SCHULTE & ASSOCIATES
Building Code Consultants
880D Forest Avenue
Evanston, IL 60202
fpeschulte@aol.com
504/644-8900

NFPA TECHNICAL MEETING: NITMAM 204-1 TESTIMONY

By Richard Schulte

NITMAM 204-1 proposed that the Smoke Management Committee's technical report on NFPA 204, the *Standard for Smoke and Heat Venting*, be returned to the committee for further study. The following are excerpts from the discussion on NITMAM 204-1 at the NFPA technical meeting held in Boston on June 15, 2011:

> **Richard Schulte, Schulte & Associates:** *I'll be brief. I think this is pretty straightforward. For 35 years we have argued over whether we should be using roof vents in sprinklered buildings. Two years ago that issue was resolved by the NFPA 13 Committee, and NFPA 13 now contains provision for the use of roof vents in sprinklered buildings.*
>
> *The substantiation for those provisions reads as follows. "The intent of the standard is that roof vents and draft curtains should not be used in conjunction with storage protection." That's pretty straightforward. So I believe the issue has been solved or been resolved.*
>
> *Also, I would like to point out a comment made by a member of the Smoke Management Committee, by Mr. Michael Dillon of Dillon Consulting Engineering, Inc. Mr. Dillon said in a comment, this is back in 2009, "Document prematurely and improperly requires and relies upon unproven methods of calculation for the effectiveness of smoke and heat vents in the presence of automatic water-based sprinkler protection systems. It also relies on calculations of questionable accuracy determining the activation times for the vents and sprinklers." I think that's pretty straightforward.*

"*Document prematurely and improperly requires and relies upon unproven methods of calculation for the effectiveness of smoke and heat vents in the presence of automatic water-based sprinkler protection systems. It also relies on calculations of questionable accuracy determining the activation times for the vents and sprinklers.*"

Also, the Smoke Management Committee has yet to address Mr. Dillon's comments. I think I'll leave it at that.

Jeff Tubbs, Arup: *Speaking against the motion. I'm a member of the Smoke Management Committee for NFPA. I do not speak on their behalf. I have no vested interest in this specific issue, other than being a member of the committee and chairing the ASHRAE Smoke Committee.*

It's obviously clear that returning the document comment is based upon our new Chapter 11 included within the document that deals with vents in sprinklered buildings. . .Within that section you'll see a new Section 11.1 that states, I'll quote, "Where provided, the design of venting for sprinklered buildings shall be based on an engineering analysis acceptable to the AHJ demonstrating that the objectives are met." Annex F.3 includes specific objectives that those analyses should be met. The remaining sections of that Chapter 11 just include additional design details.

I would like to further state that the committee proposal was developed through a consensus process that combines several proposals. . .

Buildings are being designed with sprinklers and heat vents in them currently, and there needs to be some guidance for those designs, and our committee goal was to try to develop some of the specific guidelines for that.

"*It's obviously clear that returning the document comment is based upon our new Chapter 11 included within the document that deals with vents in sprinklered buildings. . .*"

And I urge everybody to reject this motion, to go with the committee's thoughts that through a consensus process we developed something that we thought made sense on guidance. Thank you.

Richard Davis, FM Global: *. . .I am a member of the Smoke Management Committee, also a member of the task group that worked on these proposed changes. However, I'm not speaking for the committee.*

"*I would like to further state that the committee proposal was developed through a consensus process that combines several proposals. . .*"

As noted, this was returned to the committee a year ago, and I would like to remind everyone that 204 does not require the use of heat and smoke vents. It specifically says in the scope that the standards shall not specify under which conditions venting is to be provided.

And Mr. Schulte is correct, this argument has been going on for over 35 years, but at the end of the day the problem is that the codes continue to require the use of smoke and heat vents and draft curtains in sprinklered buildings, including IBC and IFC, and these installations continue to go in regardless of what 204 has or has not said over the last 35 plus years.

We need to provide guidance. Many of us are concerned about the potential adverse effect of smoke and heat vents and draft curtains on sprinkler protection. One of the key elements that we added that Jeff [Tubbs] *mentioned, we changed the word performance to engineering. We made a reference to NFPA 13. We also added very specific guidance on the location of draft curtains with respect to aisle spacing. This is a requirement to provide draft curtains in IBC or IFC, but there is no requirement about where the draft curtain goes.*

We have submitted large, full scale fire test data to show that the location of the draft curtain is very critical and it can cause an excessive number of sprinklers to operate if they're improperly located. The proposed changes in this document address that. So some of us who are concerned about sprinkler protection and the adverse effects from this, if you accept this proposal, if you don't reject this, we're going to shoot ourselves in the foot, we're going to waste another year in getting out this guidance. So I urge you to reject this proposal.

"*Many of us are concerned about the potential adverse effect of smoke and heat vents and draft curtains on sprinkler protection.*"

Schulte: *Simply because the International Building Code and the International Fire Code include requirements for roof vents and sprinklers in buildings doesn't mean NFPA should create a conflict between NFPA 13 and NFPA 204. That's what basically adoption of NFPA 204 would do, would create a conflict. I don't think NFPA wants to do that.*

Next, again, we need to take a look at how do we do this. Mr. Dillon's comment which I just read basically says we have no procedure to be able to do this, so we have no procedure, no validated procedure to implement the performance analysis that NFPA 204 requires.

Again, I would suggest that you support this motion. Thank you.

"*Mr. Dillon's comment which I just read basically says we have no procedure to be able to do this, so we have no procedure, no validated procedure to implement the performance analysis that NFPA 204 requires.*"

William Koffel, Koffel Associates, Inc.: *. . .a member of the committee, but in the committee I'm representing Smoke* [Vent] *Task Group and I'll be speaking on their behalf. I'm also a member of the NFPA 13 Sprinkler Discharge Criteria Committee, but I'm not speaking for that committee. I'm speaking against the motion.*

> "*You have heard this creates a conflict with NFPA 13. I'm not sure what that conflict is.*"

You have heard this creates a conflict with NFPA 13. I'm not sure what that conflict is. The maker of the motion is referring to something in the substantiation, but there clearly is language in NFPA 13 that addresses when you have smoke vents in a building that is protected in accordance with NFPA 13. In fact, this committee felt strongly enough to make sure there was a reference to NFPA 13. We discussed in the committee whether we should be referencing NFPA 13 in this language, and the committee said we need to reference it to make sure that someone does not violate the provisions of NFPA 13. So there is, in my opinion at least, coordination between those two documents.

I would also note that the proponent is telling us this is an ICC/NFPA issue. I will offer to you that there are provisions in NFPA documents that allow or use smoke vents as a compliance strategy in sprinklered and non-sprinklered buildings. So this is not just an ICC/NFPA issue.

I encourage you to vote against the motion.

> The vote against the motion was unanimous.

The motion to return the technical report on NFPA 204 to the Smoke Management Committee was defeated. The vote against the motion was unanimous. Although a tally of the votes was not taken, it was estimated that the vote on the motion was roughly 0-200.

On June 24, 2011, an appeal of the Association's action on NITMAM 204-1 was filed with the NFPA Standards Council by Schulte & Associates. The basis for this appeal to the Standards Council is as follows:

- Chapter 11 (and Annex F.3) in NFPA 204 conflicts with the roof vent provisions contained in the 2010 edition of NFPA 13.

- Sprinkler system design criteria has been determined by the Smoke Management Committee, rather than the NFPA 13 Committee.

- The proposal for Chapter 11 in NFPA 204 does not address the recommendations for fire fighter safety contained in NIOSH 2005-132 and NIOSH 2010-153.

- Validated "tools" necessary to perform the "*engineering analysis*" required by the provisions contained in the proposed Chapter 11 in NFPA 204 are not available. (Hence, it is not possible to perform the required *"engineering analysis*".)

DISCUSSION

Rather than recognize that the debate over the issue of the use of roof vents in buildings provided with sprinkler protection had been resolved, the Smoke Management Committee's proposal to revise NFPA 204 continues the debate by creating significant conflicts between NFPA 13 and NFPA 204.

In his testimony, Mr. Tubbs stated that the proposed provisions to be included in Chapter 11 in NFPA 204 were arrived at by a consensus of the Smoke Management Committee and that the Association membership should accept that consensus. If the consensus arrived at by the Smoke Management Committee is the polar opposite of the consensus arrived at by the NFPA 13 Committee, has consensus really been reached on the issue? The answer to that question is obvious.

In Mr. Davis' testimony, it was indicated that the International Building Code (IBC) and the International Fire Code (IFC) require the installation of roof vents and draft curtains. Given that, Mr. Davis has concluded that design professionals and code enforcement officials need guidance on how to properly combine sprinkler protection and roof vent/draft curtain systems. While the Committee's proposal provides information on where draft curtains should be located with respect to aisles and the location/spacing of sprinklers with respect to draft curtains, the proposal does not contain any additional information on the design of roof vents than is already included in the current edition of NFPA 204, the 2007 edition.

While Mr. Davis' argument appears to be logical, it should be noted that the requirements for draft curtains contained in the IBC/IFC were modified in the 2003 edition of these two codes. The IBC/IFC no longer requires that draft curtains be provided in buildings containing high-piled storage protected by a sprinkler system. That means that the IBC/IFC only requires that draft curtains be provided in one-story industrial buildings which contain undivided areas exceeding 50,000 square feet in area. How many one story industrial buildings which have undivided areas exceeding 50,000 square feet are being constructed these days? In this economy, the answer to that question is not many. In other words, the statement that "*we are going to shoot ourselves in the foot*" if the technical report on NFPA 204 is returned to the Smoke Management Committee is simply in error. The draft curtain "problem" in sprinklered buildings is "much adieu about nothing".

Mr. Koffel's statement that he doesn't see any conflicts between the roof vent provisions contained in NFPA 13 and the provisions addressing the use of roof vents and draft curtains in buildings provided with sprinkler protection included in NFPA 204 is quite surprisingly given that Koffel has been a member of the NFPA 13 committee for more than 20 years. The NFPA 13 committee's position on the use of roof vents in sprinklered storage buildings has been clear since the mid-1970's (roughly 35 years).

According to the record, the original proposal which resulted in the roof vent provisions included in the 2010 edition of NFPA 13 was as follows:

> "*Roof vents and draft curtains shall not be used in conjunction with the sprinkler protection criteria for storage in this standard.*" (**Source:** 13-325 Log #CP43 AUT-SSD)

The substantiation statement for the roof vent provisions included in the 2010 edition of NFPA 13 was as follows:

> "**Substantiation:** *The intent of the standard is that roof vents and draft curtains should not be used in conjunction with storage protection. Previous language was unenforceable.*" (**Source:** 13-325 Log #CP43 AUT-SSD)

Comments on the final wording of the roof vent provisions included in the 2010 edition of NFPA 13 read as follows:

> "BELLAMY, T.: *The installation of draft curtains has been found to be detrimental to the proper operation of automatic sprinklers in storage applications. The introduction of the proposed material within the standard offers credence to the installation of such and should not be included as a part of the standard.*
>
> KEEPING, L.: *I agree with Mr. Bellamy on this matter. If a fire was to develop under the edge of a curtain, even along a system boundary, it could open an excessive number of sprinklers beyond the ability of the overall water supply to cope with.*
>
> MULTER, T.: *The following original proposal on ROP documents dated 10/20/2007 should be accepted as proposed but with a change to the annex statement.*

"*Roof vents and draft curtains shall not be used in conjunction with the sprinkler protection criteria for storage in this standard.*" (**Source:** 13-325 Log #CP43 AUT-SSD)

12.1.1 Roof Vents and Draft Curtains. Roof vents and draft curtains shall not be used in conjunction with the sprinkler protection criteria for storage in this standard.

"*The installation of draft curtains has been found to be detrimental to the proper operation of automatic sprinklers in storage applications.*"

A.12.1.1 The design parameters in NFPA 13 were developed based upon the absence of roof vents or draft curtains. (See Annex C.6) Fire tests for sprinklers specifically listed for storage applications are tested without vents or draft curtains. References to control mode sprinklers in other building standards pertain to standard spray sprinklers that were not specifically tested by the laboratories for storage applications. With the advent of K-11.2 and larger sprinklers for storage applications and now Specific Application Control Mode sprinklers (being revised to CMSA), we need to realize that ESFRs are not the only storage sprinklers and that the use of smoke vents and draft curtains can be detrimental to all sprinklers that are specifically tested for storage applications. FM Global's recommended storage protection designs are based upon vents not being provided and that the use of automatic vents may increase the sprinkler water demand." (**Source:** 13-325 Log #CP43 AUT-SSD)

Based upon the record excerpted above, it seems reasonable to conclude that the NFPA 13 Committee does not support the use of either roof vents or draft curtains in buildings protected by a sprinkler system. Given that the International Building Code and International Fire Code mandate that roof vents (without draft curtains) be installed in one-story storage buildings provided with sprinkler protection, compromise language was developed which permits the installation of roof vents in storage buildings protected by sprinklers. The compromise language now included in 2010 edition of NFPA 13 is as follows:

"*. . .the use of smoke vents and draft curtains can be detrimental to all sprinklers that are specifically tested for storage applications. . .*"

"**12.1.1.1** *Manually operated roof vents or automatic roof vents with operating elements that have a higher temperature classification than the automatic sprinklers shall be permitted.*"

Research conducted at Underwriters Laboratories (UL) in 1997/1998 clearly demonstrated that control mode sprinkler operation interferes with the activation of (individually-activated) automatic roof vents when the temperature rating of the vent activating mechanism is the same as the temperature rating of the sprinklers. It was concluded from this research that, at most, only one automatic roof vent will open (assuming that the sprinkler system operates and successfully controls the fire). Further, it was concluded that, in many cases, no roof vents will open. (In Test P-2 in the research at UL, a roof vent located directly over the ignition point of the fire failed to open.)

(In Test P-2 in this research, a roof vent located directly over the ignition point of the fire failed to open.)

Based upon the research conducted at UL in 1997/1998, it can be concluded that (individually-activated) automatic roof vents with an activating mechanism with a temperature rating one temperature classification higher than the temperature classification will not open in a sprinklered buildings (assuming that the sprinkler system operates and successfully controls the fire). In other words, it is the intent of the roof vent provisions contained in the 2010 edition of NFPA 13 to permit the use of roof vents only where the vents must be opened manually (assuming successful sprinkler operation). Obviously, manually opened vents will cause a significant delay in venting and prevent the opening of roof vents in the early stages of the fire.

Once the intent of the roof vent provisions included in the 2010 edition of NFPA 13 is understood, then the conflicts between NFPA 13 and NFPA 204 become apparent. The proposed Chapter 11 in the next edition of NFPA 204 makes reference to Annex F.3. The following are excerpts from Annex F.3:

> "*Design features such as ganging all vents within a sprinkler zone, and automatically activating all vents within one zone following sprinkler activation might achieve objectives 2 and 3; however, additional research is needed to validate this concept.*"

"*The effect of control mode sprinkler cooling may limit the number of vents opening if control of the vent is only by fusible link or if drop-out panels are used. . .This could significantly limit the effectiveness of the smoke vent system. Use of ganged vents operated from detectors or a sprinkler flow switch is a way to avoid this situation.*"

"*The effect of control mode sprinkler cooling may limit the number of vents opening if control of the vent is only by fusible link or if drop-out panels are used. If the fusible link or if drop-out panel operating temperature is equal to or higher than the control mode sprinkler fusible element operating temperature, then vents outside the outer ring of operating control mode sprinklers are unlikely to open. This could significantly limit the effectiveness of the smoke vent system. Use of ganged vents operated from detectors or a sprinkler flow switch is a way to avoid this situation.*"

"*The studies of smoke and heat venting used in conjunction with control mode sprinklers do not provide evidence that venting has a negative effect on control mode sprinkler performance.*"

"*The experimental studies have shown that early vent activation has no detrimental effects on control mode sprinkler performance . . .Design practices should move to methods that assure early operation of vents, and vent operation should be ganged so that the benefits of roof vents is fully realized.* "

The excerpts from Annex F.3 in NFPA 204 above tell us that open roof vents do not adversely affect the operation of control mode sprinklers. If this is actually the case, why would the NFPA 13 Committee have included provisions which address the use of roof vents where control mode sprinklers are used in the 2010 edition? Obviously, the answer to that question is that the NFPA 13 Committee and the Smoke Management Committee do not agree on the effect of open vents on control mode sprinklers.

As previously indicated, the purpose of the roof vent provisions included in the 2010 edition of NFPA 13 is to significantly delay the opening of roof vents in buildings protected by either control mode or ESFR sprinklers. If this is the case, and it is, then the recommendation that the "ganged" operation of roof vents initiated by a smoke detection system or by the activation of sprinkler system water flow indicator is counter to the intent of the NFPA roof vent provisions.

Obviously, the answer to that question is that the NFPA 13 Committee and the Smoke Management Committee do not agree on the effect of open vents on control mode sprinklers.

Clearly, Mr. Koffel's statement that there are no conflicts between the intent of the NFPA 13 roof vent provisions and the proposed Chapter 11/Annex F.3 in NFPA 204 is "hogwash".

Given the fact that Mr. Koffel was part of the NFPA 13 sub-committee which developed the roof vent provisions in NFPA 13, and also a member of the Smoke Management Committee, it would also seem obvious, at least in my opinion, that Mr. Koffel was and is well aware of the conflicts between the NFPA 13 roof vent provisions and statements included in Annex F.3. In other words, it is my opinion that Mr. Koffel's testimony at the NFPA technical meeting in Boston less than a month ago was less than truthful.

One last point which needs to be made concerning the above. Section A.12.1.1.1 in Annex A in the 2010 edition of NFPA 13 includes the following statement:

> "*Sprinkler protection criteria are based on the assumption that roof vents and draft curtains not being used. (See Section C.6.)*"

If the opening of roof vents has no effect on the activation of control mode sprinklers, why would the statement above have been included in NFPA 13?

One other question which should be asked regarding the statement above-if the sprinkler protection design criteria included in NFPA 13 "*are based upon the assumption that roof vents and draft curtains not being used*", what sprinkler system design criteria should be used for buildings with roof vents? NFPA 13 doesn't provide an answer to that question and neither does NFPA 204.

It would seem that, if the purpose of Chapter 11 in the next edition of NFPA 204 is to provide guidance, Chapter 11 would address the issue of what sprinkler system design criteria should be utilized where roof vents and/or draft curtains are provided. There is no guidance provided. Hence, the rationale for going forward with the proposed Chapter 11 (and Annex F.3) in NFPA 204 advanced by Mr. Davis simply "doesn't hold sprinkler discharge".

Hence, the rationale for going forward with the proposed Chapter 11 (and Annex F.3) in NFPA 204 advanced by Mr. Davis simply "doesn't hold sprinkler discharge".

The obvious conclusion here is that Chapter 11 and Annex F.3 of the next edition of NFPA 204 contains numerous technical flaws which need to be addressed prior to publication of the next edition of the standard. Returning the technical report on NFPA 204 to the Smoke Management Committee so that conflicts with NFPA 13 and the technical flaws in Annex F.3 can be addressed is the only rational direction to take.

* * * * *