EXPRESS TERMS
FOR
PROPOSED EMERGENCY BUILDING STANDARDS
OF THE
OFFICE OF THE STATE FIRE MARSHAL
REGARDING THE 2010 CALIFORNIA FIRE CODE
CALIFORNIA CODE OF REGULATIONS, TITLE 24, PART 9
ANTIFREEZE SOLUTIONS WITHIN RESIDENTIAL BUILDING APPLICATIONS
MODIFICATIONS TO NFPA 13, 13D AND 13R FIRE SPRINKLER STANDARDS

The Office of the State Fire Marshal (OSFM) proposes to make necessary changes to the 2010 edition of the California Fire Code (CFC) adopted reference standards 2010 editions NFPA 13, 13D and 13R.

Legend for Express Terms:
1. California amendments brought forward without modification: Not shown for clarity
2. New California amendment: California language appears underlined and in Italic.
3. Repealed text: Shown as Strikeout.

[The SFM proposes to amend Chapter 47 with the following amendments and California regulations.]

CHAPTER 47
REFERENCED STANDARDS

This chapter lists the standards that are referenced in various sections of this document. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title, and the section or sections of this document that reference the standard. The application of the referenced standards shall be as specified in Sections 1.1.5, 1.1.7 and 102.6.

NFPA
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02269-9101

<table>
<thead>
<tr>
<th>Standard number</th>
<th>Title</th>
<th>Referred in code section number</th>
</tr>
</thead>
<tbody>
<tr>
<td>13—10</td>
<td>Installation of Sprinkler Systems as amended*</td>
<td>Table 903.3.1.1, 903.3.2, 903.3.5.1.1, 903.3.5.2, 904.11, 905.3.4, 907.7.3, 2301.1, 2304.2, Table 2306.2, 2306.9, 2307.2, 2307.2.1, 2308.2.2, 2308.2.2.1, 2308.4, 2310.1, 2501.1, 2804.1, 2806.5.7, 3404.3.3.9, Table 3404.3.6.3(7), 3404.3.7.5.1, 3404.3.8.4</td>
</tr>
</tbody>
</table>

*NFPA 13, Amended Sections as follows:

Revise Section 7.6.2.2 as follows:

7.6.2.2 Glycerine-water and propylene glycol-water mixtures shown in Table 7.6.2.2 shall be considered suitable for use. Antifreeze solutions exceeding 50% by volume of glycerine-water or 40% by volume of propylene glycol-water mixtures shall not be permitted within dwelling unit portions of the sprinkler system.
Revise Section 7.6.2.3 as follows:

7.6.2.3 If potable water is not connected to sprinklers, the commercially available materials indicated in Table 7.6.2.3 shall be permitted for use in antifreeze solutions. Antifreeze solutions of diethylene glycol–water or ethylene glycol–water mixtures shall not be permitted within dwelling unit portions of the sprinkler system.

Add new Section 7.6.2.5.1 as follows:

7.6.2.5.1 Antifreeze solutions shall be factory premix solutions within dwelling unit portions of the sprinkler system.

Add a new definition as 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 by the manufacturer with a quality control procedure in place that ensures that the antifreeze solution remains homogeneous.

Revise 7.6.1.5 to read as follows:

7.6.1.5 A placard shall be placed on the antifreeze system main valve that indicates the manufacture type and brand of the antifreeze solution, the concentration by volume of the antifreeze solution used, and the volume of the antifreeze solution used in the system.

Revise 7.6.2.1 to read as follows:

7.6.2.1* Antifreeze solutions shall be limited to premixed antifreeze solutions of glycerin (chemically pure or United States Pharmacopoeia 96.5%) at a maximum concentration of 50% by volume, or propylene glycol at a maximum concentration of 40% by volume.

Add a new 7.6.2.1.1 to read:

7.6.2.1.1 Premixed antifreeze solutions of propylene glycol exceeding 40% concentration by volume shall be permitted for use with ESFR sprinklers where the ESFR sprinklers are listed for such use in a specific application.

Add new 7.6.2.1.2 to read as follows:

7.6.2.1.2 Premixed antifreeze solutions other than those described in 7.6.2.1 that are listed for use in sprinkler systems shall be permitted to be used.

Add a new 7.6.2.1.3 to read as follows:

7.6.2.1.3 All premixed antifreeze solutions shall be provided with a certificate from the manufacturer indicating the type of antifreeze, concentration by volume, and freezing point.

Delete current Table 7.6.2.2 and replace it with the following table in the annex renumbered as Table A.7.6.2.1

A.7.6.2.1 See Table A.7.6.2.1.

<table>
<thead>
<tr>
<th>Material</th>
<th>Solution (by volume)</th>
<th>Specific Gravity at 77ºF (25ºC)</th>
<th>Freezing Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glycerin (C.P. or U.S.P. grade)</td>
<td>0%</td>
<td>1.000</td>
<td>32, 0</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>1.014</td>
<td>31, -0.5</td>
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<tr>
<td></td>
<td>10</td>
<td>1.029</td>
<td>28, -2.2</td>
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<td>15</td>
<td>1.043</td>
<td>25, -3.9</td>
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<tr>
<td></td>
<td>20</td>
<td>1.059</td>
<td>20, -6.7</td>
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<tr>
<td></td>
<td>25</td>
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</tr>
<tr>
<td></td>
<td>30</td>
<td>1.087</td>
<td>10, -12</td>
</tr>
</tbody>
</table>

See Table A.7.6.2.1.
### Antifreeze solutions within residential building applications – modifications to NFPA 13, 13D and 13R fire sprinkler standards

<table>
<thead>
<tr>
<th>Temperature (°F)</th>
<th>Percentage Solution</th>
<th>Freezing Point (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>1.100</td>
<td>-15.5</td>
</tr>
<tr>
<td>40</td>
<td>1.114</td>
<td>-19</td>
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<tr>
<td>45</td>
<td>1.130</td>
<td>-24</td>
</tr>
<tr>
<td>50%</td>
<td>1.141</td>
<td>-28</td>
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</tbody>
</table>

#### Propylene glycol

<table>
<thead>
<tr>
<th>Temperature (°F)</th>
<th>Percentage Solution</th>
<th>Freezing Point (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.000</td>
<td>32</td>
</tr>
<tr>
<td>5</td>
<td>1.004</td>
<td>26</td>
</tr>
<tr>
<td>10</td>
<td>1.008</td>
<td>25</td>
</tr>
<tr>
<td>15</td>
<td>1.012</td>
<td>22</td>
</tr>
<tr>
<td>20</td>
<td>1.016</td>
<td>19</td>
</tr>
<tr>
<td>25</td>
<td>1.020</td>
<td>15</td>
</tr>
<tr>
<td>30</td>
<td>1.024</td>
<td>11</td>
</tr>
<tr>
<td>35</td>
<td>1.028</td>
<td>2</td>
</tr>
<tr>
<td>40</td>
<td>1.032</td>
<td>-6</td>
</tr>
</tbody>
</table>

C.P.: Chemically Pure; U.S.P.: United States Pharmacopoeia 96.5%.

#### Delete 7.6.2.3 and Table 7.6.2.3.

#### Revise 7.6.2.4 to read as follows:

7.6.2.4 A premix antifreeze solution with a freezing point below the expected minimum temperature for the locality shall be provided.

#### Delete existing 7.6.2.5 as well as the Figures 7.6.2.5(a), 7.6.2.5(b), and 7.6.2.5(c) and Annex A.7.6.2.5.

#### Delete 7.6.2.6.

#### Add an asterisk to Section 7.6 and a new Annex A.7.6 to read as follows:

A.7.6 In cold climates and areas where the potential for freezing of pipes is a concern, options other than antifreeze are available. Such options include installing the pipe in warm spaces, tenting insulation over the piping (as illustrated in NFPA 13D), listed heat tracing, and the use of dry pipe systems and preaction systems.

In A.7.6.2, delete the second paragraph.

A.7.6.2 Listed CPVC sprinkler pipe and fittings should be protected from freezing with glycerine only. The use of diethylene, ethylene, or propylene glycols is specifically prohibited. Laboratory testing shows that glycol-based antifreeze solutions present a chemical environment detrimental to CPVC.

#### Delete existing A.7.6.2.4 and Figure A.7.6.2.4.

#### Revise Section 8.3.3.2.3 as follows:

8.3.3.2.3 Percent solution by volume of glycerine–water and propylene glycol–water mixtures shall be in accordance with Table 8.3.3.2.3, Figure 8.3.3.2.3(a), and Figure 8.3.3.2.3(b). Antifreeze solutions exceeding 50% by volume of glycerine–water or 40% by volume of propylene glycol–water mixtures shall not be permitted within dwelling unit portions of the...
Revised Section 8.3.3.2.5 as follows:

8.3.3.2.5 Percent solution by volume of diethylene glycol–water and ethylene glycol–water shall be in accordance with Table 8.3.3.2.5. Antifreeze solutions of diethylene glycol–water or ethylene glycol–water mixtures shall not be permitted within dwelling unit portions of the sprinkler system.

Add new Section 8.3.3.2.7 as follows:

8.3.3.2.7.1 Antifreeze solutions shall be factory-premix solutions

Add a new definition as 3.3.9.1.1 and related annex note to read as follows:

3.3.9.1.1* 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.

A.3.3.9.1.1 Where a tank is used as the water supply for the sprinkler system, the tank is not permitted to be filled with antifreeze.

Revise 4.1.4 and related annex note to read as follows:

4.1.4* Antifreeze Systems.

4.1.4.1 Annual Antifreeze Solution Test and Replacement Procedure.

4.1.4.1.1 Samples of antifreeze solution shall be collected by qualified individuals in accordance with 4.1.4.1.1.1 or 4.1.4.1.1.2 on an annual basis.

4.1.4.1.1.2 Solution samples shall be taken at the highest practical elevation and the lowest practical elevation of the system.

A.4.1.4.1.1.2 If not already present, test connections (valves) for collection of solution samples should be installed at the highest and lowest practical locations of the system or portion of the system containing antifreeze solution.

4.1.4.1.2 The two samples collected in accordance with the procedures specified in 4.1.4.1.1.1 or 4.1.4.1.1.2 shall be
tested to verify that the specific gravity of both samples is similar and that the solution is in compliance with 8.3.3. 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.

4.1.4.1.3* If concentrations of the two samples collected in accordance with the procedures above are similar and in compliance with 8.3.3, then (a) the solution drained in accordance with 4.1.4.1.1 can be used to refill the system, or (b) the existing undrained solution tested in accordance with 4.1.4.1.2 shall be permitted to continue to be used. If the two samples are not similar and not in compliance with 8.3.3, then a solution in compliance with 8.3.3 shall be used to refill the system.

A.4.1.4.1.3 In the past, for some existing systems subject to extremely low temperatures, antifreeze solutions with concentrations greater than what is now permitted by NFPA 13D were used. Such high concentrations of antifreeze are no longer permitted. In situations where extremely low temperatures are anticipated, refilling the fire sprinkler system with a concentration of antifreeze solution currently permitted by the standard might not provide sufficient freeze protection without additional measures. Such measures might include converting the antifreeze system to another type of sprinkler system.

4.1.4.1.4 A tag shall be attached to the riser indicating the date the antifreeze solution was tested. The tag shall also indicate the type and concentration of antifreeze solution (by volume) with which the system is filled, the date the antifreeze was replaced (if applicable), the name of the contractor that tested and/or replaced the antifreeze solution, the contractor's license number, a statement indicating if the entire system was drained and replaced with antifreeze, and a warning to test the concentration of the antifreeze solutions at yearly intervals per NFPA 13D.

Add an asterisk to 8.3.3 and add a new A.8.3.3 to read as follows:

8.3.3* Antifreeze Systems.

A.8.3.3 Where protection of pipes from freezing is a concern, options other than antifreeze are available. Such alternatives include running the piping in warm spaces, tenting insulation over pipe, dry-pipe systems, and preaction systems.

Revise 8.3.3.2.1 to read as follows:

8.3.3.2.1* Unless permitted by 8.3.3.2.1.1, 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.

Add a new 8.3.3.2.1.1 to read as follows:

8.3.3.2.1.1. 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.

Delete 8.3.3.2.2 and 8.3.3.2.3 and related Annex material A.8.3.3.2.3.

Move Table 8.3.3.2.3 to the annex and renumber as Table A.8.3.3.2.1 while deleting the rows in the table dealing with glycerine and 40% water, glycerine and 30% water, propylene glycol and 50% water and propylene glycol and 40% water. Add an annex note so that the annex and Table would appear as follows:

A.8.3.3.2.1 See Table A.8.3.3.2.1.

A.8.3.3.2.1 Properties of Glycerine and Propylene Glycol

<table>
<thead>
<tr>
<th>Material</th>
<th>Solution (by volume)</th>
<th>Specific Gravity at 60ºF (15.6ºC)</th>
<th>Freezing Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glycerine (C.P. or U.S.P. grade)</td>
<td>50% water</td>
<td>1.145</td>
<td>-20.9</td>
</tr>
<tr>
<td>Propylene glycol</td>
<td>60% water</td>
<td>1.034</td>
<td>-6</td>
</tr>
</tbody>
</table>

Office of the State Fire Marshal
Emergency Express Terms
Title 24, Part 9
Antifreeze solutions within residential building applications – modifications to NFPA 13, 13D and 13R fire sprinkler standards
Hydrometer scale 1.000 to 1.200 (subdivisions 0.002)
C.P.: Chemically Pure; U.S.P.: United States Pharmacopoeia 96.5%.

Renumber 8.3.3.2.3.1 to 8.3.3.2.2.

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

Delete 8.3.3.2.4, 8.3.3.2.5 and Table 8.3.3.2.5.

Renumber 8.3.3.2.6 as 8.3.3.2.3 and renumber A.8.3.3.2.6 as A.8.3.3.2.3. Also renumber Figure A.8.3.3.2.6 as Figure A.8.3.3.2.3.

8.3.3.2.3* An antifreeze solution with a freezing point below the expected minimum temperature for the locality shall be installed.

A.8.3.3.2.3 Beyond certain limits, an increased proportion of antifreeze does not lower the freezing point of the solution (see Figure A.8.3.3.2.3). Glycerine, diethylene glycol, ethylene glycol, and propylene glycol never should be used without mixing with water in the proper proportions, because these materials tend to thicken near 32°F (0°C).

Renumber 8.3.3.2.7 as 8.3.3.2.4 and revise to read as follows:

8.3.3.2.4 The specific gravity of the antifreeze shall be checked by a hydrometer with a scale having 0.002 subdivisions in accordance with Figure 8.3.3.2.4(a) and 8.3.3.2.4(b).

Renumber Figure 8.3.3.2.3(a) as Figure 8.3.3.2.4(a) and delete the 50% curve.

Renumber Figure 8.3.3.2.3(b) as Figure 8.3.3.2.4(b) and delete the 60% and 70% curves.

13R—10

Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height as amended*

*NFPA 13R, Amended Sections as follows:

Add new Section 5.4.2.1 as follows:

5.4.2.1 Antifreeze solutions exceeding 50% by volume of glycerine–water or 40% by volume of propylene glycol–water mixtures shall not be permitted within dwelling unit portions of the sprinkler system.

Add new Section 5.4.2.2 as follows:

5.4.2.2 Antifreeze solutions of diethylene glycol–water or ethylene glycol–water mixtures shall not be permitted within dwelling unit portions of the sprinkler system.

Authority: Health and Safety Code Sections 13100.1, 13108, 13143, 13210, 13211, 17921(b), 18928(a), and 18949.2(b) and (c)

References: 13108, 13113, 13211, 17921(b) and 18949.2(b) and (c)