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FIRE PROTECTION HISTORY-PART 123: 1982 (STANDARD SPRAY SPRINKLERS AND ROOF VENTS)

By Richard Schulte

The issue of the use of (individually-activated) automatic roof vents in industrial and storage buildings protected by a sprinkler system has been controversial since Factory Mutual Research Corporation (FMRC) conducted a study of the interaction between the two fire protection features in the early 1970's. In this study of sprinkler/vent interaction, FMRC utilized a scaled-model for research purposes.

This FMRC research was referenced in 1982 by Ernest Miller, Industrial Risk Insurers, in his reason for voting negatively on the Report of the NFPA Subcommittee on Smoke & Heat Venting. The following is the text of Mr. Miller's statement:

> "*Mr*[.] *Miller voted negatively for the following reasons*[:]
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> *It is incredible that comprehensive technical documentation refuting charges that venting is detrimental to sprinklers should be totally ignored and unwarranted inferences made in Chapter 6 that there is no design basis for combining vents and sprinklers (par b 2) and that venting increases fuel consumption (par 6 3 b) and increases water demand (par 6 3 c) by disregard of[:]*
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> *1*[.] *Fire venting designed in accordance with NFPA 204 has been installed in many sprinklered buildings for over two decades with numerous fire reports of beneficial behavior*[.] *Prior to advent of NFPA 204*[,] *thousands of fires occurred in sprinklered buildings with comfort or process ventilation through open windows*[,] *monitors*[,] *open sided structures*[,] supply/exhaust fans[.] etc[.] *Yet critics of venting have not presented a single fire incident from NFPA or other sources alleging loss of sprinkler control because of ventilation*[.]
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> *2*[.] *While remote open windows simulating substandard fire venting in absence of roof vents were suspected of responsibility of opening excessive sprinklers in one of three inconclusive rack storage fire tests of venting*[,] *the principle objective of visibility was maintained for 48 minutes*[,] *well over twice as long as any unvented test*[.] *Furthermore*[,] *38 fire tests of high*[-]*piled plastics have been conducted in the same test building with more than four times the open window area without any reported adverse influence of the ventilation on sprinkler performance*[.]

3[.] *Credulence should not be given to a model study indictment of fire venting influence on the interaction between a nondescript fire and undocumented unrealistically arranged miniature sprinklers when its unproven concept would not be recognized for evaluation of the fire/sprinkler interaction alone. The continual increase in number*[,] *size*[,] *and cost of sprinklered fire research in the past decade or so is mute evidence of the difficulty of understanding the fire/sprinkler interaction even in representative full scale configurations*[.]

Do open roof vents have an adverse impact on the activation of standard spray sprinklers? Even today, I'm not sure that we have a conclusive answer to that question, however, it seems both reasonable and logical to think that that would be the case.

What we do know, however, is that the activation of standard spray sprinklers does have an adverse impact on the opening of vents controlled by fusible links in buildings where both sprinklers and vents are installed. Either water spray droplets from sprinkler discharge are directly deposited on the vent fusible links or water droplets are entrained in the upward draft of hot gases generated by the fire and are then deposited on the vent fusible links. Regardless of the mechanism, the activation of sprinklers will prevent the openings of roof vents automatically, which, of course, defeats their purpose.

Back in 1982, no one was aware of the adverse impact of sprinklers on automatic roof vents. It wasn't until further research on the interaction of sprinklers and roof vents was conducted in 1997/1998 that we learned this. In other words, the assumption that automatic roof vents would automatically open and allow the hot gases generated by the fire to escape from the building was just that, an assumption, and that assumption turned out not to be true.

Despite of the fact that the research from 1997/1998 determined that automatic roof vents will likely not open in buildings protected by standard spray sprinklers, the International Building/Fire Code still require that automatic roof vents be provided in large industrial and storage buildings protected by a sprinkler system and buildings which contain high-piled storage protected by sprinklers.

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