INFORMATION FOR CLIENTS WITH FREEZE PROTECTED FIRE SPRINKLER SYSTEMS

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Your facility's fire sprinkler system may include a "freeze protected" system. In the event of a fire in the building, the water/glycol or water/glycerin mixture "stored" in the "freeze protected loop's" piping is discharged, but then pure water (from the water main) continues to flow through the affected sprinklers.

"Freeze protected" loops have been approved by NFPA since the 1940s. They are designed to protect any "wet pipe" system that might be exposed to below freezing temperatures (such as might exist in a ventilated attic). The requirements and limitations for such loops have changed with time. As of the early 2000s, the code allowed an entire building (such as a residence) to be "freeze protected"; and allowed concentrations of glycol up to 70% by volume. Glycerin was limited to concentrations of 50% in 2001 due to preliminary reports of higher concentrations "aerosolizing" under certain conditions –creating potential explosion hazards.

Fifty five to 65% glycol concentrations are necessary to provide -30 to -60º F freeze resistance ratings for glycol/water freeze protected loops. The lowest expected outside air temperature of a given location is often used to as the desired freeze protected temperature for projects in the Colorado Mountains. In some cases, higher "design temperatures" are appropriate.

Recently, BOTH water/glycol and water/glycerin mixtures have been found to be flammable or explosive under certain conditions of higher glycol or glycerin concentration, as may be currently installed in your facility

These higher concentrations, especially if stratified due to age or poor pre-mixing have been found to accelerate the spread of fire (not retard it) under certain conditions.

In 2010, the NFPA issued "Tentative Interim Amendments" to modify the current (2010 versions) of the NFPA Standards regulating the design of sprinkler systems. New (2013 versions) of NFPA 13, NFPA 13D, NFPA 13R and NFPA 25, when adopted, will limit the amount of glycol or glycerin in a freeze protected system in accordance with these TIAs. See the attached article from the "Fire Protection Engineering" periodical for additional information.

Your facility's pre-2013 freeze protected system may have a glycol/water (or even glycerin/water) mixture in excess of current recommendations. For example, many facilities use a glycol concentration of at least 50% (with a freeze point rating of about -28^0 F). The new recommendations and code requirements (when adopted) will limit glycol concentration to 40% (with a resultant freeze point rating of about -6^0 F). At this temperature, glycol begins to "slush". However, glycol will not fully freeze at any concentration in excess of about 38% (by volume). In other words, the piping will likely be protected against freeze/burst incidents at 40% glycol; however, it may not flow (in the event of a fire). The "flowability" of a slushed glycol system is not fully understood at this time.

Furthermore, the newest version of NFPA-13 (the Standard for Commercial projects) will limit the use of glycol in new fire sprinkler systems to "listed" glycol products. There are currently no listed glycol products on the market.

Glycerin can be used in a high enough pre-mixed concentration (of 50% by volume) to provide a better “freeze point” (according to NFPA). Note that what NFPA calls glycerin’s “freeze point” is actually glycerin’s “flow point”. It “slushes” at about the same temperature as 40% glycol/water (around 7º F), but does not freeze “solid” until, around -19° F. Glycerin’s flowability near its “freeze point” is currently thought to be better than glycol.

Existing systems can continue to use higher concentrations of inhibited glycol, if allowed by the local “Authority Having Jurisdiction” (usually the Fire Department).

In any case, the fluids must now be pre-mixed and inspected annually. New valves may need to be installed. See the attached TIA for a summary of changes for NFPA-13D (the Standard for single family homes). Similar changes are being made to the other above-referenced Standards.

Furthermore, new versions of the above-referenced Standard will require better owner testing and control of piping corrosion in fire sprinkler systems with metallic piping, especially for Microbiologically Induced Corrosion (MIC). I encourage all of my clients to learn more about MIC and what can be done to control it. There is good information on the internet and the attached “SUPPLEMENT 3 – Microbiologically Influenced Corrosion in Fire Sprinkler Systems” (from the 2007 Automatic Sprinkler Systems Handbook).

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