

## “ROOF VENTS WORK”?

By Richard Schulte

In a discussion of the ICC Code Technology Committee’s (CTC) roof vent study group proposal for revisions to section 910 in the International Building Code (IBC)/International Fire Code (IFC) and Chapter 23 in the IFC held in Birmingham, Alabama in April 2009, William Koffel, Koffel Associates, Inc., stated that “*roof vents work*”. Although Koffel did not elaborate, it was clearly implied that his statement referred to the use of roof vents in combination with sprinkler protection. To date, neither Mr. Koffel, nor other lobbyists representing the trade association which represents the manufacturers of roof vents, the Smoke Vent Task Group (SVTG), have provided any data, testing or information which supports Koffel’s assertion regarding roof vents.

In 1974, research work done by Factory Mutual Research Corporation (FMRC) raised questions about whether the opening of roof vents interfered with the operation of sprinkler systems.<sup>1</sup> The debate over FMRC’s research finding in 1974 continued until 2009 when the NFPA 13 committee finally approved specific provisions addressing the use of roof vents in buildings protected by a sprinkler system.<sup>2</sup>

While debate about the interaction of sprinklers and roof vents continued for almost a quarter of a century (1974-1998), research conducted on the interaction between sprinklers and roof vents conducted at Underwriters Laboratories (UL) in Northbrook, Illinois in 1997/1998 determined that the operation of sprinklers interfered with the activation of individually-activated automatic roof vents. In large-scale tests utilizing the combination of roof vents and sprinklers, the number of vents which opened was limited to a maximum of one and in one test, Test P-2, no vents opened even though the fire was ignited directly below a vent. The tests at UL also confirmed another FMRC research finding from 1994 that draft curtains altered the pattern of sprinkler operation where the fires occurred in relatively close proximity to a draft curtain. The results of the research at UL is published in a document referred to as **NISTIR 6196-1** dated September 1998.<sup>3</sup>

To date, neither Mr. Koffel, nor other lobbyists representing the trade association which represents the manufacturers of roof vents, the Smoke Vent Task Group (SVTG), have provided any data, testing or information which supports Koffel’s assertion regarding roof vents.

In February 1999, Craig L. Beyler and Leonard Y. Cooper, Hughes Associates, Inc. published a paper titled “*Interaction of Sprinklers with Smoke and Heat Vents*”. In the Beyler/Cooper paper, the authors acknowledge that the tests at UL referred to in the previous paragraph do indeed show that the activation of sprinklers interferes with the opening of individually-activated automatic roof vents.<sup>4</sup> In deposition in the litigation referred to as *lan David McAuslin, et al v. Grinnell Corporation, et al*, Beyler indicated that the Beyler/Cooper paper was commissioned by the trade association representing the manufacturers of roof vents.<sup>5</sup>

Roughly seven months after the Beyler/Cooper paper was released, the chairman of the Smoke Vent Task Group, Paul Simony, issued a memorandum indicating that the roof vent manufacturers would conduct further testing on the interaction of sprinklers and roof vents. This memorandum was dated September 10, 1999. To date, the SVTG has not followed-up on its commitment to conduct further testing.

In February 1999, Craig L. Beyler and Leonard Y. Cooper, Hughes Associates, Inc. published a paper titled “*Interaction of Sprinklers with Smoke and Heat Vents*”.

Subsequent to the publication of the first edition of International Building Code and the International Fire Code in 2000, several code change proposals to delete the requirements for roof vents in one-story industrial and storage buildings protected by a sprinkler system have been introduced into the code change process. With the exception of a proposal to eliminate the requirement for vents in buildings protected by ESFR sprinklers, all of these proposals were disapproved (denied) by the ICC code changes committees.

In the summer of 2006, the Smoke Vent Task Group announced that a fire modeling study of the interaction between sprinklers and roof vents would be conducted by Hughes Associates, Inc. (HAI). A report on HAI’s modeling work titled “*Analysis of the Performance of Ganged Operation of Smoke and Heat Vents with Sprinklers and Draft Curtains*”, dated February 18, 2008, was released at the ICC code development hearings held in Palm Springs, California in February/March 2008.<sup>6</sup> The HAI research indicated that the sprinkler activation interference with the opening of automatic roof vents could be addressed by the “ganged” operation of multiple roof vents and that the roof vents should be opened 60 seconds after the water flow indicator in the sprinkler system is activated.

The HAI research indicated that the sprinkler activation interference with the opening of automatic roof vents could be addressed by the “ganged” operation of multiple roof vents and that the roof vents should be opened 60 seconds after the water flow indicator in the sprinkler system is activated.

In May, 2008 and November, 2008, Dr. Craig Beyler made presentations on HAI's research on the concept of the "ganged" operations to the ICC Code Technology Committee on behalf of the Smoke Vent Task Group. After each presentation by Beyler, the issue of the "validation" of the model used in the research was challenged. In a teleconference of the Smoke Vent Task Group held on March 24, 2009, the Hughes Associates, Inc. fire modeling study was characterized as "*worthless*" due to the failure of Beyler to address the issue of model "validation".<sup>7</sup>

In 2007, a proposal to include provisions which would prohibit the installation of roof vents in buildings protected by a sprinkler system was submitted to a subcommittee of the NFPA 13 committee for consideration. Eventually, the subcommittee approved a modified version of this proposal. The modified proposal would permit the installation of roof vents in buildings protected by a sprinkler system only if the manually-activated vents were provided, or, if individually-activated vents were utilized, vents with a fusible element one temperature rating classification higher than the temperature classification of the sprinklers would be required. (The purpose of these provisions is to prevent the automatic opening of roof vents if the sprinkler system performs as intended and controls the fire.) Interestingly enough, William Koffel, was a member of the subcommittee which developed the roof vent provisions now contained in NFPA 13 and Koffel voted affirmatively on this proposal.

With the above background, it seems reasonable to ask William Koffel (and the other lobbyists employed by the Smoke Vent Task Group) to justify his statement that "*roof vents work*". Koffel is a former president of the Society of Fire Protection Engineers (SFPE) and is considered to be an expert in field of fire protection. If Koffel wants to publicly make such a statement, then he should be able to provide the testing, research and data which supports his assertion.

We've been waiting for the roof vent manufacturers to conduct further research on the interaction between sprinklers and roof vents since September 1999 and we've been waiting for Koffel to justify his assertion at the ICC Code Technology Committee meeting for over 2 years. Given all of this time (almost 12 years), it seems safe to conclude that the Smoke Vent Task Group will not be conducting any further research on the subject and that Koffel has no information to support the assertion which he made at the CTC meeting in Birmingham.

Given that the installation of roof vents in buildings protected by a sprinkler system has been controversial for more than 35 years, it seems reasonable to conclude that the roof vent manufacturers have been using "smoke and mirrors" to keep the requirement for roof vents in sprinklered buildings in the Code. Unfortunately, the fire service seems to have fallen for the ruse, but that is changing. The ICC Joint Fire Service Review Committee voted to support the unamended version of the CTC's code change proposal, **F144-09/10** in April 2010. Code change **F144-09/10** proposes that a manually-activated mechanical smoke removal system be provided in one story industrial and storage buildings protected by a sprinkler system and eliminates the requirement for roof vents.

Given the Joint Fire Service Review Committee's support of code change **F144-09/10**, it appears that the building code requirement for the use of roof vents in sprinklered buildings will soon be history. Imagine all of the wasted dollars on a fire protection technology, roof vents, that never worked in buildings protected by a sprinkler system.

#### Endnotes:

- <sup>1</sup> Letter to the editor, Gunnar Heskestad, FM Global Research, Fire Technology, 3<sup>rd</sup> Quarter-2002.

*"To justify our [FM Global Research] views we may first recall the results of the main test series of FMRC's Model Study, reported in 1974 (authors' ref. 18). . . In fires operating fewer than approximately 20 sprinklers did not activate the fusible-link actuated vents spaced at 50 ft. Larger fires, operating approximately 50 sprinklers (without venting), activated 4 vents. Among these, averaged over the number of fires for each test condition, vents alone (no draft curtains) had essentially no effect on the total number of operating sprinklers (52 versus 51 sprinklers), but delayed loss in visibility from 13.1 to 15.7 min, increased minimum recorded O<sub>2</sub> concentration (at scaled eye level, 37 ft from the ignition point) from 18.2 to 20.5%, and increased fuel consumption from 13,100 to 18,900 lb [44.2%]. Vents and draft curtains increased the number of operating sprinklers from 51 to 69, delayed loss in visibility from 13.1 to 20.2 min, increased minimum recorded O<sub>2</sub> concentration from 18.2 to 20.2%, and increased fuel consumption from 13,100 to 21,400 lb [63.2%]. . ."*

*"Adding the draft curtain made the vents more effective, bringing in more fresh air than without them, causing a further increase in burning activity. Due to the increased burning rate and confining effect of the draft curtains, gas temperatures in the smoke layer increased and caused additional sprinkler operations."*

*"With vents and draft curtains installed, we may still see an increase in the number of sprinkler operations because of the heat confining effect. In addition, increased floor-level smoke densities can be expected in the curtained/surrounding area as a result of the deep smoke layer at the moment the fire is controlled by the sprinklers."*

- <sup>2</sup> NFPA 13 Proposal 13-325 Log #CP43 AUT-SSD.

*"The intent of the [NFPA 13] standard is that roof vents and draft curtains should not be used in conjunction with storage protection."*

<sup>3</sup> “*Sprinkler, Smoke & Heat Vent, Draft Curtain Interaction-Large Scale Experiments and Model Development (NISTIR 6196-1)*”, Kevin B. McGrattan, Anthony Hammis and David Stroup, National Institute of Standards and Technology (NIST), September 1998.

<sup>4</sup> “*Interaction of Sprinklers With Smoke and Heat Vents*”, Craig L. Beyler and Leonard Y. Cooper, Hughes Associates, Inc., February 1999.

*“The experimental studies have shown that early vent activation has no detrimental effects on sprinkler performance and have also shown that current design practices are likely to limit the number of vents operated to one and vents may in fact not operate at all in very successful sprinkler operations.” (Page 1)*

<sup>5</sup> Deposition-Dr. Craig Beyler, Volume VII, *Ian David McAuslin, et al v. Grinnell Corporation, et al*, June 23, 1999.

Attorney: At whose behest and on whose behalf was this study made?

Beyler: AAMA, Smoke Vent and Heat Vent Task Group.

Attorney: What is AAMA?

Beyler: Architect - - Geez. Architectural something Manufacturers Association. Don't have it quite right, but - -

Attorney: And this is a non-profit group or a for-profit group or is it a trade association? Do you know what AAMA is?

Beyler: Formally I don't know. My impression is a trade group.

Attorney: And what industry or industries or sub-industries is it a trade group for?

Beyler: My impression is, and I don't really know the answer to the question, is that they're building products of various kinds.

Attorney: Such as smoke vents, draft curtains and roof vents?

Beyler: Yes. I particularly was working with the Smoke and Heat Vent Task Group, which are manufacturers of such devices.

Attorney: And these were individuals who funded this study, this non-profit, not-for-profit trade association?

Beyler: Yes.

[Break in transcript.]

Attorney: Okay. I thought it was clear from the content what we were referring to, and if there are multiple reports, I readily stand corrected. But I thought it was clear it was the report that you and Mr. Trelles worked on. Was there more than one report that you worked on for the AAMA?

Beyler: The review paper that I did with Mr. Cooper was also funded by that organization.

Attorney: So both of those were.

Beyler: Yes.

Attorney: Excuse me. Okay. The same sub-task force or task force.

Beyler: Yeah.

(Deposition Volume VII, Pages 1,344 and 1,345).

<sup>6</sup> “*Analysis of the Performance of Ganged Operation of Smoke and Heat Vents with Sprinklers and Draft Curtains*”, Hughes Associates, Inc., February 18, 2008.

<sup>7</sup> Smoke Vent Task Group March 24, 2009 Teleconference Call Minutes, 2009 AAMA 72<sup>nd</sup> Annual Conference (Revised as of May 11, 2009), American Architectural Manufacturers Association (AAMA), Coronado, California, February 22-25, 2009.

*“The concern remains that if C. Beyler is not willing to support the \$100K SVTG Modeling Study, then the study is worthless. The members questioned why no other groups, organizations, or Fire Protections Engineers have come forward to defend the FDS program, particularly, Kevin McGratten [McGrattan], from NIST, who wrote the original version of FDS, and has been intimately involved in it since its development. B. Sampson will contact K. McGratten [McGrattan] to obtain his thoughts on this.” (Page 127)*

\* \* \* \* \*

Copyright © 2011 Richard C. Schulte  
All Rights Reserved