

Topic: Ventilation Controlled Fires Drill Number: 13-1

Author: Chief Ed Hartin Training Code:

Aim

Firefighters understand the impact of fuel or ventilation controlled burning regime on fire behavior.

References

International Fire Service Training Association (IFSTA). (2013). Essentials of Firefighting (6th ed). Stillwater, OK: Fire Protection Publications.

Hartin, E. (2011) Ventilation controlled fires: Fire development and potential for extreme fire behavior.

Retrieved March 31, 2013 from http://cfbt-us.com/pdfs/cwifr_hazards_vent_controlled_fires.pdf

Conducting the Drill

Do not simply hand out this document and read it to your crew (as that defeats the purpose of getting the Firefighters to think and puzzle their way through the questions). Use a whiteboard or blank piece of paper to review the following concepts with your crew and discuss the questions provided with this 10-Minute Training. The 10-Minute Training document can be distributed as a reference after the discussion.

When fuel burns in an open environment (e.g. outdoors) the heat release rate is dependent on the physical and chemical characteristics of the fuel. However, when fuel burns in an enclosure, the oxygen available for combustion is limited by the volume of the enclosure and the extent of normal ventilation. As oxygen is used in the combustion reaction, the fire may become ventilation controlled, with heat release rate depending on the availability of additional oxygen.

- 1. What are the stages of fire development?
 - Ignition/Incipient
 - Growth
 - Fully Developed
 - Decay
- 2. Do the stages of fire development always occur in the same sequence?

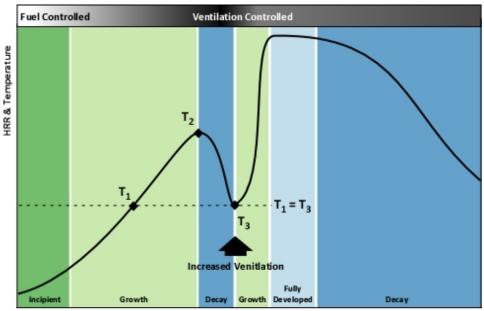
No. While ignition and progression through the incipient stage occur first and a fire that is sustained will enter the growth stage, it may progress to the fully developed stage or it may not. If the fire does not have sufficient fuel or if there is insufficient oxygen available the fire will decay (and may self-extinguish).

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3. How does burning regime (fuel or ventilation controlled) impact compartment fire behavior?

When a compartment fire becomes ventilation controlled, heat release rate is decreased (as the energy released is dependent on the mass of oxygen consumed in the combustion reaction). As heat release rate decreases, temperature in the compartment decreases.

4. Diagram the heat release rate (or temperature) curve over time in a typical compartment fire in the modern fire environment illustrating how the heat release rate changes if ventilation is increased after the fire enters the decay stage due to limited ventilation



Time

5. Why is it important for firefighters and fire officers to recognize burning regime as part of their size-up?

Increasing ventilation to a ventilation controlled fire will increase heat release rate and temperature. As such, changes in ventilation may result in rapid growth and progression through flashover to a fully developed fire or if there is sufficient gas phase fuel (think mass of fuel in the smoke) in the compartment, a backdraft may occur.

6. How does decay due to limited ventilation influence visible B-SAHF (Building, Smoke, Air Track, Heat, and Flame) indicators?

Visible smoke and air track indicators are dependent to a large extent on pressure inside the building. Pressure is developed when the temperature of the confined gases inside the building increases. However, pressure also decreases as temperature of the confined gases decreases. When a fire becomes ventilation controlled, temperature decreases and visible smoke and air track indicators may diminish or disappear. What appears to be an incipient stage or early growth stage fire may actually be significantly ventilation controlled and in the decay stage (compare the temperatures at T_1 and T_3 in the fire development graphic in the answer to Question 4)

Feedback

Please forward your feedback on this 10-minute training to Chief Ed Hartin

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