Amy Beasley Cronin
Secretary, Standards Council

16 August 2012

To: Interested Parties

Subject:

Standards Council Decision (Short):	**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 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 1066 passed ballot of the responsible Technical Committee (TC) and Technical Correlating Committee (TCC) and the Council voted to issue the TIA.

NFPA 13R, *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height*, 2013 Edition:

- TIA 1065 passed ballot of the responsible Technical Committee (TC) and Technical Correlating Committee (TCC) and the Council voted to issue the TIA.
- TIA 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 1067 passed ballot of the responsible Technical Committee (TC) and Technical Correlating Committee (TCC) and the Council voted to issue the TIA.
- TIA 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 1060 failed the ballot of the responsible Technical Committee (TC) and Technical Correlating Committee (TCC) and the Council voted not to issue the TIA.

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*NOTE: Participants in NFPA's codes and standards making process should know that limited review of this decision may be sought from the NFPA Board of Directors. For the rules describing the available review and the method for petitioning the Board for review, please consult section 1-7 of the NFPA Regulations Governing Committee Projects and the NFPA Regulations Governing Petitions to the Board of Directors from Decisions of the Standards Council. Notice of the intent to file such a petition must be submitted to the Clerk of the Board of Directors within 15 calendar days of the Date of Decision noted in the subject line of this letter.

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

- TIA 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 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~~

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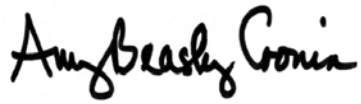
A.5.3.4.2.1 It is assumed that all antifreeze systems installed after September 30, 2012 will meet the minimum requirements of NFPA 13, 2013 Edition ~~(or TIA XXX, 2010 Edition)~~.

~~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.~~

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

Notice on Short Decisions: This is a "Short" decision, briefly stating the action on the appeals. A full Final Decision, containing further detail, will be issued in due course, and will automatically be sent to all interested parties as soon as it becomes available. Note that any Petition to the NFPA Board of Directors (see *NOTE, in the footer on the first page of this letter) must be filed within 15 days of the date of this Short Decision (see Date of Decision, in the subject line on the first page). Once the Notice has been filed, however, the Petition itself, should it be pursued, will not be due until 15 days following issuance of the Final Decision.

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

Tentative Interim Amendment

NFPA® 13

Standard for the Installation of Sprinkler Systems

2013 Edition

Reference: 3.4.1.1 Premixed Antifreeze Solution, 7.6.1, 7.6.2, 7.8.3.4, 23.1.3(42), 23.4.2.1.3, and A.7.6.1, A.7.6.2.1, A.7.6.2.2 and A.7.6.3.1
TIA 13-1
(SC 12-8-25/TIA Log #1066)

Note: Text of the TIA issued and incorporated into the text of 3.4.1.1 Premixed Antifreeze Solution, 7.6.1, 7.6.2, 7.8.3.4, 23.1.3(42), 23.4.2.1.3, and A.7.6.1, A.7.6.2.1, A.7.6.2.2 and A.7.6.3.1, therefore no separate publication is necessary.

1. Revise 3.4.1.1 to read as follows:

3.4.1.1 Premixed Antifreeze Solution. A mixture of an antifreeze material with water that is prepared and factory mixed by the manufacturer with a quality control procedure in place that ensures that the antifreeze solution remains homogeneous and that the concentration is as specified.

2. Revise 7.6.1 to read as follows:

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

7.6.1.2 Antifreeze shall not be used in ESFR systems unless ~~at least one of the following two conditions is met~~ the ESFR sprinkler is listed for use with the antifreeze solution.

3. Revise 7.6.2 to read as follows and delete existing 7.6.2.2 through 7.6.2.4:

7.6.2.1 Except as permitted in 7.6.2.2, antifreeze solutions shall be listed for use in sprinkler systems.

7.6.2.2* Premixed antifreeze solutions of propylene glycol shall be permitted to be used with ESFR sprinklers where the ESFR sprinklers are listed for such use in a specific application.

4. Revise 7.8.3.4 to read as follows:

7.8.3.4 Automatic sprinklers in areas subject to freezing shall be on dry pipe systems conforming to Section 7.2, on antifreeze systems conforming to Section 7.6, or be dry sprinklers of an adequate length connected to wet pipe systems located in heated areas.

5. Revise 23.1.3(42) to read as follows:

23.1.3(42) Information about listed antifreeze solution used (type and amount).

6. Revise 23.4.2.1.3 to read as follows:

23.4.2.1.3 For antifreeze systems greater than 40 gal (151 L) in size, the friction loss shall also be calculated using the Darcy–Weisbach formula:
(no change to Equation)

7. *Revise A.7.6.1, A.7.6.2, and A.7.6.2.1 to read as follows:*

A.7.6.1 The definition of an antifreeze system states that water will discharge after the antifreeze leaves the pipes. Systems that are all antifreeze, including tanks of antifreeze solution that will not discharge plain water, are not true antifreeze systems. Such systems should not be used without consideration to issues such as the combustibility of the antifreeze solution and the friction loss in the piping during cold conditions. Any listing associated with an antifreeze sprinkler system should address the inability for the specific antifreeze solution tested to ignite when discharged from specific sprinklers.

A.7.6.2 Listed nonmetallic sprinkler pipe and fittings should be protected from freezing with compatible listed solutions only. In addition, due to antifreeze solution limitations other methods of freeze protection such as electric heat-tracing, or insulated coverings, which are approved for use on nonmetallic piping may be used to protect nonmetallic pipes from freezing.

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 a summarized 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.7.6.2.1 Where existing antifreeze systems have been analyzed and approved to remain in service, antifreeze solutions should be limited to premixed antifreeze solutions of glycerin (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. The use of antifreeze solutions in all new sprinkler systems should be restricted to listed antifreeze solutions only. Where existing antifreeze systems are in service, the solution concentration should be limited to those noted in A.7.6.2.1 and the system requires an analysis and approval of the AHJ to remain in service.

8. Delete A.7.6.2.2 and A.7.6.3.1.

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**)**

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Tentative Interim Amendment

NFPA® 13R

Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies

2013 Edition

Reference: 5.4.2 and A.5.4.2(1)
TIA 13-2
(SC 12-8-31/TIA Log #1065)

Note: Text of the TIA issued and incorporated into the text of Section 5.4.2 and A.5.4.2(1), therefore no separate publication is necessary.

1. Revise 5.4.2 to read as follows:

5.4.2* Piping in areas that cannot be maintained reliably above 40°F (4°C) shall be protected by use of one of the following methods:
(1)*Antifreeze system using a listed antifreeze solution in accordance with NFPA 13
(2) Dry pipe system
(3) Preaction system
(4) Listed dry-pendent, dry-upright, or dry-sidewall sprinklers extended from pipe in heated areas **[ROP-26]**
(5) Heat tracing in accordance with 6.7.2.1 **[ROP-25]**

2. Revise A.5.4.2(1) to read as follows:

A.5.4.2(1) The use of antifreeze solutions in all new sprinkler systems should be restricted to listed antifreeze solutions only.

Issue Date: August 9, 2012

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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

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

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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**)**

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