SCHULTE & ASSOCIATES
Building Code Consultants
880D Forest Avenue
Evanston, IL 60202
fpeschulte@aol.com
504/220-7475

EXCERPTS FROM A LETTER TO THE EDITOR
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"INTERACTION OF SPRINKLERS WITH SMOKE AND HEAT VENTS"
CRAIG L. BEYLER AND LEONARD Y. COOPER

The following are excerpts from a letter-to-the-editor written by Gunnar Heskestad of FM Global Research and published in the 3rd quarter 2002 issue of Fire Technology. The letter addresses a paper titled "**Interaction of Sprinklers With Smoke and Heat Vents**" authored by Craig L. Beyler and Leonard Y. Cooper.

> "*In our view the first two of the authors'* [Beyler and Cooper] *conclusions are performance measures which are not met, or well met, by current technology, based on the studies referenced by the authors. The authors' recommendations may lead to much improved technology, but will require a significant new research effort. With respect to the third conclusion* [venting is a valuable asset in the event of total sprinkle system failure]*, it is our position that venting, installed as backup to an automatic sprinkler system which is inadequate or impaired, is not cost effective because it is unlikely a large loss will be averted solely due to the presence of vents.*"

> "*To justify our* [FMRC's] *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_2 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. 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_2 concentration from 18.2 to 20.2%, and increased fuel consumption from 13,100 to 21,400 lb. Unambiguous benefits of venting cannot be read into these results.*"

"*Loss of visibility was associated with the smoke being dragged down by the sprinkler sprays when buoyancy was lost in the smoke layer, following control of the fire, which occurred later in the vented fire than in the unvented fire. 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.The increased burning activity delayed further the loss in buoyancy in the smoke layer and drag down of the smoke layer to the floor, leading to loss of visibility. With these explanations we may interpret the delay in loss of visibility to be associated with increased fire activity. Do we count this delay as a benefit of venting?*"

"*A sentence slightly further down states:*

> *"Further, it is universally acknowledged that sprinklers are effective by cooling the fuel surfaces and not by gas phase mechanisms processes." This statement comes without a literature citation and is highly misleading in the context of the discussion. Surface cooling will clearly be less effective at increased oxygen concentrations since flame heat flux to the surface is increased due to increased combustion temperatures, which is a gas phase mechanism.'"*

"*When vents are installed in the absence of draft curtains we may see no change in the number of sprinkler operations relative to the unvented building, or at best there will only be a small reduction, and only a marginal improvement in visibility conditions can be expected. These minor effects are predicted since the open vents will influence so little of the smoke under the ceiling, now mostly confined to the ceiling jet and not accumulated in a layer underneath. 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.*""

"*Considering all of the effects, there is still little overall incentive to install vents in the "traditional" sense of the 1974 model study (1968 edition of NFPA 204M).*"

"*The authors have reviewed the 1989 Ghent tests in some detail and used the results to bolster the arguments in favor of vents. . . . In opposition to these* [conclusions] *must be added the conclusions of N.E. Gustafsson ("Smoke Ventilation and Sprinklers—A Sprinkler Specialist's View," Seminar at Fire Research Station, Borehamwood, Herts, 1992).Gustafsson discovered from the sprinkler operation maps in the report (authors' ref.24) that, in vented tests, sprinklers near the fire source often were delayed or did not operate altogether.*"

"*Further, placing draft curtains in aisles rather than over storage may not eliminate interference since sprinklers otherwise capable of delivering water to a fire near an aisle may be obstructed or prevented from opening by the draft curtain. A significant research effort is required to establish a design basis for combining sprinklers with heat/smoke vents.*"

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