Loveland Fire Rescue Authority
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VENT LIMITED FIRE ATTACK (1.0)

By Rory O'Farrell
Developed May 2017

- NFPA 18
- NFPA 1964
- NFPA 1700
- NFPA 1801

TASK SKILL DESCRIPTION AND DETAIL

Apparatus to the Door:

Tactical TIC 360: A tactical 360 is a 360 degree survey of the structure on fire from three perspectives: Tactically, Thermally, and Three dimensionally. Using a TIC during the 360 allows the officer to see the thermal severity, cues, and progression of the fire (Figure 1). The TIC can aid in locating victims, determining the location and severity of the fire, identifying the flow path, and controlling critical fireground factors. Addressing these factors may include closing doors to prevent fire growth, controlling utilities, and removing of a victim laying right inside the door or hanging out a window. While the officer is completing a 360, the Firefighter is getting ready to pull the hose, and the Engineer is bringing the Smoke Curtain and the Positive Pressure Fan to the door.

Figure 1. The Officer is collecting thermal data on his 360 with his TIC.

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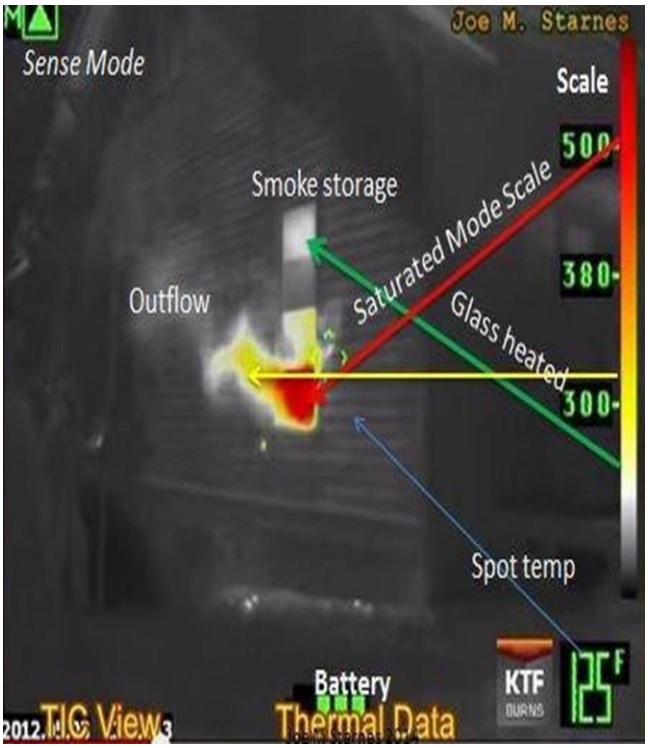

Figure 2 Thermal Data as seen on the screen of the TIC.

Information gathered during the Size up should include: Access, building information, orientation, flow paths, temperature readings at the front door, location of the fire, efficient stream placement for outside fire suppression and interior fire attack methods, and enhance search efforts.

Door:

When the Officer and Firefighter reach the door they will 3-D the door, determine if they have a GO-NO-GO situation, and take the appropriate steps to prepare for entry.

3-D the Door: The doorway can be a dangerous place to be because opening the door will change the state of ventilation within the building. The mixture of oxygen and fuel will be changing and gases that were too rich to burn may now be reaching its ideal mixture as it's reaching the door and leaving the building. Painting the door with foam (i.e. enhanced water), will create a buffer zone for the attack crew and when hot gases contact the treated surface, the water will convert into steam, cool the gases, and create a thermal ballast (Figures 3 and 4).

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Figure 3 and 4: 3D the threshold of the door to create a buffer zone and thermal ballast when contacted with hot fire gases.

The Firefighter will paint the threshold of the door with water delivered from a power cone setting on the nozzle. If there is an overhead exposure (covered porch), the Firefighter will paint the area of the exposure that is above the door.

GO-NO-GO:

The Officer uses the TIC to make a GO-NO-GO decision after opening the door. A GO decision is based on a temperature reading less than 500 degrees, a neutral plane that covers less that 50 percent of the door from top to bottom, and no turbulent smoke exiting the door (Figures 5 and 6). A NO-GO decision occurs when any one of these conditions is not met (Figure 7). This does not mean "**NEVER**" go, it means the attack crew must change the conditions first before entering the structure or re-deploy and enter the structure from a different location.

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GO Situation:

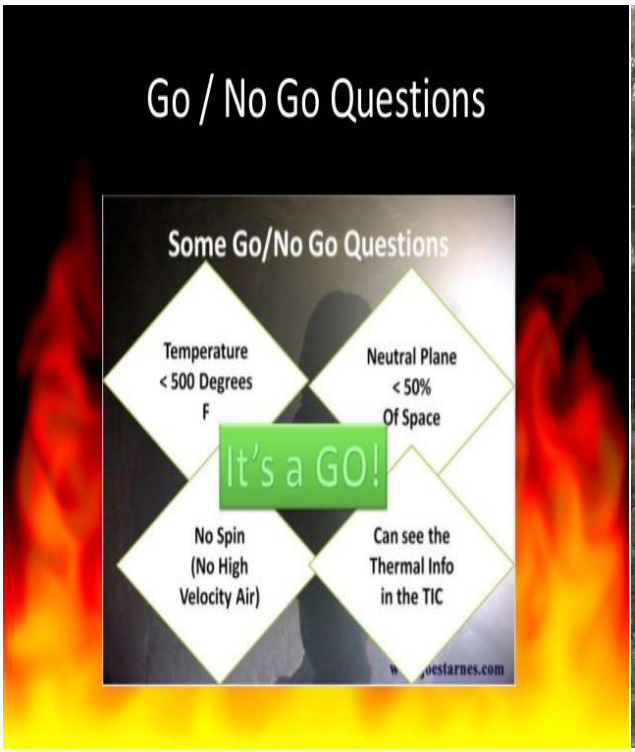

Figure 5 and 6: "GO" conditions at the front door.

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NO –GO Situation:

Neutral Plane >50% of space

Turbulent Black Smoke

>500 degree temperatures at the door

Figure 7: Conditions for a "NO GO" situation

Smoke Curtain (Anti-Ventilation) Flow Path control.

Anti-ventilation means the doors and windows leading into the compartment will remain closed up as much as possible. Placement of the smoke curtain at the front door will limit the entrainment of air traveling to the fire(underpressure zone) and will also limit the buoyant hot fire gases from leaving the building (overpressure zone). Limiting the flow path will minimize fire growth while attack crews make entry to the structure in order to extinguish the fire (Figures 8, 9 and 10). The attack crew can also place smoke curtains into failed window openings(Figures 11 and 12)).

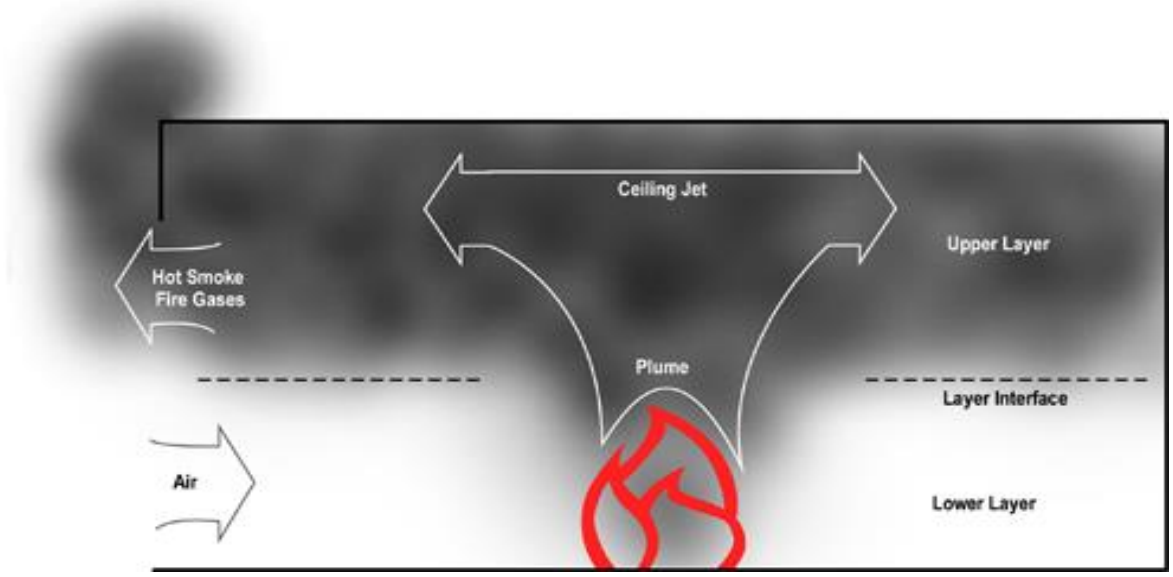

Figure 8: Overpressure Zone and Underpressure Zone are separated by the Neutral Plane.

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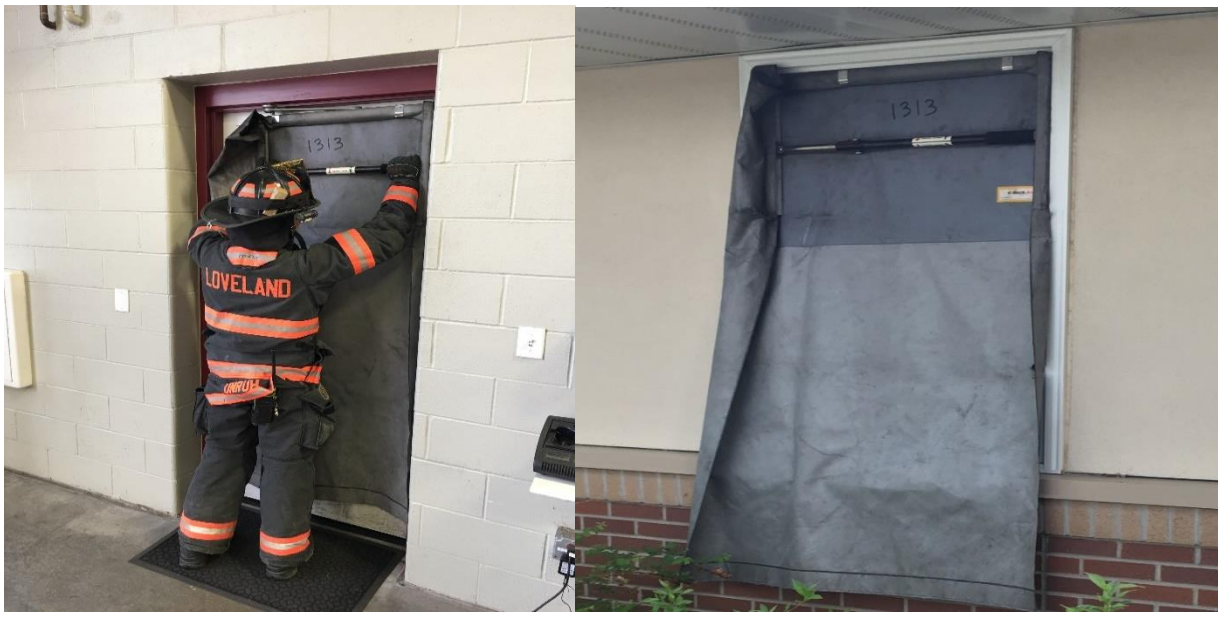

Figures 9 and 10: Smoke Curtains can be placed in the door and/or windows.

Figure 11: Open windows allowing smoke to exit the structure and air entrainment to the fire.

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Figure 12: The placement of Smoke curtains on the building will keep the fire in a Vent Limited state, help cool the fire, maintain the plug, and keep the thermal ballast inside the structure that is created by gas cooling and ballasting.

Door to Fire Room:

Owning Real estate and Tactical Pauses: The Firefighter and Officer will work together to move hose through the building, they will Gas Cool as they advance. As the attack team moves through the building the firefighter will Gas Cool and close doors of subsequent rooms as they pass them (Figure 13). "Owning Real Estate". This will help control the flow path, further compartmentalize the building, and create areas of refuge for victims behind closed doors. The attack team will also utilize "Tactical Pauses". A Tactical Pauses will typically occur at each threshold within the building. This pause will allow the Officer to monitor conditions, scan for victims, search for the fire location, communicate with his firefighter, and provide C.A.N.T(conditions, actions, needs and temperature), reports over the radio (Figure 14.

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Figure 13: The Firefighter closes the door after they have gas cooled inside the room and the officer has scanned for victims

Figure 14: The Officer monitors conditions with his TIC, scans for victims, searches for the fire, provide CANT reports and communicates with firefighter and on the radio during Tactical Pauses.

Nozzle operations:

The G-Force Nozzle is a selectable gallonage nozzle. The three selectable flow settings 250 LPM(90 GPM), 500 LPM/130 GPM, and Low Flow/155 GPM. The Firefighter will Gas Cool with the gallonage set to 250 LPM/90 GPM (Figure 15). The high pressure and lower flow distributes the most optimal size water droplets possible. The Firefighter will use the pattern selector to adjust the pattern until the tactile indicator engages. The position on the pattern selector is also marked with a black line.

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Once the Firefighter reaches the fire room, than the G-Force nozzle will be adjusted to flow 500 LPM/130 GPM (Figure 16), and the pattern selector will be adjusted all the way to the right for a straight stream pattern. The Firefighter will use these setting to either attack the fire indirectly or directly.

Figure 15: The nozzle is set to flow 250 LPM(90 GPM) and the pattern selector is set to the proper fog pattern.

Figure 16: The nozzle is set to flow 500 LPM(130 GPM) and the pattern selector is adjusted all the way to the right.

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Gas cooling:

The objective of gas cooling is the application of water droplets from a fog nozzle in short controlled bursts. Applying fine droplets cools the gases to below ignition temperature, shrinks the gas layer and raises the neutral plane due to the contraction of gases caused by gas cooling being greater than the expansion of steam (Figure 17). Gas cooling also creates condition of "Thermal Ballast".

Figure 17: Gas Cooling technique 40 to 60 degree water spray at a 45 degree angle.

When applying the Gas Cooling technique, water is directed into the smoke layer in the form of pulses. At the nozzle, the cone of the water spray is set at an angle ranging from 40 to 60 degrees. The angle of the nozzle in regards to the floor should ideally be 45° or more. The idea is for the nozzle operator to produce several short pulses or sweep pattern wall to wall at different locations in the smoke layer, hereby covering the entire width of the room (Figure 18 and 19). The amount of water the Firefighter uses depends on the size of the compartment, the amount of smoke that has accumulated, and the development of the fire.

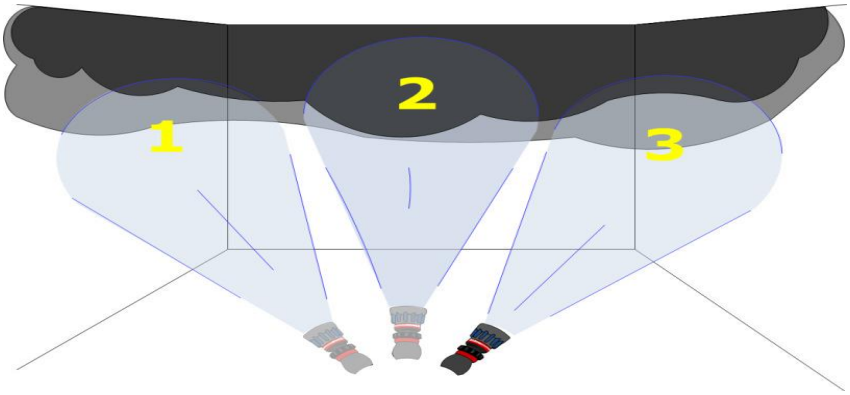

Figure 18: Amount of water usage depends on size of compartment and development of the fire.

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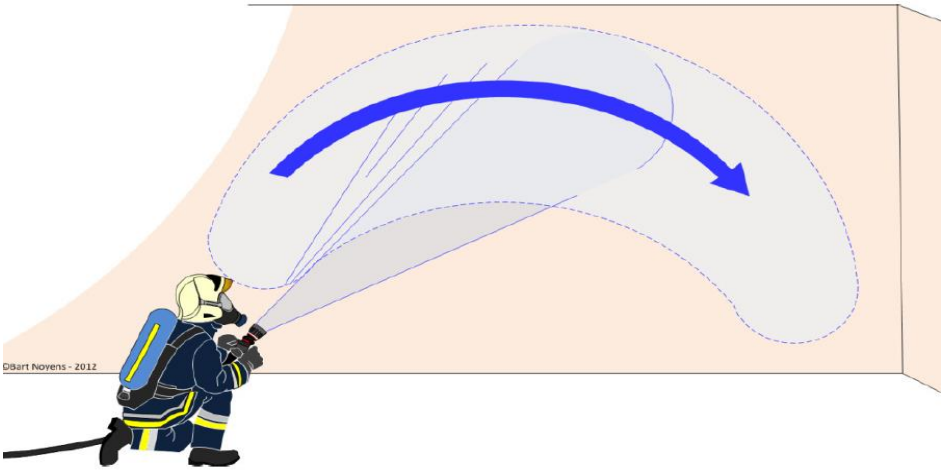

Figure 19: Sweep pattern for Gas Cooling

Surface cooling:

Surface cooling is the application of a light film of water to the walls and ceilings of the compartment, i.e. the Firefighter paints the walls and ceilings with enhanced water just like a painting would when painting a house(Figure 20). Surface cooling will create a buffer zone should fire progress into uninvolved areas, and cool the surfaces to reduce radiative feedback and stop pyrolyzation of combustable materials that make up the ceilings and walls.

Figure 20: Covering the walls and ceiling with a light film of water to cool sufaces.

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Fire Room:

Direct: Extinguish the fire by direct surface cooling the burning combustibles. Ideal method for room and contents fire (Figure 21). (Straight stream on the fire)

Figure 21: Using the correct nozzle setting to place a straight stream on the base of the fire.

Indirect: Extinguish the fire by directing a power cone stream into the upper layer and surfaces. This extinguishes the fire by creating a large amount of steam, which cools surfaces and gases. Ideal method for a fully developed fire or to suppress a potential hostile fire event (Figure 22). (Straight Stream/Powercone directed into the atmosphere, then followed up with a direct attack)

Figure 22: Using the correct nozzle setting to direct a straight stream in the atmosphere of the compartment.

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Task Skill Instructional Requirements and Implementation

- Associated PPE required for an interior fire attack.
- Primary progression steps for Tactical TIC 360, 3D the Door, Go – No Go decision, Smoke Curtain Placement, Owning Real Estate, Proper Nozzle settings, Hose Movement, Gas Cooling, Surface Cooling, Direct and Indirect Attacks.

Reference Information

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