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## Steam Snuff Systems

A discussion earlier this month on a fire protection engineering bulletin board was about whether "snuff steam" systems used for fire control in process equipment required seismic protection under the provisions of the International Building Code. The discussion revealed that the use of steam for fire suppression is a rather old technology. Even half a century ago, in a 2<sup>nd</sup> edition of "Safety in Petroleum Refineries" book by Armistead (1959), it was stated that such systems were common only in older refinery pump rooms. Others reported additional references:

- "Fire Insurance and How to Build" by F. C. Moore (1903) recommended steam jets in various industrial buildings that could be manually operated after closing all doors and windows. The recommended applications included flour mills.
- A 1943 US Navy Bureau of Yards and Docks publication on fire protection stated: "The object of smothering steam is to delay the rate of fire propagation in partly-enclosed spaces. In a space that is almost entirely enclosed, the fire may actually be extinguished. In general, there will be few places in a navy fuel depot where smothering steam may be both safely and successfully used. Water fog seems preferable. The installation of steam-smothering lines or connections in pump houses or other enclosed spaces in which men may be working is not recommended. In regard to smothering-steam connections for aboveground tanks located on tank farms, the volume of steam required for effective reduction in flame on a tank from which the roof has been partly blown off or opened up is so great that the use of smothering steam for such a purpose is not recommended."
- The 1943 NFPA National Fire Codes had a section on steam smothering that basically said they were only used in ovens and furnaces. The systems were to be automatic with slow opening control valves to allow any nearby workers time to escape (while also protecting against water hammer damage.) Arrangements were required to prevent operation of the systems when workers were inside the ovens.
- "Fire Aboard" by Frank Rushbrook (1961) advised that the 1954 ship standards permitted steam systems in various spaces in lieu of water spray or CO2 systems, but noted that they were generally for fire control until shore brigades could attack the fire, rarely resulting in actual extinguishment. A description of some tests on a cargo hold of cotton stated that a vacuum occurred after shutting off the steam system due to condensation of vapors.
- Recent editions of the *International Safety Guide for Oil Tankers and Terminals* also state that steam systems may be found on older tankers, but should be discouraged due to their inefficiency and risk of static electricity generation.

Today, steam suppression systems have generally been replaced by water spray systems. Steam obviously wouldn't contribute as much cooling as water, since the major heat absorption takes place at the point water is converted to steam. The oxygen displacement of steam loses effectiveness in other than confined spaces, and

condensation of vapors also contributes to loss of effectiveness. But the potential hazard to personnel is probably the main reason these systems aren't used more. They are still fairly standard in process heater fireboxes, and portable steam lances for small leaks are still provided in some refineries. NFPA 86 - *Ovens and Furnaces* discourages their use unless other suppression systems are not available, but gives some design guidance in Annex F of that document, to provide 8 lbs / minute for each 100 cubic feet of oven volume, or 3.6 kg / minute for each 2.8 cubic meter of oven volume for those working in the metric system. There are reportedly no other published standards for steam snuffing, but some oil companies have internal design guides for process heater fireboxes. Another application has been for covered liquid sulphur storage pits at sour gas processing plants, but the systems are manual rather than automatic.

One of the big advantages of sprinklers and water spray is the displacement of oxygen from the area of the fire as water is converted to steam, since the expansion ratio is on the order of 1600 to 1. When steam is used as the suppression medium, this expansion has already taken place.

A photograph that periodically makes the rounds on the internet demonstrates this tremendous expansion when water converts to steam through the opposite example of contraction with cooling. A train tanker car reportedly cleaned with steam was sealed when the work was completed. As it cooled, the contraction of the steam created a vacuum that collapsed the tank car like an aluminum can.



**Upcoming "Business Thursday" Online Seminar – May 21st**

*Topic: CPVC Update*

*Instructor: Chris Gaut, NFSA Central Regional Manager*

*Date: May 21, 2009*

With the large quantity of CPVC pipe being used throughout the country and with the increased need for plastic pipe installation because of future residential sprinkler usage, issues regarding CPVC pipe arise. This presentation will discuss how the industry has taken a proactive step, involving contractors, suppliers and manufacturers and other stakeholders to address the issues.

## Upcoming "Technical Tuesday" Online Seminar – June 2<sup>nd</sup>

*Topic: Hydraulics for Non-Uniform Layouts*

*Instructor: Victoria B. Valentine, P.E., NFSA Director of Product Standards*

*Date: June 2, 2009*

There are many scenarios that do not exactly fit in the hydraulic calculation guidelines provided by NFPA 13. First the rules of the density/area hydraulic calculation method will be reviewed. Then the variations of non-uniform layouts will be discussed. These will include how to calculate non-rectangular rooms, small rooms, sprinklers under obstructions, stepped ceilings and more.

Additional training opportunities available through the NFSA engineering department include...

## Two-Week Layout Technician Training

September 14-25, 2009

Baltimore, MD

October 12-23, 2009

Phoenix, AZ

## Inspection and Testing for the Sprinkler Industry

June 16-18, 2009

Leominster, MA

## Advanced Technician Training

June 23-25, 2009

Denver, CO

For more information on the above classes, contact Nicole Sprague using [Sprague@nfsa.org](mailto:Sprague@nfsa.org) or by calling 845-878-4200 ext. 149.

## In-Class Training Seminars

The NFSA training department also offers in-class training on a variety of subjects at locations across the country. Here are some upcoming seminars:

Inspection, Testing & Maintenance	Colorado Springs, CO	May 20
Sprinklers for Dwellings	Colorado Springs, CO	May 21
NFPA 13 Overview	Anaheim, CA	May 26-27
Plan Review Policies & Procedures	Anaheim, CA	May 28
NFPA 13 Overview	Branson, MO	June 2-3

ITM	Branson, MO	June 4
Introduction to Sprinkler Systems (1/2 Day)	Hillsboro, OR	June 15
General Storage	Hillsboro, OR	June 16
Hydraulics	Hillsboro, OR	June 17
Basic Seismic (1/2 Day)	Hillsboro, OR	June 18
Advanced Seismic (1/2 Day)	Hillsboro, OR	June 18
Residential Sprinklers, Homes to High Rise	Albany, NY	June 23
Introduction to Sprinkler Systems (1/2 Day)	Albany, NY	June 24
Commissioning & Acceptance Testing (1/2 Day)	Albany, NY	June 24
Special Storage	Albany, NY	June 25
Hydraulics	New Lenox, IL	July 7
NFPA 13 Overview	New Lenox, IL	July 8-9
Commissioning and Acceptance (1/2 Day)	Apple Valley, CA	July 28
CPVC Piping (1/2 Day)	Apple Valley, CA	July 28
ITM	Apple Valley, CA	July 29
Rack Storage	Apple Valley, CA	July 30
NFPA 13 Overview	Kahului, HI	August 12-13
ITM	Kahului, HI	August 14
NFPA 13 Overview	Brighton, MI	August 19-20
Dwellings	Brighton, MI	August 21
NFPA 13 Update 2007	Aurora, IL	August 26
NFPA 13 Overview	Aurora, IL	August 27-28
Introduction to Sprinkler Systems (1/2 Day)	Alexandria, MN	September 8
NFPA 13, 13R, 13D 2002 Update (1/2 Day)	Alexandria, MN	September 8
Plan Review Policies and Procedures	Alexandria, MN	September 9
ITM	Alexandria, MN	September 10
NFPA 13 Update 2007	Anaheim, CA	Sept. 22
Hydraulics	Anaheim, CA	Sept. 23
Underground Piping (1/2 Day)	Anaheim, CA	Sept. 24
Basic Seismic (1/2 Day)	Anaheim, CA	Sept. 24
ITM	Concord, NH	October 13
Residential Sprinklers, Homes to High Rise	Concord, NH	October 14
Dwellings	Concord, NH	October 15
Underground Piping (1/2 Day)	Woodland, CA	October 20
Commissioning & Acceptance (1/2 Day)	Woodland, CA	October 20
Special Storage	Woodland, CA	October 21

These seminars qualify for continuing education as required by NICET.

To register or for more information, contact: Dawn Fitzmaurice at (845) 878-4207, E-Mail: [seminars@nfsa.org](mailto:seminars@nfsa.org)

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*NFSA Tuesday eTechAlert is c. 2009 National Fire Sprinkler Association, and is distributed to NFSA members on Tuesdays for which no NFSA Technical Tuesday Online Seminar is scheduled. Statements and conclusions are based on the best judgment of the NFSA Engineering staff, and are not the official position of the NFPA or its technical committees or those of other organizations except as noted. Opinions expressed herein are not intended, and should not be relied upon, to provide professional consultation or services. Please send comments to Russell P. Fleming, P.E. [fleming@nfsa.org](mailto:fleming@nfsa.org).*

**About the National Fire Sprinkler Association**

*Established in 1905, the National Fire Sprinkler Association (NFSA) is the voice of the fire sprinkler industry. NFSA leads the drive to get life-saving and property protecting fire sprinklers into all buildings; provides support and resources for its members – fire sprinkler contractors, manufacturers and suppliers; and educates authorities having jurisdiction on fire*

*protection issues. Headquartered in Patterson, N.Y., NFSA has regional operations offices throughout the country.*  
[www.nfsa.org](http://www.nfsa.org).

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