Self-Venting Does Not Mean Ventilated

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In a recent social media post by the UL Firefighter Research & Safety Institute (FRSI), a simple photo posted from the Governor's Island experiment burns intended to make members of the fire service think turned into a heated argument over appropriate initial tactics at what appears to be a *bread and butter* fire. While reading through the well over 100 comments on the photo, and deciphering through numerous opinions on whether this is a "go in and get it aggressive interior attack" or "I would consider a transitional attack here", I was taken aback by a comment which stated, "…it's vented; heat will be reduced because of this." This picture can be seen below:

Would we all agree that this fire appears to be a pretty standard second floor job, and is a beautifully self-venting fire? Sure would, looks text book. Would we all agree that this fire calls for an aggressive interior attack? Yes, I would like to think everyone reading this would pull the 1 ¾" (smooth bore—sorry), go in the structure, up a flight to a landing, finish making the stairs up to the 2nd floor, find near perfect conditions on the fire floor with a bedroom *off*, rolling a little bit out of the doorway. Textbook. That is what you would expect pulling up to this with the fire already venting right? 9 times out of 10, yeah those are the conditions that we would have here, but remember, a self-venting fire does not always mean that the fire is properly, or rather sufficiently, ventilated.

Let's now consider the alternate. You enter the structure with the line and make the first flight of stairs to the landing, but this time are met with heavy thick black smoke that is charged and hot. You take the image of the fire venting out the window that you obtained in your walk-around and still think you can make the fire room. Upon getting up the stairs, and trying to make your way down a hall, an overzealous ladder company takes out the 2nd floor window on the A/D corner. Coincidentally your engine company was having trouble finding the seat of the fire due to the conditions and no water was able to be applied. The under-ventilated 2nd floor you are operating in quickly develops extreme fire conditions (temperatures raising 400-600 °F in less than 30 seconds, eventually leading to flashover). What occurred here is the fire condition you saw venting out the window was actually just where the fuel/air ratio was correct to sustain combustion. The rest of the 2nd floor may contain all of the components of the fire tetrahedron, minus oxygen, and was just waiting for that additional ventilation point. Reading smoke is important, but the image didn't show much smoke showing at all. Referring back to the picture, there appears to be little to no smoke from the venting window, and nothing showing from the A/D corner. One would think from what has been taught previously about smoke that this fire is well ventilated, burning clean, and is most likely just a simple room and contents. Believe it or not, the below picture (IR camera) is actual 2nd floor conditions, taken at the same time as the first picture at the same exact test burn.

The second floor was just as I described; the possibility of a ventilation-limited fire, uncharacteristic of what the conditions on the exterior appeared like, were present in this specific scenario. As we can see from the image, at the base of the stairs on the first floor conditions appear to be excellent, however as soon as you make the 2nd floor conditions are quite different and you are met with 0 visibility and high heat. These conditions were present even though the front door was open and the flow path was right up the stairs and out the self-venting window. Referring back to the anonymous person's Facebook comment that "…it's vented; heat will be reduced because of this", couldn't be further from the truth. Temperatures in this structure would continue to increase, and would increase even more dramatically if an additional ventilation point is created. In fact, during UL's Vertical Ventilation study, they had found that your standard 4'x 4' ventilation hole does not cause a fire to go from ventilation limited to fuel limited, nor does a 4' x 8'. In all cases during the course of the study, additional ventilation openings never caused this transition from vent-limited to fuel-limited. The only way out of a ventilation controlled fire is to "soften the target" or "kill the flashover" with water application, then followed by ventilation (or performed as close as possible).

Please let it be clear that the purpose of this article is not to say that *ok well if there is always a possibility of a ventilation-limited fire then we should hit this from the outside every time*. This is not what I am advocating, and not what UL is advocating. Every fire ground is different, and although an exterior attack will dramatically decrease interior temperatures and "soften the target", an improper exterior attack not coordinated with ventilation or improper hose line application can disrupt the thermal layer (although you can't "push fire" — I may drop this bomb in a future article). Rather, simply take this specific research as the facts are displayed, which UL has made clear and I have recapped below:

- No significant smoke showing does not necessarily mean that the fire is sufficiently ventilated. Experiments have found that in some cases, once a fire becomes ventilation limited, the smoke being forced out of leaks in houses greatly diminishes or stops completely. No smoke showing upon arrival should actually increase awareness of possible conditions, not ease them.

- Fire showing from a window, door, roof, crawl space, basement, etc. does not necessarily mean that fire is ventilated, although yes, it has self-vented.

- Forcing a front door, breaking out a window, or opening up the roof all trigger additional air to be fed to the fire. Every time you make any type of opening in a

structure, it needs to be coordinated with fire attack.

- UL has produced an average time for untenable conditions to develop for firefighters operating inside a structure once a horizontal ventilation point is opened without any fire suppression. This time is 100 seconds (on average) for a 1 story house, and 200 seconds (open floor plan) for a 2-story house. This means that from the time an opening is made in a structure, the engine company has anywhere from 1 minute and 40 seconds to 3 minutes and 20 seconds to get water on the fire. Once these untenable conditions develop, flashover can follow in as quickly as 10 seconds.

- Each additional ventilation opening provides a flow path of air to the fire, and fire to the air/opening. This can cause ventilation limited fires to change in behavior drastically.

I routinely hear a lot of discussion at the station and the on various fire service websites about current fire research being presented to the fire service (many positive but also numerous negative comments such as *UL is going to make us "porch" firefighters*). A great outcome taken from this specific article for those of you who come from a strong, aggressive department who has a sound understanding of fire behavior and your tactics and coordination down like clockwork, would be for you to continue your aggressive interior fire attack but to hear on the radio upon an engine making their way up to a second floor job, "Engine 1 to Ladder 1, we are just about to make the fire room, go ahead and take the window"; in place of companies breaking glass and cutting holes uncoordinated with the fire attack. The current research rarely looks at aspects of the fire scene that have not been common knowledge for years (to people who have had a solid foundation in fire dynamics), but it does provide numbers and scientific backing. If you haven't been a student of the fire service previously, now is a great opportunity to start. I look forward to providing more information on this topic and other topics on fire behavior in the near future, including the use of Fire Dynamics Simulator (FDS), a computer fire simulation, to help demonstrate certain characteristics of fire behavior and phenomena.

Some information and data was obtained from the following UL sources:

Kerber, Steve. "Impact of Ventilation on Fire Behavior in Legacy and Contemporary Residential Construction." 14 Dec. 2010.

Kerber, Steve. "Study of the Effectiveness of Fire Service Vertical Ventilation and Suppression Tactics in Single Family Homes." 15 June 2013.

Effectiveness of Fire Service Vertical Ventilation and Suppression Tactics in Single Family Homes Online Training Course: (Please click below!)
http://content.learnshare.com/courses/73/456883/story.html