EASTERN FIRE SERVICES INCORPORATED

TESTING SERVICE EFSI INSPECTIONS

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EASTERN FIRE PROTECTION COMPANY

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9/10/12

Subject: **NFPA Consumer Alert**
Antifreeze sprinkler systems

Dear Fire Sprinkler System Owner,

Recent events have led the National Fire Protection Association (NFPA) to issue Tentative Interim Amendments (TIAs) to all three fire sprinkler installation codes (NFPA 13, 13R and 13D) as well as the fire sprinkler system testing and maintenance code (NFPA 25), in regards to the use of antifreeze solutions in existing and new fire sprinkler systems. The majority of the remainder of this document concerns only the requirements now included in NFPA 25 which is applicable only to systems installed in accordance with NFPA 13 and NFPA 13R. For antifreeze requirements regarding systems installed in accordance with NFPA 13D please reference the 13D section of this document. For Maine Life Safety Sprinkler Systems and Maine Hydro Pro Sprinkler Systems please consult the State of Maine Fire Marshal's website. If your fire sprinkler system contains antifreeze, these code changes bear both financial costs and potential liability exposure to you the system owner. We have included a copy of the NFPA 25 (11-1 and 11-3) and 13D (13-1)TIA's for your use. We have also included an NFPA Standards Council document explaining the August 2012 TIAs. We also recommend that you visit the NFPA website www.nfpa.org/antifreeze for additional information. Below we will briefly explain the impact of these new code rules. Please contact our office in Auburn and ask for Gary Darling, Tom Vining or Jerry Haynes and we will make arrangements to bring your system into compliance as soon as practical.

Financial Exposure

While the code changes allow for the potential to reuse the existing antifreeze solution, the reality is that the majority of existing solution will need to be discarded and replaced. ***The only way to reuse the existing solution is to verify that the solution contains no more than 50% glycerin (-19 F) or 40% propylene glycol (-6 F) and perform a deterministic risk assessment (see below).*** The fire sprinkler industry has, for more than 100 years, almost always field mixed pure propylene glycol or glycerin to attain custom freeze points based on a particular system's exposure to freezing temperatures. Common practice for over a century has been to use concentrations of 70% glycerin and 60% propylene glycol. The code changes require that all new solution be factory mixed and prohibits the field mixing of antifreeze solution. The use of factory premixed solutions has never been prevalent.

Replacement cost of the antifreeze solution can vary greatly between systems since piping configurations and system volumes are particular to each situation. Industrial occupancies will often have systems that will drain and refill easily while residential and office occupancies will sometimes have systems that will require that each pendent style sprinkler head be removed to drain concentrated antifreeze from the drop pipe (see potential liability below).

An additional caveat of the new TIAs is that the freeze points of the new factory mixed solutions have been raised to levels that may not provide protection against freezing in some situations, requiring that alternate forms of freeze protection be explored. Additionally systems installed in accordance with NFPA 13 and 13R are required to be tested and maintained in accordance with NFPA 25 which will now require that annual test samples be taken from at least two points in the system (highest and lowest point in the piping plus intermediate points in large systems). All existing systems have a test valve at one or the other of these points but not at both requiring that at least one new test valve be installed in all existing systems.

The final, and most complex, issue is the requirement in the NFPA 25 TIA 11-3 that antifreeze solutions of glycerin and propylene glycol not exceed 38% (0 F) and 30% (11 F) respectively unless an ***"approved deterministic risk assessment"*** has been completed. These freeze points are not adequate to protect piping in the Northeast, USA therefore every system will need to have the risk assessment performed if higher concentrations capable of protecting against freezing are to be used. Fire sprinkler contractors are not capable of performing the risk assessment due to the scientific complexities of analyzing available data and potential heat release rates. Generalize information may become available in the future but it is more likely that each situation will need to be assessed independently (due to differences in fire loads and building usage) by a properly trained and certified professional engineer (or equivalent). ***This rule essentially eliminates antifreeze as an option for protecting fire sprinkler piping from freezing and forces you to explore alternate means of protecting your systems, i.e. dry systems, dry heads off of wet systems, heat taping of wet systems, additional insulation over wet systems, 38% glycerin combined with one of the wet system options or heating the space containing the wet sprinkler system pipes.***

Liability Potential

The impetus for the code rule changes was a fire where antifreeze discharged from a sprinkler head during a fire and the antifreeze increased the fire growth instead of retarding it. Subsequent testing by the NFPA proved that antifreeze solution with high concentrations of propylene glycol or glycerin could act as a fire accelerant. The NFPA also found that while field mixed solutions were often reliable, there was a too high potential for poorly mixed solutions resulting in separation of the two fluids. Propylene glycol and glycerin being heavier than water, will settle to the lowest available point creating super concentrations at pendent sprinkler heads. As a result of these findings the NFPA issued the TIAs that are now in place. TIAs usually only affect new installations taking place after the issuance of the TIA but due to the potential for bodily injury the NFPA 25 TIA includes requirements for existing antifreeze installations.

Some code enforcement officials have stated that retroactivity clauses included in the NFPA 13, 13R and 13D installation standards exempt antifreeze systems installed prior to the TIAs from the requirements for new concentrations and test points. This is possibly true but only because the installation standards apply only to new sprinkler systems or new extensions of existing sprinkler systems and have no application to preexisting sprinkler systems that are not being modified. Good sense however would lead the concerned person to the conclusion that because this is a safety issue new systems designed to older standards should comply with the TIAs since there are relatively easy solutions to limiting or eliminating the use of antifreeze.

NFPA 25 (Standard for the Inspection, Testing and Maintenance of Water Based Fire Protection Systems) has no such retroactivity clause because it is concerned only with preexisting situations and the methods necessary to insure a minimum level of confidence that existing sprinkler systems can be properly inspected, tested and maintained. The NFPA 25 TIAs are written to provide the building owner and inspection contractor with the minimum guidance necessary to maintain antifreeze systems at a minimum acceptable level of reliability for building protection and life safety. The very first section (1.1 Scope) of the Standard states "This document establishes the minimum requirements for the periodic inspection, testing and maintenance of water based fire protection systems, including land-based and marine applications." To knowingly choose to do less than required, without supporting scientific or historical data, opens the door to potential future litigation in the event of a fire.

Anytime there is potential to cause harm there is potential for liability. You, as the system owner, need to be aware that the NFPA codes require you to properly maintain any fire sprinkler system located on your property. The new code rules concerning antifreeze fall under the system owner maintenance requirements and thus should be taken seriously in regards to protection of your property and building occupants. If you are questioning your potential exposure, we would suggest that you seek the written guidance of your insurance agent and/or lawyer.

Recommendations

1. Because existing antifreeze systems are designed to protect at temperatures of -20 F and lower they will fail the requirements of TIA 11-3 paragraph 5.3.4.2.1(3) and therefore require a deterministic risk assessment by a properly trained and certified professional engineer (or equivalent).
2. If the deterministic risk assessment is accepted and 50% glycerin solution is allowed we recommend that you have us add the additional test points, if not already present, required in the NFPA 25 TIA's. This will require that the antifreeze be drained after which it can be tested for conformance with the NFPA 25 requirements. If the concentration is acceptable the old solution can be pumped back in.
3. If a test of your existing antifreeze indicates any of the conditions listed below then you should have us recharge the system to the new requirements.
    a. The antifreeze is weak and will not provide freeze protection.
    b. The existing antifreeze is adequate to prevent freezing but exceeds the new concentration levels.

Systems containing propylene glycol will typically fail all concentration tests and can only be recharged to provide protection to approximately -4 F which is not adequate in our climate and thus should be drained and recharged with a new glycerin based solution.

The new antifreeze mixture (glycerin based) will provide protection to approximately -17 F (48% glycerin since 50% is not manufactured) which should suffice in the majority of Maine and New Hampshire locations. Please see the temperature map included with the NFPA 25 TIA. For locations where -17 F protection is questionable or the deterministic risk assessment is unacceptable or undesirable we can provide recommendations for alternate forms of freeze protection, i.e. heat tracing, conversion to a dry type system, additional insulation, etc. Since this is a newly discovered problem, the marketplace will continue to explore other viable solutions and we will do our best to stay informed and keep you informed.

Pendant Sprinkler Drops

The NFPA 25 TIAs say "Where systems are drained in order to be refilled, it is not typically necessary to drain drops. Most systems with drops have insufficient volume to cause a problem, even if slightly higher concentration solutions collect in the drops. For drops in excess of 36 in. consideration should be given to draining drops if there is evidence that unacceptably high concentrations of antifreeze have collected in these long drops." No guidance is given as to how much evidence should be collected therefore we assume that one pendant sprinkler should be pulled, the drop drained and drop solution tested. There is also no guidance given as to what constitutes "unacceptably high concentrations" therefore we assume that a concentration 25% higher than the maximum allowed is a reasonable benchmark. Without a deterministic risk assessment stating otherwise the maximum allowable concentration of glycerin is 38% and propylene glycol is 30%. Adding 25% puts the maximum concentration for drop solution at 48% glycerin and 38% propylene glycol. We have asked the NFPA to clarify this and will edit this document appropriately once guidance is given.

Draining pendant sprinkler drops can be very expensive because of:

1. The need to access all areas of the building where antifreeze supplied pendant sprinkler heads are located. Furnishings may have to be moved and/or covered and occupants disrupted. All of this is very slow and labor intensive. This cost can be reduced if the building owner assists with access and protection of furnishings.

2. The potential for minor leaks at the sprinkler head thread after it is reinstalled. The use of hardening sealants is not allowed in sprinkler systems and because the sprinkler and fitting have already been tightened/stressed once the reinstallation of the sprinkler using an approved sealant is not always leak proof. This situation can usually be resolved by replacement of the sprinkler head with a new one. h
3. A common problem in plastic pipe systems is cracking of the brass thread molded into the plastic fitting. This would require opening of the ceiling to replace the fitting.

Items 2 and 3 above are functions of system component defects and are not covered by a workmanship warranty or guarantee. Neither of these situations is predictable and may occur at a rate, based on our past experience, from 0 to 5 per 100 pendant sprinklers reinstalled.

Due to the lack of guidance from the NFPA the final decision falls to the building owner as to whether pendant drops should be drained. If requested a min–max price range for draining can be provided.

NFPA 13D – 2013 Requirements

NFPA 13D sets the requirements for the installation of fire sprinkler systems in one and two family dwellings.

For existing one and two family structures NFPA 13D allows the system to remain filled with antifreeze as long as the antifreeze does not exceed 50% glycerin or 40% propylene glycol and the antifreeze was premixed at an approved factory. As discussed previously in this document it has not been common practice for the fire sprinkler industry to use factory premixed antifreeze solutions so it is likely that the majority of all existing solutions will need to be replaced with a new premixed solution. If the existing solution can be verified to have been factory premixed it can stay in service. Systems will have to be drained so that two test samples can be taken (one at the beginning and one at the end of the draining process) to verify similar readings. If the two readings are disparate this means that the solution has begun to separate and needs to be replaced. When the system is drained test valves can be installed at appropriate locations so that future annual test samples can be drawn without the cost associated with totally draining the system.

At times NFPA 13D systems have been allowed, by building code or local authority, to be installed in buildings housing more than two families. Sometimes these buildings are subdivided into small sprinkler systems protecting only one or two living units and other times the entire structure is one large zone. For structures with large zones protecting more than two living units we recommend that NFPA 25 requirements be followed due to the large network of piping and associated volume of antifreeze.

Conclusion

The use of historical methods to antifreeze fire sprinkler systems is rapidly being curtailed and possibly eliminated. The NFPA has allowed room for new technology and new testing of old technology but both of these are future developments with unknown timelines. To limit their own liability building owners with antifreeze filled NFPA 13 or NFPA 13R fire sprinkler systems should follow the requirements of NFPA 25 – 2011 and TIA's 11-1 and 11-3. Owners of one and two family dwellings should follow the NFPA 13D – 2013 TIA 13-1 or NFPA 25 - 2011. For Maine Life Safety Sprinkler Systems and Maine Hydro Pro Sprinkler Systems please consult the State of Maine Fire Marshal's website. Building owners should be sure that their insurance policies are paid up to date and that coverage is included for this specific situation. Local and State Authorities Having Jurisdiction may choose to ignore or not adopt the TIA's and/or newest installation codes. However because antifreeze is a safety issue the liability cannot simply be ignored and we recommend that all property owners comply fully with the latest practices recommended by the NFPA.

Eastern Fire as your once and/or present fire protection contractor is here to assist you with this or any other fire sprinkler, fire alarm, security or other building or life safety protection system requirement. Please don't hesitate to contact us and we will do our best to provide you with timely and accurate information. If you have time please visit our website, www.efp-efs.com, for more information about our services.

Tentative Interim Amendment

NFPA 25

Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems

2011 Edition

Reference: 3.6.4.1.1 Premixed Antifreeze Solution (New), 5.3.4, and A.5.3.4
TIA 11-1
(SC 11-3-6/TIA Log #1014)

Pursuant to Section 5 of the NFPA Regulations Governing Committee Projects, the National Fire Protection Association has issued the following Tentative Interim Amendment to NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, 2011 edition. The TIA was processed by the Technical Committee on Inspection, Testing, and Maintenance of Water-Based Systems, and was issued by the Standards Council on March 1, 2011, with an effective date of March 21, 2011.

A Tentative Interim Amendment is tentative because it has not been processed through the entire standards-making procedures. It is interim because it is effective only between editions of the standard. A TIA automatically becomes a proposal of the proponent for the next edition of the standard; as such, it then is subject to all of the procedures of the standards-making process.

1. Add a new definition as 3.6.4.1.1 to read as follows:

3.6.4.1.1 Premixed Antifreeze Solution. A mixture of an antifreeze material with water that is prepared by the manufacturer at a factory with a quality control procedure in place that ensures that the antifreeze solution remains homogeneous.

2. Revise 5.3.4 to read as follows:

5.3.4* Antifreeze Systems. Annually, before the onset of freezing weather, the antifreeze solution shall be tested using the following procedure:

(1) Using installation records, maintenance records, information from the owner, chemical tests, or other reliable sources of information, the type of antifreeze in the system shall be determined.

   a) If the type of antifreeze is found to be a type that is no longer permitted, the system shall be drained completely and replaced with an acceptable solution.
   b) If the type of antifreeze cannot be reliably determined, then the system shall be drained completely and replaced with an acceptable solution.

(2) If the antifreeze is not replaced in accordance with step 1, test samples shall be taken at the top of each system and at the bottom of each system.

   a) If the most remote portion of the system is not near the top or the bottom of the system, an additional sample shall be taken at the most remote portion.
   b) If the connection to the water supply piping is not near the top or the bottom of the system, an additional sample shall be taken at the connection to the water supply.

(3) The specific gravity of each solution shall be checked using a hydrometer with a suitable scale or a refractometer having a scale calibrated for the antifreeze solution.

(4) If any of the samples exhibits a concentration in excess of what is permitted by NFPA 25, the system shall be emptied and refilled with a new acceptable solution. If a concentration greater than what is currently permitted by NFPA 25 was necessary to keep the fluid from freezing, alternate methods of preventing the pipe from freezing shall be employed.

(5) If any of the samples exhibits a concentration lower than what is necessary to keep the fluid from freezing, the system shall be emptied and refilled with a new acceptable solution.

5.3.4.1 The use of antifreeze solutions shall be in conformity with state and local health regulations.

5.3.4.1.1* Listed CPVC sprinkler pipe and fittings shall be protected from freezing with glycerin only. The use of diethylene, ethylene, or propylene glycols shall be specifically prohibited.

5.3.4.2* Antifreeze solutions shall comply with one of the following: See TIA 11-3

(1) The concentration of a glycerin solution measured in an existing system shall be limited to 50% by volume.

(2) Newly introduced solutions shall be factory premixed antifreeze solutions of glycerin (chemically pure or United States Pharmacopoeia 96.5%) at a maximum concentration of 48% by volume.

(3) The concentration of a propylene glycol solution measured in an existing system shall be limited to 40% by volume.

(4) Newly introduced solutions shall be factory premixed antifreeze solutions of propylene glycol (chemically pure or United States Pharmacopoeia 96.5%) at a maximum concentration of 38% by volume.

(5) Other solutions listed specifically for use in fire protection systems.

5.3.4.3 The antifreeze solution shall be tested at its most remote portion and where it interfaces with the wet pipe system.

5.3.4.4 Where antifreeze systems have a capacity larger than 150 gal (568 L), tests at one additional point for every 100 gal (379 L) shall be made.

5.3.4.4.1 If the results indicate an incorrect freeze point at any point in the system, the system shall be drained and refilled with new premixed antifreeze.

5.3.4.4.2 For premixed solutions, the manufacturer's instructions shall be permitted to be used with regard to the number of test points and refill procedure.

4. Remove Table 5.3.4.1(a) and 5.3.4.1(b) and add Table 5.3.4.1 as follows:

Table 5.3.4.1- Properties of Glycerin and Propylene Glycol

Material	Solution (% by volume)	Specific Gravity at 77ºF (25ºC)	Freezing Point	
			ºF	ºC
Glycerin (C.P. or U.S.P. grade)	0	1.000	32	0
	5	1.014	31	-0.5
	10	1.029	28	-2.2
	15	1.043	25	-3.9
	20	1.059	20	-6.7
	25	1.071	16	-8.9
	30	1.087	10	-12
	35	1.100	4	-15.5
	40	1.114	-2	-19
	45	1.130	-11	-24
	50	1.141	-19	-28

Propylene glycol	0	1.000	32	0
	5	1.004	26	-3
	10	1.008	25	-4
	15	1.012	22	-6
	20	1.016	19	-7
	25	1.020	15	-10
	30	1.024	11	-12
	35	1.028	2	-17
	40	1.032	-6	-21

5. Revise A.5.3.4 to read as follows:

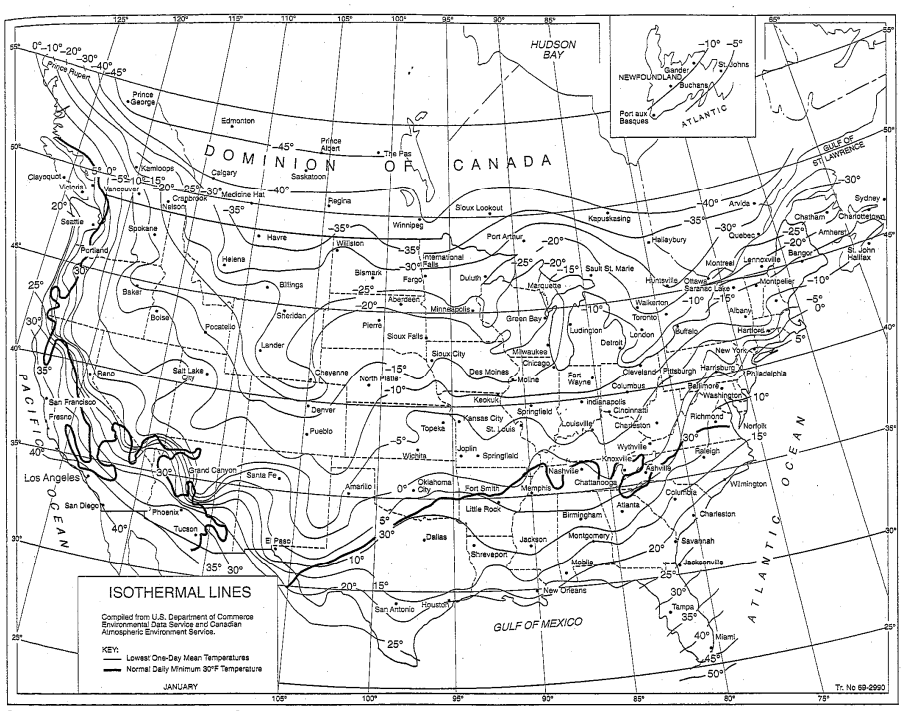
A.5.3.4 Sampling from the top and bottom of the system helps to determine if the solution has settled. Antifreeze solutions are heavier than water. If the antifreeze compound is separating from the water due to poor mixing, it will exhibit a higher concentration in the lower portion of the system than in the upper portion of the system. If the concentration is acceptable near the top, but too low near the water connection, it may mean that the system is becoming diluted near the water supply. If the concentration is either too high or too low in both the samples, it may mean that the wrong concentration was added to the system.

Two or three times during the freezing season, test samples can be drawn from test valve B as shown in Figure 7.6.2.1(1) of NFPA 13, especially if the water portion of the system has been drained for maintenance or repairs. A small hydrometer can be used so that a small sample is sufficient. Where water appears at valve B, or where the sample indicates that the solution has become weakened, the entire system should be emptied and refilled with acceptable solution as previously described.

See Figure A.5.3.4 for expected minimum air temperatures in 48 of the United States and parts of Canada where the lowest one-day mean temperature can be used as one method of determining the minimum reasonable air temperature. In situations where the piping containing the antifreeze solution is protected in some way from exposure to the outside air, higher minimum temperatures can be anticipated.

Where systems are drained in order to be refilled, it is not typically necessary to drain drops. Most systems with drops have insufficient volume to cause a problem, even if slightly higher concentration solutions collect in the drops. For drops in excess of 36 in., consideration should be given to draining drops if there is evidence that unacceptably high concentrations of antifreeze have collected in these long drops.

When emptying and refilling antifreeze solutions, every attempt should be made to recycle the old solution with the antifreeze manufacturer rather than discarding it.



Source: Compiled from United States Weather Bureau records.
For SI units, °C = ⅝ (°F −32); 1 mi = 1.609 km.

Figure A.5.3.4

6. Add a new A.5.3.4.2 to read as follows:

A.5.3.4.2 The use of factory premixed solutions is required because solutions that are not mixed properly have a possibility of separating from the water, allowing the pure concentrate (which is heavier than water) to drop out of solution and collect in drops or low points of the system. Such concentrations are combustible and could present problems during fires. The properties of glycerin are shown in Table A.5.3.4.2.

Table A.5.3.4.2 Properties of Glycerin and Propylene Glycol

Material	Solution (% by volume)	Specific Gravity at 60ºF (15.6ºC)	Freezing Point	
			ºF	ºC
Glycerin (C.P. or U.S.P. grade)	50 water	1.145	-20.9	-29.4
Hydrometer scale 1.000 to 1.200				
Propylene glycol	60 water	1.034	-6	-21.1
Hydrometer scale 1.000 to 1.200 (subdivisions 0.002)				

C.P.: chemically pure; U.S.P.: United States Pharmacopoeia 96.5%.

Issue Date: March 1, 2011

Effective Date: March 21, 2011

(Note: For further information on NFPA Codes and Standards, please see www.nfpa.org/codelist**)**

Tentative Interim Amendment

NFPA® 25

Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems

2011 Edition

Reference: 5.3.4.2, A.5.3.4.2, Table A.5.3.4.2, A.5.3.4.2.1, and A.5.3.4.2.1(3**)**
TIA 11-3
(SC 12-8-33/TIA Log #1068)

Pursuant to Section 5 of the NFPA Regulations Governing Committee Projects, the National Fire Protection Association has issued the following Tentative Interim Amendment to NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, 2012 edition. The TIA was processed by the Technical Committee on Inspection, Testing, and Maintenance of Water-Based Systems, and was issued by the Standards Council on August 9, 2012, with an effective date of August 29, 2012.

A Tentative Interim Amendment is tentative because it has not been processed through the entire standards-making procedures. It is interim because it is effective only between editions of the standard. A TIA automatically becomes a proposal of the proponent for the next edition of the standard; as such, it then is subject to all of the procedures of the standards-making process.

1. Delete 5.3.4.2 and subsections and add a new 5.3.4.2 and 5.3.4.2.1 as follows:

5.3.4.2 Except as permitted by 5.3.4.2.1 and 5.3.4.2.2, all antifreeze systems shall utilize listed antifreeze solutions.

5.3.4.2.1* For systems installed prior to September 30, 2012, listed antifreeze solutions shall not be required until September 30, 2022 where all of the following conditions are met:

(1)* The concentration of the antifreeze solution shall be limited to 50% glycerin by volume or 40% propylene glycol by volume.

(2) Newly introduced solutions shall be factory premixed antifreeze solutions (chemically pure or United States Pharmacopoeia 96.5%).

(3)*Antifreeze systems with concentrations in excess of 30% propylene glycol and 38% glycerine shall be permitted based upon an approved deterministic risk assessment.

5.3.4.2.2 Premixed antifreeze solutions of propylene glycol exceeding 30% concentration by volume shall be permitted for use with ESFR sprinklers where the ESFR sprinklers are listed for such use in a specific application.

2. Renumber A.5.3.4.2 and Table A.5.3.4.2 as A.5.3.4.2.1(1) and Table A.5.3.4.2.1(1).

3. Add new annex section to read as follows:

A.5.3.4.2.1 It is assumed that all antifreeze systems installed after September 30, 2012 will meet the minimum requirements of NFPA 13, 2013 Edition.

A.5.3.4.2.1(3) Propylene glycol and glycerin antifreeze solutions discharged from sprinklers have the potential to ignite under certain conditions. Research testing has indicated that several variables may influence the potential for large-scale ignition of the antifreeze solution discharged from a sprinkler. These variables include, but are not limited to, the concentration of antifreeze solution, sprinkler discharge characteristics, inlet pressure at the sprinkler, ceiling height, and size of fire at the time of sprinkler discharge. All relevant data and information should be carefully reviewed and considered in the deterministic risk assessment.

In addition to the variables identified above, the deterministic risk assessment should include occupancy, quantity of solution, impact on life safety, and potential increase in heat release rate.

The following is a list of research reports that have been issued by the Fire Protection Research Foundation related to the use of antifreeze in sprinkler systems that should be considered in the development of the deterministic risk assessment:

1. *Antifreeze Systems in Home Fire Sprinkler Systems – Literature Review and Research Plan,* Fire Protection Research Foundation, June 2010.
2. *Antifreeze Systems in Home Fire Sprinkler Systems – Phase II Final Report,* Fire Protection Research Foundation, December 2010.
3. *Antifreeze Solutions Supplied through Spray Sprinklers – Interim Report,* Fire Protection Research Foundation, February 2012.

The following tables provide an overview of the testing

Topic	Information
Scope of Sprinklers Tested	The following sprinklers were used during the residential sprinkler research program described in the report dated December 2010: • Residential pendent style having nominal K-factors of 3.1, 4.9 and 7.4 gpm/psi$^{1/2}$ • Residential concealed pendent style having a nominal K-factor of 4.9 gpm/psi$^{1/2}$ • Residential sidewall style having nominal K-factors of 4.2 and 5.5 gpm/psi$^{1/2}$ The following sprinklers were used during the spray sprinkler research program described in the report dated February 2012: • Residential pendent style having a nominal K-factor of 3.1 gpm/psi$^{1/2}$ • Standard spray pendent style having nominal K-factors of 2.8, 4.2, 5.6 and 8.0 gpm/psi$^{1/2}$ • Standard spray concealed pendent style having a nominal K-factor of 5.6 gpm/psi$^{1/2}$ • Standard spray upright style having a nominal K-factor of 5.6 gpm/psi$^{1/2}$ • Standard spray extended coverage pendent style having a nominal K-factor of 5.6 gpm/psi$^{1/2}$
Antifreeze Solution Concentration	**<50% Glycerine and <40% Propylene Glycol Antifreeze Solutions**—Solutions were not tested. **50% Glycerine and 40% Propylene Glycol Antifreeze Solutions**—Large scale ignition of the sprinkler spray did not occur in tests with sprinkler discharge onto a fire having a nominal Heat Release Rate (HRR) of 1.4 MW. Large scale ignition of the sprinkler spray occurred in multiple tests with sprinkler discharge onto a fire having a nominal HRR of 3.0 MW. **55% Glycerine and 45% Propylene Glycol Antifreeze Solutions** – Large scale ignition of the sprinkler spray occurred in tests with sprinkler discharge onto a fire having a nominal HRR of 1.4 MW. **>55% Glycerine and >45% Propylene Glycol Antifreeze Solutions --** Large scale ignition of the sprinkler spray occurred in tests with sprinkler discharge onto a fire having a HRR of less than 500 kW. **70% Glycerine and 60% Propylene Glycol Antifreeze Solutions –** Maximum antifreeze solution concentrations tested.
Sprinkler Inlet Pressure	Large scale ignition of the sprinkler discharge spray was not observed when the sprinkler inlet pressure was 50 psi or less for tests using 50% glycerine or 40% propylene glycol.

Ceiling Height	When discharging 50% glycerine and 40% propylene glycol antifreeze solutions onto fires having a HRR of 1.4 MW, no large scale ignition of the sprinkler spray was observed with ceiling heights up to 20 ft. When discharging 50% glycerine and 40% propylene glycol antifreeze solutions onto fires having a HRR of 3.0 MW, large scale ignition of the sprinkler spray was observed at a ceiling height of 20 ft.
Fire Control	The test results described in the test reports December 2010 and February 2012 indicated that discharging glycerine and propylene glycol antifreeze solutions onto a fire can temporarily increase the fire size until water is discharged. As a part of the residential sprinkler research described in report dated December 2010, tests were conducted to evaluate the effectiveness of residential sprinklers to control fires involving furniture and simulated furniture. The results of these tests indicated that 50% glycerine and 40% propylene glycol antifreeze solutions demonstrated the ability to control the furniture type fires in a manner similar to water. For standard spray type sprinklers, no tests were conducted to investigate the ability of these sprinklers to control the types and sizes of fires that these sprinklers are intended to protect.

Issue Date: August 9, 2012

Effective Date: August 29, 2012

(Note: For further information on NFPA Codes and Standards, please see www.nfpa.org/codelist**)**

Tentative Interim Amendment

NFPA® 13D

Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes

2013 Edition

Reference: Section 9.2 and A.9.2
TIA 13-1
(SC 12-8-28/TIA Log #1067)

Note: Text of the TIA issued and incorporated into the text of Section 9.2 and A.9.2, therefore no separate publication is necessary.

1. Revise Section 9.2 and A.9.2 to read as follows:

9.2* Antifreeze Systems.

9.2.1* Conformity with Health Regulations. The use of antifreeze solutions shall be in conformity with any state or local health regulations.

9.2.2* Antifreeze Solutions.

9.2.2.1 Except as permitted in 9.2.2.2, antifreeze solutions shall be listed for use in new sprinkler systems.

9.2.2.1.1 For existing systems, antifreeze solutions shall be limited to premixed antifreeze solutions of glycerine (chemically pure or United States Pharmacopoeia 96.5%) at a maximum concentration of 50% by volume, propylene glycol at a maximum concentration of 40% by volume, or other solutions listed specifically for use in fire protection systems.

9.2.2.2* Premixed solutions of glycerine (chemically pure or United States Pharmacopoeia 96.5%) at a maximum concentration of 48% by volume or propylene glycol at a maximum concentration of 38% by volume shall be permitted to protect piping that is supplying sprinklers in a specific area of the dwelling unit, where acceptable to the Authority Having Jurisdiction.

9.2.2.2.1* Documentation shall be presented to the AHJ to substantiate the use of the antifreeze solution.

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

9.2.2.4* The specific gravity of the antifreeze solution shall be checked by a hydrometer with a scale having 0.002 subdivisions.

A.9.2.1 Antifreeze solutions can be used for maintaining automatic sprinkler protection in small, unheated areas. Antifreeze solutions are recommended only for systems not exceeding 40 gal (151 L). Because of the cost of refilling the system or replenishing small leaks, small, dry valves should be used where more than 40 gal (151 L) are to be supplied. Propylene glycol or other suitable material can be used as a substitute for priming water to prevent evaporation of the priming fluid and thus reduce ice formation within the system.

A.9.2.2 Listed nonmetallic sprinkler pipe and fittings should be protected from freezing with an antifreeze solution that is compatible with the nonmetallic material. Laboratory testing shows that glycol-based antifreeze solutions present a chemical environment detrimental to nonmetallic pipe.

Table A.12.3.5 Properties of Glycerine and Propylene Glycol for Existing Systems
(Table A.9.2.2.1 unchanged)

A.9.2.2.2.1 The documentation should substantiate that the proposed use of premixed glycerine and propylene glycol antifreeze solutions is consistent with the FPRF testing for the specific installation parameters.

A.9.2.2.2 Examples of specific areas might include piping installed in an exterior wall or an unheated concealed space above a cathedral ceiling that cannot be protected with insulation or heat tracing. Premixed solutions of glycerine and propylene glycol should be used only where other freeze protections options are not practical. The specific areas protected by premixed glycerine and propylene glycol shall be limited to the greatest extent possible.

Propylene glycol and glycerin antifreeze solutions discharged from sprinklers have the potential to ignite under certain conditions. Research testing has indicated that several variables may influence the potential for large-scale ignition of the antifreeze solution discharged from a sprinkler. These variables include, but are not limited to, the concentration of antifreeze solution, sprinkler discharge characteristics, inlet pressure at the sprinkler, location of fire relative to the sprinkler, and size of fire at the time of sprinkler discharge. Research testing also indicates that propylene glycol or glycerin solutions can be used successfully with certain other combinations of these same variables. Given the need for additional testing to further define acceptable versus unacceptable scenarios, the use of propylene glycol and glycerin antifreeze solutions should only be considered when other sprinkler system design alternatives are not practical. If these solutions are used, all relevant data and information should be carefully reviewed and considered in the sprinkler system. The following is a list of research reports that have been issued by the Fire Protection Research Foundation related to the use of antifreeze in sprinkler systems:

1. *Antifreeze Systems in Home Fire Sprinkler Systems – Literature Review and Research Plan*, Fire Protection Research Foundation, June 2010.

2. *Antifreeze Systems in Home Fire Sprinkler Systems – Phase II Final Report*, Fire Protection Research Foundation, December 2010.

3. *Antifreeze Solutions Supplied through Spray Sprinklers – Interim Report*, Fire Protection Research Foundation, February 2012.

The following tables provide an overview of the testing.

Topic	Information
Scope of Sprinklers Tested	The following sprinklers were used during the residential sprinkler research program described in the report dated December 2010: • Residential pendent style having nominal K-factors of 3.1, 4.9 and 7.4 gpm/psi$^{1/2}$ • Residential concealed pendent style having a nominal K-factor of 4.9 gpm/psi$^{1/2}$ • Residential sidewall style having nominal K-factors of 4.2 and 5.5 gpm/psi$^{1/2}$ The following sprinklers were used during the spray sprinkler research program described in the report dated February 2012: • Residential pendent style having a nominal K-factor of 3.1 gpm/psi$^{1/2}$ • Standard spray pendent style having nominal K-factors of 2.8, 4.2, 5.6 and 8.0 gpm/psi$^{1/2}$ • Standard spray concealed pendent style having a nominal K-factor of 5.6 gpm/psi$^{1/2}$ • Standard spray upright style having a nominal K-factor of 5.6 gpm/psi$^{1/2}$ • Standard spray extended coverage pendent style having a nominal K-factor of 5.6 gpm/psi$^{1/2}$
Antifreeze Solution Concentration	**<50% Glycerine and <40% Propylene Glycol Antifreeze Solutions**—Solutions were not tested. **50% Glycerine and 40% Propylene Glycol Antifreeze Solutions**—Large scale ignition of the sprinkler spray did not occur in tests with sprinkler discharge onto a fire having a nominal Heat Release Rate (HRR) of 1.4 MW. Large scale ignition of the sprinkler spray occurred in multiple tests with sprinkler discharge onto a fire having a nominal HRR of 3.0 MW. **55% Glycerine and 45% Propylene Glycol Antifreeze Solutions** – Large scale ignition of the sprinkler spray occurred in tests with sprinkler discharge onto a fire having a nominal HRR of 1.4 MW. **>55% Glycerine and >45% Propylene Glycol Antifreeze Solutions --** Large scale ignition of the sprinkler spray occurred in tests with sprinkler discharge onto a fire having a HRR of less than 500 kW. **70% Glycerine and 60% Propylene Glycol Antifreeze Solutions –** Maximum antifreeze solution concentrations tested.
Sprinkler Inlet Pressure	Large scale ignition of the sprinkler discharge spray was not observed when the sprinkler inlet pressure was 50 psi or less for tests using 50% glycerine or 40% propylene glycol.
Ceiling Height	When discharging 50% glycerine and 40% propylene glycol antifreeze solutions onto fires having a HRR of 1.4 MW, no large scale ignition of the sprinkler spray was observed with ceiling heights up to 20 ft. When discharging 50% glycerine and 40% propylene glycol antifreeze solutions onto fires having a HRR of 3.0 MW, large scale ignition of the sprinkler spray was observed at a ceiling height of 20 ft.
Fire Control	The test results described in the test reports December 2010 and February 2012 indicated that discharging glycerine and propylene glycol antifreeze solutions onto a fire can temporarily increase the fire size until water is discharged.

	As a part of the residential sprinkler research described in report dated December 2010, tests were conducted to evaluate the effectiveness of residential sprinklers to control fires involving furniture and simulated furniture. The results of these tests indicated that 50% glycerine and 40% propylene glycol antifreeze solutions demonstrated the ability to control the furniture type fires in a manner similar to water. For standard spray type sprinklers, no tests were conducted to investigate the ability of these sprinklers to control the types and sizes of fires that these sprinklers are intended to protect.

A.9.2.3 Many antifreeze solutions are heavier than water. At the point of contact (interface), provisions are required by 9.2.3 to prevent the diffusion of water into unheated areas. To avoid leakage, the quality of materials and workmanship should be superior, the threads should be clean and sharp, and the joints should be tight. Only metal-faced valves should be used.

Issue Date: August 9, 2012

Effective Date: August 29, 2012

Amy Beasley Cronin
Secretary, Standards Council

30 August 2012

To: Interested Parties

Subject:

Standards Council Decision (Final): **D#12-3** Standards Council Agenda Item: **SC#12-8-25, 26, 27, 28, 30, 31, 32 and 33** Date of Decision: 9 August 2012
Eight TIAs on NFPA 13 (2013 Edition), NFPA 13D (2010 and 2013 Editions), NFPA 13R, (2013 Edition) and NFPA 25 (2011 Edition)

Dear Interested Parties:

At its meeting of August 7-9, 2012, the Standards Council issued a decision on the above-referenced matter. On August 16, 2012, NFPA issued the Council's decision on the appeal in the form of a "Short" decision which briefly stated the outcome of the appeal and which indicated that full a Final decision on the appeal would be issued in due course and sent to all interested parties as soon as it became available.

The Council's Final decision is now available and is attached herewith.

Sincerely,

Amy Beasley Cronin
Secretary, NFPA Standards Council

c: D. Berry, M. Brodoff, L. Fuller, M. Klaus, E. Carroll
Members, TC on Residential Sprinkler Systems (AUT-RSS)
Members, TC on Sprinkler System Installation Criteria (AUT-SSI)
Members, TCC Automatic Sprinkler Systems (AUT-AAC)
Members, TC on Inspection, Testing, and Maintenance of Water-Based Systems (INM-AAA)
Members, NFPA Standards Council (AAD-AAA)
Individuals Providing Appeal Commentary

Standards Council Decision (Final): **D#12-3** Standards Council Agenda Item: **SC#12-8-25, 26, 27, 28, 30, 31, 32 and 33** Date of Decision: 9 August 2012
Eight TIAs on NFPA 13 (2013 Edition), NFPA 13D (2010 and 2013 Editions), NFPA 13R, (2013 Edition) and NFPA 25 (2011 Edition)

SUMMARY ACTION: *The Standards Council voted to issue TIA Nos. 1066, 1067, and 1065 on NFPA 13, NFPA 13D, NFPA 13R, respectively on the 2013 editions. The Council issued a modified TIA No. 1068 on NFPA 25, 2011 edition. TIA Nos. 1062, 1061/1060, 1046 on 13R, 13D and 25 respectively were not issued.*

At its meeting of August 7-9, 2012, the Standards Council considered eight proposed Tentative Interim Amendments (TIAs) regarding antifreeze in fire sprinkler installations and took the following actions:

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2013 Edition*:*

- TIA No. 1066 passed ballot of the responsible Technical Committee (TC) and Technical Correlating Committee (TCC) and the Council voted to issue the TIA, concurrently with the issuance of the 2013 edition of NFPA 13.

NFPA 13R, *Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies*, 2013 Edition:

- TIA No. 1065 passed ballot of the responsible Technical Committee (TC) and Technical Correlating Committee (TCC) and the Council voted to issue the TIA, concurrently with the issuance of the 2013 edition of NFPA 13.
- TIA No. 1062 failed the ballot of the responsible Technical Committee (TC) and Technical Correlating Committee (TCC) and the Council voted not to issue the TIA.

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

- TIA No. 1067 passed ballot of the responsible Technical Committee (TC) and Technical Correlating Committee (TCC) and the Council voted to issue the TIA, concurrently with the issuance of the 2013 edition of NFPA 13D.
- TIA No. 1061 failed the ballot of the responsible Technical Committee (TC) and Technical Correlating Committee (TCC) and the Council voted not to issue the TIA.

NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, 2010 Edition:

- TIA No. 1060 failed the ballot of the responsible Technical Committee (TC) and Technical Correlating Committee (TCC) and the Council voted not to issue the TIA.

NFPA 25, *Standard for the Inspection Testing and Maintenance of Water-Based Fire Protection Systems*, 2011 Edition:

- TIA No. 1046 had originally passed ballot of the responsible Technical Committee (TC) but was superseded by the passage of TIA 1068 and the Council, therefore, voted not to issue the TIA.
- TIA No. 1068 passed ballot of the responsible Technical Committee (TC). The Council voted to issue the TIA with the following revisions displayed in legislative text as follows:

> **5.3.4.2.1***
>
> **….**
>
> **(3)*** Antifreeze systems with concentration in excess of 30% propylene glycol and 38% glycerine shall be permitted base upon an approved deterministic risk assessment ~~except where explicitly permitted under 5.3.4.2.1(4)~~.
>
> ~~**(4)** A risk assessment shall not be required for the following applications:~~
>
> > ~~**(a)** Light hazard occupancies with ceiling heights not exceeding 20 ft (6.1m) where Quick Response sprinklers are installed~~
> >
> > ~~**(b)** Dwelling Units where residential or other fast response sprinklers are installed~~
>
> ****
>
> **A.5.3.4.2.1** It is assumed that all antifreeze systems installed after September 30, 2012 will meet the minimum requirements of NFPA 13, 2013 Edition ~~(or TIA XXX, 2010 Edition)~~.
>
> ~~Subject to the approval of the AHJ, small installations in normally occupied areas such as dust collectors and similar spaces may utilize concentrations in excess of the limits established in 5.3.4.2.1. Where concentrations in excess of 5.3.4.2.1 are desired for larger systems, an equivalency should be approved by the AHJ.~~

As noted above, four of the processed TIAs either failed ballot (TIA No. 1062 on 13R, TIA No. 1061 on 13D, 2013 edition and TIA No. 1060 on 13D, 2010 edition) or, one case (TIA No. 1046 on NFPA 13R) was replaced by a superseding TIA (TIA No. 1068). By reason of their lack of committee support and in the absence of any appeals, the Council has voted not to issue these TIAs. The remainder of this decision, after providing a brief background, discusses the four TIAs that the responsible committees have passed and submitted to the Council for issuance. As detailed above, the Council has voted to issue three of the TIAs, as submitted, and to issue the remaining TIA, with the revisions set forth above.

Background

The development and consideration of the TIAs currently before the Council is part of ongoing activities within the NFPA standards development process relating to the use of antifreeze in automatic sprinkler systems to protect piping in unheated areas subject to freezing temperatures. The background relating to this subject can be accessed in greater detail in previous decisions of the Council. See Standards Council Decision #10-10 (SC Agenda Items #10-8-15 thru 10-8-20, August 5, 2010); Standards Council Decision #11-5 (SC Agenda Items #11-3-3-e, 11-3-4-e and

11-3-5-d, March 1, 2011) and Standards Council Decision #12-2 (SC Agenda Item #12-3-8, March 6, 2012). See also SC Minute Items 10-10-21 (October 2010), 11-3-6 & 7 (March 2011), and 11-8-48 (August 2011). This and other information, including Research Foundation reports discussed in the Council decisions can be found at www.nfpa.org/antifreeze.

Of these decisions, the most recent one, Decision #12-2 (March 2012), is most relevant to the current TIA development activities. That decision discussed newly available results of full scale fire tests with antifreeze in standard spray sprinklers. These results were reported in a February 2012 Fire Protection Research Foundation report, "*Antifreeze Solutions Supplied through Spray Sprinklers: Interim Report*" (hereafter Non-residential Report) authored by Steve Wolin, Code Consultants. While previous testing and standards development activities on antifreeze in sprinkler systems had focused on residential applications, the testing reported in the Non-residential Report related to standard spray sprinklers generally used in commercial, non-residential applications. The results of the testing were summarized in the Council Decision #12-2 as follows:

> As documented in the Non-Residential Report, however, spray sprinklers did not perform well in many of the tests. In the earlier residential sprinkler tests using 50% glycerine, ignition of the spray pattern was not seen. In the Non-Residential Report, however, ignition of the spray pattern occurred in 4 of the 15 fire tests, and in many of the 15 tests substantial increases in heat release rates were recorded. For example, tests 2 and 15 experienced spray pattern ignition. See Non-Residential Report at pp. 6 and 8. In addition to the tests noted at 8 feet and 15 feet, tests at 20 feet experienced ignition of the solution and substantial increases in heat release rates, including increases as high as 8 MW and 22 MW. As the Non-Residential Report noted with respect to the 20 foot tests, "substantial ignition of the antifreeze spray and flames extending away from the ignition source were observed during two of the tests with the sprinkler positioned at 20 ft above the floor." See Non-Residential Report at p. 6.

The Council stressed that its discussion of the Non-Residential Report was not meant to describe or analyze that report in depth or set forth all its results or areas of concern, but the discussion, in the Council's view "does illustrate . . . that the Non-Residential Report raises serious concerns that need to be reviewed and addressed." See Non-Residential Report at p. 10.

In conclusion, the Council directed the responsible TCs to review the Non-Residential Report and take necessary action through developing TIAs for submission to the Council by its August 2012 meeting. Specifically, the Council directed as follows:

> The Council, therefore, is requesting that the responsible committees meet and review the Non-Residential Report (and any supplemental report, as it becomes available) as soon as possible.
>
> The Automatic Sprinkler Project and the NFPA 25 TC should take one of the following steps. These technical committees should process Tentative Interim Amendments (TIAs) for submission to the Council no later than its August 2012 meeting. Should the Committees wish to act prior to the August 2012 Council meeting, the Council will make every effort to expedite its consideration of the

matter through a special meeting or letter ballot. If TIAs are not proposed, the committees should provide the Council with a full report detailing why the current antifreeze requirements do not require revision based on the findings of the Non-Residential Report (and any supplement), and why the findings of the Non-Residential Report do not present safety concerns requiring emergency action.

The sprinkler committees, thereafter, proceeded to review and act in accordance with the Standards Council Decision #12-2. The results, as indicated earlier in this decision, are four TIAs that have passed ballot and achieved consensus within the responsible committees and that now come to the Standards Council for consideration. The Council accords great respect and deference to the results yielded by the standards development process. Indeed, it is generally the responsibility of technical committees to assess the technical issues and available substantiation to arrive at consensus judgments about the content of NFPA standards, and absent exceptional circumstances, the Council will issue TIAs that have passed the ballot of the responsible technical committees. It is, moreover, particularly evident here that the responsible committees have made sustained efforts to grapple with the difficult technical issues associated with antifreeze and to rapidly incorporate new knowledge about antifreeze into the sprinkler standards in a way that addresses the safety issues while affording consideration to the problems of freeze protection, particularly in existing systems. The Council respects the difficulty of the tasks placed before the sprinkler committees and in large part has deferred to the judgment of the committees. In respect to portions of one TIA, however, the Council has found the exceptional circumstances in which it must take corrective action. As this decision now discusses, the Council is issuing three of the four TIAs as submitted. In the case of the fourth, it is issuing the TIA, but has found a clear and substantial basis to issue it with certain revisions.

Issuance of TIAs 1065, 1066 and 1067, as submitted

While the Council has reviewed and considered all the TIAs in their entirety, this decision does not attempt a full or complete description of the TIAs which should be consulted directly for a full understanding of their provisions. Generally speaking, TIA No. 1066 on NFPA 13 and TIA No. 1065 on NFPA 13R take the significant step of requiring that all antifreeze solutions used in new fire sprinkler installations must be listed. Similarly, TIA No. 1067 also requires the use of listed antifreeze in new NFPA 13D systems, but allows a limited exemption for Authority Having Jurisdiction (AHJ) approval for a non-listed solution in the case of antifreeze concentrations for premixed glycerine at or below 48% or premixed propylene glycol at or below 38% where documentation justifies the use of those concentrations for specific portions of the home. Apart from this limited exception, the TIAs, through the new listing requirement (hereafter, "the Listing Requirement"), effectively prohibit the use of antifreeze in new sprinkler systems unless and until antifreeze products are available that can achieve a third-party listing that "address[es] the inability for the specific antifreeze solution tested to ignite when discharged from specific sprinklers" (See NFPA 13, A.7.6.1, as amended by TIA No. 1066). These TIAs, moreover, apply to residential applications (13, 13R and 13D) as well as nonresidential 13 systems, so while the Council, in Decision #12-2, had asked the committees to focus on the nonresidential applications investigated in the Nonresidential Report, the committees went further and revised and strengthened their previous treatment of residential systems. In the Council's view, these TIAs are based on reasonable judgments that have been reasonably substantiated. Having achieved the consensus of the responsible committees, the Council has voted to issue them.

Issuance of TIA No. 1068, with revisions

TIA No. 1068 on NFPA 25 proposes several revisions that expand upon or revise the committee's previous antifreeze TIA (TIA #11-1; Log No. 1014, March 2011). The TIA will not be described in detail here and should be directly consulted for a full understanding of its provisions. The TIA, in principal part, sets in place a timetable for the maintenance of sprinkler systems that will phase in, over time for existing sprinkler systems, the Listing Requirement now being required for new sprinkler system installations, per the NFPA 13 and NFPA 13R TIAs described above. The Council has found no basis on which to question most of the TIA, including the phase-in approach. After considering the entire record, however, the Council has found that, in two respects, the responsible technical committee has materially failed to sufficiently support its conclusions to such a degree that the Council is unwilling to issue the TIA as written.

The Exemptions to the Risk Assessment Provision

First, the TIA requires that, for systems installed prior to September 20, 2012, listed antifreeze solutions shall not be required until September 30, 2022, where certain conditions are met. See NFPA 25, at 5.3.4.2.1, as amended by TIA No. 1068. One of these conditions provides that antifreeze systems with concentrations in excess of 30% propylene glycol and 38% glycerine (but no higher than 50% glycerine or 40% propylene glycol per 5.3.4.2.1[1]) shall be permitted "based upon and approved deterministic risk assessment." See 5.3.4.2.1(3) ("the Risk Assessment Provision"). This Risk Assessment Provision, however, goes on to exempt from any risk assessment certain light hazard occupancies and certain dwelling units. See 5.3.4.2.1(4). The Council has been unable to conclude that the exemptions from the Risk Assessment Provision are supported by reasonable substantiation.

As to the exemption for light hazard occupancies, there is insufficient data to deem that, in all situations, light hazard occupancies with ceiling heights not exceeding 20 ft (6.1 m) are safe with the higher concentrations of antifreeze set forth in 5.3.4.2.1(1). Second, the exemption for dwelling units where residential or other fast response sprinklers are installed is apparently based on the assumption that a credible fire scenario would never encounter a fire with a peak heat release rate greater than 1.4 MW. This assumption is flawed because there are realistic scenarios where the fire can exceed this intensity, such as a Christmas tree or clustered upholstered furniture fire. The test results reported in the Foundation Reports, particularly the Non-residential Report, simply do not merit so a high degree of confidence as to forego a risk assessment in the case of the stated exemptions. The exemptions are particularly concerning when it is considered that they would apply to a broad array of light hazard and dwelling units occupancies, including board and care facilities, nursing homes, and high-rise apartment buildings. Moreover, during the hearing before the Council, there was discussion about "DETACT" modeling of relevant scenarios that was not fully available to the TC during its consideration of the TIA. The discussion of the modeling and other factors raised serious doubts that the exemptions were appropriate. The Council concludes that, based on the record, the more conservative, case-by-case risk assessment approach required by the Risk Assessment Provision, should be applied without this exemption, and the Council has accordingly issued the TIA with the exemptions deleted.

The Unoccupied Spaced Exemption

Second, the Council has concluded that a provision contained in annex note A.5.3.4.2.1 has not been adequately supported. That provision instructs AHJs that it is appropriate to allow, in their discretion, small sprinkler installations in normally unoccupied areas to contain concentrations of antifreeze in excess of the maximum limits set in NFPA 25. Although this exemption is included as Annex material and is therefore guidance only, it is guidance that is inconsistent with the section of NFPA 25 to which it corresponds. More importantly, it fails to take into account how normally unoccupied spaces might impact adjacent occupied areas, and, more generally, it serves to minimize the potential dangers of antifreeze concentrations prohibited in NFPA 25. Allowing unlimited concentrations of antifreeze is inconsistent with the dangers confirmed through actual fire incidents and through Fire Protection Research Foundation fire testing data. Accordingly the Council has voted to issue the TIA as revised to delete the unoccupied space exemption portion of A.5.3.4.2.1

Conclusion and further Directions

The issuance of TIAs does not, as those who spoke at the hearing made clear, end the consideration of the issues concerning antifreeze. In particular with respect to TIA No. 1068 on NFPA 25, the Technical Committee on Inspection, Testing, and Maintenance of Water-Based Systems (TC) is still in its revision cycle, and its members have indicated that the TC plans to continue to refine the work reflected in TIA No. 1068 as the TC continues its review during the Comment stage of the revision cycle. As it does so, the Council wishes the TC to address a final concern of the Council regarding TIA No. 1068. As described above, the Risk Assessment Provision in the TIA at 5.3.4.2.1(3), requires that, for systems installed prior to September 30, 2012, an exemption from the listing requirement may be obtained in certain circumstances provided that it is "based upon an approved deterministic risk assessment." As written, this provision provides insufficient guidance on how such a deterministic risk assessment should be conducted and who should conduct it. Should the TC retain this exemption during its current revision cycle, it should work on making the Risk Assessment Provision more robust by including greater specificity as to matters such as the method, interpretation and evaluation of results leading to the assessment as well as the qualifications or competencies of those who may conduct and submit the assessment for AHJ approval.

Council Member Roland Huggins recused himself during the hearings, deliberations and vote on the issue.