OE-3: 2015-04 **October 2015**

NRC Notice: Antifreeze Agents in Fire Water Sprinkler Systems

PURPOSE

This Operating Experience Level 3 (OE-3) document provides information about safety concerns identified by the Nuclear Regulatory Commission (NRC) that could potentially apply to work performed at Department of Energy (DOE) facilities. These concerns were identified in NRC Information Notice (IN) 2015-02, *Antifreeze Agents in Fire Water Sprinkler Systems,* (http://pbadupws.nrc.gov/docs/ML1432/ML14323A176.pdf).

This IN was issued to inform licensees of recent Tentative Interim Amendments (TIAs) issued by the National Fire Protection Association (NFPA) Standard Council to NFPA Standard 13, *Standard for the Installation of Sprinkler Systems* (NFPA 13) and NFPA Standard 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems* (NFPA 25).

DISCUSSION

Research and testing by the NFPA suggest that under certain conditions, antifreeze-water mixtures discharged from fire sprinklers can accelerate a fire when sprayed onto a flame.

Based on this research and testing the NFPA issued TIAs for Standard 13 and Standard 25.

The changes to the NFPA codes for new and existing construction are summarized below.

New Sprinkler Systems (i.e., installed after September 30, 2012)

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

- Factory premixed antifreeze solutions of propylene glycol in excess of 40% by volume are permitted in ESFR (Early Suppression Fast Response) sprinkler systems where the sprinklers are listed for such use in a specific application.
- The listing will indicate the maximum percentage of propylene glycol that can be used with the specific sprinkler.
- New systems, once installed, must be annually tested in the manner required for existing systems.

Existing Sprinkler Systems

The testing and maintenance provisions for NFPA 13 antifreeze systems are governed by NFPA 25. NFPA 25 provides that, by September 2022, existing systems (systems installed before

September 30, 2012), like new systems, will be required to use only listed antifreeze solutions. Until then, traditional antifreeze solutions may continue to be used where certain conditions, confirmed by annual testing, have been met. These are described below.

- Until a listed non-combustible solution is introduced into the system, antifreeze solutions in existing systems must be tested annually, prior to the onset of freezing weather.
- If it is determined, based on records, tests or other reliable information that the solution found in the system is no longer permitted or if the type of antifreeze cannot be reliably determined, the system must be drained and replaced with an acceptable factory premixed solution.
- If the initial review indicates that the solution type is acceptable, test samples must be taken at the top and bottom of each system.
- If all the test samples indicate a concentration of glycerine not greater than 38% by volume or propylene glycol not greater than 30% by volume, then the solution is permitted and may remain in the system.
- Where the test samples indicate that the solution is between 38% and 50% glycerine or 30% and 40% propylene glycol, the solution may remain in the system pending the approval of a deterministic risk assessment (see NFPA 25: 5.3.4.2.1(3)).
- If any of the samples indicate a concentration in excess of 50% glycerine or 40% propylene glycol, the system must be emptied and refilled with an acceptable solution or an alternate method of freeze protection must be employed. An acceptable solution would be a solution that contains less than 38% glycerine or 30% propylene glycol, or a solution that has been approved by the Authority Having Jurisdiction based on a deterministic risk assessment.
- All traditional antifreeze solutions must be replaced by listed antifreeze solutions, or alternative freeze protection methods, by September 2022.

For areas where the new antifreeze concentration limits are not sufficient to prevent sprinklers' freezing, the NFPA suggests pipe insulation, heating systems, or the use of dry-pipe or pre-action systems.

Please refer to www.nfpa.org/antifreeze (January 2014) for more information.

CONCLUSION

The NRC recommends that licensees review these TIAs and keep up-to-date with the newest developments.

These industry and NRC requirements and guidelines are for information only and do not supersede requirements in DOE Orders or supplemental guidance in Guides and Standards.

However, because sharing operational experience is crucial in maintaining safe facilities and performing safe work, readers can stay current by going to a variety of outside resources, including NRC Information Notices at http://www.nrc.gov/reading-rm/doc-collections/gen-comm/info-notices/

REFERENCES

- Tentative Interim Amendments to NFPA Standard 13, *Standard for the Installation of Sprinkler Systems*, and Standard 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*

- O 420.1C, *Facility Safety*, and guidance in DOE STD 1137-2014, *Fire Protection*.

Questions regarding this OE-3 document should be directed to Larry Stirling at 202-586-2417 or john.stirling@hq.doe.gov.

This OE-3 document requires no follow-up report or written response.

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