Current Requirements for Sprinkler Systems Containing Antifreeze – A Summary

NOTE: This summary is current as of January, 2014, and replaces the previous antifreeze alerts dated July 2010 , August 2010, and April 5, 2011.

Background

Following reports of a fire incident involving a sprinkler system that contained a high concentration antifreeze solution, research and standards development activities were begun to address concerns raised by the combustibility of antifreeze solutions in residential sprinkler systems. NFPA published several Safety Alerts providing guidance from NFPA in its role as a safety advocate. In addition, NFPA standards development activities were begun to consider and addressed the issues and these activities resulted, as more information and research became available, in successive Tentative Interim Amendments (TIAs) to NFPA sprinkler standards. [[The historical documentation relating to these activities are collected at (url?) below, including previous TIA's, safety alerts, Standards Council Decisions and Fire Protection Research Foundation reports.]] What follows is a brief summary of the current antifreeze requirements in NFPA sprinkler standards. This summary is not intended to provide all of the details or all of the provisions; the current applicable NFPA sprinkler standards, should be directly consulted for a complete and accurate understanding of the requirements related to the use of antifreeze.

The Current Requirements for Sprinkler Systems Containing Antifreeze – A Summary

The current provisions in NFPA standards relating to the use of antifreeze in sprinkler systems concerning are contained in the following standards:

NFPA 13, *Standard for the Installation of Sprinkler Systems* (2013 edition),

NFPA 13R, *Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies* (2013 edition)

NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes* (2013 edition),

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems* (2014 edition).

New Sprinkler Systems (i.e., installed after September 30, 2012) Containing Antifreeze – NFPA 13, NFPA 13D and NFPA 13R Sprinkler Systems

• With limited exceptions, all new antifreeze systems (systems installed after September 30, 2012) are required to use listed antifreeze solutions. The listing of the antifreeze solution must indicate that the solution will not ignite when discharged from a sprinkler. The exceptions to the requirement for listed antifreeze solutions are as follows:

- Factory premixed antifreeze solutions of propylene glycol in excess of 40% by volume are permitted in ESFR (Early Suppression Fast Response) systems where the sprinklers are listed for such use in a specific application. The listing will indicate the maximum percentage of propylene glycol that can be used with the specific sprinkler.
- Limited use of factory premixed antifreeze solutions of propylene glycol up to 38%and glycerin up to 48%are permitted in "specific areas" of new NFPA 13D installations where approved by the authority having jurisdiction (AHJ).
    - The designer must provide documentation to the AHJ substantiating the use of traditional antifreeze solutions.
- New systems, once installed, must be annually tested in the manner required for existing systems, summarized below.

Existing Sprinkler Systems (i.e., installed before September 30, 2012) Containing Antifreeze

Existing NFPA 13D Sprinkler Systems

• Existing NFPA13D systems **(systems installed before September 30, 2012)** must be tested annually by a qualified individual. NFPA 13D provides two alternative test procedures. In the first alternative, the system is drained and two solution samples are taken, one near the beginning and one near the end of the draining process. In the second alternative, the system is not drained and two solution samples are taken, one at the highest practical elevation and one at the lowest practical elevation of the system.

• The two samples collected using either alternative procedure are then tested to verify that the specific gravity of both samples is similar. If the specific gravity of both samples is similar and if the system is found to contain factory premixed antifreeze solutions of either glycerin at a maximum concentration of 50% by volume or propylene glycol at a maximum concentration of 40% by volume ,then the existing solution is allowed to remain in service. If these conditions are not met, the existing solution must be replaced with a premixed antifreeze solution of either glycerin at a maximum concentration of 50% by volume or propylene glycol at a maximum concentration of 40% by volume (or other solutions listed specifically for use in fire protection systems).

• The concentration of antifreeze solutions shall be limited to the minimum necessary for the anticipated minimum temperature.

• Following the annual test, a tag must be attached to the riser indicating the date of the last test, the type and concentration of antifreeze solution, the date the antifreeze was replaced (if applicable), the name and license number of the contractor that tested and/or replaced the antifreeze solution, a statement indicating if the entire system was drained and replaced with antifreeze and a notice to test the concentration of the solution at yearly intervals per NFPA 13D.

Existing NFPA 13 and NFPA 13R Sprinkler Systems

The testing and maintenance provisions for NFPA 13 and 13R antifreeze systems are governed by NFPA 25. NFPA 25 provides that, by September 2022, existing systems (systems installed after September 30, 2012), like new systems, will be required to use only listed antifreeze solutions. Until then, traditional antifreeze solutions may continue to be used where certain conditions, confirmed by annual testing, have been met, summarized as follows.

Until a listed non-combustible solution is introduced into the system, antifreeze solutions in existing systems must be tested annually, prior to the onset of freezing weather.

- If it is determined, based on records, tests or other reliable information that the solution found in the system is no longer permitted or if the type of anti-freeze cannot be reliably determined, the system must be drained and replaced with an acceptable factory premixed solution.
- If the initial review indicates that the solution type is acceptable, test samples must be taken at the top and bottom of each system (in some cases an additional sample must be taken).
- If all the test samples indicate a concentration of glycerin not greater than 38% by volume or propylene glycol not greater than 30% by volume, then the solution is permitted and may remain in the system.
- Where the test samples indicate that the solution is between 38% and 50% glycerine or 30% and 40% propylene glycol, the solution may remain in the system pending the approval of a deterministic risk assessment (see NFPA 25: 5.3.4.2.1(3)).
- If any of the samples indicate a concentration in excess of 50% glycerin or 40% propylene glycol, the system must be emptied and refilled with an acceptable solution or an alternate method of freeze protection must be employed. An acceptable solution would be a solution that contains less than 38% glycerine or 30% propylene glycol, or a solution that has been approved by the AHJ based on a deterministic risk assessment.

• All traditional antifreeze solutions must be replaced by listed antifreeze solutions, or alternative freeze protection methods, by September 2022.

NOTE: At this time, listed antifreeze solutions do not yet appear to be available. Until listed antifreeze solutions become available, many systems will not be able to utilize

antifreeze and, as discussed in the sidebar, must look to other freeze protection design approaches.

NFPA Further Recommends
Since no listed solutions currently exist, other freeze protection design approaches must be employed for new systems.

For existing systems where traditional antifreeze solutions remain an option, consideration should still be given to alternatives to the use of antifreeze. It is important to remember that, while NFPA sprinkler standards allow the limited use of antifreeze in existing systems as an option to address freeze potential, they do not require the use of antifreeze in sprinkler systems. Both in designing new NFPA 13D systems and evaluating existing systems, owners and contractors are encouraged to investigate other methods of maintaining wet pipe systems in environments where freezing of pipes may be a concern. Several alternative design options exist including the use of insulation, heating areas where sprinkler piping is run, or the use of dry pipe and preaction systems in areas subject to freezing.

Where traditional antifreeze solutions are used, only the minimum necessary concentration should be considered. Where antifreeze is used in sprinkler systems, the concentration of antifreeze solution used in the system should be limited to the minimum concentration necessary for the lowest anticipated temperatures. Of course, in no event should the minimum concentration ever exceed the concentrations permitted by the applicable NFPA sprinkler standard.

If testing for antifreeze has not been conducted per the requirements of the NFPA sprinkler standards, testing should be initiated as soon as possible and be conducted by a qualified individual. NFPA recommends that homeowners with residential sprinkler systems contact a local sprinkler contractor for assistance.

For more information on antifreeze in sprinkler systems, including historical information, research, and reports please go to www.nfpa.org/antifreeze. Note that the NFPA standards described in this summary are, like all NFPA standards, revised and amended from time to time. To be sure you have the most up-to-date versions of NFPA sprinkler standards, and to view the full text of those standards, go to www.nfpa.org/document for a list of NFPA standards and click on the appropriate standard (i.e. NFPA 13, 13D 13R 25). These "document info" pages also offer the option to sign up for an "Alert" feature to receive email notifications when new updates and other information is posted regarding the standard.

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