

ANTIFREEZE SPRINKLER SYSTEMS IN COLD CLIMATES

Water-based fire protection systems may be vulnerable to pipes freezing or bursting during the winter in colder climates. To prevent this from happening, a water and antifreeze (glycerin or propylene glycol) mixture is sometimes used in the sprinkler system. However, the National Fire Protection Association has recently issued technical requirements limiting antifreeze solutions in sprinkler systems. These requirements include using only pre-mixed solutions with maximum concentrations by volume of either glycerin or propylene glycol.

On the positive side, the new requirements reduce the likelihood of automatic sprinkler discharge exacerbating a fire condition. It is now evident from several fire incidents that antifreeze sprinkler systems can contain too high a concentration of glycerin or propylene glycol in water, which can actually jeopardize fire safety by intensifying the fire when discharging from sprinklers. In a California home several years ago, the automatic sprinkler discharge from the antifreeze sprinkler system turned a cooking fire into a violently explosive and fatal flash fire.¹

Material Safety Data Sheets (MSDS) for both glycerin and propylene glycol caution against their possible ignition when they are in the form of a mist. Fire investigators have pointed to the possibility of a combustible antifreeze “mist” created by both the high water

pressure and the small diameter orifices of the sprinklers that opened. The National Fire Sprinkler Association (NFSA), based in Patterson, New York, has indicated antifreeze solution samples taken in adjacent apartments not involved in the California fire were as much as 70% antifreeze by volume. Meanwhile, certain preliminary fire tests by the National Fire Protection Research Foundation (NFPRF) resulted in large-scale ignition of antifreeze solutions of 70% glycerin in water and 60% glycerin in water.²

Building owners are now restricted from adding glycerin or propylene glycol antifreeze in anything but factory pre-mixed amounts, which may prove to be insufficient for colder climates. Effective March 21, 2011, the National Fire Protection Association released a Tentative Interim Amendment (TIA) to its NFPA Pamphlet No. 13, *Standard for the Installation of Automatic Sprinkler Systems*, 2010 Edition in which it allows for only 48% and 38% maximum concentrations in water, respectively, where glycerin and propylene glycol solutions are pre-mixed in factories. The pre-mixed antifreeze solutions are defined by NFPA in the TIA as “a mixture of an antifreeze material with water that is prepared by the manufacturer with a quality control procedure in place that ensures that the antifreeze solution remains homogeneous.” Unfortunately, the single-day low mean temperatures across much of North

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America are lower than the -13°F and -3°F freezing points, respectively, for 48% glycerin and 38% propylene glycol solution concentrations.³

Building owners following this new requirement should understand the hazards of having incorrect antifreeze solutions in their antifreeze sprinkler systems and that the antifreeze solution may naturally concentrate in lower portions of these systems. These hazards include pipe freeze, sprinkler leakage and the potential for aggravated fire conditions caused by an incorrect antifreeze solution mix. NFPA Pamphlet No. 25, *Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems, 2011 Edition*, has also provided a TIA revising requirements for antifreeze sprinkler systems. This now includes an

annual check of the antifreeze solution’s specific gravity before the onset of cold weather, including any low points in such systems.

In cold climates or areas where there is a concern for pipes freezing, it may be necessary for building owners to employ options other than an antifreeze system. This may include installing pipe in warm spaces, tenting insulation over piping, installing listed heat tracing on piping, or using dry pipe or pre-action sprinkler systems. Turning off sprinkler systems to prevent potential freezing can jeopardize the building and fire insurance coverage, especially where a sprinkler warranty or protective systems endorsement is made part of the insurance policy.

DATA TABLE: ANTI FREEZE SOLUTION ADDITIVES

PHYSICAL CHARACTERISTICS	PROPYLENE GLYCOL	GLYCERIN
Lower Flammable Limit (LFL)	2.6%	0.9%
Flash Point (Closed Cup Test)	210°F	320°F
Solubility in Water	Fully miscible	Fully miscible
NFPA 704 - Flammability	1	1
CAS #	57-55-6	56-81-5
Specific Gravity (Water = 1.0)	1.036	1.264
Vapor Density (Air = 1.0)	2.62	3.17

Source: MATERIAL SAFETY DATA SHEETS

CONTACT

To learn more about the correct installation or maintenance of antifreeze sprinkler systems contact your Property Risk Control Consultant or:

Joe Stavish, PE

National Technical Director
Property Risk Control
Willis Strategic Outcomes Practice
+1 973 829 2955
joe.stavish@willis.com

For information on other claim and loss prevention issues, please visit our site on willis.com.

The observations, comments and suggestions we have made in this publication are advisory and are not intended nor should they be taken as legal advice. Please contact your own legal adviser for an analysis of your specific facts and circumstances.

¹ <http://www.subrogationrecoverylawblog.com/tags/truckee-california/>

² <http://www.firesprinklerinitiative.org/News/News-Articles/June-2011/Antifreeze-solutions-project-wins-FPRF-award.aspx>

³ http://www.dps.alaska.gov/Fire/PRB/docs/Technical_Interim_Agreement_NFPA25.pdf