

LFP™ Antifreeze Agency Listed Solution for Fire Sprinkler Systems

General Description

LFP™ antifreeze is a pre-mixed freeze protection solution designed and listed for use in wet fire sprinkler systems. The solution is designed for systems subject to freezing temperatures that can cause damage to equipment or impede the proper function of the system. The solution has been developed to meet the requirements of UL 2901 for compliance to the 2019 editions of NFPA 13, 13R, 13D, and the 2017 edition of NFPA 25.

LFP™ antifreeze remains in a liquid state at temperatures as low as -10°F (-23,3°C). Upon operation of the sprinklers during a fire event, the solution immediately discharges from the sprinklers and is followed by water from the water supply. Use of the solution in sprinkler systems eliminates the delivery delay times associated with dry pipe systems.

Allowable Temperature Range

Minimum Use Temperature:
-10°F (-23,3°C)

Maximum Use Temperature:
150°F (65°C)

Fire Performance

LFP™ antifreeze has been tested for exposure to fire and fire fighting effectiveness.

Safe Handling Procedures

LFP™ antifreeze has been formulated to reduce risks to humans and the environment. Gloves and eye protection are recommended when handling LFP™ antifreeze. For additional product information and Safety Data Sheet, see www.tyco-fire.com.

Typical Properties

Appearance

Liquid, colorless

Freeze Point

-13°F (-25°C)

Note: Freeze point is the temperature at which crystallization begins.

Density at 77°F (25°C)

9.4 lb/gal (1129 kg/m³)

pH

7–8

Conductivity

1000–1400 µS/cm

Refractive Index

See Table C

Specific Gravity

See Table C

Viscosity

See Table D

Pour Point

-16.6°F (-27°C)

Technical Data

Approvals

UL Certified (Listed)
FBC™ System Compatible

Note: FBC™ System Compatible indicates that this product has been tested, and is monitored on an ongoing basis, to assure its chemical compatibility with FlowGuard Gold®, BlazeMaster® and Corzan® pipe and fittings. FBC™, FlowGuard Gold®, BlazeMaster® and Corzan® are licensed trademarks of The Lubrizol Corporation or its affiliates.



Compatibility

The following materials are compatible with LFP™ antifreeze:

- Steel piping
- Brass materials
- Stainless steel piping
- Black steel
- Copper
- Bronze
- Cast iron
- CPVC
- PEX
- EPDM
- Natural rubber
- Nitrile rubber (BUNA-N)
- Styrene-butadiene rubber (SBR)
- Fusion bonded epoxy coated ductile iron

NOTICE

For use with other materials, contact Technical Services.

Transitioning from dissimilar piping materials requires a dielectric union.

Initial Fluid Volume gal (L)	Temperature Change				
	20°F (-7°C)	40°F (4°C)	60°F (16°C)	80°F (27°C)	100°F (38°C)
	Approximate Fluid Expansion/Contraction gal (L)				
25 (95)	0.2 (0,8)	0.4 (1,5)	0.6 (2,3)	0.8 (3,0)	1.0 (3,8)
50 (189)	0.4 (1,5)	0.8 (3,0)	1.1 (4,2)	1.5 (5,7)	1.9 (7,2)
75 (284)	0.6 (2,3)	1.1 (4,2)	1.7 (6,4)	2.3 (8,7)	2.9 (11,0)
100 (379)	0.8 (3,0)	1.5 (5,7)	2.3 (8,7)	3.1 (11,7)	3.9 (14,8)
150 (568)	1.1 (4,2)	2.3 (8,7)	3.4 (12,9)	4.6 (17,4)	5.8 (22,0)
200 (757)	1.5 (5,7)	3.0 (11,4)	4.6 (17,4)	6.2 (23,5)	7.8 (29,5)
250 (946)	1.9 (7,2)	3.8 (14,4)	5.7 (21,6)	7.7 (29,1)	9.7 (36,7)
300 (1136)	2.3 (8,7)	4.6 (17,4)	6.9 (26,1)	9.2 (34,8)	11.6 (44,0)

NOTES

- Interpolation and extrapolation can be calculated for values outside temperatures and volumes listed in Table A.
- For examples on calculating fluid expansion and contraction, see the sections titled Expansion Example and Contraction Example, respectively.

TABLE A
LFP™ ANTIFREEZE EXPANSION

Tubing Size	Approximate Gallons of Fluid/100 ft			
	Steel Schedule 40 Pipe	Polybutylene Tube	CPVC Pipe	Copper Pipe Type L
1/2 in.		2		1.5
3/4 in.		2.5	3.5	2.5
1 in.	4.5	3.5	5	4.5
1 1/4 in.	8	5.5	8	6.5
1 1/2 in.	11	6.5	10.5	9.5
2 in.	17.5	8.5	16.5	16.0
2 1/2 in.	25		24.0	25
3 in.	38.5		35.5	
4 in.	66.5			

NOTES

- Values are approximate.

TABLE B
LFP™ ANTIFREEZE PIPE FILL

Concentration of LFP™ Antifreeze %	Specific Gravity at 77°F (25°C)	Refractive Index at 77°F (25°C)
100	1.122 – 1.129	1.3960 - 1.3995

TABLE C
ACCEPTABLE PROPERTY RANGES OF LFP™ ANTIFREEZE FOR MINIMUM USE TEMPERATURE -10°F (-23,3°C)

Temperature °F (°C)	Viscosity, Centipoise
-10 (-23,3)	86.7
36 (2,2)	12.8
70 (21,1)	6.0
120 (48,9)	2.6
150 (65,6)	2.3

TABLE D
LFP™ ANTIFREEZE VISCOSITY ACROSS TEMPERATURE RANGES

Design Criteria

LFP™ antifreeze is a solution specifically tested and listed by UL for use within the strict parameters and requirements in this Technical Data Sheet.

All fire protection systems shall conform to state, local, and NFPA requirements if employing the use of LFP™ antifreeze.

Layout and Design

Flow rates, pipe sizing, sprinkler spacing, hanging methods, and system design must be in accordance with NFPA 13, 13R, and 13D. Fire sprinkler systems utilizing LFP™ antifreeze shall meet the system size limitations as follows:

NFPA 13D

No limitations on sprinkler system volume. Antifreeze shall only be used in above-ground piping.

NFPA 13R - Occupancies with Dwelling Units Only

No limitations on sprinkler system volume in buildings only containing dwellings. Antifreeze shall only be used in above-ground piping.

NFPA 13R - Mixed Use Occupancies

Where buildings contain mixed use occupancies that are fed by a single sprinkler system, the system size shall be limited to 40 gal (151 L). Where a sprinkler system feeds solely dwelling units, the system size has no limitations. Antifreeze shall only be used in above-ground piping. Where a system feeds non-dwelling units, it shall be limited to 40 gal (151 L). If future building renovations result in occupancy classification changes, a fire sprinkler system evaluation must be performed to determine if any changes are required for the use of antifreeze.

NFPA 13

Buildings with occupancy classifications of Light Hazard and Ordinary Hazard Group 1 and 2 are limited to a sprinkler system volume of 40 gal (151 L). Storage applications using non-ESFR sprinklers are limited to a sprinkler system volume of 40 gal (151 L).

NOTICE

LFP™ antifreeze is not listed for use in protecting extra hazard occupancies, flammable liquids, or use with ESFR sprinklers.

Hydraulic Calculations

For systems greater than 40 gal (151 L), pipe sizing shall be determined using the TYCO Sprink-Calc Hydraulic Program and/or the Darcy-Weisbach and Hazen Williams methods. Because of the density of LFP™ antifreeze, the k-factor must be adjusted and the friction loss must be considered in the system design. The flowing pressures are to be based upon a k-factor calculated using the following equation:

$$K_A = 7.94K_W \sqrt{\frac{1}{\gamma_A}}$$

K_A = sprinkler k-factor discharging the antifreeze solution

K_W = sprinkler K-factor discharging water

γ_A = density of the antifreeze solution at the temperature used for testing in lb/ft³

Minimum Design Pressure

The minimum design pressure of the sprinkler system must be the minimum required pressure for the sprinklers used.

Fluid Sampling Valve Connection

The riser must be installed in an area not subject to freezing with a minimum temperature of 40°F (4°C). A fluid sampling valve connection must be located at the top of each system riser. The sampling valves should be located for ease of access to the valve by contractors.

The sampling connection will facilitate implementing the service requirements outlined in the Care and Maintenance section.

Fluid Contraction and Expansion

Fluids expand and contract when exposed to changes in temperatures, resulting in changes in fluid density. Thermal expansion shall be taken into account when designing or retrofitting a sprinkler system that will use LFP™ antifreeze by use of an expansion tank. Table A shows the thermal expansion or contraction of the solution at different temperatures in sprinkler system volumes, using the equation for sizing the expansion chamber due to thermal expansion in NFPA 13.

These values and the NFPA 13, 13R, and 13D Standards for the Installation of Sprinkler Systems can be used by the installer to determine the proper expansion or contraction arrangement of a sprinkler system containing LFP™ antifreeze.

Expansion Example

A sprinkler system containing 50 gal (189 L) of LFP™ antifreeze is subjected to an environmental temperature of 0°F (-18°C) in the winter months and an increase of system temperature to 100°F (38°C) in the summer months, or a temperature change of 100°F (38°C). This results in fluid expansion of approximately 2 gal (8 L).

Contraction Example

A sprinkler system containing 300 gal (1136 L) of LFP™ antifreeze is subjected to an environmental temperature of 70°F (21°C) with a later decrease in system temperature to -10°F (-23°C), or a temperature change of 80°F (27°C). This results in a fluid contraction of approximately 9.2 gal (35 L).

Expansion Tank

A listed expansion tank must be installed in a system using LFP™ antifreeze to account for variations in system volume and pressure throughout the year.

The vessel sizing should be based on the anticipated operating conditions the system will experience and the corresponding expansion values in Table A.

Installation

NOTICE

LFP™ antifreeze is pre-mixed at the factory per NFPA 13, 13R, 13D. Do not dilute LFP™ antifreeze with water. Diluting with water or other constituents in the field can adversely impact the properties and performance of the solution. The functional life of the solution may be impacted by the end use environmental conditions. It is recommended to only use antifreeze in closed systems as oxygen can contribute to an increased rate of corrosion.

New Systems

Use the following guidelines when preparing a new sprinkler system for LFP™ antifreeze installation:

1. Make certain the system has been outfitted with air vent valve(s) and fluid sampling valve connections per the plans provided by the system designer. The upper sampling valve(s) should be easily accessible by contractors. The drain valves should be located and oriented in a way that allows a variety of connections with ease.
2. The system should be air-tight to prevent leakage.
3. Use water to conduct a complete flush of branch lines and mains to prevent potential risks of contaminants. Perform a pressure test to 200 psi (13,8 bar), per NFPA 13, 13R, 13D, to ensure no leakage is present. Loss can be determined by drop in gauge pressure or visual leakage. The water shall be completely removed from the system prior to introducing LFP™ antifreeze to the system.
4. Prior to filling the system with LFP™ antifreeze, use an appropriate refractometer and/or hydrometer to test the solution to demonstrate compliance to property ranges in Table C. A detailed description of an appropriate hydrometer or refractometer can be found in the sections titled Using a Hydrometer and Using a Refractometer, respectively. If the solution is discolored or the container has dirt present, contact Customer Services.

NOTICE

Storing or carrying the antifreeze solution in any container other than the original may introduce contaminants and reduce the functional life of the solution.

5. Fill the system with LFP™ antifreeze. The use of a pump with a backflow preventer and pressure capabilities to get the system to the supply pressure is recommended. For LFP™ antifreeze to work correctly, purge as much air as possible from the system. Accelerated corrosion may occur where air pockets exist in the system.
6. After filling the system with LFP™ antifreeze, test the system to verify the solution has not been diluted. Take samples of the solution from a high and low point in the system. The test results from the samples shall be the same before and after installation for the installation to be successful. Perform a pressure test to 200 psi (13,8 bar), per NFPA 13, 13R, 13D, to ensure no leakage is present. Loss should be determined by drop in gauge pressure or visual leakage.

Existing Systems

Use the following guidelines when preparing an existing sprinkler system for LFP™ antifreeze installation:

1. Inspect all sprinkler drops for mechanical damage, corrosion, and leakage within the system. If any damage is apparent, replace the sprinkler per NFPA 25.
2. The system should be air-tight to prevent leakage. Air vents are recommended to reduce the oxygen in the system.
3. Use water to conduct a complete flush of branch lines and mains to prevent potential risks of contaminants. Perform a pressure test to 200 psi (13,8 bar), per NFPA 13, 13R, 13D, to ensure no leakage is present. Loss should be determined by drop in gauge pressure or visual leakage. The water shall be completely removed from the system prior to introducing LFP™ antifreeze to the system.
4. Prior to filling the system with LFP™ antifreeze, use an appropriate refractometer and/or hydrometer to test the LFP™ antifreeze to demonstrate compliance to property ranges in Table C. A detailed description of an appropriate hydrometer or refractometer can be found in the sections titled Using a Hydrometer and Using a Refractometer, respectively. If the solution is discolored or the container has dirt present, contact Customer Services.

NOTICE

Storing or carrying the antifreeze solution in any container other than the original may introduce contaminants and reduce the functional life of the solution.

5. Fill the system with LFP™ antifreeze. For LFP™ antifreeze to work correctly, purge as much air as possible from the system. Accelerated corrosion may occur where air pockets exist in the system.
6. After filling the system with LFP™ antifreeze, test the system again to verify the solution has not been diluted with remaining liquids in the system. Take samples of the solution from a high and low point in the system. The test results from the samples shall be the same before and after installation for the installation to be successful.

System Tag

A system tag must be present on an antifreeze system main valve identifying the following:

- Type and manufacturer of the antifreeze solution used
- Volume of antifreeze used
- Percent concentration by volume of antifreeze used

If using LFP™ antifreeze, the percent concentration by volume would be 100% since it is a pre-mixed solution. A tag for inspection, testing, and maintenance can also be hung at the system riser to record annual testing data. Tag design is available on www.tyco-fire.com.

Storage

Store the product in original container and at a temperature between 40°F (4,4°C) minimum and 90°F (32,2°C) maximum. Do not mix the product with other liquids. Eye and hand protection are recommended when handling the antifreeze solution.

Care and Maintenance

The sprinkler system owner is responsible for the inspection, testing, and maintenance of their fire protection system and devices in compliance with this document, as well as with the applicable NFPA standards, in addition to the standards of any authority having jurisdiction. Contact the installing contractor or product manufacturer with any questions.

It is recommended that automatic sprinkler antifreeze systems be inspected, tested, and maintained by a qualified inspection, testing, and maintenance service.

Fluid Test

At least once a year, an inspection, testing, and maintenance service shall take a measurement of the specific gravity or refractive index of the fluid in the LFP™ antifreeze system. The fluid must be replaced if either property deviates from that originally supplied within the allowed tolerance, as specified in Table C.

A detailed description of an appropriate hydrometer or refractometer can be found in the sections titled Using a Hydrometer and Using a Refractometer, respectively. A recommended hydrometer, refractometer and accessories are available for purchase, as listed in the Ordering Procedure section.

It is required to have test equipment calibrated annually to reduce the risk of incorrect test results. Two test methods are acceptable per NFPA 25, and either may be used to verify that the antifreeze is within the specification limits.

Using a Hydrometer

1. Ensure that your hydrometer measures specific gravity. The range of specific gravity measurements should cover the acceptable specific gravity range listed in Table C and the hydrometer should have increments of at most 0.002.
2. Ensure the main supply valve is closed prior to taking a sample to test. If the valve is open, supply water will be pulled into the system when the first sample is removed from the system. Test separate samples from the top of each system and at the bottom of each system, or otherwise required by applicable NFPA standards. If the most remote portion of the system or the interface with the wet pipe system is not near the top or the bottom of the system, additional samples must be checked.

3. Discharge a 1/2 gal (2 L) of fluid from the fluid sampling valve connection. Collect and seal the sample in a clean and dry 3/4 gal (3 L) or larger container. Allow the sample to warm until it reaches the minimum temperature in Table C.
 4. Once the solution reaches the minimum temperature, fill the 500 ml calibrated cylinder with the solution and gently insert the hydrometer into the cylinder to allow it to float. Fluid may be added to the cylinder until the hydrometer is floating. Note the specific gravity as shown on the hydrometer. Check the temperature using an appropriate thermometer.
 5. Verify the specific gravity falls within the acceptable range listed in Table C. If the test results for all the samples are within the acceptable ranges, the inspection is complete.
 6. If the test results from any of the samples fall outside of the acceptable ranges, drain out the system, and pump in new LFP™ antifreeze. Take samples and test again. If the samples continue to fall outside of the acceptable specifications, then the system shall be emptied and vacuumed clean of any remaining fluid. Recharge the system per the Existing System Installation section. If the samples fall within the acceptable range, top off the system to replace the liquid removed for the samples.
3. Discharge a 1/2 gal (2 L) of fluid from the fluid sampling valve connection. Collect and seal the sample in a clean and dry 3/4 gal (3 L) or larger container.
 4. To measure the refractive index, use a digital refractometer that is temperature compensating. Fill the well in the refractometer with solution and shut the cover. Note the refractive index as shown on the refractometer.
 5. Verify the refractive index falls within the acceptable range listed in Table C. If the test results for all the samples are within the acceptable ranges, the inspection is complete.
 6. If the test results from any of the samples fall outside of the acceptable ranges, drain out the system, and pump in new LFP™ antifreeze. Take samples and test again. If the samples continue to fall outside of the acceptable specifications, then the system shall be emptied and vacuumed clean of any remaining fluid. Recharge the system per the Existing System Installation section. If the samples fall within the acceptable range, top off the system to replace the liquid removed for the samples.

NOTICE

Contaminants or other foreign materials within a sprinkler system may adversely impact the properties and performance of LFP™ antifreeze. Refer to the Installation section for instructions on flushing and recharging the system if the solution falls outside of the acceptable range since the last inspection.

NOTICE

Use of LFP™ antifreeze shall be in conformance with all state and local health and environmental regulations for the location where it is installed. If a small amount of antifreeze solution is spilled, absorbent towels are recommended to clean up spill. Towels used to clean up spill can be disposed of in the garbage. Use caution following a spill as the floor may remain slippery in the area of the spill. Consult with a local waste water treatment plant or council for information on procedures to follow for the disposal of large amounts of waste water.

Disposal

Any disposal of LFP™ antifreeze shall be in conformance with all federal, state, and local waste regulations. Refer to the LFP™ antifreeze Safety Data Sheet for more details.

Limited Warranty

For warranty terms and conditions, visit www.tyco-fire.com.

Ordering Procedure

Contact your local distributor for availability. When placing an order, indicate the full product name and Part Number (P/N).

LFP™ Antifreeze

Specify: LFP™ Antifreeze, (specify net contents), P/N (specify):

Pallet of 5 gal (19 L) pails,
36 per pallet 54028
Pallet of 30 gal (114 L) drums,
5 per pallet 54029

Note: Minimum order quantity is 1 pallet, 36 pails or 5 drums.

Testing Instruments

Recommended instruments for testing LFP™ antifreeze for installation or maintenance can be purchased through FISHER SCIENTIFIC, using the following part numbers:

Hydrometer 13202421
Graduated Cylinder 115822
Thermometer 13201647
Refractometer 12561346