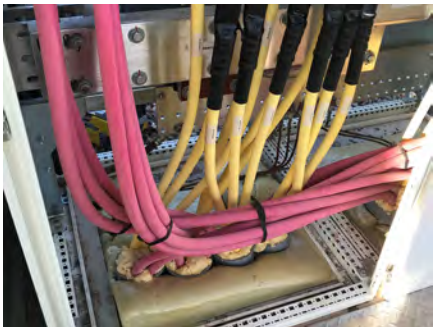
Pour-In Sealant Barrier that Prevents Costly Outages

PRODUCT BENEFITS

- **Deterrent:** Keeps rodents, snakes, insects, and water from entering enclosures.
- **Easy to Use:** Ready to mix and apply. No water needed.
- **Blocks:** Flows and self-levels before expansion to seal the entire opening.
- **Re-enterable:** Saw or drill after installation to install new ducts or cables.
- **Protects:** Offers permanent protection through weather extremes or change-outs.

Safeguard Enclosures and Equipment from Damage

Polywater® InstaGrout™ Sealant is a two-part urethane foam that seals out pad-mounted equipment openings to prevent outages and service disruptions. Safer to use and more effective than concrete grout. InstaGrout will not collapse during change-outs and adheres to various pad-mounted materials.



Completed installation in solar inverter

Completed installation in transformer pad

polywater.com | 651-430-2270

American Polywater® Corporation

Catalog # PMT-2

Catalog # PMT-10

Convenient Kits for Easy Installation

Polywater InstaGrout Sealant Barrier is supplied in kits that contain everything needed for an excellent seal, including resins, burst packs, mixing pails, gloves, and instructions.

The PMT-1 and PMT-2 burst packs make sealing openings easy. Perfect for congested areas or smaller voids in transformer pads. The two parts are conveniently mixed inside the flexible package once the center seal is broken. The resin is then deployed into the duct through the mixing nozzle.

The PMT-3 and PMT-10 contain premeasured containers of the two-part curing resin and hardener. These packages are for sealing larger openings in transformers, switchgear, sectionalizing cabinets, and inverters.

POLYWATER INSTAGROUT

Catalog #	Package Description	Units/Case
PMT-1	1 – 750-mL burst pack; 1 – pair of gloves; 1 – instruction sheet *Kit covers 1 square foot (approx.) at a three-inch depth/930-cm² at 7.6 cm depth.*	2
PMT-2	1 – 1500-mL burst pack; 1 – pair of gloves; 1 – instruction sheet *Kit covers 2 square feet (approx.) at a three-inch depth/1860-cm² @ 7.6 cm depth*	2
PMT-3	1 – bottle part A; 1 – bottle part B; 1 – mixing pail; 1 – mixing stick; 1 - pair of gloves; 1 – instruction sheet *Kit covers 3 square feet (approx.) at a three-inch depth/2790 cm² at 7.6 cm depth*	1
PMT-10	1 – jug part A; 1 – jug part B; 1 – mixing pail; 1 – pair of gloves; 1 – instruction sheet *Kit covers 10 square feet (approx.) at a three-inch depth/9290 cm² at 7.6 cm depth*	1

SPECIFICATIONS AND APPLICATIONS:

- **Material Compatibility:** Polywater InstaGrout Sealant is compatible with cable jacket materials, conduits, and various transformer pad materials. The foam is an inert solid that will not attack the jacket material.
- **Adhesion:** Polywater InstaGrout Sealant has good adhesion to a variety of materials found in electrical cabinets, including PVC, copper, aluminum, fiberglass pads, polymer concrete pads, polyester, and polyethylene.
- **Water and Chemical Resistance:** Polywater InstaGrout Sealant does not absorb water and is chemically resistant to gasoline, oils, dilute acids, and bases.

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InstaGrout™ Sealant

American Polywater® Corporation

TECHNICAL DATA SHEET

Description:

Polywater® InstaGrout™ Sealant creates a barrier to protect transformer pads, J boxes, control cabinets, and switchgear base openings. Polywater® InstaGrout™ keeps out moisture and stops rodents, snakes, spiders and insects such as wasps and fire ants from burrowing up through earthen gaps into the pad enclosure, potentially causing costly outages or safety hazards to crews. The strong, lightweight seal withstands freeze-thaw cycles and environmental extremes. It is compatible with cable jacket materials and will not corrode metal.

InstaGrout™ Sealant is packaged in pre-measured kits for easy, on-site mixing. It flows around cables, conduits and other complex geometry. InstaGrout™ Sealant adheres to metals, plastics, wood and concrete, creating a permanent, but re-enterable barrier.

InstaGrout™ Sealant is used to fill a transformer cabinet base in place of concrete.

Self Leveling Application:

InstaGrout™ Sealant is easy to install because it flows into the target area before expanding.

InstaGrout™ is mixed and poured

InstaGrout™ fills in irregularities of the surface on which it is applied and finds its way between the maze of conduits and cables that complicate the application of grouts and other systems.

It flows and expands after 20 minutes

InstaGrout™ is engineered with a time delay that allows this flow before it expands and reacts into its final, durable form. It will naturally flow into small spaces and does not require troweling.

Product Benefits:

- Keeps out rodents, snakes and insects
- Creates a strong, resilient, lightweight seal
- Self levels and flows before expanding.
- Easy to mix and apply; *no water required*
- Tolerates environmental extremes
- Sturdy, cross-linked structure will not crumble or cave-in like concrete grout
- Compatible with cable jacket materials

End Use:

InstaGrout™ Sealant creates a strong base that can:

- Be used for minor repairs or large areas
- Fill and block openings and channels
- Level transformer bases

Component Properties:

Polywater® InstaGrout™ Sealant is a two-part, reactive system. It is a slightly gelled liquid for use with manual mixing.

Property	Part A (Resin)	Part B (Curing Agent)
Color	Brown	Gray
Form	Viscous Liquid 300 cps	Viscous Liquid 1,100 cps
Specific Gravity	1.24	1.07
VOC Content:	0 g/L	0 g/L

Cured Properties:

Polywater® InstaGrout™ Sealant cures to form a solid, closed cell matrix.

Property	Typical Result
Appearance	Light gray with small, even cells
Closed Cell Content	98%
Density	8 lbs/cu. ft.
Compressive Strength (ASTM D1691)	615 psi
Seal Strength Water	1 foot continuous,
Seal Strength Air	1 psi
Dielectric Value (ASTM D149)	61 V/mil

Material Compatibility

Polywater® InstaGrout™ Sealant is compatible with cable jacket materials. The foam is an inert solid that will not attack the jacket material.

Chemical Resistance

Polywater® InstaGrout™ Sealant is chemically resistant to gasoline, oils, dilute acids and bases, and most unsaturated hydrocarbons.

Adhesion:

Polywater® InstaGrout™ Sealant has good adhesion to a variety of materials found in control cabinets.

InstaGrout™ Sealant is cured around a one-inch bar at a depth of 1.5 inches. Force required to remove bar is measured. Adhesion is calculated based on seal surface area.

Material	Adhesion	Value
PVC	Excellent	100 lbs/ sq. in
Copper	Excellent	90 lbs/ sq. in
Aluminum	Excellent	95 lbs/ sq. in
HDPE	Good	25 lbs/ sq. in

Water Resistance:

Polywater® InstaGrout™ Sealant does not absorb water. To test water blocking performance, InstaGrout™ is installed into a PVC conduit, forming a 3-inch plug. Water is added to the system, and then pressurized to create a “water-head”.

Condition	Result
PVC Conduit	Holds 10 psi, 7 days (22.5 feet water)

InstaGrout™ Sealant will keep water out if it is properly installed with good seal at all the edges.

Environmental Resistance:

Polywater® InstaGrout™ Sealant withstands the rigors of the environment.

Temperature Use Range
-20°F to 200°F (-29°C to 93°C) Continuous
-40°F to 250°F (-40°C to 121°C) Peak

Polywater® InstaGrout™ Sealant withstands direct sunlight with no decrease in functionality. Surfaces exposed to UV will discolor and yellow. The cured product retains its hardness and continues to act as a barrier. Discoloration will not harm the performance of the material.

InstaGrout™ Sealant may also be protected with a weather proofing paint or coating. Acrylic, urethane and epoxy based products have excellent adhesion to the foam.

Application:

Field-Ready Kits
Polywater® InstaGrout™ Sealant is a two-part system packaged in pre-measured quantities for easy, on-site mixing.

Application Temperature

Working temperature for Polywater® InstaGrout™ Sealant is 35°F to 110°F (4°C to 43°C).

Usage Quantity

Carefully measure the area to be sealed by multiplying the width by the length of the opening pad in the structure. Do not subtract any conduits or other stub-up utilities. Use this measurement to estimate the minimum quantity required. Round up to determine quantity of InstaGrout™ Sealant required. It is best to use field measurements rather than measurements from plans or specs to calculate your job quantity. The openings to be filled in the field may not have the same dimensions as the drawing.

Example: Pull box measuring 15 inches (1.25 feet) by 36 inches (3 feet).

- *Pull box area is 3.75 square feet.*
- *Seal requires one PMT-3 Kit and one PMT-1 Kit to cover 4 square feet at 3 inches. The additional PMT-1 will fill any holes or gaps left after the application of the PMT-3 Kit.*

Kit Size	Area Coverage (3-inch depth)	Volume Coverage
PMT-1	1 square foot	0.25 ft^3
PMT-3	3 square feet	0.75 ft^3
PMT-10	10 square feet	2.5 ft^3

Area Preparation and Application

Prepare target area by filling holes and leveling the surface. Cover pea-gravel with one inch sand or dirt. Mix two parts well for at least 30 seconds until the product is a uniform gray color. Slowly pour onto target surface.

For full installation information, please see the InstaGrout™ Installation Instructions.
(www.polywater.com/PMTinstructions.pdf)

Re-entering:

Additional conduits or cables may be passed through InstaGrout™ Sealant with relative ease. Cured InstaGrout™ Sealant may be drilled with auger bits or hole saws designed for wood. The overall integrity of the seal allows such drilling without collapsing the seal, which may be seen with grout. Simply drill through the InstaGrout™, and pass through the conduit or cable. Once the new conduit or cable is in place, an additional application of InstaGrout™ can reseal the area against future intrusion.

Cure Rate:

Application Temperature
Polywater® InstaGrout™ Sealant will set up and cure more quickly in warm temperatures.

Temperature	Seal Formation	Full Cure
35°F	1 hour	12 hours
70°F	20 minutes	4 hours
110°F	8 minutes	2 hours

Safety:

Polywater® InstaGrout™ Sealant is a two-part urethane containing highly reactive chemicals. Polyurethanes are common in the construction industry and have been used for many years. Some individuals may become sensitized to components in the unreacted resin. Precautions must be observed during use and handling of these materials.

The use of Polywater® InstaGrout™ Sealant in the prepackaged containers controls and reduces exposure. Use of protective gloves and eyewear is recommended. Once reacted, the foam is a solid, closed-cell polyurethane. The finished product may be considered non-toxic. See SDS for more information.

Clean-up

Any unreacted material may be cleaned from surfaces with Polywater's Grime-Away™ Multipurpose Cleaner. Reacted material must be removed mechanically by scraping or sanding.

Storage and Handling:

Keep containers cool, dry and away from sunlight. Leave cartridges in the protective foil pouch until ready to use/reuse.

Product shelf life is one year.

Order Information:

Cat #	Package Description
PMT-1 (covers **one** ft^2 at 3-inch depth)	1 Bottle Part A 1 Bottle Part B 1 Pair Gloves Instruction Sheet
PMT-3 (covers **three** ft^2 at 3-inch depth)	1 Bottle Part A 1 Bottle Part B 1 Pair Gloves 1 Mixing Pail 1 Mixing Stick Instruction Sheet
PMT-10 (covers **ten** ft^2 at 3-inch depth)	1 Jug Part A 1 Jug Part B 2 HTC-1 (Grime-Away™ Wipes) 1 Pair Gloves 1 Mixing Pail Instruction Sheet *(recommend using a drill paint mixer to mix)*

Important Notice: The statements here are made in good faith based on tests and observations we believe to be reliable. However, the completeness and accuracy of the information is not guaranteed. Before using, the end-user should conduct whatever evaluations are necessary to determine that the product is suitable for the intended use.

American Polywater expressly disclaims any implied warranties and conditions of merchantability and fitness for a particular purpose. American Polywater's only obligation shall be to replace such quantity of the product proven to be defective. Except for the replacement remedy, American Polywater shall not be liable for any loss, injury, or direct, indirect, or consequential damages resulting from product's use, regardless of the legal theory asserted.

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ Software

American Polywater® Corporation

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Polywater® UPR™

UTILITY WOOD POLE REPAIR

UPR NF application

Expanding Sealant Repairs Woodpecker Damage in Wood Poles

PRODUCT BENEFITS

- **Expands:** Completely fills irregular-shaped cavities.
- **Adheres:** Integrates with wood.
- **Hardens:** Cures to the strength of wood poles.
- **Gaffable:** Will hold climbing gaffs.
- **Quick Mixing:** Two-part formula mixes in nozzle when applied.

Extends Pole Life

Polywater® UPR™ Utility Pole Repair makes it easy to repair woodpecker damage and pole line hardware holes on utility poles. The UPR Utility Pole Repair resin and hardener are specially formulated to expand and fill irregular-shaped cavities to protect poles from rot.

UPR PR application

UPR NF 600-mL cartridge application

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American Polywater® Corporation

UPR-NFKIT12 kit components

UPR-NF6B10 kit components

Multiple Packages for All Applications

UPR comes in two types. The “NF” is a quick-gel version that will not leak or drip out of wood cracks at the bottom of the hole. The “PR” version is a liquid formula that flows around wood block fillers to save material.

To fix one “football-sized” hole on a pole, order the UPR-NFKIT4 or UPR-PRKIT3. For multiple holes, large nesting cavities, or transmission line jobs, order the UPR-NFKIT12 or UPR-PRKIT12.

UPR is packaged in kit form with everything needed to do the repair, including additional mixing nozzles for multiple repairs. Most UPR kits can be applied with a standard high-ratio caulking gun. Partially used cartridges can be resealed and reused with a new nozzle.

POLYWATER UPR

Catalog #	Package Description	Units/Case
UPR-PRKIT3	3 - 250-mL UPR cartridges; 4 - mixing nozzles; 5 - green-treated wood blocks; 1 - roll of stretch wrap; 1 - pair of gloves; 1 - instruction sheet	1
UPR-PRKIT12	12 - 250-mL UPR cartridges; 16 - mixing nozzles; 18 - green-treated wood blocks; 1 - roll of stretch wrap; 4 - pairs of gloves; 1 - instruction sheet	1
UPR-NFKIT4	4 - 250-mL UPR No Flow Pole Repair cartridges; 6 - mixing nozzles; 1 - roll of stretch wrap; 1 - pair of gloves; 1 - instruction sheet	1
UPR-NFKIT12	12 - 250-mL UPR No Flow Pole Repair cartridges; 18 - mixing nozzles; 1 - roll of stretch wrap; 3 - pairs of gloves; 1 - instruction sheet	1
UPR-NF6B10	10 - 600-mL UPR No Flow Pole Repair side-by-side cartridges; 10 - mixing nozzles; 1 - roll of stretch wrap; 3 - pairs of gloves; 1 - instruction sheet	1
UPR-NF250PT1	2 - 250-mL UPR No Flow Pole Repair cartridges; 1 - 18” x 18” canvas; 50 - ½-inch staples; 1 - pair of gloves; 1 - instruction sheet	1
TOOL-250	1 - high-ratio caulking gun	1

SPECIFICATIONS AND APPLICATIONS:

- **Strength and Gaffability:** UPR has good compressive strength, comparable to wood. When tested with a gaff, it holds well. The gaff penetrates to an acceptable depth with similar force compared to wood.
- **Compatibility:** Can be used to repair penta-treated wood, western red cedar, Douglas fir, red pine, southern yellow pine, lodgepole pine poles, and other varieties of wood.

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Utility Pole Restoration
UPR™ PR (Standard) and NF (No Flow)

American Polywater® Corporation

TECHNICAL DATA SHEET

Description:

UPR™ PR and NF Pole Repair Sealants repair woodpecker holes in wooden utility poles. They are easy and convenient to use. The two-part formulas are deployed with a standard caulking gun and mix right in the nozzle. There is no direct handling of the products.

UPR™ PR kits include wood blocks to fill cavity space so that less product is required. UPR™ NF quickly gels so that it does not flow through cracks in the wood.

UPR™ PR and NF Pole Repair expand in the hole to fill irregular shaped cavities and integrate with the wood. This creates superior adhesion to the wood. It hardens like wood with compression strength similar to the cross-sectional hardness of a wood pole. They remain gaffable and will not chip out in chunks when a climber's hooks are embedded into its surface structure.

Compressive Strength

UPR™ PR and NF Pole Repair have similar compressive strength to wood, perpendicular to the grain. Common utility pole wood is compared.
(Data U.S. Forest Products Laboratory)

Compressive Strength

UPR™ PR Standard	1500 psi
UPR™ NF No Flow	850 psi
Southern Yellow Pine	910 psi
Douglas Fir	760 psi

UPR™ PR and NF Pole Repair match wood pole strength. The repair area will not create a stress point when the pole flexes during storms and high winds.

Fungal Resistance

UPR™ PR and NF Pole Repair are inert materials: mold and fungus cannot use them as a food source. The reaction temperatures exceed 212° F (100° C), eliminating most molds and fungus. The repairs block moisture. This keeps the areas dry and less likely to support mold and fungus growth.

Woodpecker damage repaired with UPR™ Pole Repair

Product Benefits:

- Expands to fill all voids
- Creates a strong resilient repair
- Blocks water ingress
- Matches wood characteristics, gaffable
- Wide installation temperature range

Installation Benefits:

Both UPR™ PR and NF Pole Repair come in convenient packaging and kitting.

- No special deployment tools needed
  Less expensive, more convenient
- No drilling to deploy the product
  Less labor time
- No mixing or direct handling of the product
  Less mess and safer
- Single kit will repair one hole
  Less waste

Component Properties:

Both UPR™ PR and NF Pole Repair are two-part, urethane structural foams mixed at a 1/1 ratio.

UPR™ PR & NF Pole Repair

Property	Part A (Resin)	Part B (Curing Agent)
Color	Amber	Brown
Form	Liquid 200 -250 cps	Liquid 1050 cps
VOC Content:	0 g/L	0 g/L
Specific Gravity	1.22 -1.23	1.05

Cured Properties:

Both products cure to solid, closed-cell foams.

UPR™ PR & NF Pole Repair

Property	Typical Result
Appearance	Brown with small, even cells
Closed Cell Percent	> 90%
Density (static mixer)	
UPR™ PR Standard	25 lbs/cu ft
UPR™ NF No Flow	26 lbs/cu ft
Compressive Strength (ASTM D1691)	
UPR™ PR Standard	1,500 psi
UPR™ NF No Flow	850 psi

Moisture Testing:

UPR™ Pole Repair does not absorb water, so it will not increase the chance of pole decay. It is good practice to use a dry fungicide prior to deploying any wood pole repair product to reduce or negate any fungal growth that is present.

Moisture Repellency Testing
Six 1-1/2-inch cubes reacted UPR™ were aged in water for 7 days at 122°F (50°C). Weight gain was measured.

	Water Weight Gain
UPR™ PR Standard	< 1%
UPR™ NF No Flow	< 1%

The UPR™ PR and NF Pole Repair act to seal the hole from water and protect the pole from further degradation.

OSHA Requirements:

OSHA 1910.269 App D requires poles to be inspected and tested before climbing. The standard notes that “hollow spots and woodpecker holes can reduce the strength of the wood pole.” Pole repair satisfies OSHA requirements and improves the pole strength. It also reduces the likelihood of decay.

Gaff Testing:

Cut-Out Test

The “Pole Cut Out Test”[1] was used as a guideline to test Polywater’s UPR™ PR and NF Pole Repair repairs. In this test, the climber jabs the gaff into the pole at a 30° angle to a depth of ¼-inch. Pressure is exerted onto the gaff and the point of the gaff penetrates the wood. The pole surface cut is measured, and shall be no more than 2 inches.

[1] *Buckingham Manufacturing Company, Inc. Buckingham Gaff & Climber Information; “How to Perform the Pole Cut Out Test”*

Gaff Surface Cut	Result
½ to 1-½inch	Pass

The Pole Cut-Out Test showed that both UPR™ PR and NF Pole Repair are gaffable.

Penetration Test

UPR™ PR and NF Pole Repair were molded into 7-inch cylinders. A Buckingham gaff was used to penetrate the side of the form. An Instron unit was set to 50 mm/minute to drive the gaff into the form to a depth of 0.475 inches and load force was measured. An average of three tests was calculated:

Substrate	Penetration Force
UPR™ PR Standard	270 lb_f
UPR™ NF No Flow	140 lb_f
Douglas Fir	244 – 290 lb_f
Southern Yellow Pine	232 – 475 lb_f

Both UPR™ PR and NF Pole Repairs fall within the same range as the wood poles[2] and are relatively easy to penetrate.

[2] Shupe, Todd F. and Freeman, Mike H. (October, 2011) *Effect of Preservative Type and Gaff Type on Gaff Penetration Into Wood Poles*. Eastern Utility Pole Conference, Baltimore, MD.

Installation:

Polywater® UPR™ PR and NF Pole Repair are packaged in kit form. Everything needed to repair damage to wood poles caused by woodpeckers is included.

The two-part formulas are dispensed using a 2-part coaxial caulking tube with static mixing nozzle. They do not require hand mixing, which allows for multiple applications, and makes it easier to direct the product into the hole when deployed. The curing temperatures are not dangerously hot as are some other repair products, yet may be warm enough to reduce pole decay.

Once a skin has formed, the foam may be visually inspected through the shrink wrap to determine whether the hole has been completely filled.

To decrease cure time in cold temperatures, warm UPR™ Pole Repair cartridges prior to use. UPR™ NF *must be warmed* to 60°F.

Usage Quantity

UPR™ PR Standard

Hole Depth (in)	Product Required	Hole Diameter 6 inches	Hole Diameter 8 inches
8	Cartridge	3	6
	Blocks	5	7
12	Cartridge	5	9
	Blocks	6	10

UPR™ NF No Flow

Hole Depth (in)	Product Required	Hole Diameter 6 inches	Hole Diameter 8 inches
8	Cartridge	5	9
12	Cartridge	8	13

Safety:

UPR™ PR and NF Pole Repair are two-part urethane foams containing reactive chemicals. Polyurethanes are common in the construction industry and have been used for many years. Some individuals may become sensitized to components in the unreacted resin. Precautions must be observed during use and handling of these materials.

Cure Rate:

UPR™ PR can be used in temperatures down to 20°F (-6°C) as long as the cartridge is above freezing. UPR™ NF can be used in temperatures down to 20° F (-6°C) but *must be warmed* to 60° F (15°C). At low temperatures, the reaction is slow, but will completely foam and cure with time. At cold temperatures, the components become more viscous and flow through the mixing nozzle at a slower rate. This higher viscosity may block the UPR™ NF nozzle if it is not warmed. Cure times are as follows:

UPR™ PR Standard Pole Repair	Reaction Time (Minutes) 40° F (4° C)	70° F (21° C)
Foaming, Expansion Complete	8 - 9	4 – 5
Hard, Non-sticky Skin Formation	15 – 18	7 – 9

UPR™ NF No Flow Pole Repair	Reaction Time (Minutes) 40° F (4° C)	70° F (21° C)
Foaming, Expansion Complete	--	3 – 5
Hard, Non-sticky Skin Formation	--	3 – 5

Environmental Resistance:

UPR™ PR and NF Pole Repairs withstand the rigors of the changing, outdoor environment.

Cured Sealant Temperature Use Range
-40° F to 150° F (-40° C to 65° C)

Clean-up

Any unreacted material may be cleaned from surfaces with a solvent wipe such as Polywater's Type HP™ Cleaner/Degreaser. The Part A, amber resin will react with water if surfaces are washed with a soap and water solution. Once reacted, the foam has strong adhesion, and may be scraped or cut from surface. The reacted product is an inert solid with non-hazardous character.

The use of UPR™ PR and NF Pole Repair in the prepackaged cartridge controls and reduces exposure. Once reacted, the foams are solid, closed-cell polyurethanes. The finished products may be considered non-toxic. See SDS for more information.

Storage and Handling:

Keep containers cool, dry and away from sunlight. Leave cartridges in the protective foil pouch until ready to use/reuse.

Product shelf life is one year. Shelf life is one month after the product is opened.

Model Specification:

The statements below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

Approved utility pole repair sealant is UPR™ Pole Repair Sealant. The repair sealant shall come in a multiple-use cartridge to fill various sized defects in poles. The sealant shall be an expanding foam system to best fill all voids in the defect.

The packaging shall automatically meter and mix the sealant. The sealant kit shall include wood blocks which act as filler reducing the needed amount of sealant. The cure rate of the sealant shall be fast. It shall reach full expansion in less than 5 minutes at 70°F (21°C) and form a hard, non-sticky skin in less than 10 minutes at 70°F (21°C). The reaction temperature of the sealant should reach a minimum of 212°F (100°C) to help kill microbes present in the defect.

Once cured, the sealant shall be waterproof. The sealant shall have compressive strength similar to utility wood as measured perpendicular to the grain. It shall be between 750 and 2,000 psi. The foamed sealant shall have a density of 25 lbs/cu ft. The foamed sealant shall pass the Cut-Out Test to determine gaffability. The sealant shall yield a less than 300 lbf in the Gaff Penetration Test.

Order Information:

Cat #	Package Description
UPR-PRKIT12 (1 unit/case)	12 - 8½-oz two-part foam caulking style cartridges with resealing cap 16 - Static mixing nozzles 1 - Roll shrink wrap 18 - Wood blocks (filler) 1.5” X 1.5” X 4” 4 - Pair gloves 1 - Instructions
UPR-PRKIT3 (1 unit/case)	3 - 8½-oz two-part foam caulking style cartridges with resealing cap 4 - Static mixing nozzles 1 - Roll shrink wrap 5 - Wood blocks (filler) 1.5” X 1.5” X 4” 1 - Pair gloves 1 - Instructions
UPR-NFKIT12 (1 unit/case)	12 - 8½-oz two-part foam caulking style cartridges with resealing cap 18 - Static mixing nozzles 1 - Roll shrink wrap 3 - Pair gloves 1 - Instructions
UPR-NFKIT4 (1 unit/case)	4 - 8½-oz two-part foam caulking style cartridges with resealing cap 6 - Static mixing nozzles 1 - Roll shrink wrap 1 - Pair gloves 1 - Instructions

For installation instructions, video and other product information, please see the **UPR™ Pole Repair Website**
(www.polywater.com/upr.asp)

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ Software

American Polywater® Corporation

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Polywater® AirRepair®

PRESSURIZED LEAK REPAIR SYSTEM

AirRepair applied to a telco cable

Seals Air Leaks in Pressurized Cable and Splices

PRODUCT BENEFITS

- **Eliminates Hot Lead Wiping:** Improved safety and convenience.
- **Multiple Uses:** Seals air leaks in lead-sheathed cables, splice enclosures, polyethylene stalpeth cable jackets, load coils, end-plates, and more.
- **Easy to Apply:** AR paste seals hard-to-reach areas.
- **Fast Cure Time:** Ready for pressurization in 15 minutes.
- **Saves Money:** Less expensive and faster than hot lead wiping.

Revolutionary Leak Repair System

AirRepair® Sealant seals leaks in lead-sheathed cables and splice enclosures. It eliminates messy and dangerous molten lead “hot wipe” procedures. AirRepair sealant allows a single craftperson, with minimal training, to effectively and economically seal 20 or more leaks per day.

AR-KIT with cable and completed patch

AirRepair applied to lead splice

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American Polywater® Corporation

Single AR-KIT

Customized kits to fit specific needs

Multiple Package Types Cover All Cleaning Needs

AirRepair Sealant is provided in a kit customized to end-user needs. The kit contains the preparation and patching materials necessary to repair air leaks in polyethylene and lead-sheathed cables and splice enclosures. Components typically include sealant, putty, cleaning wipes, abrasive cloth, mixing and application tools, gloves, primer (for polyethylene applications), and detailed instructions.

POLYWATER AIRREPAIR

Catalog #	Package Description	Units/Case
AR-KIT	Customized AirRepair kit. Call for details	Varies
AR-STICK	7-in. (18-cm) putty stick for temporary leak plugging	12
PW-1	Plastic primer towelette	10
RP-1	Type RP™ surface prep wipes	96

SPECIFICATIONS AND APPLICATIONS:

- **Pre-Measured Packaging:** One kit contains enough material to to seal a leak, approximately 6 square inches at ¼-in. thickness.
- **Chemical Resistant:** Sealant is chemically resistant to dielectric fluids, SF_6 gas, UV rays, water, and oil.
- **Impact Resistance:** The repair patch has the flexibility to withstand a steel-ball impact of at least 65 in.-lbs. on lead and 55 in.-lbs. on polyethylene.
- **Excellent Adhesion, No Sag:** Repair patch has excellent adhesion to multiple substrates and will not sag while curing. This allows for application to the bottom side of leaking surfaces without running or dripping.

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Pressurized Leak Repair

TECHNICAL DATA SHEET

Description:

AirRepair® Paste Sealant is a two-part, rapid-cure, resin system for pressurized telephone cables and splices. AirRepair® seals air leaks in lead-sheathed cables and splice enclosures, polyethylene Stalpeth® cable jackets, load coils, end-plates, and more. AirRepair® eliminates messy and dangerous molten lead "hot wipe" procedures. The cured resin maintains a high level of adhesion and structural integrity to insure a quality leak repair.

AirRepair® Sealant is sold as a field repair system and includes materials to seal active leaks. It is a fast cure sealant designed for quick and easy use. AirRepair® allows a single craftsperson, with minimal training, to effectively and economically seal 20 or more leaks per day. Sealant bonds to polyethylene, lead, aluminum, ceramic and steel.

Performance:

AirRepair® Paste Sealant is designed specifically for the field repair of air-pressurized cable systems.

To test the performance, specialized test methods were developed. A 1/16-inch hole is punched into the center of a lead disk and placed into a small, specially designed pressure chamber set to 10 psi. Repaired disks are kept under pressure for 24 hours to pass the test.

Aging Condition on Lead	Result
Initial Application	Pass
6 Months Ambient Aging	Pass
6 Months Immersion, Tap Water	Pass
6 Months Immersion, Salt Water	Pass

In similar testing, an air-core, polyethylene cable and a galvanized steel pipe are punctured with a 1/16-inch hole, sealed and pressurized.

Aging Condition	Result
Polyethylene Cable, 80 psi	Pass
Galvanized Pipe, 200 psi	Pass

Product Benefits:

- Quick plugging action
- Easy to install, fast repair time
- Permanent, long-lasting seal
- Durable, withstands environmental extremes
- Impervious to water and other manhole contaminants
- Seals and protects oil-filled system
- Convenient, field-ready kit

Typical Applications:

- Lead Splice
- Load Coil
- Manifold
- Waffle Case
- End Plate
- Polyethylene “Air-Core” Cables

Component Properties:

AirRepair® Sealant is a 2-part, thick paste sold ready to mix and use.

Property	Part A (Resin)	Part B (Curing Agent)
Color	Black	White
Form	Thick Paste	Thick Paste
VOC Content:	0 g/L	0 g/L
Specific Gravity	1.7	1.4

Cured Properties:

AirRepair® Sealant cures to form a solid patch. Pre-measured packaging contains enough material to seal one typical leak, approximately 6 square inches at ¼-inch thickness.

Property	Typical Result
Color	Dark Grey
Peak Exotherm @ 70º F	< 200°F
Hardness 7 Days @ 70º F (Shore D Durometer)	75
Flexural Strength (ASTM D790)	6,925 lb_f/in^2 1.43 X 10^{-2} in/in

Typical Impact Resistance:

Substrate	Result
Air-core polyethylene cable	55 in-lbs
Air-core lead cable	65 in-lbs

Tested using ASTM G14. Samples are sanded, cleaned and allowed to cure for 24 hours.

Typical Shear Strength:

Substrate	Result
Aluminum	> 1,000 lbs/in^2
Polyethylene	114 lbs/in^2
PVC	148 lbs/in^2

Tested using ASTM D1002. Samples are sanded, cleaned and allowed to cure for 24 hours.

Typical Peel Strength:

Substrate	Result
HDPE (90°)	49 pli
Glass-filled PPO Resin	34 pli
PVC (90°)	46 pli
Ceramic (90°)	>100 pli
Galvanized Steel (180°)	>100 pli
Aluminum (180°)	>100 pli
Lead (180°)	16.5 pli
Copper (180°)	>100pli
Stainless Steel (180°)	>100 pli

Tested using ASTM C794. Samples are sanded, cleaned and allowed to cure for 24 hours.

Chemical Resistance

AirRepair® Sealant is chemically resistant to dielectric fluids, SF_6 gas, uv, water and oil.

ASTM D1002 is used to test the shear strength of the PowerPatch® Sealant on steel after exposure to solvent. The sample is allowed to cure 7 days, immersed in solvent and aged at 50°C.

Fluid*	Appearance (6 months)	Comparison to Control
Mineral Oil	No Change	100% (Pass)
Polybutene Fluid	No Change	100% (Pass)
Hydrocarbon Fluid	No Change	100% (Pass)
Silicone Oil	No Change	100% (Pass)

**Mineral Oil (Holland 70), Polybutene (Duddek PLIC), Hydrocarbon Fluid (Bio Temp), Silicone Oil (GE Silicone SF 96-100)*

Application:

AirRepair® Sealant is easy to use. For full installation information, please see AirRepair® Use Instructions. *(www.polywater.com/ARinstructions.pdf)*

For applications on polyethylene, Stalpeth® cable, AirRepair® Plastic Primer is available.

In cold weather, materials should be kept as warm as possible. Store materials in a warm vehicle and use chemical warming pad to increase the temperature of the repair area.

Cure Rate:

Application temperature is 40°F to 120°F. Cure rate depends on temperature.

Temperature	Working Time	Functional Cure
35° F	40 Minutes	7 Hours
52° F	20 Minutes	3 ½ Hours
60° F	10 Minutes	1 ½ Hours
70° F	6 Minutes	60 Minutes
88° F	4 Minutes	40 Minutes

Installation:
A pressure test was used to determine seal time under ambient conditions. Lead disk was prepared, and placed into specially designed pressure chamber.

Aging Condition	Seal Time	Result
Seal time at 70°F	6 Minutes,	Holds 10 psi air pressure

At ambient temperatures, seal is completed in less than 10 minutes.

Vertical Sag:

AirRepair® Paste clings to vertical surfaces and other difficult angles common in field repairs. Once applied, it stays in place.

In this test, the AirRepair® Paste is mixed and applied to a metal platen at a 90° angle. Displacement is measured and recorded.

Temperature	Displacement from Center
60°F	0 inches
75°F	1/16 inch
95°F	3/32 inch
110°F	3/16 inch

AirRepair® Paste shows minimal sag within a large temperature range.

Environmental Resistance:

Temperature Range:

Application:	40°F to 120°F
Usage:	-40°F to 400°F

Temperature Cycle Testing
(-22 ºF/203 ºF 10 Cycles)
No significant change in adhesion:

Material	Adhesion Compared to Non-Aged Control
Galvanized Steel	100 % (Pass)
Aluminum	100 % (Pass)
Ceramic	100 % (Pass)
Copper	100 % (Pass)
Stainless Steel	100 % (Pass)
Lead	100 % (Pass)

AirRepair® Sealant is resistant to ultraviolet exposure and withstands direct sunlight with no decrease in functionality.

Safety:

AirRepair® Sealant has a low level of toxicity. Good industrial hygiene practice and appropriate precautions should be employed during use. Avoid inhalation of vapors and personal contact with the product. Provide appropriate ventilation/respiratory protection against decomposition products during welding/flame operations (i.e. torches used to install heat shrink products) on or near cured product. See SDS for specific details.

Storage and Handling:

Keep containers cool, dry and away from sunlight. Keep containers tightly closed.

Product shelf life is 15 months.

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

Approved air pressure repair compound is AirRepair® Sealant. The air pressure repair compound shall be available in a system that allows rapid, permanent repairs without any special equipment. It shall be possible to make the repairs under low air pressure. The product shall not sag during cure so that it may be applied to the bottom side of leaking surfaces without running or dripping. Once cured, the adhesive patch shall have the following properties.

The adhesive repair patch shall have excellent adhesion to a variety of substrates with minimum peel strength of 15 pli on lead, 40 pli on polyethylene, 100 pli on steel, and 100 pli on ceramic when measured by ASTM C 794. The adhesive repair patch will retain 100% of the adhesion as measured by peel strength after 5 freeze/thaw cycles. The adhesive repair patch shall withstand temperatures from -50°F to 250°F. It shall be impervious to water, salt water, oils, and dilute acids and bases.

The repair patch shall have the flexibility to withstand a steel ball impact of at least 65 in-lbs on lead and 55 in-lbs on polyethylene as measured by ASTM G14. It shall have a minimum flexural strain of 1.1 in/in as measured by ASTM D790. The adhesive patch shall not contain any metals. It shall be non-conductive and shall not corrode.

Order Information:

Cat #	Package Description
AR-KIT97	1 Set Two-Part AirRepair® Sealant (parts A and B) 1-3/4" Putty Stick 2 Type RP Cleaning and Preparation Wipes 12" Strip Sanding Cloth 2 Mixing Sticks 1 Pair disposable gloves 1 Instruction sheet
AR-KIT97P ***(Special Order)***	AR-KIT97 Components 1 Plastic Primer Wipe (PW-1) 1 Cotton Swab Primer Applicator
AR-KIT99	1 Set Two-Part AirRepair® Sealant (parts A and B) 1-3/4" Putty Stick 3 Type RP Cleaning and Preparation Wipes 12" Strip Sanding Cloth 2 Mixing Sticks 1 Plastic Primer Wipe (PW-1) 1 Cotton Swab Primer Applicator 1 Trowel Tool 1 Pair disposable gloves 1 Instruction sheet

***Custom kits available. Call factory for details*

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ Software

American Polywater® Corporation

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Polywater® PedFloor™

PEDESTAL SEALING FOAM BARRIER

Polywater PedFloor burst pack installation

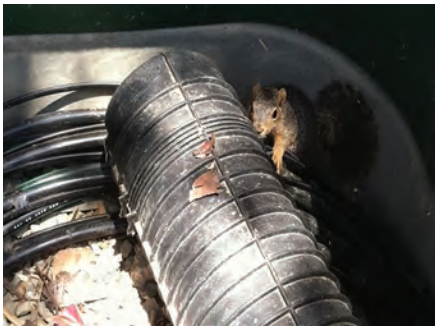
Creates a Hard Foam Barrier to Prevent Pest Infestation

PRODUCT BENEFITS

- **Deterrent:** Keeps rodents, snakes, and insects from entering the pedestal or cabinet.
- **Strong:** Structural foam matrix creates a strong seal.
- **Complete Seal:** Flows and self-levels before expansion to prevent ground entry.
- **Versatile:** Can be used as a suspended floor or directly on the ground.
- **Protects:** Cured product offers permanent protection through weather extremes.

Structural Barrier to Prevent Service Disruptions

Polywater® PedFloor™ Pedestal Sealant helps prevent outages and service disruptions by curing into a resilient and impermeable structural barrier. PedFloor keeps out moisture and stops pests from burrowing into the enclosure and causing costly outages or health and safety hazards.



Rodent inhabitation

Unsanitary rodent nest

polywater.com | 651-430-2270

American Polywater® Corporation

PedFloor burst packs

PF-3 kit components

Convenient Kits for Easy Installation

Polywater PedFloor kits include resins, plastic containment sheet, tape, gloves, and instructions. The PF-1, PF-2, and FSTBP-200B6 are "burst packs" *(photo 1);* parts A & B are mixed in the flexible packaging after breaking the pack's center seal. PF-3 *(photo 2)* contains premeasured containers of the two-part foam.

POLYWATER PEDFLOOR

Catalog #	Package Description	Units/Case
PF-1	1 - PedFloor burst pack (750 mL); 1 - pair of gloves; 1 - plastic sheet (per case); 1 - roll duct tape; 1 - instruction sheet Covers 1 square foot, 3 inches thick	2
PF-2	1 - PedFloor burst pack (1500 mL); 1 - pair of gloves; 1 - roll duct tape; 1 - plastic sheet; 1 - instruction sheet Covers 2 square feet, 3 inches thick	2
PF-3	1 - bottle part A; 1 - bottle part B; 1 - pair of gloves; 1 - mixing pail; 1 - mixing stick; 1 - plastic sheet; 1 - roll duct tape; 1 - instruction sheet Covers 3 square feet, 3 inches thick	1
For small repairs and/or supplemental patching, use an FSTBP™ Burst Pack:		
FSTBP-200B6	6 - FSTBP-200 (200 mL) burst packs; 6 - pairs of gloves; 1 - instruction sheet	1

SPECIFICATIONS AND APPLICATIONS:

- **Working Temperature:** PedFloor is most effective when used between 35°F (2°C) and 110°F (43°C).
- **No Application Tool:** The convenience of a burst pack ensures no application tools or accessories are necessary in the field.
- **Reaction/Curing Time:** Sealant will flow and expand for approximately 20 minutes.
- **Multiple Applications:** Bonds well to itself, ensuring multiple applications of PedFloor have the same strength as a single deployment.

CONTACT US

1-800-328-9384 Toll Free
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email: support@polywater.com

American Polywater® Corporation

11222 60th Street N | Stillwater, MN 55082 USA

Communications Cleaners

Polywater® AquaKleen™

WATER-BASED FIBER OPTIC CLEANER

AquaKleen cleaning fusion splicer

Cleaner for Fiber Optic Termination, Splicing, and Maintaining Fusion-Splicing Units

PRODUCT BENEFITS

- **Nonflammable:** Safe to use.
- **Nonhazardous for Shipment:** No restrictions via land or air shipping.
- **Maintains Equipment:** Prolongs the life of costly fiber-splicing units by cleaning heat strippers, V-grooves, and camera lenses.
- **No Toxic Solvent Fumes:** No irritating solvent vapor exposure.
- **Made with Pure Deionized Water:** No residue after evaporation to affect light transmission.

Contains Innovative Water-Based Technology

AquaKleen™ (AQ) Cleaner is the safe solution for maintaining clean fiber connections. It is a special blend of 90%+ deionized water-soluble cleaning solvents. AQ is environmentally friendly. It is safer than pure solvents and leaves no residue after evaporation.

AquaKleen applied to a lint-free towel

Cleans ferrules, bulkheads, and endfaces

polywater.com | 651-430-2270

American Polywater® Corporation

AQ-KIT3 kit components

AQ family

Packaged for Convenient, Precise Application

AquaKleen Cleaner comes in small dropper or spray bottles. This cleaner works well with the FiberKleen™ towelettes (DT-D175). These lint-free towels can be used to clean ferrules, bulkheads, and fiber endfaces. The nonwoven, highly absorbent towel traps the dirt and debris, making cleaning easier and more effective.

POLYWATER AQUAKLEEN

Catalog #	Package Description	Units/Case
AQ-2LP	2 fl. oz. (60-mL) bottle with finger sprayer	12
AQ-2DR	2 fl. oz. (60-mL) bottle with dropper tip	12
AQ-35LF	1-qt (0.95-liter) bottle with flip-top cap	12
AQ-KIT2	2 - AQ-2LP; 1 - DT-D175; 1 - SWB-250F100	1
AQ-KIT3	2 - AQ-2DR; 1 - DT-D175; 1 - SWB-250F100	1
DT-D175	175 - microfiber towels in a plastic dispenser	12
DT-D175R	175 - microfiber towel refill for DT-D175	6

SPECIFICATIONS AND APPLICATIONS:

- **Testing Standards:** Passes the rigorous standards of Telcordia GR 2923-CORE, “Generic Requirements for Fiber Optic Connector Cleaning Products”.
- **Safety:** Minimal toxicity. Contains no listed carcinogens. Cleaner is nonflammable.
- **High Performance:** Excellent cleaning effectiveness on dry/ionic soil (dust, salt), wet/nonionic soil (oil, buffer gel), or a combination soil.
- **Temperature Use Range:** 32°F to 120°F (0°C to 50°C).
- **Compatibility:** Compatible with most common plastics and rubbers.

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AquaKleen™
Water-based Fiber Cleaner

American Polywater® Corporation

TECHNICAL DATA SHEET

Description:

AquaKleen™ Fiber Cleaner is formulated for cleaning fiber-optic cables and endfaces. Its excellent wetting reaches precision parts to lift dust, buffer gel, lint, finger prints, and oils. AquaKleen™ dissipates static to remove surface charges so that the surface is less likely to be re-contaminated.

AquaKleen™ Fiber Cleaner contains innovative, water-based technology. A special blend of 94% ultra-pure deionized water with proprietary solvents; it does not leave a residue. AquaKleen™ is an environmentally desirable cleaner. It does not contribute to global warming or ozone depletion and has very low VOC content. AquaKleen™ is non-flammable and has low toxicity for safe use.

AquaKleen™ Fiber Cleaner is packaged in easy-to-use containers that allow precise cleaner application, reduce waste, and limit contamination. Polywater's non-woven FiberKleen™ towelettes trap dirt and absorb contaminants from high-speed fiber and optical equipment. A smooth wiping surface and durable material promote easy, effective cleaning.

Performance Properties:

AquaKleen™ Fiber Cleaner is a high-performance optical cleaner. AquaKleen™ removes a broad variety of endface contaminants.

Soil Type	Cleaning Effectiveness
Dry/Ionic Soil (dust, salt)	Excellent
Wet/Non-Ionic Soil (oil, buffer gel)	Excellent
Combination Soil	Excellent

AquaKleen™ Fiber Cleaner has been tested to the rigorous standards of Telcordia GR 2923-CORE, "Generic Requirements for Fiber Optic Connector Cleaning Products."

Product Benefits:

- Eco Friendly, Non-Toxic
- Water-based
- Dissipates Static
- No Residue
- Excellent Solvency
- Non-Flammable
- Easy to Transport

End Use:

AquaKleen™ Fiber Cleaner is an excellent choice for cleaning precision fiber-optic components such as:

- Endfaces
- Single-mode Fiber
- Multi-mode Fiber
- Ferrules
- Bulkheads
- Lenses, Mirrors

Approvals:

- Meets Telcordia GR 2923-CORE, "Generic Requirements for Fiber Optic Connector Cleaning Products."
- RoHS and WEEE compliant.

Physical Properties:

AquaKleen™ Fiber Cleaner is a high purity, optical grade cleaner.

Property	Result
Residue	< 100 ppm
Flashpoint (ASTM D93)	>140°F (60°C)
Initial Boiling Point	212°F (100°C)
Specific Gravity	1.0
Evaporation Rate	Medium

Environmental Impact:

AquaKleen™ Fiber Cleaner is an excellent alternative to solvent-based cleaners.

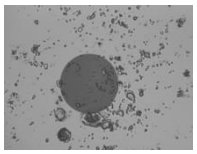
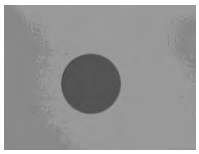
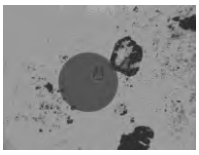
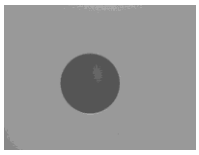
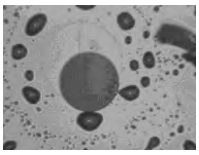
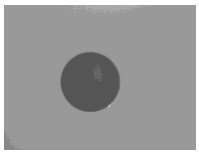
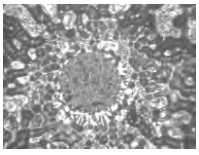
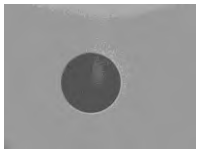
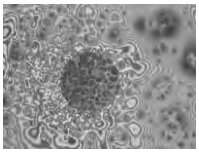
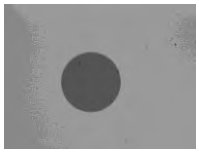
Property	Result
VOC Content	60 grams/liter
Global Warming Potential	Does not contain global warming compounds
Ozone Depletion Potential	None
CFC, HCFC, HFC Content:	None
RCRA	Not regulated as hazardous waste
CERCLA/SARA Status	Not regulated as a hazardous substance
RoHS and WEEE	Compliant
REACH	Compliant

Safety:

AquaKleen™ Fiber Cleaner has a low level of toxicity and does not contain any listed carcinogens. Good industrial hygiene practice and appropriate precautions should be employed during use. See MSDS for specific details.

Cleaning Properties:

AquaKleen™ Fiber Cleaner removes a broad range of contaminants from fiber connectors. To prove this, reference reflectance and transmitted power is measured on an unsoiled test connector at 1310 nm, 1550 nm and 1625 nm. Then the near-end connector plug is removed and soiled according to standard[1]. Connector end adapter is cleaned using recommended procedure. Insertion loss and reflectance are measured and compared to control. An electronic image of each cleaning is recorded.

Soil	Image – Soiled	Image – 1st Cleaning
Gypsum		
Carbon Black		
Olive Oil		
Gypsum/ Buffer Gel		
Gypsum/ 10W30 Oil		

Soil	Insertion Loss	Reflectance
Gypsum	Pass (<0.05 dB loss)	Pass (<2 dB change)
Carbon Black	Pass (<0.05 dB loss)	Pass (<2 dB change)
Olive Oil	Pass (<0.05 dB loss)	Pass (<2 dB change)
Gypsum/Buffer Gel	Pass (<0.05 dB loss)	Pass (<2 dB change)
Gypsum/10W30 Oil	Pass (<0.05 dB loss)	Pass (<2 dB change)

[1] *Tested using methods from Telcordia GR-2923-CORE, "Generic Requirements for Fiber Optic Connector Cleaning Products."*

Compatibility:

AquaKleen™ Fiber Cleaner is compatible with most common plastics and rubbers.

Polycarbonate:
Injection-molded plaques of polycarbonate are cut into bars, 2½ inch by ½ inch. Samples are bent in a three-point fixture. Percent strain is calculated based on the bar thickness and the radius of curvature.

"Strain limit" is the greatest percent strain where no stress cracking occurs. A strain limit greater than 0.5% indicates strain resistance.

Strain Limit > 0.7%

AquaKleen™ Fiber Cleaner shows good compatibility with polycarbonate.

Cladding:
Fiber cladding (Corning Cable) is firmly wiped 5 times with a cleaner-saturated towel. Towel and cable are visually inspected for cladding transfer or damage.

Cladding shows no visible damage.

AquaKleen™ Fiber Cleaner shows good compatibility with fiber cladding.

Soak Testing:
Materials are immersed in AquaKleen™ Fiber Cleaner for 72 hours at 50°C (122°F). Rubbers may swell slightly, but will return to their original state once the cleaner evaporates.

Plastic	Compatibility
Acrylic	Excellent
ABS	Excellent
Nylon 66	Excellent
Polycarbonate	Excellent
Polyethylene (HDPE)	Excellent
Polyethylene (LDPE)	Excellent
PVC	Excellent

Rubber	Compatibility
Silicone Rubber	Excellent
EPDM	Excellent

Usage Directions:

AquaKleen™ Fiber Cleaner is best used with the combination wet - dry cleaning procedure recommended in Telcordia GR-2923-CORE. Microfiber towels (DT-D175) and holder (FC-HOLDER), available from American Polywater Corporation work well with this method.

Several drops or a light spray of cleaner is placed on the towel. Preferred cleaning motion is a straight line motion, drawing the endface through the wetted portion of the towel, and then through a clean portion of a second dry towel. Use of the FC-HOLDER optimizes the cleaning process. Swabs may be dampened on the wetted portion of the towel in order to clean the bulkhead or equipment.

Application Properties:

Temperature Use Range:
20°F to 120°F (-5°C to 50°C)

Storage and Shelf Life:
Keep containers tightly closed when not in use. Shelf life is 2 years.

Packaging:

AquaKleen™ Fiber Cleaner is packaged in safety sealed containers that resist spills, leaks and contamination. The 2-fluid-ounce spray and dropper bottles have over 500 uses.

Microfiber Towels:
FiberKleen™ Dry Towels offer high absorbency and are made from non-linting, non-fraying, ultra-clean material. This specialty, microfiber fabric is engineered for optimum particle entrapment. The durable towel has a smooth surface for easy cleaning. It meets Telcordia Specification.

Convenient Kit Packaging and Cleaning Accessories

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The fiber cleaner shall be effective on both ionic and non-ionic soils. It shall meet the cleaning criteria of Telcordia GR 2923-CORE, "Generic Requirements for Fiber Optic Connector Cleaning Products." It shall contain an oxygenated solvent component for static dissipation.

The cleaner shall leave minimal residue of less than 100 ppm. It shall be compatible with fiber optic components. It shall not stress crack polycarbonate and shall have a strain limit greater than 0.5%.

The cleaner shall be water-based with low toxicity and low environmental impact. It shall have a volatile organic content (VOC) less than 100 grams/liter. It shall not contain any global warming compounds and have no ozone depletion potential.

Order Information:

Cat #	Package Description
AQ-2LP	2-oz AquaKleen™ Fiber Cleaner Finger Sprayer
AQ-2DR	2-oz AquaKleen™ Fiber Cleaner Squeeze Bottle Dropper
AQ-KIT2	AquaKleen™ Fiber Cleaner Kit: 2 AQ-2LP 1 DT-D175 1 SWB-250F100
AQ-KIT3	AquaKleen™ Fiber Cleaner Kit: 2 AQ-2DR 1 DT-D175 1 SWB-250F100
DT-D175	175 microfiber towels in a sealed plastic dispenser pack with cleaning pad
SWB-250F100	2.5 mm FiberKleen™ foam swab (100 pack)
SWB-125F10	1.25 mm FiberKleen™ foam swab (10 pack)
SWB-C100	FiberKleen™ cotton swab (100 pack)
SWB-V100	V Groove FiberKleen™ foam swab (100 pack)
SWB-M100	Mirror FiberKleen™ foam swab (100 pack)

Lit-AQTECHSPEC/REV002

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ Software

American Polywater® Corporation

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Polywater® HydraSol®

CABLE GEL REMOVER

Prepping copper cable for cleaning icky-pic

Water-Based Cleaner for Removing Cable Filling Greases

PRODUCT BENEFITS

- **Fast and Effective:** Maximum solvency power on PE/PJ or ETPR greases.
- **Clean:** Rinses completely with water.
- **Less Waste:** Good for multiple cleanings.
- **Safe:** No chlorinated solvent, CFC, or glycol ether content.
- **Tailored for the Job:** Available in a variety of convenient packages.

A Unique Approach in Cable Cleaning Materials

HydraSol® is a water-based, non-flammable cleaner that effectively cleans copper and fiber gel-filled cables. This cleaner excels at dissolving and removing cable filling greases (icky-pic) and is safer to use than other solvent-based cleaners.

HS-32 applied to towelette for cleaning

HS-1 towelette wiping gel from fiber

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American Polywater® Corporation

HydraSol family

HS-D72 towelette dispenser

Multiple Package Types Cover All Cleaning Needs

The HydraSol family (*photo 1*) is available in multiple packages to address the need of the user. The HS-1 is a durable, non-linting saturated towelette for convenient field use. Saturated towelettes are also available in a 72-count dispenser (*photo 2*). The HS-32 is an easy-to-handle quart bottle that is available with a flip-top cap or a trigger sprayer (HS-32LR).

POLYWATER HYDRASOL

Catalog #	Package Description	Units/Case
HS-1	Premoistened lint-free towelette in foil pack	144
HS-D72	Dispenser with 72 - 10” x 12” premoistened towelettes	6
HS-16LR	1-pt. (475-ml) spray bottle	12
HS-32LR	1-qt. (0.95-liter) spray bottle	12
HS-32	1-qt. (0.95-liter) bottle with flip top	12
HS-96	3 quarts (2.8 liters) in a 1-gal. pail	4
HS-128	1-gal. (3.8-liter) jug	4
HS-384	3 gallons (11.4 liters) in a 5-gal. pail	1
HS-640	5-gal. (18.9-liter) pail	1
HS-DRUM	55-gal. (209-liter) drum	1

SPECIFICATIONS AND APPLICATIONS:

- **Water-Based Cleaner:** Over 50% water-based solvent cleaner for unique safety and handling.
- **Low Toxicity:** Components have low toxicity whether by inhalation or dermal exposure, making it safe for use in vaults and confined spaces.
- **Effectiveness:** Using the Solvency Power Test Method, HydraSol outperformed isopropanol and other competitors’ products in cleaning effectivness and efficiency on multiple types of gels and flooding compounds.
- **Easy to Use:** Rinses easily off hands and tools. Dissolved grease is not redeposited as the cleaner residue dries.
- **Flash Point:** 155°F (68°C), Closed Cup (PMCC).

CONTACT US

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Polywater® SqueekyKleen™

FIBER AND COPPER GEL-FILLED CABLE CLEANER

TC-35LR cleaning 200-pair copper cable

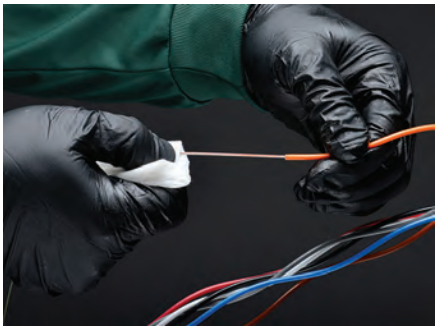
Cable Filling Gel Cleaner for Loose-Tube and Ribbon Fiber

PRODUCT BENEFITS

- **Effective Cleaner:** Quickly cleans cable filling gel and flooding compounds.
- **Cleans IBP Flooding Compound:** Good for cleaning coax cable.
- **Fast Gel Cleaner:** Requires only two wipes and the fiber squeaks and fans.
- **No Residue:** Nothing left to require a secondary alcohol wipe.
- **Industry Tested:** Approved by users and manufacturers.

Safe, Efficient Cleaner That Leaves No Residue

SqueekyKleen™ cleans and fans fiber in two wipes, saving time and money. No follow up with alcohol is required to clean and separate fibers before splicing. It reduces chemical odors and keeps vapor concentrations to a minimum in splice trailers and vaults to ensure a safe environment.



TC-1 wiping gel from fiber

TC-1 cleaning coax cable

polywater.com | 651-430-2270

American Polywater® Corporation

TC-D300 towelette dispenser


SqueekyKleen family

Effective Towelette Leaves Fiber "Squeaky Clean"

The SqueekyKleen TC-1 is a durable, non-linting saturated towelette. This wipe is the ideal package for field use because it limits vapor concentration and has no risk of spilling. Saturated wipes are also available in a 300-count dispenser (*photo 1*).

POLYWATER SQUEEKYKLEEN

Catalog #	Package Description	Units/Case
TC-1	Individual 8" x 12" saturated wipe	144
TC-1D42	Dispenser pack with 42 - TC-1	1
TC-D300	Dispenser with 300 - 5" x 6" premoistened wipes	6
TC-16LF	1-pt. (475-mL) bottle with flip top	12
TC-35LF	1-qt. (0.95-liter) bottle with flip top	12
TC-35LR	1-qt. (0.95-liter) bottle with sprayer	12
TC-96	3 quarts (2.8 liters) in a 1-gal. pail	4
TC-128	1-gal. (3.8-liter) jug	4
TC-640	5-gal. (18.9-liter) pail	1
TC-DRUM	55-gal. (209-liter) drum	1

SPECIFICATIONS AND APPLICATIONS:

- **Cleaning:** When wiping a 3-foot section of 12-count fiber from a buffer tube, a saturated towelette will squeak and fan fibers with 2 wipes.
- **Solvency Power:** At 68°F (20°C) it will dissolve a 0.02" (0.5-mm) film of PE/PJ or ETPR grease completely from cable jacket with less than two minutes of vigorous agitation (no wiping).
- **Residue:** When placed on a clean glass panel and dried, the solvent shall leave less than 100 parts per million of residue (<100 ppm).
- **Water Content:** When tested by the ASTM 1533B method, water content shall be less than 75 parts per million (<75 ppm).
- **Flash Point:** When tested via a Pensky-Martin Closed Cup Test (ASTM D93), the cleaner shall have a flash point above 140°F (60°C).

CONTACT US

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SqueekyKleen™
Cable Gel Remover

American Polywater® Corporation

TECHNICAL DATA SHEET

Description:

SqueekyKleen™ Cable Gel Remover effectively cleans filling gels and flooding compounds from fiber optic cables. Designed to quickly solubilize a wide range of gel types, SqueekyKleen™ results in quick and time-saving gel removal from buffer tubes, ribbon cable, and individual fibers. It easily removes flooding compounds from coaxial cables.

In just a few wipes, SqueekyKleen™ completely removes gels and leaves fibers fanned, ready for connection. It does not leave a residue. SqueekyKleen™ is compatible with most materials and plastics including polycarbonate, acrylate coating and ribbon fiber.

SqueekyKleen™ Cable Gel Remover is safe and easy to use. It lasts longer than fast evaporating alcohol and is ideal for gel removal. SqueekyKleen™ emits no dangerous vapors. With a high flash point, it is safe to transport. SqueekyKleen™ is the gel remover of choice for network and cable installers worldwide.

Cleaning Properties:

SqueekyKleen™ Cable Gel Remover dissolves a broad range of gels, filling and flooding compounds.

Property	Result
Gel Removal	Excellent (100% in less than 2 minutes)
Fiber Fan-Out	Excellent (<2 wipes to “squeak”)

Removal: A measured amount of PE/PJ or ETPR gel is spread onto a stainless steel spatula with a coating thickness of 0.5 mm. The spatula is stirred in the gel remover. The amount of gel removed is quantified by observation.

Fan-Out: A towel saturated in SqueekyKleen™ is wrapped around 12 to 18 fibers from a buffer tube. Using the thumb and forefinger to grasp the towel with firm pressure, the cable bundle is flattened and wiped clean. The fibers will fan apart when clean.

Product Benefits:

- No Alcohol Required
- Minimal Wiping
- No Residue
- Safe to Use on Ribbon Cable
- Fans Fibers Quickly
- Compatible with Most Plastics and Rubbers
- Multiple Package Options

End Use:

Removes Gels and Flooding Compounds from:

- Buffer Tubes
- Ribbon Cables
- Individual Fibers
- Coaxial Cables
- Connectors
- Splicing Tools

Physical Properties:

SqueekyKleen™ Gel Remover is a high purity solvent with low aromatic content. It does not leave a residue.

Property	Result
Flash point (ASTM D93)	>140°F (>60°C)
Initial Boiling Point	365°F (185°C)
Specific Gravity	0.79
Percent Aromatics	< 1%
Water Content (ASTM D1533B)	< 75 ppm
Evaporation Rate	Medium
Residue (ASTM D2369)	<100 ppm

Use Directions:

SqueekyKleen™ Cable Gel Remover is suitable for many types of gels and filling compounds. It cleans asphaltic or polybutene flooding compounds from coaxial cables. Use SqueekyKleen™ Remover to clean tools and work areas.

To clean and fan fibers, use the pre-moistened, SqueekyKleen™ Wipe. Do not open the towel. Start at the buffer tube and place stripped fibers into the fold of the towel. Use thumb and forefinger to flatten fibers. Press firmly on the fiber, pulling along the surface to wipe off the gel. Repeat action with a clean fold until fiber "squeaks" clean and fans. SqueekyKleen™ does not require further rinsing or cleaning with alcohol.

Safety:

SqueekyKleen™ Cable Gel Remover has a low level of toxicity and does not contain any listed carcinogens. It is combustible and should not be exposed to fire or flame. Good industrial hygiene practice and appropriate precautions should be employed during use. See MSDS for specific details.

Wipe Package Convenience

SqueekyKleen™ Cable Gel Remover pre-saturated wipes are a convenient package with multiple safety benefits.

Control
Pre-saturated wipes minimize solvent exposure on sensitive fiber optic components. Directly spraying or immersing the part allows the solvent to puddle into small openings. Wipe cleaning will also ensure that the solvent evaporates more quickly.

Safety
The pre-saturated wipe package eliminates spill hazard and limits solvent vapor exposure. Wipes contain a carefully measured quantity of solvent and are an excellent way to control vapor. SqueekyKleen™ Cable Gel Remover does not require a follow-up wipe with alcohol, further reducing vapor exposure. The wipe package is a great choice for underground or confined space applications.

Convenience
Each wipe package utilizes non-linting, non-tearing towels. Clean wipes are always available, eliminating recontamination of fibers with dirty rags or lint.

Convenient wipe package controls solvent exposure and vapor emissions

Environmental Impact:

SqueekyKleen™ Cable Gel Remover Cleaner is a safer alternative to chlorinated solvents.

Property	Result
VOC Content	790 grams/liter
Global Warming Potential	Does not contain global warming compounds
Ozone Depletion Potential	None
CFC, HCFC, HFC Content:	None
CERCLA/SARA Status	Not regulated as a hazardous substance

Compatibility:

SqueekyKleen™ Gel Remover is compatible with most components used in the communications industry. It meets standard test requirements for the various materials in which it may come in contact.

Polyethylene
SqueekyKleen™ Gel Remover is compatible with polyethylene and does not cause environmental stress cracking. [1]

Polycarbonate
SqueekyKleen™ Gel Remover is safe on polycarbonate. Polycarbonate shows chemical resistance to SqueekyKleen with a resistant strain limit of >0.9%.[2]

Corrosivity:
SqueekyKleen™ Gel Remover will not corrode or stain metal parts. It does not tarnish or corrode copper. [3]

[1] Testing based on ASTM D1693, "Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics." Polyethylene shows less than 20% stress cracking after 50°C for 14 days.

[2] Testing based on Mobay Corporation, Plastics and Rubber Division, "Chemical Compatibility Test for Unreinforced Thermoplastic Resins, 1989."

[3] Testing based on ASTM D130, "Standard Test Method for Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test."

Soak Testing:

Materials are immersed in SqueekyKleen™ Cable Gel Remover for 72 hours at 50°C (122°F). Some rubbers will swell, but should return to their original state once the cleaner evaporates. Wipe cleaning minimizes solvent exposure.

Plastics	% Weight Change	Appearance
ABS	+0.04	NC
Acrylic	-0.01	NC
Delrin®	+0.03	NC
Epoxy	0.00	NC
Nylon 66	-0.02	NC
Nylon 101	+0.07	NC
Polycarbonate	+0.04	NC
Phenolic	-0.05	NC
PPO	+0.02	NC
PVC	+0.01	NC
Teflon®	+0.03	NC
Tygon®	-0.25	NC
Ultem® 1000	-0.01	NC
Valox® 420	0.00	NC

Elastomers	% Weight Change	Appearance
Neoprene®	+9.31	SS
Nitrile	-2.01	NC
SBR	+47.34	S
Viton®	+0.07	NC

KEY:

NC = No Change
S = Swelling
ES = Extreme Softening
C = Crazing
SS = Slight Swelling
D = Disssolved

Testing based on ASTM D543, "Standard Test Method for Resistance of Plastics to Chemical Reagents."

Delrin®, Teflon®, Neoprene® and Viton® are trademarks of Du Pont. Ultem® 1000 and Valox® 420 are trademarks of G.E. Plastics. Tygon® is a trademark of Norton Performance Plastics

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The Gel Remover solvent shall be at least 80% high purity, de-aromatized, aliphatic hydrocarbon enhanced with a cyclic terpene. Aromatic content shall be less than 1%. There should be no surfactants used in the Gel Remover and the residue shall be less than 100 ppm.

The Gel Remover shall dissolve a .020" (.5mm) film of PE/PJ or ETPR grease with less than two minutes of agitation. When wiping a 2-foot section of 24 count fiber from a buffer tube, a towel pre-saturated with the Gel Remover shall "squeak" the fibers with 3 wipes or less. The Gel Remover shall be compatible with materials typical to the communications industry.

The Gel Remover shall be safe to use. It shall have a flash point greater than 140°F (60°C). The Gel Remover shall not be a carcinogen or listed by CERCLA as a hazardous waste.

Order Information:

Cat #	Package Description
TC-1	Single, saturated wipe 144/case
TC-1D42	42 TC-1 in a dispenser pack
TC-16LF	1-pint bottle with flip top (480 ml) 12/case
TC-16LR	1-pint bottle with sprayer (480 ml) 12/case
TC-35LF	1-quart bottle with flip top (95 ml) 12/case
TC-35LR	1-quart bottle with 6 sprayers (95 ml) 12/case
TC-128	1-gallon jug (3.8 l) 4/case
TC-384	3 gallons in 5-gallon pail (11.6 liter)
TC-640	5-gallon pail (18.0 liter)
TC-96	3-quarts in a 1-gallon pail (2.85 liter)
TC-D300	Dispenser w/300 5"X6" (16 cm X 13 cm) Pre-moistened wipes
TC-DRUM	55-gallon drum (210 liter)

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ Software

American Polywater® Corporation

11222 60TH St. N
Stillwater, MN 55082
U.S.A

1-800-328-9384
1-651-430-2270
http://www.polywater.com(URL) support@polyhwater.com (e-mail)

Polywater® Type FO™

ALCOHOL FIBER OPTIC CLEANER

Type FO cleaning fusion splicer

Water-Free Alcohol Fiber Optic Connector Cleaner

PRODUCT BENEFITS

- **Excellent Solvency:** Removes oil, dust, and other contaminants.
- **99.8% Anhydrous Isopropyl:** Water-free for fiber optic cleaning.
- **Large Cleaning Wipe:** 5” x 8” wipe means longer working time and more cleaning per wipe.
- **No Residue:** No interference with light transmission.
- **Fast Evaporating:** Minimal delay before continuing with job.

Highest Quality Grade Cleaning Alcohol Available

Type FO™ Fiber Optic Cleaner is great for cleaning glass fiber end faces for better light transmission performance. FO removes dust, oil, and other contaminants, and leaves no residue. The anhydrous alcohol in FO is water-free. Avoidance of water is important in fiber optic cleaning.

Type FO family with fusion splicer

FO-1 premoistened alcohol wipe

polywater.com | 651-430-2270

American Polywater® Corporation

FO product family

Variety of Packages for Fiber Optic Prep Applications

The durable, non-linting Type FO wipe is a convenient field package. Compared to others, its larger size (40 sq. in./260 cm^2) allows longer working times while still limiting vapor exposure and spill potential for the worker. Also available in a variety of bulk packages.

POLYWATER TYPE FO

Catalog #	Package Description	Units/Case
FO-1	Individual saturated 5” x 8” / 13 cm x 20 cm premoistened wipe	50
FO-2LP	2 fl. oz. (60-mL) refillable spray bottle	12
FO-8LF	8 fl. oz. (236-mL) bottle with flip-top cap	12
FO-16	1-pt. (475-mL) bottle	12
FO-32	1-qt. (0.95-liter) bottle	12
FO-128	1-gal. (3.8-liter) jug	4

SPECIFICATIONS AND APPLICATIONS:

- **High Performance:** Excellent cleaning effectiveness on dry/ionic soil (dust, salt), wet/non-ionic soil (oil, buffer gel), or a combination soil.
- **Compatibility:** Compatible with most common plastics and rubbers.

CONTACT US

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email: support@polywater.com

American Polywater® Corporation

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Polywater® QuicKleen™

FIBER OPTIC CLEANER

Cleaning fiber with a QC-2LP spray bottle

Fast Evaporating Cleaner for Ferrules, Bulkheads, and Fiber End Faces

PRODUCT BENEFITS

- **Cleans Fiber End Faces:** Minimizes signal loss and maximizes connectivity.
- **No Flash Point:** Non-hazardous for air shipment.
- **Cleans Multi-Mode and Single Mode:** Suitable for all glass fiber, including 1625 nm.
- **No Residue:** No streaking ensures complete light transmission.
- **Evaporates Quickly:** Ready to reinsert or connect immediately after cleaning.

Maximize Optical Network Performance

QuicKleen™ is a unique solvent blend that cleans completely, evaporates quickly, and leaves no residue. QuicKleen Fiber End Face Cleaner is available in a convenient 2 fl. oz./60-mL spray bottle as part of an all-inclusive kit.

QC-KIT2 in convenient travel bag

QC-2LP spray bottle

QC-2LP case of 12

The QuicKleen Primary Package is a Small, Convenient Spray Bottle

This QuicKleen spray bottle is effectively used with FiberKleen™ towelettes. These microfiber towelettes can be used to clean ferrules, bulkheads, and fiber end faces. The nonwoven, highly absorbent towelettes trap the removed dirt and debris, making cleaning easier and more effective. Swabs are also available for insertion cleaning.

POLYWATER QUICKLEEN

Catalog #	Package Description	Units/Case
QC-2LP	2 fl. oz./60-mL bottle with finger sprayer	12
QC-KIT2	2 - QC-2LP; 1 - DT-D175; 1 - SWB-250F100; travel bag	1
DT-D175	175-count dispenser pack of microfiber towelettes with cleaning pad	12
DT-D175R	Refill for DT-D175	6
SWB-250F100	2.5-mm FiberKleen foam swab (100/pack)	5
SWB-125F10	1.25-mm FiberKleen foam swab (10/pack)	5
SWB-C100	FiberKleen cotton swab (100/pack)	5
SWB-V100	V Groove FiberKleen foam swab (100/pack)	5
SWB-M100	Mirror FiberKleen foam swab (100/pack)	5

SPECIFICATIONS AND APPLICATIONS:

- **Testing Standards:** Passes the rigorous standards of Telcordia GR 2923-CORE, “Generic Requirements for Fiber Optic Connector Cleaning Products”.
- **Safety:** Minimal toxicity and contains no listed carcinogens. Cleaner is non-flammable.
- **Compatibility:** Compatible with most common plastics and rubbers.
- **Temperature Use Range:** 20°F to 120°F (-5°C to 50°C).

CONTACT US

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QuicKleen™
Performance Fiber Cleaner

American Polywater® Corporation

TECHNICAL DATA SHEET

Description:

QuicKleen™ Fiber Cleaner is formulated for fast cleaning of high speed fiber and specialty optics. It quickly penetrates precision parts to lift drywall dust, buffer gel, lint, finger prints, and oils. The excellent cleaning capabilities of QuicKleen™ minimize dB losses to maximize optical network performance.

QuicKleen™ Fiber Cleaner evaporates quickly without residue. The fast-drying character means solvent is not trapped in the connector to reduce signal loss. QuicKleen™ dissipates static and removes surface charge so that the surface is less likely to be re-contaminated. QuicKleen™ is non-flammable and safe to use.

QuicKleen™ Fiber Cleaner is packaged in an easy to use pump sprayer that allows precise cleaner application which limits waste and contamination. Polywater's non-woven FiberKleen™ towelettes trap dirt and absorb contaminants from high speed fiber and optical equipment. A smooth wiping surface and durable material promote easy, effective cleaning.

Performance Properties:

QuicKleen™ Fiber Cleaner is a high performance optical cleaner. QuicKleen™ removes a broad variety of endface contaminants.

Soil Type	Cleaning Effectiveness
Dry/Ionic Soil (dust, salt)	Excellent
Wet/Non-Ionic Soil (oil, buffer gel)	Excellent
Combination Soil	Excellent

QuicKleen™ Fiber Cleaner has been tested to the rigorous standards of Telcordia GR 2923-CORE, "Generic Requirements for Fiber Optic Connector Cleaning Products."

Product Benefits:

- Evaporates Quickly
- Maximizes Connectivity
- No Residue
- No Streaking
- Dissipates Static
- Non-Flammable
- Easy to Transport

End Use:

QuicKleen™ Fiber Cleaner is an excellent choice for cleaning precision fiber-optic components such as:

- Endfaces
- Single-mode Fiber
- Multi-mode Fiber
- Ferrules
- Bulkheads
- Lenses, Mirrors

Approvals:

- Meets Telcordia GR 2923-CORE, "Generic Requirements for Fiber Optic Connector Cleaning Products."
- RoHS and WEEE compliant

Physical Properties:

QuicKleen™ Fiber Cleaner is a high-purity, optical grade cleaner.

Property	Result
Residue	< 100 ppm
Flash Point (ASTM D93)	None
Initial Boiling Point	131°F (55°C)
Specific Gravity	1.48
Evaporation Rate	Fast

Environmental Impact:

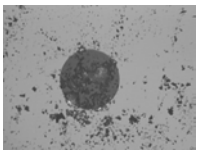
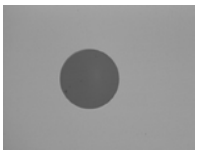
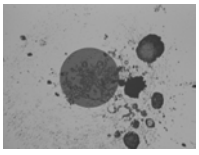
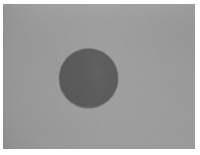
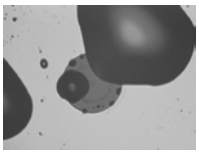
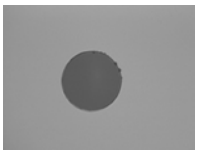
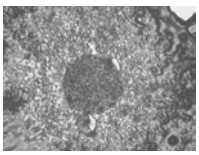
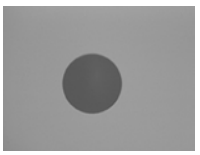
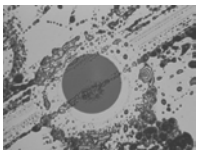
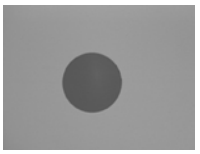
Property	Result
VOC Content	67 g/L
Global Warming Potential	310
Ozone Depletion Potential	0
CFC, HCFC Content:	None
RCRA	Not regulated as hazardous waste
CERCLA/SARA Status	Not regulated as a hazardous substance
RoHS and WEEE	Compliant
REACH	Compliant

Safety:

QuicKleen™ Fiber Cleaner has minimal toxicity and does not contain any listed carcinogens. Good industrial hygiene practice and appropriate precautions should be employed during use. See SDS for specific details.

Cleaning Properties:

QuicKleen™ Fiber Cleaner removes a broad range of contaminants from fiber connectors. To prove this, reference reflectance and transmitted power is measured on an unsoiled test connector at 1310 nm, 1550 nm, and 1625 nm. Then the rear-end connector plug is removed and soiled according to standard[1]. Connector end adapter is cleaned using recommended procedure. Insertion loss and reflectance are measured and compared to control. An electronic image of each cleaning is recorded.

Soil	Image – Soiled	Image – 1st Cleaning
Gypsum		
Carbon Black		
Olive Oil		
Gypsum/ Buffer Gel		
Gypsum/ 10W30 Oil		

Soil	Insertion Loss	Reflectance
Gypsum	Pass (<0.05 dB loss)	Pass (<2 dB change)
Carbon Black	Pass (<0.05 dB loss)	Pass (<2 dB change)
Olive Oil	Pass (<0.05 dB loss)	Pass (<2 dB change)
Gypsum/Buffer Gel	Pass (<0.05 dB loss)	Pass (<2 dB change)
Gypsum/10W30 Oil	Pass (<0.05 dB loss)	Pass (<2 dB change)

[1] *Tested using methods from Telcordia GR-2923-CORE, "Generic Requirements for Fiber Optic Connector Cleaning Products."*

Compatibility:

QuicKleen™ Fiber Cleaner is compatible with most common plastics and rubbers.

Polycarbonate:
Injection-molded plaques of polycarbonate are cut into bars, 2½ inch by ½ inch. Samples are bent in a three-point fixture. Percent strain is calculated based on the bar thickness and the radius of curvature.

"Strain limit" is the greatest percent strain where no stress cracking occurs. A strain limit greater than 0.5% indicates strain resistance.

Strain Limit > 0.5%

QuicKleen™ Fiber Cleaner shows good compatibility with polycarbonate.

Cladding:
Fiber cladding (Corning Cable) is firmly wiped 5 times with a cleaner-saturated towel. Towel and cable are visually inspected for cladding transfer or damage.

Cladding shows no visible damage.

QuicKleen™ Fiber Cleaner shows good compatibility with fiber cladding.

Soak Testing:
Materials are immersed in QuicKleen™ Fiber Cleaner for an hour at 50°C (122°F). Rubbers may swell slightly, but will return to their original state once the cleaner evaporates.

Plastic	Compatibility
Nylon 66	Excellent
Polycarbonate	Excellent
Polyethylene (HDPE)	Excellent
Polyethylene (LDPE)	Excellent
PVC	Excellent

Rubber	Compatibility
Silicone Rubber	Excellent
EPDM	Excellent

Usage Directions:

QuicKleen™ Fiber Cleaner is best used with the combination wet/dry cleaning procedure recommended in Telcordia GR-2923-CORE. Microfiber towels (DT-D175) available from American Polywater Corporation work well with this method.

A light spray of cleaner is placed on the towel. Preferred cleaning motion is a straight-line motion, drawing the endface through the wetted portion of the towel, and then through a clean portion of a second dry towel. Swabs may be dampened on the wetted portion of the towel in order to clean the alignment adaptor or scope.

Application Properties:

Temperature Use Range:
20°F to 120°F (-5°C to 50°C)

Storage and Shelf Life:
Keep containers tightly closed when not in use. Shelf life is 2 years.

Packaging:

QuicKleen™ Fiber Cleaner is packaged in a safety sealed container that resists spills, leaks, and contamination. The 2-fluid ounce spray bottle has over 500 uses.

Microfiber Towels:
FiberKleen™ Dry Towels offer high absorbency and are made from non-linting, non-fraying, ultra-clean material. This specialty microfiber fabric is engineered for optimum particle entrapment. The durable towel has a smooth surface for easy cleaning. It meets Telcordia Specification.

Convenient Kit Packaging and Cleaning Accessories

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The fiber cleaner shall be effective on both ionic and non-ionic soils. It shall meet the cleaning criteria of Telcordia GR 2923-CORE, "Generic Requirements for Fiber Optic Connector Cleaning Products." It shall contain an oxygenated solvent component for static dissipation.

The cleaner shall be fast evaporating and non-flammable. It shall leave minimal residue of less than 100 ppm. The cleaner shall be compatible with fiber optic components. It shall not stress crack polycarbonate and shall have a strain limit greater than 0.5%.

The cleaner shall not contain an aerosol propellant. It shall be packaged in a plastic bottle that allows cleaner to be dispensed in a fine mist spray pattern.

Order Information:

Cat #	Package Description
QC-2LP	2-oz QuicKleen™ Fiber Cleaner Finger Sprayer
QC-KIT2	QuicKleen™ Fiber Cleaner Kit: 2 QC-2LP 3 DT-D50 1 SWB-250100
SWB-250100	2.5 mm FiberKleen™ foam swab (100 pack)
SWB-125F10	1.25 mm FiberKleen™ foam swab (10 pack)
SWB-C100	FiberKleen™ cotton swab (100 pack)
SWB-V100	V Groove FiberKleen™ foam swab (100 pack)
SWB-M100	Mirror FiberKleen™ foam swab (100 pack)
DT-D50	50 non-linting towels in a sealed pocket case
DT-D175	125 microfiber towels, in a sealed case with cleaning pad
DT-D175R	Refill roll of microfiber towels (125) for DT-D175

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ Software

American Polywater® Corporation

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Cleaners

Polywater® Type HP™

MULTIPURPOSE CLEANER

Use presaturated, lint-free wipes

Cleaner Degreaser for Electrical Construction and Maintenance Needs

PRODUCT BENEFITS

- **Multipurpose:** One cleaning solvent for electrical applications.
- **High Solvency:** Excellent for cable splice preparation and electrical equipment cleaning.
- **No Residue:** Type HP evaporates completely, leaving no residue.
- **Non-Conductive:** Will not short across typical electrical voltages.
- **Safe:** Replaces chlorinated electrical cleaners. No carcinogens.

The Industry's Preferred Electrical Cleaner

Polywater® Type HP™ is our most popular electrical cleaner for cable splice preparation, cable termination, and electrical apparatus maintenance. HP fits the needs of electrical utilities, line contractors, and medium voltage crews that need to comply with regulatory and safety requirements.

Catalog # HP-P158ID

Residue from cleaning

polywater.com | 651-430-2270

American Polywater® Corporation

Catalog # HP-D72

Type HP package options

Packaged for Large Jobs and Precision Cleaning

Polywater Type HP is available in a large variety of bulk packages and splice preparation kits. The unique HP Tandem Pack™ contains a saturated wipe for cleaning and a lint-free drying wipe to speed evaporation, if needed. PEL-PAC® prep kits contain saturated wipes, sanding cloth, and dry wipes in convenient packaging that limits solvent exposure.

POLYWATER TYPE HP

Catalog #	Package Description	Units/Case
HP-1	Saturated 8” x 12”/20 cm x 30 cm wipe	144
HP-P158ID	Tandem Pack wet/dry 5” x 8”/12 cm x 20 cm wipe	144
HP-3PS	PEL-PAC kit contains: 3 - HP-P158ID wet/dry wipes; 1 - strip 120-grit non-conductive sanding cloth	10
HP-P63	PEL-PAC kit contains: 6 – HP-P158ID wet/dry wipes; 3 – strips 120-grit non-conductive sanding cloth; 1 – instruction card	12
HP-T369	PEL-PAC kit contains: 3 - saturated 6” x 9”/15 cm x 23 cm wipes in a tin	24
HP-T369/S	Same as kit above; with sanding cloth	24
HP-T369/S-D	Same as kit above; includes dry towel	24
HP-D72	Dispenser with 72 - 10” x 12”/25 cm x 30 cm wipes	6
HPY-12	16-oz. aerosol can (475 mL)	12
HP-16LF	1-pt. bottle with flip top (475 mL)	12
HP-35LF	1-qt. bottle with flip top (.95 liters)	12
HP-128	1-gal. jug (3.8 liters)	4
HP-640	5-gal. can (18.9 liters)	1
HP-DRUM	55-gal. drum (208 liters)	1

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatible:** Meets the standard electrical utility test requirements based on IEEE 1493 cable cleaning standard.
- **Dielectric Strength:** >40KV at a 100-mL gap per ASTM D877 standard test method.
- **Flashpoint:** >140°F (60°C) per ASTM D93 standard test method.
- **Residue:** <100 ppm per ASTM D2369 standard test method. Leaves no residue.

CONTACT US

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American Polywater® Corporation

11222 60th Street N | Stillwater, MN 55082 USA

Type HP™
Multi-Purpose Cleaner

American Polywater® Corporation

TECHNICAL DATA SHEET

Description:

Type HP™ Cleaner effectively cleans semi-conducting cable shield, corrosion inhibiting compound, silicone greases, filling gels, transformer oils and many other contaminants found in electrical construction and maintenance. It evaporates with no residue. Type HP™ is non-conductive.

Type HP™ Cleaner replaces ozone-depleting CFC's, trichloroethane and other carcinogenic chlorinated solvents. Type HP™ Cleaner lasts longer than fast evaporating solvents and is compatible with most materials and plastics, including polycarbonate.

Type HP™ Cleaner is available in multiple package options. Bulk Type HP™ Cleaner is an excellent choice for soaking or rinsing parts. Pre-saturated towels limit solvent exposure and eliminate spill hazard. Depending on end use, Type HP™ Cleaner has the optimal package available.

Performance Properties:

Type HP™ Cleaner meets IEEE 1493 performance criteria[1]. It effectively cleans semi-conducting cable shield. A towel saturated with cleaner quickly removes the compound and becomes visibly black.

Property	Result
Cleaning Effectiveness	Excellent
KB Value	33
Hildebrand Solubility Parameter	7.5
Dielectric Strength 100 mil gap (ASTM D877):	>40 KV
Water Content (ASTM D1533B)	< 50 ppm
Evaporation Rate	Medium
Residue (ASTM D2369)	<100 ppm

[1] Tested using methods from IEEE 1493, "Guide for the Evaluation of Solvents Used for Cleaning Electrical Cables and Accessories."

Product Benefits:

- Excellent Solvency
- No Residue
- Non-Conductive
- Contains No Chlorinated Solvents
- Compatible with Most Plastics and Rubbers
- Multiple Package Options

End Use:

- Transformers
- Switch Gear
- Motor Control Devices
- Fusible Disconnecting Devices
- Wind Turbine Nacelles
- Relays
- Generators
- Motors
- Circuit Boards
- Rheostats
- Tools

Physical Properties:

Type HP™ Cleaner is a high purity solvent with low aromatic content.

Property	Result
Flashpoint (ASTM D93)	>140°F (60°C)
Initial Boiling Point	365°F (185°C)
Specific Gravity	0.79
Percent Aromatics	< 1%

Cleaning Properties:

Type HP™ Cleaner dissolves a broad range of contaminants. Contaminant is added to 20 grams cleaner at ambient temperature. The quantity dissolved is recorded.

Contaminant	Amount Dissolved
PCB (Aroclor® 1260)	10 grams
Cutting oil (Rigid Nu-Clear, sulphurized oil)	10 grams
Silicone grease (Dow Corning 4 Compound)	2 grams
Animal oil (Lanolin-Tech Grade)	2 grams

Usage Directions:

Type HP™ Cleaner is suitable for many types of cleaning and degreasing and is effective at room temperature. It does not freeze and can be used in cold weather applications.

Cleaning time and effectiveness will vary based on the contaminant and cleaning method. Wiping or agitation cleans faster than just soaking. Experiment with your particular contaminant and conditions.

Type HP™ Cleaner is residue-free. For precision cleaning, a final rinse of fresh cleaner should be used. Finish with a fresh wipe, spray until the solvent runs clear, or rinse in a fresh bath of Type HP™ cleaner.

For faster drying, air or centrifugal dryers can be used to accelerate evaporation. Wiping the part with an absorbent, lint-free towel (Cat.# DT-69) will reduce drying time considerably.

Drying Time Comparisons:

No Drying:	60-90 Mins.	Cool Air:	3-5 Mins.
Drying Wipe:	1-2 Mins.	Hot Air:	2-3 Mins.

Safety:

Type HP™ Cleaner has a low level of toxicity and does not contain any listed carcinogens. It is combustible and should not be exposed to fire or flame. Good industrial hygiene practice and appropriate precautions should be employed during use. See SDS for specific details.

Pel Pac System

Type HP™ Cleaner presaturated towelettes are a convenient package with multiple safety benefits.

Control
Presaturated wipes minimize solvent exposure on sensitive electrical parts. Directly spraying or immersing the part allows the solvent to puddle into small openings. Wipe cleaning will also ensure that the solvent evaporates more quickly.

Safety
The presaturated towelette package eliminates spill hazard and limits solvent vapor exposure. Wipes contain a carefully measured quantity of solvent and are an excellent way to control vapor. Type HP™ Cleaner presaturated towelettes are a great choice for underground or confined space applications.

Convenience
Each Pel-Pac package utilizes non-linting, non-tearing towels. Clean wipes are always available, eliminating recontamination of parts with dirty rags. Custom kits may include extra dry towels or abrasive cloth as needed.

Convenient Wet/Dry Tandem Pack (HP-P158ID) controls solvent exposure.

Environmental Impact:

Type HP™ Cleaner is a safer alternative to chlorinated solvents.

Property	Result
VOC Content	790 grams/liter
Global Warming Potential	Does not contain global warming compounds
Ozone Depletion Potential	None
CFC, HCFC, HFC Content:	None
RCRA	Not regulated as hazardous waste
CERCLA/SARA Status	Not regulated as a hazardous substance

Compatibility:

Type HP™ Cleaner is compatible with most common plastics and rubbers. It meets standard electrical utility test requirements based on IEEE 1493.

Plastic Materials - XLPE
XLPE jacket material immersed in Type HP™ Cleaner retains tensile and elongation characteristics and shows minimal weight change[1].

Rubber Materials – EPDM and Silicone Rubber
Platen samples of EPDM and Silicone Rubber immersed in Type HP™ Cleaner retain tensile and elongation characteristics and show minimal weight change[1].

Volume Resistivity of Cable Insulation Shield
Type 0691 XLPE immersed in Type HP™ Cleaner shows acceptable volume resistivity values[1]. After exposure to the cleaner, volume resistivity measurements return to control levels.

Corrosivity:
Type HP™ Cleaner will not corrode or stain metal parts. It does not tarnish or corrode copper[2].

[1] Tested using methods from IEEE 1493, "Guide for the Evaluation of Solvents Used for Cleaning Electrical Cables and Accessories."

[2] Testing based on ASTM D130, "Standard Test Method for Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test."

Soak Testing:

Materials are immersed in Type HP™ Cleaner for 72 hours at 50°C (122°F). Some rubbers will swell, but should return to their original state once the cleaner evaporates. Wipe cleaning minimizes solvent exposure.

Plastics	% Weight Change	Appearance
ABS	+0.04	NC
Acrylic	-0.01	NC
Delrin®	+0.03	NC
Epoxy	0.00	NC
Nylon 66	-0.02	NC
Nylon 101	+0.07	NC
Polycarbonate	+0.04	NC
Phenolic	-0.05	NC
PPO	+0.02	NC
PVC	+0.01	NC
Teflon®	+0.03	NC
Tygon®	-0.25	NC
Ultem® 1000	-0.01	NC
Valox® 420	0.00	NC

Elastomers	% Weight Change	Appearance
Neoprene®	+9.31	SS
Nitrile	-2.01	NC
SBR	+47.34	S
Viton®	+0.07	NC

KEY:

NC = No Change
S = Swelling
ES = Extreme Softening
C = Crazing
SS = Slight Swelling
D = Disssolved

Testing based on ASTM D543, "Standard Test Method for Resistance of Plastics to Chemical Reagents."

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The cleaning solvent shall be at least 80% high purity, dearomatized, aliphatic hydrocarbon enhanced with a cyclic terpene. Aromatic content shall be less than 1%. Water content shall be less than 75 ppm.

The cleaner shall not leave a residue. The cleaner shall not significantly affect the volume resistivity of Union Carbide 0691 XLPE cable insulation shield. The cleaner shall show a voltage withstand of at least 40 kV before breakdown.

The cleaner shall not significantly affect the tensile and elongation properties of XLPE, silicone rubber, and EPDM rubber when tested to guidelines proposed in IEEE P1493. When wiped over an XLPE (Union Carbide Type 0691) insulation shield, a clean towel wetted with the cleaner shall become visibly "black" with two wipes over 2-inches of cable length with light hand pressure.

The cleaner shall not be a carcinogen or listed by CERCLA as a hazardous waste. It shall not be on the EPA Phase I or Phase II list of banned or phased-out chlorofluorocarbons.

Order Information:

Cat #	Package Description
HP-1	Single, saturated towelette 144/case
HP-P158ID	Wet/dry wipe Tandem Pack™ 144/case
HP-D72	72-Count Wipe Canister 6/case
HPY-12*	16-oz aerosol can 12/case
HP-16LF	1-pint bottle with flip top (475 ml) 12/case
HP-35LF	1-quart bottle with flip top (.95 Liter) 12/case
ST-R	Trigger sprayer, fits pint and quart bottles 12/case
HP-128	1-gallon bottle (3.8 Liter) 4/case
HP-640	5-gallon can (18.0 Liter)
HP-DRUM	55-gallon drum
HP-P63	Tandem Pack™ Cable Prep Kit contains 6 HP-P158ID wet/dry wipes 3 strips 120-grit non-conductive aluminum oxide sanding cloth 1 instruction card 12/case
HP-T369	Pel-Pac® Kit, 3 saturated towels in sturdy tin 24/case
HP-T369/S	Pel-Pac® Kit with sandpaper 24/case
HP-T369/S-D	Pel-Pac® Kit with sandpaper and dry towel 24/case
DT-1212	Non-linting, 12" X 12" dry towels 100/box
DT-69	Non-linting, 6" X 9" dry towels 200/box

**Government NSN # 6850-01-387-4567 for HPY-12*

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ Software

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Polywater® Type RP™

FAST-EVAPORATING CABLE CLEANER

Catalog # RP-1 presaturated lint-free towelette

Medium & High Voltage Cable Preparation Cleaner/Degreaser

PRODUCT BENEFITS

- **Safe:** Excellent alternative to brominated and chlorinated solvents.
- **Versatile:** Available in PEL-PAC® towelettes or aerosol cans.
- **Fast Evaporation:** Evaporates quickly and leaves no residue.
- **Tested:** High dielectric strength of 56Kv meets IEEE 1493.
- **Proven:** Approved by medium voltage cable manufacturers.

All-Around Electrical Cleaning Solution

Polywater® Type RP™ Rapid Power medium voltage cable cleaner evaporates quickly without the health and safety issues of other volatile cable cleaners. Type RP is packaged several ways to make cleaning and maintenance safer and easier.

Lint-free wipes leave no residue

Catalog # RP-16

Removing transformer oil residue

Type RP package options

Type RP Makes Cleaning Effortless

The PEL-PAC single wipes are lint-free and saturated with the optimal amount of solvent for the job. The RP-1L wipes easily fit into tool bags, nose bags, and splicer tool buckets. Prepackaged wipes ensure the use of a lint-free towel, limit the solvent exposure, eliminate waste, and properly prep the cable. Using too much solvent to clean cables can result in pooling of the solvent, potentially causing tracking failure.

The RP-16 aerosol is best suited for cleaning busbars, transformer oils, switchgear, meters, and electric motors. The versatile RP-16 also satisfies numerous other degreasing needs.

POLYWATER TYPE RP

Catalog #	Package Description	Units/Case
RP-1	Saturated 5” x 8”/12 cm x 20 cm wipes	96
RP-1L	Saturated 8” x 12”/20 cm x 30 cm wipes	144
RP-P63	6 - Type RP cleaning wipes (cat # RP-1) 3 - strips of sanding cloth 1 - instruction sheet	12
RP-16	16 fl. oz. aerosol can (475 mL)	12

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatible:** Meets the standard electrical utility test requirements based on IEEE 1493 cable cleaning standard.
- **Dielectric Strength:** >56KV at a 100-mL gap per ASTM D877 standard test method.
- **Flashpoint:** >19°F (60°C) per ASTM D93 standard test method.
- **Residue:** <100 ppm per ASTM D2369 standard test method. Leaves no residue.

CONTACT US

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American Polywater® Corporation

11222 60th Street N | Stillwater, MN 55082 USA

Type RP™
Rapid Power Cleaner

American Polywater® Corporation

TECHNICAL DATA SHEET

Description:

Type RP™ Cleaner effectively cleans semi-conducting cable shield, corrosion inhibiting compound, silicone greases, filling gels, transformer oils and many other contaminants found in electrical construction and maintenance.

Type RP™ Cleaner evaporates quickly and does not leave a residue. Type RP™ has excellent dielectric properties and is non-conductive. Type RP™ Cleaner is compatible with most materials and plastics, including polycarbonate.

Type RP™ Cleaner is available in convenient pre-saturated towelettes. Use of individual towels limits solvent exposure and eliminates spill hazard.

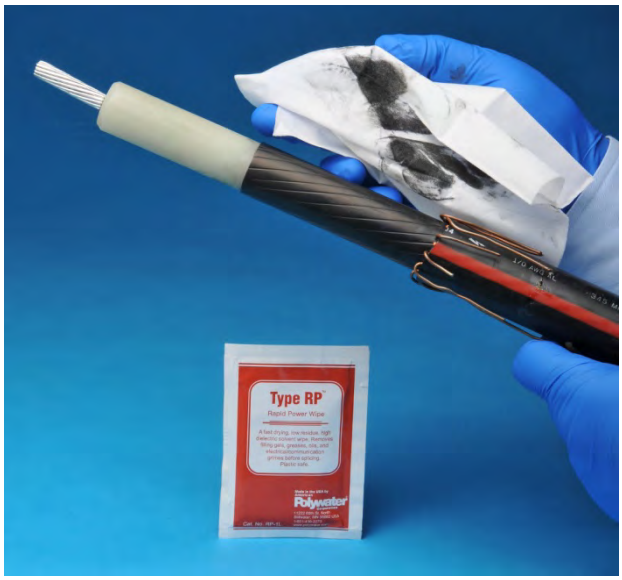
Cleaning Properties:

Type RP™ Cleaner meets IEEE 1493 performance criteria[1]. It effectively cleans semi-conducting cable shield. A towel saturated with cleaner quickly removes the compound and becomes visibly black. Type RP™ Cleaner dissolves a broad range of contaminants.

Type RP™ Cleaner has excellent solvency across a broad spectrum of grimes. Contaminant grease is spread onto a polyethylene plaque with 6 mm thick ribbons. The plaque is immersed in RP™ Cleaner and agitated. Cleaning time is noted.

Contaminant	Cleaning Time
Silicone Grease, DC #4	<60 seconds
Dielectric Oil	<30 seconds
Hydrocarbon Grease	<30 seconds
Aluminum Oxide Grease	<60 seconds

[1] Tested using methods from IEEE 1493, "Guide for the Evaluation of Solvents Used for Cleaning Electrical Cables and Accessories."



Type RP™ Rapid Power is fast evaporating and effective

Product Benefits:

- Fast Evaporation
- Excellent Solvency
- No Residue
- Non-Conductive
- Contains No Chlorinated Solvents
- Compatible with Most Plastics and Rubbers

End Use:

- Splicing and Terminating Cables
- Cleaning Relays, Generators, Motors, Circuit Boards and other Electrical Equipment
- Maintaining Transformers and Switch Gear
- Preparing Surfaces for Adhesives, Sealants and Tapes

Performance Properties:

Property	Result
Cleaning Effectiveness	Excellent
Dielectric Strength 100 mil gap (ASTM D877):	56 KV
Evaporation Rate	Fast (similar to alcohol)
Residue (ASTM D2369)	<100 ppm (None)

Usage Directions:

To prepare cable for splice, buff the insulation with the abrasive strip to remove any conductive material remaining on the insulation. The surface should be smooth with no particle contaminants.

Clean the cable insulation with the Type RP™ Cleaning Wipe. Wipe away from the conductor towards the insulation shield. Turn the solvent towelette after each wipe, using a fresh portion of the towel each time. It is important not to wipe material from the insulation onto the insulation shield. Do not wipe the insulation shield. RP™ Cleaning Wipes can also be used to clean the cable jacket for improved adhesion of mastics and tapes used in splicing and termination.

For general electrical cleaning, follow manufacturers' instruction. RP™ Cleaning Wipes are fast evaporating. Do not open until ready to use.

Environmental Impact:

Type RP™ Cleaner is a safer alternative to chlorinated solvents.

Property	Result
VOC Content	720 grams/liter
Global Warming Potential	Does not contain global warming compounds
Ozone Depletion Potential	None
CFC, HCFC, HFC Content:	None
RCRA	Not regulated as hazardous waste
CERCLA/SARA Status	Not regulated as a hazardous substance

Safety:

Type RP™ Cleaner has a low level of toxicity and does not contain any listed carcinogens. It is flammable and should not be exposed to fire or flame. Towelette package limits hazard. Good industrial hygiene practice and appropriate precautions should be employed during use. See SDS for specific details.

PEL-PAC® System

Type RP™ Cleaner pre-saturated towelettes are a convenient package with multiple safety benefits.

Control
Pre-saturated wipes minimize solvent exposure on sensitive electrical parts. Directly spraying or immersing the part allows the solvent to puddle into small openings. Wipe cleaning will also ensure that the solvent evaporates more quickly.

Safety
The pre-saturated towelette package eliminates spill hazard and limits solvent vapor exposure. Wipes contain a carefully measured quantity of solvent and are an excellent way to control vapor. Type RP™ Cleaner pre-saturated towelettes are a great choice for underground or confined space applications.

Convenience
Each PEL-PAC® package utilizes non-linting, non-tearing towels. Clean wipes are always available, eliminating recontamination of parts with dirty rags.

Convenient pre-saturated towelettes (RP-1L, RP-1) control solvent exposure.

Physical Properties:

Type RP™ Cleaner is a high-purity solvent with low aromatic content.

Property	Result
Flashpoint (ASTM D93)	19°F (-7°C)
Initial Boiling Point	144°F (62°C)
Specific Gravity	0.72

Compatibility:

Type RP™ Cleaner is compatible with most plastics and rubbers. It meets standard electrical utility test requirements based on IEEE 1493.

Plastic Materials - LLDPE
LLDPE jacket material immersed in Type RP™ Cleaner retains tensile and elongation characteristics and shows minimal weight change[1].

Rubber Materials – EPDM and Silicone Rubber
Platen samples of EPDM and Silicone Rubber immersed in Type RP™ Cleaner retain tensile and elongation characteristics and show minimal weight change[1].

Volume Resistivity of Cable Insulation Shield
Cables with either XLPE or EPR insulation show acceptable volume resistivity values after immersion in Type RP™ Cleaner [1]. After exposure to the cleaner, volume resistivity measurements return to control levels.

Corrosivity:
Type RP™ Cleaner will not corrode or stain metal parts. It does not tarnish or corrode copper[2].

Polycarbonate:
Injection-molded plaques of polycarbonate are cut into bars, and bent in a three-point fixture. “Strain limit” is the greatest percent strain where no stress cracking occurs. A strain limit greater than 0.5% indicates strain resistance.

Strain Limit > 0.5% (Stress Crack Resistant)[3]

[1] Tested using methods from IEEE 1493, “Guide for the Evaluation of Solvents Used for Cleaning Electrical Cables and Accessories.”

[2] Testing based on ASTM D130, “Standard Test Method for Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test.”

[3] Testing based on Mobay Corporation, Plastics and Rubber Division, “Chemical Compatibility Test for Unreinforced Thermoplastic Resins, 1989.”

Soak Testing:

Materials are immersed in Type RP™ Cleaner for 7 days at 22°C (72°F). Some rubbers will swell, but should return to their original state once the cleaner evaporates. Wipe cleaning minimizes solvent exposure.

Plastics	% Weight Change	Appearance
ABS	+4.09	NC
Acrylic	+0.59	SS
Delrin®	+0.07	NC
Epoxy	+1.77	NC
Nylon 66	+0.16	NC
Nylon 101	+0.14	NC
Polycarbonate	+0.09	NC
Phenolic	+6.64	NC
Noryl	+0.63	NC
PVC	+0.43	NC
Teflon®	+0.01	NC
Tygon®	-1.26	NC
Ultem® 1000	-0.04	NC
Valox® 420	+0.01	NC
HDPE	+2.39	NC
LDPE	+4.95	NC
SAN	+0.00	NC

Elastomers	% Weight Change	Appearance
Neoprene®	-12.48	H
Nitrile	-4.93	NC
SBR	-9.15	NC
Viton®	+2.52	NC
Natural Rubber	+0.25	NC
EPDM	-26.56	H

KEY:

NC = No Change
S = Swelling
ES = Extreme Softening
C = Crazing
SS = Slight Swelling
H = Hardens

Testing based on ASTM D543, “Standard Test Method for Resistance of Plastics to Chemical Reagents.”

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The cleaner shall not leave a residue. The cleaner shall not significantly affect the volume resistivity of Union Carbide 0691 XLPE cable insulation shield. The cleaner shall show a voltage withstand of at least 40 kV before breakdown.

The cleaner shall not significantly affect the tensile and elongation properties of XLPE, silicone rubber, and EPDM rubber when tested to guidelines proposed in IEEE P1493. When wiped over an XLPE (Union Carbide Type 0691) insulation shield, a clean towel wetted with the cleaner shall become visibly "black" with two wipes over 2-inches of cable length with light hand pressure.

The cleaner shall not be a carcinogen or listed by CERCLA as a hazardous waste. It shall not be on the EPA Phase I or Phase II list of banned or phased-out chlorofluorocarbons.

Order Information:

Cat #	Package Description
RP-1	Single, saturated towelette (5"X8") 96/case
RP-1L	Single, slightly saturated towelette (8"X12") 144/case
RP-P63	Cable Preparation Kit includes: 6 RP-1 wipes 3 Strips 120-grit, non-conductive aluminum oxide sanding cloth 1 Instruction card 12/case
RP-16	16 fl. oz (475ml) aerosol can 12/case

LIT-RPTECHSPEC/REV001

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ Software

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Polywater® Type FD™

HIGH VOLTAGE ELECTRICAL CLEANER

Spraying onto a Polywater lint-free towel

Fast-Drying Cleaner for General Electrical and Industrial Use

PRODUCT BENEFITS

- **Fast Evaporating:** Saves time and ensures moisture doesn't compromise the splice.
- **Multipurpose:** One cleaning solvent for routine maintenance and electrical services.
- **Compatible:** Will not corrode or stain metal. Safe to use with most plastics.
- **Variety of Packaging:** To meet different end uses.
- **Non-Conductive:** Will not short across typical electrical voltages.

Versatile Cleaner with Excellent Properties

FD™ Electrical Contact Cleaner is a fast-drying, multipurpose cleaner. FD cleans everything from bus bar to splices and terminations. Approved by medium and high voltage cable manufacturers. FD removes semicon residue, adhesive, silicone grease, anti-oxidants, and contaminants. FD leaves no residue.

Refillable spray bottles

Polywater® DT-69 lint-free towelette

polywater.com | 651-430-2270

American Polywater® Corporation

Refillable solvent resistant packaging

FD packaging

Field-Friendly Packaging

FD Electrical Cleaner evaporates with no residue. It is excellent for cleaning contacts, meters, communication radios, and medium voltage cable during the terminating process. For precision cleaning (residue-free use), prevent recontamination with existing grime by finishing with a fresh wipe, spraying until the solvent runs clear, or rinsing in a fresh bath of FD cleaner. FD is fast evaporating and requires no forced air to dry. In areas where solvent has pooled, wipe the part with an absorbent, lint-free towel.

POLYWATER FD

Catalog #	Package Description	Units/Case
FD-9	9 net wt. oz. (255 g)	12
FD-35LF	1-qt. bottle with flip top (0.95 liter)	12
FD-128	1-gal. can (3.8 liters)	4
FD-640	5-gal. pail (18.9 liters)	1
FD-DRUM	55-gal. drum (208 liters)	1

SPECIFICATIONS AND APPLICATIONS:

- **Cable Compatible:** FD Electrical Contact Cleaner will not corrode or stain metal parts. It does not tarnish or corrode copper per ASTM D 130 and D 1729.
- **Dielectric Strength:** 36 KV per ASTM D 877 standard test method.
- **Flashpoint:** ~20˚F (-5˚C) per ASTM D 56 standard test method.
- **Residue:** <100 ppm per ASTM D 2369 standard test method. Leaves no residue.

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 LIT-TYPEFDFLYER/REV000

American Polywater's

Technical Bulletin

FD™

Electrical Contact Cleaner

A Fast-Drying Cleaner for General Industrial and Maintenance Use

Description

FD™ Electrical Contact Cleaner is a fast drying, multi-purpose industrial and maintenance cleaner. It replaces ozone-depleting CFC's, trichloroethane, HCFC's, perchloroethylene and other carcinogenic chlorinated solvents. FD™ Electrical Contact Cleaner effectively dissolves industrial grimes, greases, lubrication fluids, silicone, tars, adhesives, and fluxes.

FD™ Electrical Contact Cleaner evaporates quickly without a residue. It is suitable for use in electrical maintenance as a replacement for 1,1,1-trichloroethane. Transformer oils, corrosion inhibitor compounds, silicone grease, semi-conducting paints, and many other kinds of electrical grime clean up quickly with Type FD™ Cleaner.

Typical Physical Properties

Dielectric Strength (ASTM D877)	36 KV
Relative Evaporation Rate	Fast
Residue (ASTM D 2369)	< 100 ppm
Flashpoint (ASTM D 56)	~ 20°F/-5°C
Initial Boiling Point	141°F/60°C
Specific Gravity	0.69
Percent Aromatics	< 0.1%
Propellant (aerosol only)	CO_2
Cleaning Strength	Excellent

Advantages

- Multiple packages to fit different end uses
- Fast evaporating
- Good general solvency power
- One cleaner for many needs
- Contains no CFC's or HCFC's
- Contains no chlorinated solvents
- Harmless to most plastics
- Non-conductive, non-corrosive, non-staining

FD™ Electrical Contact Cleaner aerosol (cat. # FD-9) has a variable spray head (low, medium, high) for better spray control.

Usage Directions/Performance

FD™ Electrical Contact Cleaner is suitable for many types of cleaning and degreasing, including contact cleaning and electrical maintenance cleaning. It can be used as a spray, wipe, or solvent rinse. FD™ Cleaner is effective at room temperature. It does not freeze and can be used in cold weather applications. FD™ Electrical Contact Cleaner is authorized by the USDA for use in federally inspected meat and poultry plants.

FD™ Cleaner has good solvency power. Cleaning time and effectiveness will vary based on the contaminant and cleaning method. Wiping or agitation speeds the cleaning. Experiment with your particular contaminant and conditions.

A comparison of FD™ Cleaner to other solvent types is charted below. A stainless steel surface is coated with 50 mils of contaminating compound. The surface is immersed and lightly agitated in FD™ Cleaner. The time at which the contaminant has dissolved is noted.

Silicone Electrical Insulating Compound	
Cleaner	**Cleaning Time**
FD™ Electrical Contact Cleaner	<2 Minutes
Odorless Mineral Spirits	5 Minutes
Isopropyl Alcohol	>5 Minutes

Hydrocarbon Lubricating Grease	
Cleaner	**Cleaning Time**
FD™ Electrical Contact Cleaner	<3 Minutes
Odorless Mineral Spirits	>5 Minutes
Isopropyl Alcohol	>>5 Minutes

Cable Filling Grease (PE/PJ)	
Cleaner	**Cleaning Time**
FD™ Electrical Contact Cleaner	5 Minutes
Odorless Mineral Spirits	>5 Minutes
Isopropyl Alcohol	>>5 Minutes

Oxide Inhibiting Compound	
Cleaner	**Cleaning Time**
Type FD™ Cleaner	<1 Minutes
Odorless Mineral Spirits	<2 Minutes
Isopropyl Alcohol	>>5 Minutes

FD™ Electrical Contact Cleaner contains no surfactants and leaves no residue once dried. For precision cleaning (residue free use), prevent recontamination with existing grime by finishing with a fresh wipe, spraying until the solvent runs clear, or rinsing in a fresh bath of FD™ Cleaner.

FD™ Electrical Contact Cleaner is fast evaporating and does not require forced air to dry. In areas where solvent has pooled, the part may be wiped with an absorbent, lint-free towel.

Evaporation Rate

FD™ Electrical Contact Cleaner:	40 mg/min.
111 Trichloroethane:	50 mg/min.
Perchloroethylene:	20 mg/min.
Isopropyl Alcohol:	10 mg/min.
Odorless Mineral Spirits:	.3 mg/min.

Compatibility

FD™ Electrical Contact Cleaner will not corrode or stain metal parts. It does not tarnish or corrode copper per ASTM D130 and D1729.

FD™ Electrical Contact Cleaner is compatible with most plastics and elastomers. Tables I and II show the effect of FD™ Cleaner on various plastics and rubbers.

Testing, shown in charts I and II, is based on a soak test described in ASTM D543. FD™ Cleaner may temporarily swell some rubber compounds. These rubbers should return to their original state after the cleaner has evaporated. Immersion will affect sensitive materials more than incidental contact of a spray or wipe. It is recommended that all plastic parts, gaskets, seals and O-rings be tested for specific use and exposure method.

FD™ Solvent Compatibility with Plastics and Elastomers

TABLE I

PLASTICS	AGING 72 HOURS AT 50°C		
	% WEIGHT CHANGE	% THICKNESS CHANGE	APPEARANCE
ABS	+0.81	0	NC
Acrylic	+0.06	+0.15	NC
CPE Thermoplastic	+6.49	0	NC
CPE Thermoset	-6.51	0	NC
Delrin®	+0.24	0	NC
Epoxy	+0.08	0	NC
Nylon 101	+0.70	+0.27	NC
Polycarbonate	+0.18	0	NC
Phenolic	+6.99	+9.00	NC
Polyethylene	+12.46	+3.78	NC
Polystyrene	+31.49	+33.12	SF
PVC	-0.03	0	NC
Teflon®	+0.07	0	NC
Tygon®	-0.17	+6.62	NC
Ultem® 1000	-0.08	+0.27	NC
Valox® 420	+0.10	+1.12	NC

TABLE II

ELASTOMERS	AGING 72 HOURS AT 50°C		
	% WEIGHT CHANGE	% THICKNESS CHANGE	APPEARANCE
EPDM	+100.88	+37.15	S
Neoprene	+2.36	+2.72	NC
Nitrile	+2.00	+5.26	NC
SBR	+16.96	+31.53	SS
Silicone	+65.97	+47.50	S
Viton®	+1.98	+4.43	NC

KEY:
NC = NO CHANGE
S = SWELLING
SS = SLIGHT SWELLING
SF = SOFTENING

FD™ Cleaner is a trademark of American Polywater Corporation
Delrin®, Teflon®, and Viton® are trademarks of Du Pont
Ultem® 1000 and Valox® 420 are trademarks of G.E. Plastics
Tygon® is a trademark of Norton Performance Plastics

Safety

FD™ Electrical Contact Cleaner has a low level of toxicity. As with any solvent, ventilation should be sufficient to keep vapors at safe levels. Avoid eye contact and excessive skin contact. Wash hands with soap and water after using.

FD™ Electrical Contact Cleaner is an extremely flammable liquid. It should not be used on energized equipment. FD™ Electrical Contact Cleaner should not be used for high temperature cleaning or exposed to pilot lights, flames or heated surfaces. Good industrial hygiene practice and appropriate precautions should be employed during use. See MSDS for specific details.

Storage

FD™ Electrical Contact Cleaner is classified as flammable. Keep containers cool, dry and away from sources of ignition and oxidizing materials. Do not expose aerosol cans to direct sunlight or temperatures above 120°F. Do not puncture or incinerate aerosol cans.

Package Options

Catalog No.	Description
FD-9	9-wt. oz. aerosol with adjustable nozzle (16 oz can) (12/cs)
FD-16LF	16-fl. oz. bottle with flip top (12/ cs)
FD-35LF	1-quart bottle with flip top (12/cs)
ST-R	Trigger sprayer fits pt. & qt. Bottles (12/cs)
FD-128	1-gallon can (4/cs)
FD-640	5-gallon pail (1 ea).
FD-Drum	55-gallon drum (1 ea)

LIT-FDTECHB/4-03/C1000(8/04)

Makers of Polywater® and Dyna-Blue® Cable Lubricants and Pull-Planner™ 2000 Software

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Polywater® Cable Preparation

CABLE PREPARATION PRODUCTS

Lint-free towels are critical for terminations

Precision Accessories that Safeguard Electrical Reliability

PRODUCT BENEFITS

- **Non-Conductive:** SP-ROLL leaves no conductive grit that could lead to tracking or arcing.
- **Durable:** SP-ROLL resists shredding and helps to evenly "pencil" semicon layer.
- **Convenient:** Snip the SP-ROLL for desired amount. Eliminates waste.
- **Versatile:** Use DT towels to apply bulk Polywater® cleaners.
- **Non-Linting:** DT towels leave no residue that could lead to tracking.

Eliminate Residue and Tracking Exposure

SpliceMaster® 120-grit, non-conductive, aluminum oxide sandpaper rolls (SP-ROLL) are used to remove semi-con shield residue and jacket polymers from cable insulation during splicing. SpliceMaster non-linting towels (DT-69 & DT-1212) contain no fiber binding adhesives and won't leave a residue.

Catalog # SP-ROLL

Cable prep using the DT-69

Bulk cleaning using DT-1212

Packages designed for mobility

Accessories for Safer Electrical Cleaning

The Polywater Cleaning/Drying Wipes (DT-69 and DT-1212) are made from a creped, highly absorbent, non-woven material. These non-linting, non-tearing, and non-snagging wipes have many uses beyond cable cleaning. SpliceMaster Sandpaper Rolls contain 50 yards of 1-inch wide, flexible, 120-grit, non-conductive aluminum oxide sanding cloth. Deposits can lead to tracking or arcing and must be removed prior to splicing electrical cable.

POLYWATER MEDIUM VOLTAGE ACCESSORIES

Catalog #	Package Description	Units/Case
SP-ROLL	1-inch x 50-yard roll of 120-grit sanding cloth	1
DT-69	Box with 200 – 6” x 9” dry wipes	1
DT-1212	Box with 100 – 12” x 12” dry wipes	1

SPECIFICATIONS AND APPLICATIONS:

- **Performance:** Specification-grade Polywater DT lint-free wipes contain no fiber-bonding adhesives and out-perform other commercially available towels. The use of rags or other non-specified wipes can leave lint residues on cable insulation that cause tracking. Bonding adhesives can dissolve in solvent, redeposit on cable insulation, and lead to failure. Recycled rags may also contain oils or other contaminants that can then be deposited onto the insulation.
- **Compatibility:** Only non-conductive sanding materials such as spec-grade Polywater SP-ROLL should be used. Emery cloth and standard store-bought sandpapers and abrasives can leave conductive grit residues that could lead to cable failure and hazardous conditions. Never abrade an energized cable.
- **Specify:** The key to a good splice and creating a reliable utility system is to use recommended materials and follow the proper procedures. Specify Polywater’s DT dry towels and SP-ROLL to ensure that conforming products are used in the field.

CONTACT US

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American Polywater® Corporation

11222 60th Street N | Stillwater, MN 55082 USA

Polywater® Type P7™

PENETRATING OIL

P7 protects locking mechanisms

Multi-Functional Penetrating Oil for Electrical and Industrial Use

PRODUCT BENEFITS

- **Protects:** Extends equipment life by providing a protective film.
- **Displaces Water:** Seals out moisture and dries out ignitions.
- **Penetrates:** Loosens stuck metal parts and apparatus.
- **Safe:** Harmless to most plastics and safe on metal, paint, and rubber.
- **Non-Conductive:** Leaves a protective film that is non-conductive.

Lubricate, Safeguard, and Maintain Field Apparatus

Type P7™ Penetrating Oil is suitable for all kinds of electrical, industrial, and telecommunication uses. Type P7 works four ways: as a moisture displacer, rust preventative, lubricant, and penetrating oil. P7 eliminates the need to carry multiple products for separate tasks.

Liberally apply P7 to loosen

Nozzle precisely directs P7

polywater.com | 651-430-2270

American Polywater® Corporation

Loosening pole line bolts

Catalog # P7-12

One Product for Multiple Jobs

P7 Penetrating Oil is excellent for preventing electrical disruption caused by moisture penetration. P7 is ideal for pole line hardware, transformers, connectors, circuit breakers, controls, chucks, relays, communication assemblies, motors, starters, cabinets, and enclosures. P7 penetrates quickly to loosen stuck or frozen parts. Use P7 to maintain and lubricate equipment and motors. Service crews utilize P7 for maintaining substations, wind farms, solar arrays, and DOT apparatus. It displaces moisture, which is critical to restoring electrical or electronic equipment systems damaged by water ingress. Refer to our storm damage restoration procedure below for more information on the proper way to bring electrical systems back online after flooding.

POLYWATER PR

Catalog #	Package Description	Units/Case
P7-12	16-oz. aerosol can (475 mL)	12

SPECIFICATIONS AND APPLICATIONS:

- **Properties:** Flashpoint (ASTM D93) 100˚F/38˚C, Initial Boiling Point 245˚F/118˚C, Specific Gravity 0.69, Dielectric Strength (ASTM D877) 13 KV, USDA Approved.
- **Compatibility:** P7 Multipurpose Oil is compatible with most plastics and elastomers. Testing is based on a soak test described in ASTM D 543. P7 Oil will temporarily affect some rubber compounds, but they should return to their original state after the solvent carrier has dried. It is recommended that all plastic parts, gaskets, seals, and O-rings be tested for specific use and exposure method.
- **Water Displacement:** P7 Multipurpose Oil displaces moisture and dries out ignitions. It creeps under water and ice, dissolving and carrying away these contaminants. A non-conductive, protective film is left behind. P7 Oil displaces water according to the procedure described in Mil-Spec C-16173E. No rusting or mottling was observed on the treated surface.
- **Storm Restoration Procedure:** www.polywater.com/wp-content/uploads/pdf/LIT-STORM-DAMAGE-10-05.pdf

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 LIT-P7FLYER/REV000

Technical Bulletin

American Polywater's

P7™

Multipurpose Oil

Multipurpose Penetrating Oil for Industrial and Electrical Use

Description

P7™ Multipurpose Oil is suitable for all kinds of electrical and industrial uses. P7™ Oil cleans dirt and grime, loosens rust and scale, and penetrates frozen parts. Use it to maintain and lubricate equipment.

P7™ Multipurpose Oil is multi-functional. It cleans, penetrates, and lubricates to extend equipment life. P7™ Oil also acts as a moisture displacer and corrosion inhibitor. It drives out moisture and dries wet connections, leaving a protective film which is non-conductive.

Advantages

- Lubricates Moving Parts
- Frees Stuck Parts
- Protects Against Rust and Corrosion
- Displaces Moisture
- Removes Grime and Rust
- Film is Non-Conductive
- Harmless to Most Plastics
- Safe on Metal, Paint, & Rubber
- Contains No CFC's or Chlorinated Solvents
- Silicone-Free
- Cleans Tar, Grease, Rust, and Adhesives

Properties

Flashpoint (ASTM D93)	100°F/38°C
Initial Boiling Point	245°F/118°C
Specific Gravity	0.69
Dielectric Strength (ASTM D877)	13 KV
Relative Evaporation Rate	Fast
Propellant	Hydrocarbon
USDA	Approved

P7™
Multipurpose Oil Aerosol (cat. # P7-12) penetrates into tight spots and frees stuck parts.

Penetration and Cleaning

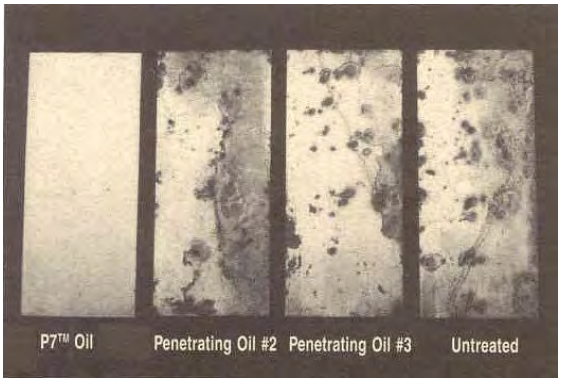
P7™ Multipurpose Oil cleans grease and tars and removes adhesives and rust. Other solvent cleaners are not necessary. P7™ Oil dissolves grit and grime contaminants, leaving behind a fine protective film.

P7™ Multipurpose Oil has a low surface tension, which allows it to spread into a very fine film. One 12-ounce can of P7™ Oil will cover approximately 300 square feet of surface. This low surface tension allows P7™ Oil to "creep" up surfaces against gravity. It will penetrate and coat 16mm of a threaded bolt in 15 minutes. P7™ Multipurpose Oil will lubricate tight crevices and loosen frozen parts.

Protection and Corrosion Prevention

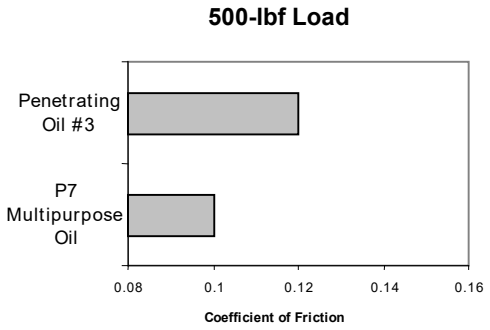
P7™ Multipurpose Oil offers superior corrosion protection by leaving a non-conductive film. This long-lasting film increases service life.

The photo below shows the results of a three-week outdoor weathering test run on low carbon steel. The plates were sanded, cleaned, and saturated with various penetrating oils. The steel plates were left in the elements, untouched for three weeks. P7™ acts as a tough, protective barrier; the steel plate has no rusting or mottling at the conclusion of the test.



Lubrication

P7™ Multipurpose Oil is an exceptional lubricant. The coefficient of friction can be determined using the Falex Pin and Vee Block Test Machine (ASTM D3233A). Load is applied to two V-blocks which press against a rotating steel journal immersed in the oil. The coefficient of friction value is derived from the torque measurement on the pin. The more the penetrating oil lubricates and lowers the torque, the lower the resulting coefficient of friction. Results documented in the following chart show that P7™ has a significantly lower coefficient of friction than another commonly used multipurpose oil.



Extreme pressure testing using the Pin and Vee Block Test Machine confirms P7™ Oil's excellent performance under high loads. The test will run to a load force of over 1,000 pounds before failure.

Water Displacement

P7™ Multipurpose Oil displaces moisture and dries out ignitions. It creeps under water and ice, dissolving and carrying away these contaminants. A non-conductive, protective film is left behind. P7™ Oil displaces water according to the procedure described in Mil-Spec C-16173E. No rusting or mottling was observed on the treated surface.

Compatibility

P7™ Multipurpose Oil is compatible with most plastics and elastomers. Tables I and II show the effect of P7™ Oil on various plastics and rubbers.

Testing is based on a soak test described in ASTM D 543. P7™ Oil will temporarily affect some rubber compounds. These rubbers may swell, but should return to their original state after the solvent carrier has dried. Immersion will affect sensitive materials more than incidental contact of a spray and wipe. It is recommended that all plastic parts, gaskets, seals and O-rings be tested for specific use and exposure method.

P7™ Compatibility with Plastics and Elastomers

TABLE I

PLASTICS	AGING 72 HOURS AT 50°C		
	% WEIGHT CHANGE	% THICKNESS CHANGE	APPEARANCE
ABS	+0.04	+0.79	NC
Acrylic	-0.02	-0.04	NC
CPE Thermoplastic	+16.10	+4.27	NC
CPE Thermoset	+22.12	+20.99	SS
Delrin®	+0.17	+0.25	NC
Epoxy	-0.05	0	NC
Nylon 101	-0.08	-1.57	NC
Polycarbonate	-0.03	-0.59	NC
Phenolic	+1.24	0	NC
Polyethylene	+14.19	+5.44	NC
Polystyrene	+13.85	-3.64	SF
PVC	+0.06	0	NC
Teflon®	+0.07	-0.25	NC
Tygon®	+4.95	0	NC
Ultem® 1000	-0.08	-0.27	NC
Valox® 420	+0.03	-1.11	NC

TABLE II

ELASTOMERS	AGING 72 HOURS AT 50°C		
	% WEIGHT CHANGE	% THICKNESS CHANGE	APPEARANCE
EPDM	+149.56	+43.77	S
Neoprene	+26.64	+9.79	SS
Nitrile	+1.06	0	NC
SBR	+52.48	14.36	S
Silicone	+48.04	+17.87	S
Viton®	+0.56	+0.26	NC

KEY:

NC=NO CHANGE
SS=SLIGHT SWELLING
SF=SOFTENING
S=SWELLING

Usage Directions

Position nozzle 6 to 8 inches (15-20 cms) from surface and spray with light even strokes. Use extension tube for difficult to reach areas. Let P7™ Oil soak for several minutes to loosen rusted parts. Allow 4 to 6 hours to fully dry. P7™ Multipurpose Oil leaves a non-conductive, protective film.

Safety

P7™ Multipurpose Oil has a low level of toxicity. Avoid breathing spray, mist, or vapor. As with any solvent, ventilation should be sufficient to keep vapors at safe levels.

P7™ Multipurpose Oil is combustible. Do not expose to fire or flame. Good industrial hygiene practice and appropriate precautions should be employed during use.

Storage

P7™ Multipurpose Oil is classified as combustible. Keep containers cool, dry and away from sources of ignition and oxidizing materials. Do not expose aerosol cans to direct sunlight or temperatures above 120°F (50°C). Do not puncture or incinerate aerosol cans. Aerosol cans are freeze/thaw stable. This product has a shelf life of three years.

Package Options

Catalog No.	Description
P7-12	10-wt. oz. aerosol can in 16 oz can

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LIT-P7TECHB/REV000)

Polywater® Type CG™

COLD GALVINIZING SPRAY

Protect ferrous metals

For Weld Coating, Metal Protection, and Repair

PRODUCT BENEFITS

- **Protects:** Coating contains 95% pure zinc to prevent rust and corrosion.
- **Repair:** Touch up damaged or exposed galvanized surfaces.
- **Universal:** Can be used on all ferrous-based metals.
- **Efficient:** Nozzle minimizes drips and dries quickly.
- **Safe:** Compatible with plastics and carcinogen free.

Actively Fights Corrosion and Rust

Type CG™ Cold Galvanize is an industrial aerosol coating for metal protection and repair. Type CG contains 95% pure zinc. When sprayed on metal it forms a zinc-rich coating that prevents rust and inhibits corrosion through sacrificial galvanic action.

Coats evenly to combat corrosion

Immediately cold galvanizes

polywater.com | 651-430-2270

American Polywater® Corporation

Catalog # CG-13

Protecting Surfaces Effortlessly

Type CG aerosol offers easy on-the-job application and is ideal as a primer or for touch-up. Numerous applications for the electrical utility, waste water treatment, petro-chemical, manufacturing, and pulp and paper industries. Suggested uses: pole line hardware, conduit, trailers, threads, cut steel apparatus, fasteners, brackets, panels, cabinets, and welds. The nozzle does not gum up and plug as easily as other cold galvanizing sprays on the market.

POLYWATER CG

Catalog #	Package Description	Units/Case
CG-13	13 net wt. oz. (369 g)	12

SPECIFICATIONS AND APPLICATIONS:

- **Mil Specifications & Certifications:** P-26915A: Type 1 Class A primer for Steel (USAF); DOD-21035A: Zinc Rich Galvanize Repair; P-46105: Weld through Zinc Rich Primer; Salt Fog: Pass 1,000 Hours (ASTM B117); Humidity: Pass 500 Hours (ASTM D2247).
- **Temperature Resistance:** 250˚F (121˚C)—Sustained, 300˚F (149˚C)—Intermittent.
- **Surface Preparation:**
  New Steel: Surface must be dry and free of contamination. Remove all weld splatter and grind all rough welds to a smooth contour. For severe exposure (immersion, chemical, etc.) near-white blast clean per SSPC SP 10-63T. For other exposures, blast clean per SSPC SP 6-63 to a maximum profile of 1.5 mils (.038mm).
  Previously Painted Surfaces: Must be free of oil, grease, and other contamination. For best results, spot blast exposed areas to be coated. Power tool brushing may be used for minor touch-up.
- **Usage Instructions:** Surface shall be dry, 5˚F (3˚C) above the dew point, with air temperatures greater than 50˚F (10˚C). Surface must be free of rust bloom. Shake can vigorously until agitator frees. Spray using light, even strokes about 18 inches (½ meter) from surface. Several thin coats are recommended. Allow 15 minutes drying time between coats. Final coat should dry thoroughly (up to 24 hours). To avoid clogging nozzle, invert can and spray until only air escapes.

CONTACT US

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 LIT-CGFLYER/REV000

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July 27, 2004

Specification
CG™ Cold Galvanize
(CG-13)

CG™ Cold Galvanize is an organic zinc rich coating for steel and ferrous metals that combines the resistance properties of an epoxy and the galvanic properties of zinc. This high performance epoxy compound fuses zinc to the metal substrate and protects against corrosion equal to Hot Dip Galvanizing. CG™ Cold Galvanize is self-healing and prevents creepage even when the surface has been penetrated or scratched. After curing, CG™ Cold Galvanize may be coated with conventional primers and finishes.

FEATURES

- 95% Organic Zinc in Dry Film
- Long Term Corrosion Protection
- Meets Mil Specifications

SPECIFICATIONS	
Appearance	Gray/Matte Finish
Coverage	10 – 15 Square Feet per Aerosol Can (CG-13)
Dry Film Thickness	1.0 to 3.0 mils (.025mm - .075mm)
Zinc Content	95% in Dry Film
Drying Time	To Handle – 30 minutes @ 70˚F (21˚C) To Topcoat – 3 hours @ 70˚F (21˚C)
Temperature Resistance	250˚F (121˚C) – Sustained, 300˚F (149˚C) - Intermittent
Weldable	Yes
Mil Specifications & Certifications	P-26915A - Type 1 Class A primer for Steel (USAF) DOD-21035A - Zinc Rich Galvanize Repair P-46105 - Weld through Zinc Rich Primer Salt Fog - Pass 1,000 Hours (ASTM B117) Humidity - Pass 500 Hours (ASTM D2247)

SURFACE PREPARATION

New Steel: Surface must be dry and free of contamination. Remove all weld splatter and grind all rough welds to a smooth contour. For severe exposure (immersion, chemical, etc.) near-white blast clean per SSPC SP 10-63T. For other exposures, blast clean per SSPC SP 6-63 to a maximum profile of 1.5 mils (.038mm).
Previously Painted Surfaces: Must be free of oil, grease, and other contamination. For best results, spot blast exposed areas to be coated. Power tool brushing may be used for minor touch-up.

PROPERTIES	
Specific Gravity	1.19
Solids by Weight	43%
VOC Lb/Gallon (Kg/L)	5.6 Lbs/Gallon (0.67Kg/L)
Flash Point	-156˚F (-104˚C) TCC for Aerosol
Shelf Life	24 months
APPLICATIONS	
Recommended Film Thickness	1.0 to 3.0 mils (.025mm - .075mm)
Cure Time	30 to 40 minutes. Air Dry

USAGE INSTRUCTIONS

Surface shall be dry, 5˚F (3˚C) above the dew point, with air temperatures greater than 50˚F (10˚C). Surface must be free of rust bloom. Shake can vigorously until agitator frees. Spray using light, even strokes about 18 inches (1/2 meter) from surface. Several thin coats are recommended. Allow 15 minutes drying time between coats. Final coat should dry thoroughly (up to 24 hours). To avoid clogging nozzle, invert can and spray until only air escapes.

CONTAINS

Zinc Dust (CAS 7440-66-6), 2-Butanone (CAS 78-93-3), Xylene, Mixed Isomers (CAS 1330-20-7), Ethyl Benzene (CAS 100-41-4), VMP Naptha-66 (CAS 64742-89-8) and Propane (CAS 74-98-6).

CAUTION

Keep away from Heat, Sparks, Open flames, Electrical equipment, etc. DO NOT MIX WITH WATER OR USE WATER FOR FIRE. (See MSDS Sheet).

Polywater® Grime-Away™

CLEANING WIPES

Grime-Away makes cleaning tools easy

Heavy-Duty Cleaning Wipes for Hand and Tool Cleaning

PRODUCT BENEFITS

- **Excellent Cleaner:** Removes the toughest grimes.
- **Approval:** Salisbury by Honeywell approved hand cleaning for compatibility with rubber-insulating gloves.
- **Field Friendly:** Easy to store in truck bins.
- **Double-Sided Towel:** Textured on one side for scrubbing and soft on the other for wiping.
- **Moisturize:** Softens hands while cleaning tools and surfaces. Will not dry out hands.

Superior Cleaning Power

Grime-Away™ Wipes can be used to clean hands, tools, equipment, transformers, service vehicles, and work surfaces. Easily removes anti-oxidant compounds, hydraulic fluid, cable gels, dirt, silicone greases, adhesives, caulk, C-Cement, tar/asphalt, transformer oils, and more.

Removes contaminants that damage gloves

Cleans up PVC pipe cement

polywater.com | 651-430-2270

American Polywater® Corporation

Clean tools for better operation

Catalog # HTC-D72

Available in Single Wipes or the 72-Count Container

Grime-Away is a unique water-based cleaner that will not defat hands and cause them to dry out like most other hand and tool cleaners. Grime-Away is packaged in a multiple-use 72-count canister or individual wipes that store easier in tool pouches or lineman bags.

POLYWATER GRIME-AWAY

Catalog #	Package Description	Units/Case
HTC-D72	Dispenser with 72 10" x 12"/25 cm x 30 cm premoistened wipes	6
HTC-1	Saturated 10" x 12"/ 25 cm x 30 cm wipes	144

SPECIFICATIONS AND APPLICATIONS:

- **Physical and Electrical Properties:** Tested and approved for compatibility with rubber-insulating gloves. Salisbury by Honeywell used their "Criteria for Evaluating Chemicals in Contact with Salisbury Natural Rubber Lineman Equipment" to determine the effect of Grime-Away on skin contact with insulating gloves. Salisbury approves Grime-Away for cleaning hands which then contact insulating gloves (not for use on the gloves themselves). Document available upon request.
- **Insulating Rubber Goods:** To clean rubber-insulating line hose, grounds, blankets, sleeves, and gloves use Polywater® Rubber Goods Cleaner.

CONTACT US

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American Polywater® Corporation

POLYWATER® GRIME-AWAY™

DESCRIPTION

Grime-Away™ Wipes can be used to clean hands, tools, equipment, transformers, service vehicles, and work surfaces. Easy to store in truck bins. Convenient and effective solution for general cleaning.

PHYSICAL PROPERTIES

PROPERTY	RESULT
Appearance (liquid)	Slightly cloudy emulsion
pH	Neutral
Specific gravity @ 25°C	0.98
Flash point	192°F (89°C)
VOC content	98 g/l

CLEANING EFFECTIVENESS

Grime-Away is an effective cleaner for a wide variety of grimes. It easily removes anti-oxidant compounds, hydraulic fluid, cable gels, dirt, silicone greases, adhesives, caulk, C-Cement, tar/asphalt, transformer oils, and more.

CLEANERS/MATERIALS CLEANED	CLEANING RESULT
Acrylic adhesives/sealants/caulks	Great/best cleaning
Antioxidant compounds	Great/best cleaning
Asphalt/tar	Great/best cleaning
Cable gels	Better than average cleaning
C-Cement	Average cleaning
Zinc anti-seize compounds	Great/best cleaning
Corrosion inhibitors	Great/best cleaning
Silicone adhesives/sealants/caulks	Better than average cleaning
Grease (heavy)	Great/best cleaning
Oil-based lubricant	Great/best cleaning
Cable filling greases	Better than average cleaning

COMPATIBILITY

Tested and approved for compatibility with Salisbury Class 2 Lineman Gloves using in-house test protocol “Criteria for Evaluating Chemicals in Contact with Salisbury Natural Rubber Lineman Equipment”. Grime-Away shows minimal effect on the aged tensile strength of the exposed rubber materials. Salisbury by Honeywell approves Grime-Away for cleaning hands/skin that contacts insulating gloves. Document available upon request.

MODEL SPECIFICATION

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The multipurpose cleaner shall be safe on hands and effectively remove a variety of greases, oils, and adhesives. It shall completely remove a 4-mm dried coat of the contaminant in 5 wipe passes. Grimes effectively cleaned will include: c-cement (rubber-based adhesive), heavy grease, polybutene, silicone greases and caulks, asphaltic crack sealant, anti-oxidant compounds, wax-based rust preventatives, transformer oils, and zinc anti-seize compounds.

Wipe material shall be a fine fiber meltblown polypropylene. Wipe shall be heavy duty, with a tensile strength (MD) greater than 400 g/cm. Wipes shall have a textured scrub side and a smooth wipe side.

Cleaner shall have a minimal effect on natural rubber. It shall not change the electrical properties (breakdown and leakage). It shall have minimal effect on aged tensile strength and elongation with less than 6% difference from the control. Cleaner shall pass manufacturer (Salisbury) testing: ***Cleaner shall be acceptable for use on Salisbury Natural Rubber Lineman Equipment under normal conditions of use.*** Full lab report shall be available upon demand.

PACKAGING

Grime-Away Wipe material is a fine fiber meltblown polypropylene. Towels are double-sided; textured on one side for scrubbing, and soft on the other for wiping. Grime-Away is packaged in a multiple-use 72-count canister or individual wipes for easy storage in tool pouches or lineman bags.

ORDER INFORMATION

CATALOG #	PACAKAGE DESCRIPTION	UNITS/CASE
HTC-D72	Dispenser with 72 10” x 12” (25.4 cm x 30.5 cm) premoistened wipes	6
HTC-1	Saturated 10” x 12” (20.3 cm x 30.5 cm) premoistened wipes	144

CONTACT US

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SALISBURY
by Honeywell

Ref: Evaluation of the Effect of GRIME AWAY on Salisbury Class 2 Lineman Gloves:

A sample of Grime Away was evaluated for its effect on Salisbury Lineman Gloves Class 2 (red/black), using the in-house test protocol "Criteria for Evaluating Chemicals in Contact with Salisbury Natural Rubber Lineman Equipment".

Based on the results for this test, the following statement can be used to describe the use conditions of this material: -

"GRIME AWAY has only minor affects on the aged tensile strength and should not harm Salisbury Natural Rubber Lineman Equipment under normal conditions of use. Such conditions include minimal contact between the wipes and the Salisbury Natural Rubber Lineman Equipment. Salisbury Natural Rubber Lineman Equipment should also be cleaned after exposure".

The results of the tests are shown below: -

Physical Properties:

	Tensile (psi)		500% Modulus (psi)		Elongation (%)		Area Swell (sq.mm)	
	RT	Aged	RT	Aged	RT	Aged	RT	Aged
Original	4136	4604	1362	1474	710	720	650	650
Exposed	4212	4869	1360	1432	730	730	650	650
% Diff	+ 1.8	+ 5.8	- 0.1	- 2.8	+ 2.8	+ 1.4	0.0	0.0

Electrical Properties:

	Dry Electricals		Soak Electricals	
	Breakdown (kV)	Leakage (mA)	Breakdown (kV)	Leakage (mA)
Original	30.0	11.0	30.0	11.0
Exposed	30.0	11.0	30.0	11.0
% Diff	0.0	0.0	0.0	0.0

A copy of the procedure and acceptance limits is available on request.

Barry Richards BSc (Hons)
Laboratory and Development Manger 4/29/09

Live-Line Tool Cleaning

CLEAN = SAFE

Live Line, Insulating, Rubber Goods Maintenance Products Meet OSHA Live-Line Tool Standards

S-1™ Hot Stick Wipe

The S-1™ Hot Stick Wipe cleans hot stick and treats with a water repellent as part of daily stick maintenance. Meets OSHA regulation 29 CFR part 1910.

- Convenient, Pre-Saturated, Lint-Free Wipe
- Dual Action - Cleans and Applies Water Repellent Film
- Does Not Remove or Adversely Affect Gloss Coat
- Evaporates Quickly
- No "Build-Up" Over Time
- Prevents Continuous Water Film on Stick in Wet Weather
- Removes Grease, Dirt, and Grime
- Designed for One-Time Use
- Meets IEEE Maintenance Recommendations (Std #978)
- Disposal Helps Compliance with OSHA Reg 1910.269 Part J

To view technical information go to:
Support Page: **www.polywater.com/hotstick.html**
Application Videos: **www.polywater.com/videos.asp**

Catalog #	Description	Units/Case
S-1	Saturated towelette	144

Insulated Fiberglass Boom Cleaners

The pre-wash wipe is a cleaner-saturated towel that cleans grease, tar, insects, creosote, salt spray, pine pitch, hydraulic fluid and road debris off fiberglass boom arms. The cleaner is water soluble, and washes off during subsequent water rinsing. Boom pre-wash does not adversely affect the gel coat on the boom. Available for use in a 72-count towelette canister or an individually saturated 2-foot-square towel.

The Boom Wash Concentrate is a specially formulated non-butyl water-based liquid that is mixed with water (1 part concentrate to 3-5 parts water) to make a mild water-based boom cleaner. Once rinsed and dried, the boom should be waxed with American Polywater Fiberglass Wax. The wax helps protect the boom's outer layer and ensures that water will bead up.

To view technical information go to:
Support Page: **www.polywater.com/boomwipe.html**
Application Videos: **www.polywater.com/videos.asp**

Catalog #	Description	Units/Case
B-1	24" x 24" saturated towel	24
B-D72	72-count saturated wipe dispenser	6
BWC-128	1-gal concentrate	4

Fiberglass Wax & Buff Kit

The Fiberglass Wax and Buff Kit contains a lint-free wipe saturated with a fast-hazing fiberglass wax and a soft lint-free towel for buffing the wax to a shine. This kit is suitable for use on non-conductive fiberglass booms and hot sticks.

The Fiberglass Wax is also available in a 16-oz can, the perfect size for maintaining insulated boom trucks. This wax hazes quickly and buffs easily to a shine. The wax leaves a long-lasting surface barrier that protects the insulated fiberglass booms.

To view technical information go to:
Support Page: **www.polywater.com/waxwipe.html**
Application Videos: **www.polywater.com/videos.asp**

Catalog #	Description	Units/Case
W-1	Wax saturated wipe with Dry Buffing Towel	72
W-16	16-oz. can	12

Polywater® Insulated Rubber Goods Cleaner

Polywater® Rubber Goods Cleaner is a specially formulated water-based cleaner for removing grease, dirt, carbon, creosote, and other grimes from insulating blankets, lineman's gloves, rubber sleeves, jumper cables, hot jumpers, and line-hose. Polywater® Rubber Goods Cleaner is safe for use on all natural and synthetic rubbers.

Unlike other water-based rubber cleaners Polywater® Rubber Goods Cleaner contains no hazardous ingredients and is pH neutral, making it safe for use on skin. Polywater® Rubber Goods Cleaner is also completely biodegradable and safe for the environment.

Polywater® Rubber Goods Cleaner is ready to use and is available in multiple, convenient packages. It works well as a daily cleaner for field use.

- Great pre-wash prior to machine washing
- No mixing required
- Excellent cleaning power
- Harmless to all elastomers (rubbers)
- Multiple package options
- Environmentally friendly
- Non-toxic and non-corrosive
- Not an RCRA-regulated hazardous waste

Catalog #	Description	Units/Case
RBG-D72	72-count saturated wipe dispenser	6
RBG-35LR	1-qt bottle with sprayer	12
RBG-128	1-gal	4
RBG-640	5-gal	1

To view technical information go to:
Support Page: **www.polywater.com/rubber.asp**
Application Videos: **www.polywater.com/videos.asp**

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ADHESIVES | **CLEANERS** | LUBRICANTS | SEALANTS WWW.POLYWATER.COM

IEEE Guide for In-Service Maintenance and Electrical Testing of Live-Line Tools
Sponsor

Transmission and Distribution Committee of the IEEE Power Engineering Society

IEEE Std 978-1984

4.2 Periodic Inspection and Checking

Insulating tools should be visually inspected before use for indications that they may have been mechanically or electrically overstressed (see 5.1.1). Tools that show evidence of overstress (such as damaged, bent, worn, or cracked components) should be removed from service and evaluated for repair. Elongated or deformed rivet ends, for instance, indicate that excessive mechanical loading has occurred and has weakened or sheared the bond between the ferrules and the insulating pole.

The surface of each tool must be inspected before and after each use for contamination such as dirt, creosote, grease, or any other foreign material. If any of the above contaminants exist, the tool surface should be cleaned.

When the insulating member of a tool shows signs of accumulated contamination, surface blisters, excessive abrasion, nicks, or deep scratches the tool should be removed from service and cleaned or refinished as recommended by the manufacturer, and re-tested. Any moisture penetration will reduce the insulating properties of these tools.

When the tools have been exposed to excess moisture, their moisture content can be measured with a moisture meter, which is commercially available (see 4.5), or their general condition determined on the basis of ac dielectric- loss measurements (see 5.9)

4.3 Cleaning and waxing

Before each use, insulating tools should be wiped with a clean, absorbent paper towel or a clean, absorbent cloth and followed by wiping with a silicone-treated cloth.

Caution: Do not use cloths that have been washed in harsh solvents, since some residues on the cloth can be deposited on the pole surface

If simple wiping does not remove the contaminant then apply denatured alcohol with a paper towel or clean, absorbent cloth and follow by wiping with a silicone-treated cloth. Other solvents or cleaners may be used as recommended by the manufacturers of the insulating tools.

Caution: Do not use soap detergents, liquid or powdered form, such as 409, Fantastic, Comet, ND-150, Bon Ami, Ajax, etc, to clean fiberglass tool under field conditions because of the following problems:

(1) The above described cleaning agents will leave a conductive residue unless rinsed with generous amounts of water (usually not available in the field).

(2) Abrasive cleaners will destroy the surface gloss on the stick.

Note: All fiberglass tools that are subjected to such cleaning agents should be electrically tested under wetting conditions to ensure complete removal of residue from soap-type cleaners (see 5.3).

Waxing is not necessary after every use of the tools but rather as needed to maintain a glossy surface that will cause any moisture or water to bead on the surface (see 5.5). Before the tool is rewaxed, to avoid a wax buildup, the pole should always be cleaned with a solvent or cleanser recommended by the manufacturer of the tools.

Waxing imparts not only a glossy finish to the surface of the fiberglass but also adds to the electrical integrity of the tool by providing a protective barrier against dirt, creosote, and other contaminants, and moisture.

Copy of OSHA Regulation 1910.269 Part J – Live Line Tools

(j)
"Live-line tools."

(j)(1)
"Design of tools." Live-line tool rods, tubes, and poles shall be designed and constructed to withstand the following minimum tests:

..1910.269(j)(1)(i)

(j)(1)(i)

100,000 volts per foot (3281 volts per centimeter) of length for 5 minutes if the tool is made of fiberglass-reinforced plastic (FRP), or

(j)(1)(ii)
75,000 volts per foot (2461 volts per centimeter) of length for 3 minutes if the tool is made of wood, or

(j)(1)(iii)
Other tests that the employer can demonstrate are equivalent. Note: Live-line tools using rod and tube that meet ASTM F711- 89, Standard Specification for Fiberglass-Reinforced Plastic (FRP) Rod and Tube Used in Live-Line Tools, conform to paragraph (j)(1)(i) of this section.

(j)(2)
"Condition of tools."

(j)(2)(i)
Each live-line tool shall be wiped clean and visually inspected for defects before use each day.

(j)(2)(ii)

If any defect or contamination that could adversely affect the insulating qualities or mechanical integrity of the live- line tool is present after wiping, the tool shall be removed from service and examined and tested according to paragraph (j)(2)(iii) of this section before being returned to service.

(j)(2)(iii)

Live-line tools used for primary employee protection shall be removed from service every 2 years and whenever required under paragraph (j)(2)(ii) of this section for examination, cleaning, repair, and testing as follows:

(j)(2)(iii)(A)

Each tool shall be thoroughly examined for defects.

.1910.269(j)(2)(iii)(B)

(j)(2)(iii)(B)

If a defect or contamination that could adversely affect the insulating qualities or mechanical integrity of the live-line tool is found, the tool shall be repaired and refinished or shall be permanently removed from service. If no such defect or contamination is found, the tool shall be cleaned and waxed.

(j)(2)(iii)(C)
The tool shall be tested in accordance with paragraphs (j)(2)(iii)(D) and (j)(2)(iii)(E) of this section under the following conditions:

(j)(2)(iii)(C)(1)
After the tool has been repaired or refinished; and

(j)(2)(iii)(C)(2)
After the examination if repair or refinishing is not performed, unless the tool is made of FRP rod or foam-filled FRP tube and the employer can demonstrate that the tool has no defects that could cause it to fail in use.

(j)(2)(iii)(D)
The test method used shall be designed to verify the tool's integrity along its entire working length and, if the tool is made of fiberglass-reinforced plastic, its integrity under wet conditions.

(j)(2)(iii)(E)
The voltage applied during the tests shall be as follows:

(j)(2)(iii)(E)(1)
75,000 volts per foot (2461 volts per centimeter) of length for 1 minute if the tool is made of fiberglass, or

(j)(2)(iii)(E)(2)
50,000 volts per foot (1640 volts per centimeter) of length for 1 minute if the tool is made of wood, or

(j)(3)
Other tests that the employer can demonstrate are equivalent. Note: Guidelines for the examination, cleaning, repairing, and in- service testing of live-line tools are contained in the Institute of Electrical and Electronics Engineers Guide for In-Service Maintenance and Electrical Testing of Live-Line Tools, IEEE Std. 978-1984.

BE CLEAN! BE SAFE!

BOOM CLEANER

WAX

HOT STICK CLEANER

RUBBER GOODS CLEANER

GRIME-AWAY™ MULTI-PURPOSE CLEANER

BOOM CLEANER
B-1 ..... Prewash Wipe for Boom Maintenance
B-D72 .... 72-Count Boom Wipe Canister

WAX
W-1 ..... Fiberglass Wax & Buff Kit
W-16 ..... 16-Oz Fast-Hazing Fiberglass Wax

HOT STICK CLEANER
S-1 ..... Hot Stick Cleaner/Water Repellent Wipe

RUBBER GOODS CLEANER*
RBG-1 ..... Saturated Wipe
RBG-35LR .... Qt Spray Bottle
RBG-128 ..... 1-Gallon Jug
RBG-640 ..... 5-Gallon Pail
RBG-D72 ..... 72-Count Wipe Canister

GRIME-AWAY™ MULTI-PURPOSE CLEANER*
HTC-1 ..... Grime-Away™ Saturated Wipe
HTC-D72 ..... 72-Count Grime-Away™ Wipe Canister

* *Tested and approved for rubber goods use by SALISBURY by Honeywell*

American Polywater® Corporation
651-430-2270
www.polywater.com

Distributed by:

Polywater® S-1™ Wipe

HOT STICK CLEANER & WATER-REPELLENT WIPE

Wiping down a shotgun stick

For Live-Line Tool Cleaning & Maintenance

PRODUCT BENEFITS

- **Compatible with Sticks:** Does not remove or affect the gel coat.
- **Good Maintenance Practice:** Meets IEEE Std #978 and OSHA 29 CFR Part 1910 guidelines.
- **Beads Up Water:** Silicone coating prevents continuous conductive water film on stick in wet weather.
- **Good Cleaner:** Removes grease, dust, and grime while leaving a protective silicone layer.
- **Convenient Use:** Field-friendly, one-time-use towelettes.

Removes Electrical Tracking Contaminants

The Polywater® S-1™ Hot Stick Wipe cleans hot sticks and treats with a water repellent as part of the daily requirement to inspect and wipe sticks clean prior to each use. S-1 is effective at cleaning telescoping/extendo sticks so they glide into position without sticking.

Wiping down a telescoping hot stick

S-1 leaves a silicone coating

Revitalize fiberglass rodders

Catalog # S-1

Safeguard Your Live-Line Tools

The S-1 is a one-use wipe in a field-friendly package. Unlike the S-1, other reusable silicone wiping cloths don't clean live-line tools and become loaded with contaminants, rendering them ineffective.

POLYWATER S-1

Catalog #	Package Description	Units/Case
S-1	Saturated 8"x12" / 20 cm x 30 cm wipe	144

SPECIFICATIONS AND APPLICATIONS:

- **Versatile:** S-1 wipes make a big difference in cleaning and protecting shotgun sticks, hot sticks, bracing arms, cutters, and jumper holders.
- **OSHA Live-Line Tool Standard:** Requires that "Each live-line tool shall be wiped clean and visually inspected for defects before use each day." It notes that "a hot stick can become electrically unsafe because of … a combination of wetting, surface contamination, and a loss of surface gloss …" and "… the best defense against accidents is a clean, glossy stick that causes water to bead up …"
- **IEEE Maintenance Standard #978:** States the best way to clean a stick is to use isopropyl alcohol followed by a silicone wiping cloth. The S-1 cleverly combines both alcohol and silicone in a one-step process.

CONTACT US

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Polywater® RBG™

INSULATED RUBBER GOODS CLEANER

Cleaning an insulating blanket

Safely Cleans EPDM and Natural Rubber Protective Products

PRODUCT BENEFITS

- **Excellent Cleaner:** Restores high visibility to rubber goods.
- **Multiple Packages:** Can be used in the field, in tool rooms, and testing facilities.
- **Compatible:** Safe to use on EPDM and natural rubber.
- **Increases Reliability:** Uncovers hidden damage.
- **Biodegradable:** Environmentally friendly.

Reduce Tracking and Restore Visibility

Polywater® Rubber Goods Cleaner is a specially formulated water-based cleaner for removing grease, dirt, carbon, creosote, and other grimes from insulating blankets, lineman's gloves, rubber sleeves, jumper cables, hot jumpers, and line hose.

Blanket cleaning residue

Cleaning a ground with catalog # RBG-D72

Cleaning a line hose

Rubber Goods Cleaner package options

Rubber Goods Cleaner is ready to use and available in multiple, convenient packages. It works well as a daily cleaner for field use. Unlike other water-based rubber cleaners, Rubber Goods Cleaner contains no hazardous ingredients and is pH neutral, making it safe for use on skin. Rubber Goods Cleaner is also completely biodegradable and safe for the environment.

POLYWATER RBG

Catalog #	Package Description	Units/Case
RBG-D72	Dispenser with 72 - 10” x 12”/25 cm x 30 cm premoistened wipes	6
RBG-1	Saturated 8” x 12”/20 cm x 30 cm wipe	144
RBG-35LR	1-qt. bottle with sprayer (.95 liter)	12
RBG-128	1-gal. jug (3.8 liters)	4
RBG-640	5-gal. pail (18.9 liters)	1

SPECIFICATIONS AND APPLICATIONS:

- **Independent Testing:** Tested by an independent NAIL® for PET (North American Independent Laboratories for Protective Equipment Testing) accredited laboratory in accordance with ASTM F496, “Standard Specification for In-Service Care of Insulating Gloves and Sleeves.” Test data available on request.
- **Compatibility:** Passes all tests regarding synthetic and natural rubber in accordance with the ASTM and OSHA standards.
- **Performance Properties:** Passes Rubber Property—Effect of Liquids (ASTM D471) and Specification for In-Service Care of Insulating Gloves and Sleeves (ASTM F496).
- **Safe:** Not an RCRA-regulated hazardous waste.

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American Polywater® Corporation

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Rubber Goods Cleaner

American Polywater® Corporation

TECHNICAL DATA SHEET

Description:

Polywater® Rubber Goods Cleaner is a specially formulated water-based cleaner for removing grease, dirt, carbon, creosote, and other grimes from insulating blankets, lineman's gloves, rubber sleeves, jumper cables, hot jumpers, and line-hose. Polywater® Rubber Goods Cleaner is safe for use on all natural and synthetic rubbers.

Unlike other water-based rubber cleaners Polywater® Rubber Goods Cleaner contains no hazardous ingredients and is pH neutral, making it safe for use on skin. Polywater® Rubber Goods Cleaner is also completely biodegradable and safe for the environment.

Polywater® Rubber Goods Cleaner is ready to use and is available in multiple, convenient packages. It works well as a daily cleaner for field use.

Performance Properties:

Polywater® Rubber Goods Cleaner is safe on synthetic and natural rubber. It is also an effective cleaner. Polywater® Rubber Goods Cleaner removes difficult grimes with minimal soaking and wiping.

Used insulating rubber goods are obtained from a local utility. Samples are blackened with ground grime, typical of the industry. Polywater® Rubber Goods Cleaner is allowed to soak into the surface for 2 minutes. 90% of the grime is removed after 3 wipes.

Property	Result
Rubber Property-Effect of Liquids (ASTM D471)	Passes all tests
Specification for In-Service Care of Insulating Gloves and Sleeves (ASTM F496)	Passes all tests
Cleaning Strength	Excellent

Product Benefits:

- Great pre-wash prior to machine washing
- No mixing required
- Excellent cleaning power
- Harmless to all elastomers (rubbers)
- Multiple package options
- Environmentally friendly
- Non-toxic and non-corrosive
- Not an RCRA-regulated hazardous waste

End Use:

- Blankets
- Sleeves
- Line Hose
- Jumper Cables
- Grounds
- Lineman's Gloves

Approvals:

Approved by Salisbury (Honeywell Safety Products) for use with Salisbury Rubber Protective Parts.

Physical Properties:

Polywater® Rubber Goods Cleaner is a safe, water-based cleaner with excellent cleaning properties.

Property	Result
Flashpoint (ASTM D93)	No flash
Initial Boiling Point	~ 212°F (100°C)
pH	Neutral
Specific Gravity	< 1%
VOC Content	0 g/L

Compatibility:

Protective rubber gloves are exposed to Polywater® Rubber Goods Cleaner as described below, then washed and dried at the testing laboratory.[1] Gloves are inspected for defects. Items that fail visual inspection are rejected and immediately rendered unusable. Rubber goods additionally undergo an electrical test as specified by the "class rating" of the item and the ASTM and OSHA Standards (maximum 40kv A.C.). Again, any item that fails the electrical test is rejected.

Rubber Goods Exposed to Surface Wipe

Class	Type	Visual Check	Electrical Test (max 40kv A.C.)
00	1	PASS	PASS
00	2	PASS	PASS
0	2	PASS	PASS
1	1	PASS	PASS
2	1	PASS	PASS

Rubber Goods Exposed to 5-minute Soak

Class	Type	Visual Check	Electrical Test (max 40kv A.C.)
0	2	PASS	PASS
1	1	PASS	PASS

Rubber Goods Exposed to 24-hour Soak

Class	Type	Visual Check	Electrical Test (max 40kv A.C.)
00	1	PASS	PASS
00	2	PASS	PASS
0	2	PASS	PASS
1	1	PASS	PASS
2	1	PASS	PASS

[1] Tested by an independent NAIL® for PET (North American Independent Laboratories for Protective Equipment Testing) accredited laboratory in accordance with ASTM F496, "Standard Specification for In-Service Care of Insulating Gloves and Sleeves."

Soak Testing:

Polywater® Rubber Goods Cleaner is compatible with plastics and elastomers. Immersion will affect sensitive materials more than incidental contact of a spray and wipe.

Immersed 72 Hours at 122°F (50°C)

Elastomers	% Weight Change	Appearance
EPDM	NC	NC
EPDM (Type II) blanket, line hose	NC	NC
EPDM gloves	NC	NC
Natural Rubber	NC	NC
Natural Rubber (Type I) blanket	NC	NC
Natural Rubber (Type I) gloves	NC	NC
SALCOR® (Type II) blanket	NC	NC
Silicone	NC	NC

Immersed 28 Days at 70°F (21°C)

Elastomers	% Weight Change	Appearance
EPDM	NC	NC
EPDM (Type II) blanket, line hose	NC	NC
EPDM gloves	NC	NC
Natural Rubber	NC	NC
Natural Rubber (Type I) blanket	NC	NC
Natural Rubber (Type I) gloves	NC	NC
SALCOR® (Type II) blanket	NC	NC
Silicone	NC	NC

KEY:

NC = No Change
S = Swelling
ES = Extreme Softening
C = Crazing
SS = Slight Swelling
D = Dissolved

Testing based on ASTM D471, "Standard Test Method for Rubber Property Effect of Liquids."

Usage Directions:

Apply Polywater® Rubber Goods Cleaner by spraying, dipping, brushing, or wiping. Evenly coat rubber surface with cleaner. If using Polywater® Rubber Goods Wipe (RBG-1 or RBG-D72), open towel and use soft side to wipe down and fully wet surface of material.

Leave Polywater® Rubber Goods Cleaner on the surface of the material to be cleaned for 2 minutes or more to loosen and dissolve deposits. Allow cleaner to soak material longer for more difficult grimes. The longer Polywater® Rubber Goods Cleaner is on the surface the more it penetrates and breaks loose the creosote, dirt, grease, oils and other grimes without harming the rubber surface.

Once material has soaked, wipe surface clean with a rag or towel. A minimal amount of scrubbing may be required.

Rinse material with water and either dry with a clean cloth or air dry before use. Use Polywater® Rubber Goods Cleaner daily to clean the rubber's surface for visual inspections to uncover burns, cuts, nicks, crush points, and abrasions on equipment and gloves.

For best results leave RBG cleaner on rubber goods for at least 2 minutes before wiping or scrubbing down surface.

To see a demonstration video of Rubber Goods Cleaner go to www.polywater.com/videos.asp

Safety:

Polywater® Rubber Goods Cleaner has a low level of toxicity and is environmentally friendly. Good industrial hygiene practice and appropriate precautions should be employed during use. See SDS for specific details.

Safe LIVE LINE Equipment Practices:

Proper protection and performance of rubber protective equipment requires a detailed visual inspection before each use. Visual inspection of rubber goods should be performed before each use in accordance with ASTM F1236 "Standard Guide for Visual Inspection of Electrical Protective Rubber Products". Rubber protective equipment should be checked for:

- Abrasions, cuts, crush points, gouges, holes, punctures, and tears
- Embedded foreign objects
- Ozone cutting or ozone checking
- Swelling, softening, hardening, stickiness, and inelasticity
- Any other defect that damages the rubber insulating properties of the protective equipment

Cleaning of rubber protective equipment is necessary not only for visual inspections but to preserve the protective equipment. Creosote, dirt, grease, and other contaminants can be conductive, especially when combined with moisture from rain, snow, and fog. Protective equipment should be cleaned daily and whenever contaminated during use. **Strong industrial cleaners and solvents may cause permanent damage to the rubber protective equipment.** These products may cause rubbers to swell, soften, and lose electrical insulating properties.

Polywater® Rubber Goods Cleaner is safe to use on all rubber products, including: covers, line-hose, gloves, sleeves, and insulating blankets. Daily use of Polywater® Rubber Goods Cleaner makes inspection of protective equipment easier and helps to maintain the electrical insulating properties of the equipment.

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The rubber goods cleaner shall be a pH neutral, water-based solution that effectively cleans all types of grimes from insulating rubber goods. The cleaner shall remove a wide variety of contaminants such as hydrocarbon grease, carbon grime, creosote, tree sap, fertilizer residue, soils and dirt.

The rubber goods cleaner shall be safe for use on all types of rubber goods, insulating blankets, lineman's gloves, rubber sleeves, jumper cables, and line hose. EPDM rubber, silicone rubber, and natural rubber shall not be affected when immersed in the rubber goods cleaner and tested according to ASTM D471, Standard Test Method for Rubber Property-Effect of Liquids. Rubber goods exposed to a 24-hour soak shall pass high voltage testing in accordance with ASTM F496, Standard Specification for In-Service Care of Insulating Gloves and Sleeves. **Standard testing must be completed by an independent, NAIL® for PET (North American Independent Laboratories for Protective Equipment Testing) accredited laboratory to verify testing compliance.**

The rubber goods cleaner shall not require dilution, shall be pH neutral, and shall not have a flashpoint. The rubber goods cleaner shall be available in a number of packaging options, including presaturated towels and spray trigger bottles.

Order Information:

Type RBG™ Rubber Goods Cleaner is available in multiple package options.

Cat #	Package Description
RBG-1	Individual saturated wipe (144/cs)
RBG-D72	72-count saturated wipe dispenser (6/cs)
RBG-35LR	1-quart bottle with sprayer (12/cs)
RBG-128	1-gallon bottle (4/cs)
RBG-640	5-gallon pail (1 ea)

Lit-RBGTECHSPEC2011/REV000

Makers of Boom™ Cleaner, Live-Line Tool Cleaning and Wax Wipes (W-1) and Hot Stick Cleaner and Wax Repellent Wipes (S-1)

Polywater®

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Toll Free: 877-406-4501
Telephone: 630-343-3700
Fax: 630-343-3838

Date: 4/18/2011

To: Joe Climaco

From: John Terzic

Re: Rubber Goods Cleaner

A sample of Rubber Goods Cleaner, Catalog #RBG-35LR, from Polywater Corporation, along with the MSDS and Technical Bulletin, were received to determine if this product can safely be used in field cleaning of our rubber protective products such as blankets and sleeves.

In reviewing both the Technical Bulletin and MSDS, this product appears safe for this application. To confirm it, we took natural rubber yellow sleeve, an EPDM orange blanket, and a yellow EPDM blanket. The three products were well rubbed with the cleaning solution and allowed to sit overnight with the top side covered with the solution. After 24 hours the three parts were rinsed and carefully examined. We found no discoloration or any other deformities. The three parts were also tested for physical properties before and after the test. Tensiles, elongation, and the hardness remained the same after the test.

In view of these findings, this product is safe for the cleaning of Salisbury rubber protective parts. The soap must immediately be rinsed out with water after the application.

All safety instructions given in the MSDS for this product must be observed. Also the application instructions on the product label must be observed.

Polywater® Fiberglass Wax & Buff Kit

INSULATED FIBERGLASS WAX

Waxing protects the gel coat

Hot Stick and Insulated Boom Truck Protectant

PRODUCT BENEFITS

- **Protects:** Does not remove or affect gel coat. Leaves non-conductive, water-repellent coating.
- **Fast Acting:** Wax applies easily and hazes quickly.
- **Convenient:** Dual-action tandem pack—wax-saturated wipe and dry buffing towel.
- **Restores:** Brings back luster and helps to protect gel coat.
- **IEEE Compliant:** Meets IEEE maintenance recommendations (Std #978).

Regular Maintenance is the Key to Safety

Regular inspection and cleaning of live line tools and insulated boom trucks after they've been dielectrically tested is required by OSHA to keep them in safe working order. Waxing the insulated fiberglass areas of boom trucks and hot sticks between testing periods protects the gel coat from degradation.

Catalog # W-1

Restoring the luster on fiberglass

polywater.com | 651-430-2270

American Polywater® Corporation

Catalog # W-16

Catalog # W-1

Packaging for All Types of Applications

The Fiberglass Wax and Buff Kit contains a lint-free, wax-saturated wipe and a soft, lint-free towel for buffing. The W-16 16-ounce bulk package is recommended when servicing insulated fiberglass areas on boom trucks. Polywater Wax is formulated especially for hot sticks and insulating boom arms to haze quickly and buff out easily. This carnuba-based wax restores the luster of the fiberglass to help protect the gel coat. It beads water on the insulating surface to inhibit tracking.

POLYWATER WAX

Catalog #	Package Description	Units/Case
W-1	Saturated 8” x 12”/ 20 cm x 30 cm wipe with dry buffing towel	72
W-16	16-oz. can (475 mL)	12

SPECIFICATIONS AND APPLICATIONS:

- **Best Practice:** Once a boom has been properly cleaned with Polywater Boom Cleaner, Polywater Wax should be used to protect the gel coat surface and force water beading during misty or wet weather. All products used on boom trucks, including cleaners and protectants designed specifically for fiberglass booms, should be approved by the aerial lift manufacturer. American Polywater products are approved by boom truck manufacturers. Refer to our boom truck cleaning and maintenance best practice for more detailed information to keep your fleet in proper working order. www.polywater.com/wp-content/uploads/pdf/LIT-BOOMguide.pdf
- **Industry Recommendations:** Companies should follow boom truck manufacturer guidelines on the frequency of dielectric testing, proper cleaning practice, and other maintenance procedures. The ANSI A92.2-1990 Standard (Section 5.4.3) also addresses proper dielectric testing intervals and field inspections for aerial truck testing. Follow manufacturer and industry guidelines on the maintenance of boom trucks for safe and long-lasting aerial fleets.

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American Polywater® Corporation

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Polywater® BOOM™ Wipes

CLEANER FOR INSULATED BUCKET TRUCKS

Catalog # B-1 (2-ft² towel)

Removes Residues that Can Cause Tracking

PRODUCT BENEFITS

- **Powerful Cleaner:** Removes hydraulic fluid, insects, tar, salt, and grime before rinsing.
- **Gel Coat Safe:** Won't remove or adversely affect the gel coat.
- **Approved:** Bucket truck manufacturer recommended.
- **Convenient:** Presaturated cleaning wipes designed for overall or spot cleaning.
- **Biodegradable:** Water soluble and solvent free.

Maintain Equipment to Work Safely

Polywater® BOOM™ Prewash Wipes are saturated towels that clean grease, tar, creosote, salt spray, hydraulic fluid, pine pitch, insects, and road debris from insulated fiberglass boom arms, insulators, and buckets. BOOM Prewash is water soluble and washes off during water rinsing.

Removes hydraulic fluid easily

Cleans large areas

polywater.com | 651-430-2270

American Polywater® Corporation

B-D72 soiled wipe

BOOM Wash packaging

Two Types of Wipes to Fit all Cleaning Needs

Polywater BOOM Prewash Wipes are available as individual saturated towels (Catalog # B-1) or in a canister containing 72 wipes (Catalog # B-D72). Cleaning insulated fiberglass areas on a regularly scheduled basis after a boom or bucket truck is dielectrically tested is critical to working safely. Contaminants build up over time on trucks and need to be removed to prevent tracking hazards.

Boom Wash Concentrate (Catalog # BWC-128) is a detergent liquid that is mixed with water to make a mild boom cleaner. Note: This detergent-based liquid is NOT the same solvent cleaner as the saturated B-1 and B-D72 prewash wipes, and would typically be used to clean off any persistent grime after using the wipes.

POLYWATER BOOM WIPES

Catalog #	Package Description	Units/Case
B-1	Saturated 24”x 24”/71 cm x 71 cm towel	24
B-D72	Dispenser with 72 - 10” x 12”/25 cm x 30 cm premoistened wipes	6
BWC-128	1-gal. (3.8 liters) jug	4
BWC-640	5-gal. (18.9 liters) pail	1

SPECIFICATIONS AND APPLICATIONS:

- **Testing:** Companies should follow boom truck manufacturer guidelines on the frequency of dielectric testing, proper cleaning practice, and other maintenance procedures. The ANSI A92.2-1990 Standard (Section 5.4.3) also addresses proper dielectric testing intervals and field inspections for aerial truck testing.
- **Guidance:** Common degreasers or solvents can harm and strip the gel coat on the boom, causing weak or soft spots. Many crews have access to solvents and know how well these solvents remove grease, but many of those solvents can be harmful to the fiberglass portion of the boom arm or bucket. Some cleaners contain abrasives and leave a considerable residue. Others, like acetone, xylene, and toluene, can cause permanent damage if left in contact with the surface for too long a period. These solvents are also flammable and are often hazardous. Personnel should be trained to use only BOOM Wash for the boom and bucket areas to keep the truck in proper working order.
- **Protect:** After cleaning a boom or bucket truck with BOOM Wash, the fiberglass areas should be treated with Polywater Wax to protect the gel coat surface. Available in bulk 16-ounce bottles (W-16) or presaturated wipes (W-1).

CONTACT US

1-800-328-9384 Toll Free
1-651-430-2270 Main
1-651-430-3634 Fax

email: support@polywater.com

American Polywater® Corporation

11222 60th Street N | Stillwater, MN 55082 USA

 LIT-BOOMFLYER/REV000

Solar Panel Wash

Polywater® Solar Panel Wash

SOLAR PANEL CLEANER

Polywater SPW sprayed onto panel surface

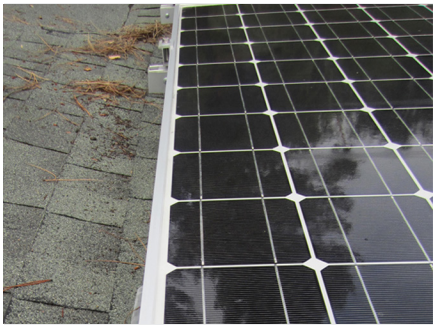
An Effective, Safe, and Economical Cleaner for Photovoltaic (PV) Panel Installations

PRODUCT BENEFITS

- **Industry Approved:** SPW is approved by major PV panel manufacturers.
- **Increase Output:** Cleaner panels produce more power.
- **Economical:** Reduces water use and cleaning costs.
- **Safe on Equipment:** Compatible with panel hardware and anti-reflective films.
- **Environmentally Friendly:** Will not harm local water sources or plant life.

Clean PV Panels Maximize Power Production

SPW™ is a highly concentrated, nonsolvent compound that leaves panel surface areas clean and shiny. Panels cleaned with SPW maximize power generation and economic return of PV installations. Effectively removes bird droppings, jet fuels, dust, pollen, salt spray, and pollution residues.



Clean panels maximize power production

Eliminate hotspot damage

One-quart hose adaptor refillable bottle

SPW packaging

Effective Rooftop and Large Plant PV Panel Cleaning

SPW will not oxidize or abrade aluminum rails on solar panels or solar mounting apparatus. Many store-bought detergents contain alkalines that promote oxidation on aluminum and shouldn't be used to clean panels. SPW is formulated to lift and suspend contaminants so they are carried off the panel. SPW promotes water sheeting.

POLYWATER SOLAR PANEL WASH

Catalog #	Package Description	Units/Case
SPW-35HS	1-qt. bottle with sprayer (.95 liters)	12
SPW-35LF	1-qt. bottle (.95 liters)	12
SPW-128	1-gal. jug (3.8 liters)	4
SPW-640	5-gal. pail (18.9 liters)	1
SPW-DRUM	55-gal. drum (208 liters)	1

SPECIFICATIONS AND APPLICATIONS:

- **DI & RO Water:** Reduce or eliminate deionized or reverse osmosis water expense.
- **Automated Cleaning:** Enhance effectiveness of existing cleaning systems.
- **Recycling Systems:** Reduce costs and H_2O use by recycling water/SPW mixture.
- **Clean Many Contaminants:** Effectively removes dust, pollen, diesel film, industrial pollution, and other common contaminants.
- **Manufacturers' Approvals:** SPW use is approved by many of the largest PV panel manufacturers in the world.

CONTACT US

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email: support@polywater.com

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Telephone: 1-651-430-2270
Fax: 1-651-430-3634

www.polywater.com
support@polywater.com

General Maintenance Note:
Inspect the entire solar array system prior to cleaning to detect loose or broken wires, panels, or improperly functioning apparatus. Make necessary repairs before cleaning. Take before-and-after photos and system output readings for presentation to the customer. Schedule quarterly cleaning and maintenance with the customer to keep their system operating at its theoretical maximum output.

Solar Panel Wash SPW™ Usage Recommendation:
Recommended dilution ratio is 1 part Solar Panel Wash SPW™ to 25 parts water (25-1). For heavily soiled areas, use a higher SPW™ cleaner concentration, brushing or more rinsing. The catalogue # SPW-35HS hose adapter package has a selector switch atop the sprayer to toggle between the 25-1 and water-only ratios.

Always schedule panel cleaning early in the morning or at night when it is cool. This will minimize thermal stress on photovoltaic cells and protective glass which could damage the panels.

1) Use 25-1 Solar Panel Wash solution to rinse panels. Rinsing removes loose sand and debris from the panels, and protects the panel from scratching when brushes are used in Step 2 below. In locales known for hard water, deionized water can be used to dilute the SPW™. It is okay to rinse with local water only. **Wet only the number of panels that can be brushed and rinsed before the SPW™ solution dries.** Large arrays may need to be cleaned section by section. Use heavier amounts of SPW™ on areas with bird droppings or other organic matter.

2) Scrub panels with a very soft brush.(Hog's Hair is recommended.) Rinse the brush bristles frequently when cleaning heavily soiled arrays to reduce scratching. The use of brushes also helps agitate the SPW™; dirt tends to "carry" or be lifted from the panels better. Water alone--even deionized water--will not lift or carry dirt adequately. SPW™ is far more effective at removing residue and cleaning panels.

3) Allow the contamination and SPW solution to shed from the panel surface. Repeat Steps 1& 2 if hard to remove contamination remains.

4) Rinse the panels with a 25-1 SPW™ solution and let dry; otherwise, rinse with deionized water or local water supply.

5) If desired, buff dry, clean panels with blue microfiber cloths followed by white microfiber cloths for a fine finish.

SUNSHINE SOLUTIONS
Efficiency Matters

January 26, 2015

My company, Sunshine Solutions, specializes in cleaning and maintaining solar panels for residential, commercial and solar farm operations.

We pride ourselves on the way we clean solar panels. Just using deionized water alone will not effectively clean panels and won't make the job any easier the next time a scheduled cleaning is needed because you're not using any cleaner along with it to help remove dirt, soil, airline fuel residue and bird droppings. If you don't remove the dirt from panels it will scratch them so much that eventually it reduces their output.

Recently we used a product from American Polywater Corporation called "Solar Panel Wash" for two weeks on a variety of jobs, including a very tough one on a 314-panel solar array at a car dealership. This product was superior to the product we were using because we used less of it to clean the same number of panels, it didn't dry out as quickly on the panels as the other products, and it didn't leave a film.

Our cleaning operation differentiates itself from "window washing" companies because we carry insurance to be on roofs, can identify and fix operational problems in the solar system, utilize specialty brushes and micro fiber towels to buff the panels clean, and use Polywater's Solar Panel Wash, which is biodegradable and compatible with the solar panels' parts.

Our company plans to use Polywater's Solar Panel Wash on all of our projects to help make the job of cleaning easier the next time we are there to service them. By using their product and cleaning panels on a regular basis, your system will produce more output and last longer than others. Many owners don't realize the damage that can occur when they fail to clean their panels.

Sincerely,

JR
Sunshine Solutions
http://www.socalsunshinesolutions.com/

3283 Trade Center Drive Riverside, Ca 92507 951-787-9803

Hello Wendy,

The cleaning solution that we have been using is called Winsol Solar Brite. This product has worked pretty well for most of our projects. We used your product on an extremely dirty job and it out performed the product we are currently using.

Thanks,

Eric Jorgensen
Pampered Panels, Inc.
www.pamperedpanels.com

SOLARWORLD AMERICAS INC.
25300 NW Evergreen Rd.
Hillsboro, OR 97124
U.S.A.
Telephone: 800-947-6527
Fax: 503-844-3403
customerservice@solarworld.com
Website: solarworld.com

September 23, 2015

To whom it may concern,

American Polywater Corporation's Polywater® Solar Panel Wash SPW™ has been tested with SolarWorld photovoltaic solar modules under the accelerated test procedure outlined below.

Test Duration:

May 1 to May 14, 2015

Test Set-Up

Two new SolarWorld panels were provided to American Polywater and installed at a 45-degree angle on a south facing well at their factory location in Stillwater, MN.

To simulate precipitation and soiling the modules were sprayed for 15 minutes daily at 3 am with standard ground water. The ground water conductivity was measured at 95 µS and a water hardness of 67 parts per million (ppm).

Test Methodology

1. Monday: Between 8 and 10 am each panel was rinsed with a 25:1 solution of Solar Panel Wash SPW and water. The panels were then scrubbed with a soft nylon bristle brush and then rinsed with the same 25:1 solution of Solar Panel Wash SPW and allowed to air dry without any additional rinse.
2. Tuesday – Friday: Between 8 and 10 am each day the panels were rinsed with the 25:1 solution of SPW and allowed to air dry.
3. Saturday – Sunday: The panels were not cleaned over the weekends but were sprayed for 15 minutes at 3 am each day.
4. This process was run for a total of two weeks from May 1 to May 14

Results

The modules were returned to SolarWorld Americas and retested; their post-test performance was compared to their original manufactured performance. Polywater® Solar Panel Wash SPW™ did not have any appreciable effect on the module performance, antireflective glass coating or frame anodized coating.

Conclusion

When used as directed by American Polywater their Solar Panel Wash SPW™ is not an exclusion to the standard SolarWorld warranty. Care must be taken when cleaning solar panels. When cleaning solar modules with water or Solar Panel Wash SPW™ a soft bristle brush must be used and the modules should only be cleaned when they are cool; failure to do so may damage the module. Furthermore SolarWorld's performance and limited product warranty are never void but we do retain the right to deny claims based on the exclusions within the guarantee and limited product warranty document at the time of purchase.

Sincerely,

Eric Olson
Product Manager – Modules
SolarWorld Americas, Inc.

NO: TS20168267
Date: November 22, 2016

To: Christine Otam
American Polywater Corporation
christine@polywater.com
11222 60th Street North, Stillwater, MN 55082-9310 USA

Subject: Confirmation letter for usage of SPW to clean module

Dear Christine,

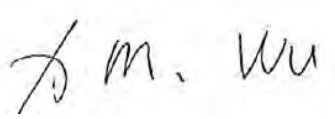
Thank you for your inquiry about our products. Canadian Solar modules have been certified in accordance with CSA certification body.

Canadian Solar hereby confirms that usage of American polywater's Solar Panel Wash (SPW) is approved for Canadian Solar's module cleaning. Canadian Solar suggests the module should be washed again using water after the usage of American polywater.

Please refer to CSI Installation Manual for the maintenance methods. Damages induced by inappropriate cleaning procedures will void Canadian Solar warranty.

Appendix 1: SPW Supplement 2016
Appendix 2: SPW use instructions 10-19-2016
Appendix 3: LIT-SPWTECHSPEC 2016

Sincerely,



Ximei Wu
Manager of Global Sales Technical Support
Email: ximei.wu@canadiansolar.com

Noark 诺雅克

Date: 24 December 2016

Subject: Confirmation Letter for Usage of SPW to clean Solar Panel Modules

To Whom it May Concern,

Noark-Electric Shanghai Co. Ltd (Noark) hereby confirms that usage of American Polywater's Solar Panel Wash (SPW) is approved for our Noark module cleaning. Noark suggests that the modules be rinsed again using water after the usage of American Polywater's SPW.

Please refer Noark's Installation and Maintenance Methods Manual for proper cleaning procedures. Damages induced by inappropriate cleaning procedures will void Noark warranty.

Sincerely: William Li

William Li

Electric Department Design Manager

William.li@noark-electric.com.cn

Noark-Electric Shanghai Co. Ltd.

No. 3857 Sixian Road, Songjiang District, Shanghai, China

Date: 29 December 2016

Subject: Confirmation Letter for Usage of SPW to clean Solar Panel Modules

To Whom it May Concern,

Beijing Sixvan Intelligent Systems Technology Co.Ltd.(Sixvan) hereby confirms that usage of American Polywater's Solar Panel Wash (SPW) is approved for our company solar module cleaning. Sixvan suggests that the modules be rinsed again using water after the usage of American Polywater's SPW.

Please refer to Sixvan Installation and Maintenance Methods Manual for proper cleaning procedures. Damages induced by inappropriate cleaning procedures will void Sixvan warranty.

Sincerely:

Manager-Purchasing Department

independenceday@qq.com

Beijing Sixvan Intelligent Systems Technology Co.Ltd.

509 D# Changping road 97 changping district beijing China

Date: 29 December 2016

Subject: Confirmation Letter for Usage of SPW to clean Solar Panel Modules

To Whom it May Concern,

Shanghai JA Solar Technology Co. Ltd. (JA Solar) hereby confirms that usage of American Polywater's Solar Panel Wash (SPW) is approved for our company solar module cleaning. JA Solar suggests that the modules be rinsed again using water after the usage of American Polywater's SPW.

Please refer to JA Solar Installation and Maintenance Methods Manual for proper cleaning procedures. Damages induced by inappropriate cleaning procedures will void JA Solar warranty.

Sincerely:

Kexiu.Qian

Manager-Purchasing Department

Kexiu.qian@jasolar.com

Shanghai JASolar Technology Co. Ltd.

36 Jiangchang Three Road, Zhebei District, Shanghai, China

TECHNICAL DATA SHEET

Description:

Polywater® Solar Panel Wash™ (SPW) effectively cleans PV panels and maximizes power generation. Its special formulation removes a wide range of contaminants such as air pollution residue, pollen, bird droppings, dust, and volcanic ash. It is designed with a rinsing aid to eliminate the need for deionized (DI) or reverse osmosis (RO) water. The SPW™ solution rinses clean without spotting.

Polywater® SPW™ works without damaging specialty polymer coatings and without oxidation or abrasion to metallic rails and mounting brackets. Its use has been approved by many global solar panel and cleaning equipment manufacturers.

Polywater® SPW™ is safe for users and the environment. It quickly biodegrades, so it will not affect surrounding plant life or water-table/aquifers. SPW™ contains no solvents and is non-corrosive.

Reduces Water Use:

Polywater® SPW™ is more effective than water alone. As a result, soils are removed more efficiently and *less water is used*. Field experience proves this:

Polywater® SPW™ was tested at a winery in India where the existing cleaning procedure used 5 liters of water alone per panel. Using a 25:1 water-to-SPW™ mix, only 3 liters were required to clean 10 panels. *Water use was reduced by a factor of 15*.

In a Mexican trial, approximately 1.7 liters of SPW™ solution was used per panel. Water use was also reduced in this field trial.

Polywater® Solar Panel Wash™ has a spot-free rinse, eliminating the need for deionized water. Elimination of deionized water yields more water savings, since it takes more than a gallon of water to create one gallon of DI or RO water.

Efficient cleaning saves water and is more environmentally appropriate. It is an effective cleaning method that also saves labor time.

Product Features:

- Effectively removes all types of contaminants
- Cleans efficiently, conserves water
- Works without deionized water
- Quick sheeting action—dries without spots
- Biodegradable—does not harm the environment
- Does not contain solvents or corrosive soaps
- Compatible with anti-reflective films, metal rails, and mastics

Approvals:

Polywater® Solar Panel Wash™ is approved for use on most types of solar panels by the following manufacturers:*

- Canadian Solar
- Solar World
- JASolar Technology Co.
- Sixvan Intelligent Systems Technology Co.
- Noark-Electric Co.

** Approval letters available upon request.*

Compatibility:

Polywater® SPW™ Solar Panel Cleaner is compatible with PV panels and is approved by multiple panel manufacturers. It is compatible with:

- Specialty Films
- Aluminum Rails
- Cables and Wiring
- Mastics and Sealants

Test Method: Panels were placed against a south-facing wall at a 45° angle, at American Polywater's factory in Stillwater, MN.

A sprinkler sprayed the panels with ground water for 15 minutes at 3:00 each morning. Water conductivity was measured at 95 µS, approximately 67 ppm water hardness. The panels were exposed to Polywater® Solar Panel Wash SPW™ using the following process over a two-week period:

1) Monday: Between 8:00 and 10:00 a.m. each panel was rinsed with a 25:1 solution of the Solar Panel Wash SPW™ in water. The panel was then scrubbed with a very soft brush, then rinsed again with the 25:1 SPW™ solution and allowed to dry without any further water rinse.
2) Tuesday–Friday: Between 8:00 and 10:00 a.m. each day, both panels were rinsed with the 25:1 SPW™ solution and allowed to dry.
3) The panels were not cleaned over the weekends, but the sprinkler continued to spray the panels with groundwater for 15 minutes at 3:00 each morning.

Conclusion: Modules were re-flashed after they were returned to SolarWorld. No degradation of the antireflective coatings or other irregularities to the panels were detected after application of American Polywater Corporation's Solar Panel Wash (SPW™).

Environmental Impact:

Polywater® SPW™ Solar Panel Wash is readily biodegradable per OECD Guidelines. Materials must be 60% biodegraded within 10 days to meet these OECD Guidelines. The resulting products of biodegradation are carbon dioxide and water. Because Polywater® Solar Panel Wash SPW™ is so biodegradable, it does not accumulate in the environment. Polywater® Solar Panel Wash SPW™ is the environmentally safe solution to cleaning solar panels.

Physical Properties:

SPW™ is a clear, odorless, non-caustic liquid cleaner that contains no solvents. It is freeze-thaw stable and safe to use.

Property	Result
Initial Boiling Point	~100°C
Specific Gravity	1.0
pH	Neutral
Solvent/Volatile Content	None
Phosphate Content	None
Ammonia Content	None
Flashpoint (ASTM D93)	None

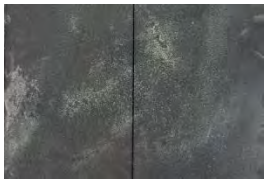
Cleaning Effectiveness:

SPW™ Cleaner removes a broad range of ash, dust, oils, and organic matter, rinsing the contamination clean from PV surfaces and aluminum rails.

Bentonite, oils, and salts were coated on glass panels to test cleaning efficacy. A 25:1 solution of the Solar Panel Wash SPW™ in water was used to clean the surface. Cleaning solution effectiveness was compared to a water control.

Panels are coated and dried for 24 hours to set. Contaminated surface is lightly and evenly sprayed with either SPW™ cleaning solution or DI water control. Wetted surface is lightly passed with soft cleaning brush, then rinsed with tap water. Result is noted.

Contamination	SPW Solution	Control
Bentonite and Mineral Oil	Excellent (4)	Poor (1)
Salt Solution and Bentonite	Good (3)	Fair (2)
Bentonite and WD-40®	Excellent (4)	Fair (2)



Before cleaning

Control *SPW*

SPW™ diluted 25:1 emulsified oils and lifts dusts. It simplifies and speeds the cleaning with less scrubbing and faster dry times.

Usage Directions:

General Maintenance Note:

Inspect the entire solar array system prior to cleaning to detect loose or broken wires and panels, or improperly functioning apparatus. Make necessary repairs before cleaning. Schedule quarterly cleaning and maintenance to keep system operating at theoretical maximum output.

Solar Panel Wash SPW™ Usage Recommendation:

Recommended dilution ratio is 1 part Solar Panel Wash SPW™ to 25 parts water (25-1). For heavily soiled areas, use either a higher SPW™ cleaner concentration or more rinsing. The cat #SPW-35HS hose adapter package has a selector switch atop the sprayer to toggle between the 25-1 and water-only ratios.

Always schedule panel cleaning early in the morning or at night when it is cool. This will minimize thermal stress on photovoltaic cells and protective glass that could damage the panels.

1) Use 25-1 Solar Panel Wash™ solution to rinse panels. Rinsing removes loose sand and debris from the panels and protects them from scratching when brushes are used in Step 2 below. In locales known for hard water, deionized water can be used to dilute the SPW™. It is okay to rinse with local water only. **Wet only the number of panels that can be brushed and rinsed before the SPW™ solution dries.** Large arrays may need to be cleaned section by section. Use heavier amounts of SPW™ on areas with bird droppings or other organic matter.
2) Scrub panels with a very soft brush (Hog's Hair or similar). Rinse the brush bristles frequently when cleaning heavily soiled arrays to reduce scratching. The use of brushes also helps agitate the SPW™; dirt tends to "carry" or be lifted from the panels better. Water alone—even deionized water—will not lift or carry dirt adequately. SPW™ is far more effective at removing residue and cleaning panels.
3) Allow the contamination and SPW™ solution to shed from the panel surface. Repeat Steps 1 and 2 if hard-to-remove contamination remains.
4) Rinse the panels with a 25-1 SPW™ solution and let dry; otherwise, rinse with deionized water or local water supply.
5) If desired, buff dry, clean panels with blue microfiber cloths followed by white microfiber cloths for a fine finish.

End Uses:

- Utility-Owned Solar Farms
- Industrial Arrays
- Commercial Arrays
- Residential Ground and Rooftop-Mounted Panels

Washing Panels Increases Performance:

Regular cleaning maximizes PV system performance and longevity. A 2011 World Academy of Science, Engineering and Technology study concluded that "accumulated dust on the surface of photovoltaic solar panels can reduce the system's efficiency by up to 50%."[1]

In an EPRI study, industry stakeholders estimate "panel washing can improve efficiencies by as much as 10-15%."[2]

Cleaning maximizes return on investment. It is especially effective on flat, low-tilt panels. Google cleaned solar panels on their campus for the first time after 15 months of operation, and energy output doubled. A second cleaning, 8 months later, resulted in a 36% increase in output.[3]

Even small areas of contamination can have a significant impact on panel performance. Solar cells connected in series are only as good as the lowest performing cell. Cleaning is also a good practice to avoid hot spots.

[1] Sulaiman S, et al, "Effects of Dust on the Performance of PV Panels." *World Academy of Science, Engineering and Technology. International Journal of Mechanical Aerospace, Industrial, Mechatronic and Manufacturing Engineering* Vol: 5, No 10, 2011. Web. 23 January 2017.

[2] "Addressing Solar PV Operations & Maintenance Challenges: A Survey of Current Knowledge and Practices." *EPRI*, Palo Alto, CA. 2010. 1008434.

[3] Lam, Winnie. "Should you spring clean your solar panels?" Google Official Blog, 31 July 2009. Web 23 January 2017.

Model Specification:

The statement below may be inserted into a customer specification to help maintain engineering standards and ensure work integrity.

The solar panel cleaning solution shall not contain solvents or other volatile components. It shall be non-toxic with a neutral pH for safe handling. It shall be biodegradable based on OECD standards.

The solar panel cleaning solution shall remove a wide range of contaminants including dust, ash, clay, pollen, industrial grime, and bird excrement. The cleaning solution shall rinse with a thin, water-shedding film to minimize spotting.

The solar panel cleaning solution shall be compatible with all panel components. It shall be approved and tested by solar panel manufacturers.

Order Information:

Cat #	Package Description
SPW-35LF	1-qt bottle with flip-top cap (.95 liters)
SPW-35HS	1-qt bottle with hose sprayer attachment (.95 liters)
SPW-128	1-gal pail (3.8 liters)
SPW-640	5-gal pail (18.9 liters)

LIT-SPWTECHSPEC/REV002.

American Polywater® Corporation

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Stillwater, MN 55082
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1-651-430-2270
http://www.polywater.com (URL) support@polywater.com (e-mail)

Electro Fusion Products

Polywater® EFW™

CLEANER FOR PE FUSION

Cleaning after cutting PE gas pipe

Cleaning Wipe for After the Peeling or Scraping Process

PRODUCT BENEFITS

- **99.8% Anhydrous Isopropyl Alcohol:** Exceeds industry standards.
- **Good Solvency:** Removes mud, dirt, and other contaminants from elbows, Ts, saddles, and MET fittings.
- **Large Cleaning Wipe:** Easier to handle and cleans larger areas.
- **Supportive:** Best choice to use after peeling, scraping, or cutting.
- **Effective Cleaner:** More consistent and stronger HDPE fusion splices.

PE Fusion Towelettes

Polyethylene pipe starts oxidizing as soon as it leaves the plant. Polywater® EFW™ Electrofusion Wipes clean the PE pipe surface after the peeling, scraping, shaving, or cutting process on gas, water, and sewer pipes. Cleaning is critical prior to the electrofusion or butt fusion process.

Cleaning fitting prior to fusion

Cleaning uncovers hidden contaminants

polywater.com | 651-430-2270

American Polywater® Corporation

Removing dirt with the EFW-1

Catalog # EFW-1

Comply with Industry PE Fusion Standards

Polywater EFW-1 is a lint-free, presaturated, 99.8% pure anhydrous alcohol wipe that exceeds the 96% isopropyl alcohol industry content standard. EFW has no water content and won't leave a residue.

When VOC regulations do not allow the use of alcohol, the Polywater ACE™ acetone wipe is the best industry alternative. This water-free solvent wipe also offers excellent cleaning with no residue. Acetone evaporates slightly faster than alcohol.

POLYWATER EFW

Catalog #	Package Description	Units/Case
EFW-1	Saturated 5" x 8"/13 cm x 20 cm wipe	50
ACE-1L	Saturated 10" x 12"/25 cm x 30 cm wipe	100

SPECIFICATIONS AND APPLICATIONS:

- **Methodology:** Numerous industry organizations and equipment and tool manufacturers agree that a wipe containing at least 96% isopropyl should be used in the PE fusion process. Cleaning after the peeling, scraping, shaving, and cutting process is critical to creating the best possible connection.
- **Proper Training:** Cleaning contaminants off the pipe prior to cutting, peeling, or scraping is also recommended. Contaminants such as directional drilling fluids, dirt, cutting fluids, and markers that contain oils all can affect the fusion process.
- **Caution:** Crews that use <96% anhydrous isopropyl, or utilize bulk containers versus presaturated wipes, risk contaminating the alcohol. Isopropyl alcohol is hygroscopic. When containers are left open for periods of time the alcohol absorbs and is diluted by water, again affecting the PE fusion process.

CONTACT US

1-800-328-9384 Toll Free
1-651-430-2270 Main
1-651-430-3634 Fax

email: support@polywater.com

American Polywater® Corporation

11222 60th Street N | Stillwater, MN 55082 USA

Polywater Video Search Page

These videos demonstrate Polywater products and their use and application. Product relevant videos are also shown on the resource sidebar on the detailed product page. The best way to use this list is to search using subject (e.g., duct block, pedestal repair, cable lubrication) to narrow the list. The link will start the video on a separate browser tab.

http://www.polywater.com/polywater-video-search/

American Polywater® Corporation

Safety Data Sheet Search Page

The Safety Data Sheets (SDS) for Polywater products are linked below. All Safety Data Sheets are in the GHS (Global Harmonized System) hazard classification format.

Use the search box to search by product name (e.g., “Bonduit”) or product catalog prefix (e.g., “BT-“). Please contact customer service if you cannot find the SDS you need.

http://www.polywater.com/polywater-sds-search/

American Polywater® Corporation

Polywater Calculators

These on-line calculators determine appropriate product quantities based on job details. Look through or search the list using subject (e.g. duct block, lubrication, etc.) to narrow the list. The calculator will open on a separate browser tab.

http://www.polywater.com/polywater-calculators/

American Polywater® Corporation

American Polywater® Corporation

FOR MORE INFORMATION:

www.polywater.com

Email: support@polywater.com

Orders: orderentry@polywater.com

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