ICEFREE™ ANTIFREEZE GEL INSTRUCTIONS FOR USE

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POLYWATER® ICEFREE™ ENCAPSULATING ANTIFREEZE GEL SYSTEM

IceFree is a specialty, non-freezing gel that is pumped into conduits around fiber cable to prevent water ingress and subsequent ice formation. IceFree is recommended for sections of ducts that are susceptible to freezing, such as bridge crossings or areas where the duct is placed above the frost line.

INSTALLATION

- Installation temperature:
  20°F to 120° F (-6°C to 49°C)
- In-service temperature:
  -50°F to 200°F (-45°C to 93°C)

SAFETY

- Wear eye protection.
- Use protective gloves.

MATERIALS AND EQUIPMENT

- IceFree Antifreeze Gel
- Duct sealant
  - Polywater FST Duct Sealant – to seal accessible conduit
  - Polywater-Hauff Technik PHRD Mechanical Seals – to seal accessible conduit
  - IceFree Chemical Duct Block – to seal conduit with limited access
- High pressure grease pump

  A standard pneumatic grease pump with 50-1 ratio is recommended.
  Pump must be able to develop 5000 psi. Pumps manufactured by ARO and Lincoln have worked.
  Note: Polywater LP-D5 can be used for short install under 20 feet (6 m).
- Follower plate
- Hose

HOSE ID	HOSE OD	PUMPABLE DISTANCE
0.25 inch (6 mm)	0.50 inch (13 mm)	100 feet (30 m)
0.33 inch (8 mm)	0.66 inch (17 mm)	150 feet (46 m)
0.50 inch (13 mm)	0.80 inch (20 mm)	200 feet (61 m)
0.625 inch (16 mm)	1.00 inch (25 mm)	250 feet (76 m)

- High volume air compressor
  Minimum 180 CFM
- Miscellaneous items
  - 1-gallon pail (to measure flow rate)
  - Spray paint (to mark hydraulic hose)
  - Rags (for cleaning hoses)

ICEFREE INSTALLATION INSTRUCTIONS

IceFree installation site.

1. SITE PREPARATION

Access to the site and conduit may be the most difficult part of the installation. It is easiest to install IceFree when the conduit can be accessed in boxes, vaults, or manholes from both sides. Before starting, prove and clear duct. Remove any existing water and ice.

IceFree drum with grease pump attached.

2. PUMP SET-UP

Set up pump according to manufacturer instructions. Place follower plate on top of IceFree gel. The follower plate prevents air pocket formation and eliminates cavitation.

Note: Pump can be damaged by dirt. Keep the pump clean by sealing it in a plastic bag or in a container when not in use.

3. DETERMINE PUMPING RATE

Mark the installation hose with bright spray paint every 10 feet (3 m). This will help during the installation of the IceFree.

$$Pumping\ Rate = \frac{Volume}{Time}$$

Before inserting the hose, the flow rate of the IceFree must be determined based on the specific pump, compressor, hose diameter, and length used in the installation. Measure the time it takes to fill a 1-gallon (3.8 L) pail in minutes to calculate conduit fill rate later. Test the rate two or three times for accuracy. IceFree used in this testing can be placed back into the container for reuse.

The pumping rate is used to determine the rate the hose will be pulled out during pumping.

Duct sealing options

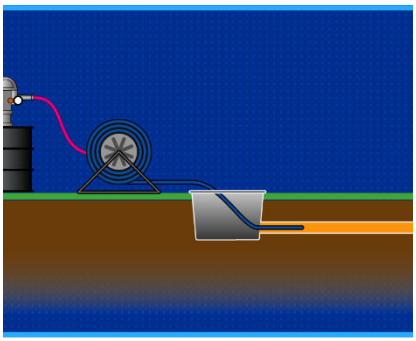
4. SEALING CONDUIT

To prevent IceFree from slowly migrating, or from exposure to water, the IceFree will need to be sealed into the conduit. Seal end with FST Duct Sealant or Polywater Hauff Technik mechanical seal.

Location and timing of plugging will be determined by actual field situations.

If pumping from a manhole or vault, leave about two feet of space for the duct seal as you are installing IceFree. Clean the conduit and then follow duct seal installation instructions **after installing IceFree**.

If pumping into a bridge wall, or to insert IceFree into an inaccessible point beyond the frost line, use **IceFree Chemical Duct Block** to create a re-enterable plug inside the conduit **before installing IceFree**. See IceFree Chemical Duct Block for instructions.



Inserting injection hose into conduit.

5. HOSE INSERTION

A pulling rope and Polywater lubricant may be needed to help install the hose.

Push the insertion hose into the conduit the desired distance or use a pulling rope if both ends of the conduit are accessible.

If the installation is being done during winter, ice may be causing a blockage and a steam hose can be used to help melt the ice and break up ice blockages.

Insert the steam hose between the innerduct and the conduit; do not apply steam directly to a cable. Use the insertion hose in the conduit to help break up the ice.

6. CALCULATING FILL RATE

Use the pumping rate (PR) from step 3 to calculate the time it will take to fill 10 feet (3 m) of conduit. Determine the volume gallon (L) fill for every 10 feet (3 m) using the formula or following table below.

Gallons/10 Feet Duct

$$= 1.63\left[\left(\frac{ID}{2}\right)^2 - \left(\frac{OD}{2}\right)^2\right]$$

Liters/3 Meter Duct

$$= 0.00942\left[\left(\frac{ID}{2}\right)^2 - \left(\frac{OD}{2}\right)^2\right]$$

Where:

ID = inside diameter conduit (inches, mm)
OD = outside diameter cable (inches, mm)

GALLONS PER 10 FT (LITERS PER 3 M)			
	CABLE SIZE		
CONDUIT SIZE	½ INCH (12 mm)	¾ INCH (19 mm)	1 INCH (25 mm)
1.00 inch (25 mm)	0.3 gal (1.1 L)	0.2 gal (0.6 L)	N/A
1.25 inch (32 mm)	0.5 gal (2.1 L)	0.4 gal (1.6 L)	0.3 gal (0.9 L)
1.50 inch (38 mm)	0.8 gal (3.1 L)	0.7 gal (2.6 L)	0.5 gal (1.9 L)
2.00 inch (50 mm)	1.5 gal (5.5 L)	1.4 gal (5.0 L	1.2 gal (4.4 L)
4.00 inch (100 mm)	6.4 gal (23 L)	6.3 gal (22 L)	6.1 gal (22 L)

To determine the time, it will take to fill 10 feet (3 m) of conduit:

$$\text{Fill Rate} = \frac{\text{10 ft (3 m) duct volume in gallons (Liters)}}{\text{Pumping rate in gallons (Liters)/minute}}$$

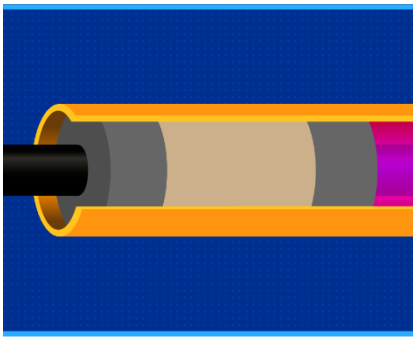
Removing hose during filling

7. INJECTING ICEFREE

Begin pumping the IceFree into the conduit. Keep time and pullout the installation hose at the rate calculated. Do this in increments of 10 feet. You should feel the hose get easier to pull as the hose is coming out of the IceFree. If the hose gets stuck, stop pumping and free the hose before continuing.

Most crews will clean the hose with a dry rag and roll it onto the hose reel as it exits the innerduct. As the hose gets closer to the end, it should push itself out. Leave two to three feet of the duct end unfilled to allow room for the FST.

Note: If there is water in the conduit, IceFree will displace it. Displaced water may collect in an enclosed area and may need to be removed or diverted.



Finished seal with IceFree.

8. SEALING THE CONDUIT

After the IceFree is installed and the hose removed, the conduit must be sealed. Use Polywater FST or Polywater Hauff Technik PHRD mechanical seals to seal the conduit ends if they are accessible.