



UFF Position Statement: Fire Behavior and Tactical Considerations.

Structure fires today are different from those faced by prior generations of firefighters, and they hold significant challenges for firefighter safety. Because of the changes to the modern fire environment, traditional firefighting methods may not always be the safest and most effective. Increased risks in the fire environment include larger homes, different home geometries, increased synthetic fuel loads, and new construction materials. Additionally, new materials have decreased the failure time of wall linings, windows and interior doors, which can speed the rate of fire growth. These changes can speed up the stages of fire development, creating an increased potential for ventilation-limited — or oxygen-starved — fires.

Ventilation-limited fires can make it more difficult to determine the specific location of the fire from outside the structure. Furthermore, traditional ventilation tactics may feed oxygen to the fire, rapidly intensifying it giving firefighters little time to recover from poorly timed ventilation.

Based on varying building configurations, there may be several flow paths within a burning structure. Firefighting or rescue operations conducted in a flow path will place firefighters and residents at significant risk. Interrupting the flow path — disrupting the flow of the fire within the burning structure — involves tactics that are innovative and sometimes counterintuitive. However, research shows that these methods can: 1) reduce heat within the structure; 2) minimize the potential for flashover; and 3) greatly enhance the survivability of both occupants and firefighters.

In addition to a better understanding of fire behavior, research has helped validate new, more effective tactics to enhance firefighter safety and survivability.

- Applying water to the fire as soon as possible from the outside cools the environment and helps firefighters gain the upper hand. Firefighters can lower room temperatures by applying a hose stream through a window or door into a room involved in a fire. Exterior fire attack increases the potential survival time for building occupants and provides safer conditions for firefighters performing search and rescue. Water should be applied with a straight or solid stream applied directly to the seat of the fire if the fire is in the incipient stage or has decayed to burning contents or to the ceiling if the fire is ventilation limited and fire or turbulent smoke is coming out of the window or doorway (avoid “whipping” the nozzle into an opening to limit air entrainment into the structure).
- In a ventilation-limited structure fire, continue to limit ventilation until water is applied or ready to be applied to the fire --- limit opening doors, clearing windows or cutting the roof as it may lead to a rapid transition to flashover.
- While operating in a flow path it is important to control gases by applying water to cool them until water is able to be applied directly to the seat of the fire. This greatly reduces the potential of being caught in rapidly deteriorating conditions during an interior attack.
- Limit fire growth and reduce temperatures by closing doors or windows to interrupt the flow path until water is applied to the fire as part of a coordinated fire attack
- In structures where front and rear doors were open and windows had been vented, apply water through one of the vents to improve conditions throughout the structure.
- Once conditions inside the structure are made safer, continuing the attack from the inside increases the speed and effectiveness of fully extinguishing the fire and searching for occupants.

The Urban Fire Forum supports the research efforts and the above stated findings. Inasmuch, Chief Officers will review and seek to change departmental standard operating procedures as they relate to the following tactical considerations.

1. **Size-up:** Assure that a 360 view of the structure is conducted and that fire location, fire extent, and smoke conditions are reported to command.
2. **Identify the flow path:** Know where smoke and fire are exiting, where the entry point is for fire attack crews, and where ventilation is taking place. Every new ventilation opening provides a new flow path to the fire.
3. **Cool or “soften” the fire from the exterior (Soften the Target):** Cooling the gases can greatly improve interior conditions, even when not applying water directly on the seat of the fire. This should be accomplished with a straight or solid stream applied directly to the seat of the fire or to the ceiling (avoid “whipping” the nozzle in the window).
4. **Assess and understand smoke tunneling (Read Smoke):** Rapid inrush of air or a tunneling effect at point of entry or point of ventilation could indicate a ventilation-limited fire.
5. **Vent close to the fire origin:** Venting rooms far away from the seat of the fire significantly increases the temperatures in these rooms and creates a flow path for the fire to move to previously uninvolved areas. Venting far away from the fire may cause the burning room to transition to flashover and fire to move toward the ventilation locations.
6. **Coordinate ventilation with hose attack:** Once air is introduced, the fire responds quickly and conditions can become untenable with potential flashover. Unless water is applied, venting causes the fire to grow faster and flashover to occur due to the new flow paths. Coordinate vertical and horizontal ventilation with fire attack. To make sure the fire does not get larger and that ventilation works as intended, take the fire from ventilation-limited (where it needs air to grow) to fuel limited by applying water.
7. **Vent Enter Isolate Search (VEIS):** Close the door of the room being entered. This increases tenability for potential occupants and firefighters while smoke ventilates from the isolated room.
8. **Close the door:** Closing the door between the occupant and the fire or between the firefighter and the fire will cause conditions to remain tenable for temperature and oxygen concentration. This action increases the chance of survivability.
9. **Control the access door:** Controlling the door (or closing as much as possible) at the point of entry upon arrival limits the incoming airflow. The door should be controlled until water is applied to the fire. Once water goes on the fire and the attack crew has the upper hand, the door can be opened. At that point, it is no longer a ventilation-limited fire so all ventilation will allow more hot gases and smoke out of the environment than are being created by the fire.

As part of the overall mission of the Urban Fire Forum, Chief Officers will share this position and associated information with other officers and firefighters in an effort to educate and assist additional departments in implementing safe, efficient and effective fireground tactics.

Sources:

Interrupting the Flow Path, New Science, Fire Safety, Winter 2014. UL.Com/newscience.

Innovating Fire Attack Tactics, New Science, Fire Safety, Summer 2013. UL.Com/newscience.

Fire Service Summary Report: Study of the Effectiveness of Fire Service Vertical Ventilation and Suppression Tactics in Single Family Homes, Firefighter Safety Research Institute, ULfirefightersafety.com.