

# Tuesday e-Tech Alert

July 19, 2005



## Thin Combustible Ceiling Caution

Last week's NFSA "Technical Tuesday" online seminar was a report on the June 2005 NFPA World Safety Conference in Las Vegas, and included mention of presentations dealing with the special fire protection challenges of the large casino properties. Coincidentally, Douglas H. Evans, P.E., a fire protection engineer for the Clark County Building Department, issued a special letter to the editor of a variety of fire industry publications last week, presenting his concern that thin combustible ceilings might compromise sprinkler protection. His letter is reprinted in its entirety as follows:

### *Do Thin Combustible Ceilings Compromise Sprinklers?*

*The Las Vegas Strip contains many of the largest and most unique buildings in the world. To create the desired look and feel within a space, the owners and designers occasionally propose suspended ceilings out of thin combustible materials, such as fabrics or plastics.*

*At temperatures somewhat below 300 °F, most thermoplastics start to lose their tensile strength and liquefy (melt). As such, plastics that exceed one-quarter of an inch thick may even fit into the category described in the following paragraphs. Fabrics are also thermally thin materials and even if they are made out of natural products, they can be expected to degrade at moderate temperatures generated during a fire.*

*Whether these materials do or do not comply with building code requirements as a ceiling can be debated. If one fully understands the intent of the codes, the required tests, and what constitutes a compliant application, it is easy to conclude that these products cannot be used. Not only must the requirements for suspended ceilings be considered, but when these materials create a plenum, additional limitations are imposed. Although these fire protection aspects must be considered, the primary concern addressed herein is that these materials may adversely affect sprinkler activation and effectiveness.*

*Depending on the depth of the void above a combustible ceiling, NFPA 13 requires sprinklers to be installed in the plane of the ceiling and at the deck above. When a fire originates beneath a thin combustible ceiling, which set of sprinklers will activate first?*

*Several full-scale fire tests have been conducted on some of these materials. Some of the tests indicate that these materials may be good performers. Others indicate the opposite. The physics applicable to proper sprinkler activation appears to be:*

- 1. When flames from a fire do not extend anywhere near the ceiling and the space is bounded (walls or draft curtains), temperatures at the membrane ceiling can be below the degradation temperature of the material. The heat can then spread out on the ceiling, without breaching the membrane, and bank down. In this situation, sprinklers in the plane of the ceiling activate as expected and can then keep the fire from spreading.*

2. *When flames from a fire extend reasonably close to the ceiling and the temperature at the membrane exceeds the degradation temperature of the material, the membrane opens up where it is impacted by the heat. The size of the hole created is approximately the diameter of the heat plume. The heat then enters the space above the membrane. As described in the following paragraph, proper sprinkler operation cannot be assured. This scenario may also apply to a large space that is essentially unbounded (walls located a substantial distance from the fire).*

*Imagine a fire centrally located between four sprinklers with the heat having created a breach in the thin membrane approximately the diameter of the plume. Once the heat enters the cavity above the membrane, we can expect the sprinklers at the deck to activate before the sprinklers in the plane of the membrane activate. The sprinklers at the deck will then pre-wet the membrane below. The intended sprinkler spray distribution will be obstructed by the pre-wetted membrane and not penetrate to the seat of the fire below the membrane. In addition, the piping/sprinklers that penetrate the membrane will be pre-wetted. This scenario can allow the fire to spread below the membrane. Even if lower level sprinklers activate, these thin membranes may drape down and restrict proper sprinkler spray distribution.*

*Of course sprinklers with activation temperatures below 300 °F can be used, but the ceiling temperature prior to sprinkler activation is the real question/concern. Due to the thermal lag of the “fusible link”, the actual temperature at the ceiling can be expected to exceed the listed activation temperature of the sprinkler. The actual ceiling temperature prior to sprinkler activation is further affected by the distance between the location where the heat plume hits the ceiling and the adjacent sprinklers. Ceiling temperatures prior to sprinkler activation are also dependent on the growth rate of the fire.*

*Based on the preceding, it seems reasonable that appropriate fire tests must be developed to ensure that these products do not adversely affect proper sprinkler protection. Until then, it may be necessary to consider combustible membrane ceilings only on a case-by-case basis with a documented engineered fire protection analysis .*

Editor’s Note: While Mr. Evans has put forward an interesting question, it should be noted that no information has been submitted on this subject to the NFPA Automatic Sprinkler Committee for its consideration as it prepares the 2007 edition of NFPA 13. Mr. Evans will be encouraged to submit test data to the Committee.

## **Upcoming “Nine for Eight” Online Seminars on NFPA 13 Issues**

The “Technical Tuesday” online seminars scheduled for the last five months of 2005 will feature nine special topics from NFPA 13. These topics were addressed briefly during the 10-session series on the 2002 edition of NFPA 13, but now will be addressed in more detail. Although the individual registration fee for these seminars will be the usual \$125 for members and \$250 for nonmembers, a special “nine for eight” rate of \$800 will be available to NFSA members who sign up for all nine. This represents a discount of nearly 30 percent. The same percentage discount will be given from the nonmember rate. **This will be the only discount available in this series.** Go to [www.nfsa.org](http://www.nfsa.org) for full descriptions and registration for the online seminars. Registering for all nine seminars will trigger the discounted price. The seminars in the series:

August 2, 2005 – **Vertical Shafts**

August 23, 2005 – **Atria and High Ceilings**

September 13, 2005 – **Sprinkler Temperature Ratings**

September 27, 2005 – **Meters, Backflow Preventers, and Pressure Reducing Valves**

October 11, 2005 – **Sloped Ceilings**

October 25, 2005 – **Hose Stream and Hose Stations**

November 8, 2005 – **Pitching and Draining of Sprinkler Systems**

November 22, 2005 – **Obstructions**

December 6, 2005 – **Fire Department Connections**

*NFSA Tuesday e-Tech Alert is c. 2005 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 except as noted. Please send comments to Russell P. Fleming, P.E. . [fleming@nfsa.org](mailto:fleming@nfsa.org)*

*In the promotion of the fire sprinkler concept, the National Fire Sprinkler Association represents all fire sprinkler industry interests including fire sprinkler contractors, manufacturers and suppliers of fire sprinklers and related equipment and fire protection professionals. Established in 1905, the National Fire Sprinkler Association provides publications, nationally accredited seminars, representation in codes and standards-making, market development, labor relations and other services to its membership. Headquartered in Patterson, New York, the National Fire Sprinkler Association has regional operations offices throughout the country*

## **Free SFPE Membership for NFSA Member Company Employees**

The Society of Fire Protection Engineers has announced a special free trial membership available to employees of NFSA member companies. A form is attached to this issue of *Tuesday e-Tech Alert* that can be faxed to SFPE headquarters. During the 6-month trial period, you will receive copies of SFPE publications such as *Fire Protection Engineering* magazine, the last two issues of which have addressed fire sprinkler economics, and the *Journal of Fire Protection Engineering*, the most recent issue of which contained a research paper on sprinkler skipping. You will also be able to keep up with other information being sent out regularly to the fire protection engineering community and avail yourself of membership discounts and benefits. Even if you are already affiliated with a local SFPE chapter, you may not be a member of the SFPE itself. This easy form allows you to find out what SFPE membership is all about. The offer is available only to individuals who are not currently members of SFPE. The response form should be faxed to SFPE by July 29, 2005.



*Advancing the science and practice of Fire Protection Engineering Internationally*

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### ***Benefits of SFPE Membership:***

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Opportunity to participate in the development of Engineering Standards  
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Annual Technology Showcase  
Annual Meeting with picnic - free to members  
Discounted professional liability and group insurance plans  
Opportunity to join a local SFPE Chapters

## Who are SFPE members?

**Professional Members** are graduates of an engineering program with a minimum of three years engineering experience in responsible charge of fire protection engineering work, or equivalent. **Associates** are graduates of an engineering program, or equivalent in practice. **Affiliates** are entry-level members who support the goals and objectives of SFPE.

- Yes, enroll me immediately in SFPE for a FREE 6-month trial affiliate membership.
- I would also be interested in upgrading my FREE membership to Associate or Professional Member.
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