



Continuing Education Course



Evaluating the Human Factor on the Fireground

BY THOMAS DUNNE

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Evaluating the Human Factor on the Fireground

Educational Objectives

On completion of this course, students will

1. Discover the nonphysical aspect of firefighting.
2. Learn what human behavior is the first response in a fire.
3. Review several fires that resulted in a large loss of life due to specific human behaviors.
4. Learn recommendations to manage the human factor on the fireground.

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CONSIDER THE FOLLOWING SCENARIOS:

- A moderate smoke condition is drifting through a public corridor in a suburban shopping mall. An employee informs the arriving firefighters that a dozen people have sought refuge in a small store about 20 feet from an exterior exit. The firefighters immediately go to work and consider the rescue possibilities. If they need to move these people to the exit, will they be able to move through the smoke?

- Meanwhile, across town, a company officer is operating at a fire in an apartment house. The fire is contained, but smoke spreads throughout the structure and the building fire alarm system is creating a loud noise. One of his members offers to disable the alarm system to eliminate the sound to make it easier for firefighters to communicate with each other. The officer pauses and considers his best course of action.

- In an adjoining town, a chief has responded to a 20-story office building that must be evacuated because of a loss of electric power. None of the elevators are working. As his units arrive at the scene, he considers some vital questions: How long will it take to evacuate the building occupants? How long will it take his firefighters to walk up to the top floor?

All of these scenarios illustrate another dimension in the art of firefighting. Our standard tactics are based on our knowledge of building construction, hydraulics, and fire chemistry, but performing these tactics requires hands-on physical efforts using hoselines, ladders, and tools.

However, as you can see from these examples, we must also factor in the nonphysical aspect of our work. We routinely encounter situations requiring us to consider the decision-making



(1) Photos by Bill Tompkins unless otherwise noted.

processes and physical capabilities of the people we protect. Knowledge of this “human factor” can help guide our decision making and facilitate our rescue efforts on the fireground.

When evaluating the human factor, first consider that people tend to display the same type of behavior at different types of disaster. Fires, hurricanes, and plane crashes will all tend to evoke similar human responses. Behavioral analysts commonly accept that panic is not the likely initial response; in reality, a dazed lethargy is the most usual behavior from people involved in a fire or other disaster.

Studies have indicated that groups under stress will display three types of responses. Ten to 20 percent will stay composed and maintain their reasoning and decision-making abilities. Another ten to 20 percent may experience a paralyzing level



Photo by Chris Tompkins.



of anxiety and exhibit extreme emotional distress. However, the majority (70 to 80 percent) will tend to become sheep-like, stunned and uncertain of what to do next. Denial and inactivity are in fact much more likely to characterize group behavior than panic.

History provides many examples of this. In the 1987 London King's Cross subway station fire, many commuters followed their routines and continued to shove their way into the station complex despite the fact that people were literally on fire just a few yards away from them. The 1977 Beverly Hills Supper Club fire in Kentucky led to 167 deaths, yet many patrons remained passively at their tables even as smoke entered their rooms. And a 2005 National Institute of Standards and Technology (NIST) study of World Trade Center 9/11 survivors revealed that they had waited an average of six minutes before deciding to head downstairs.

FIRST REACTIONS

When determining how long it will take occupants to evacuate a premises, you can generally figure that about two-thirds

of the total evacuation time will be spent not on movement but in preparation for movement. Although this is "wasted" time in terms of escaping danger, it does satisfy a very human need for the "milling process." This involves people moving around and seeking out coworkers or friends to discuss what might be happening and what their best course of action should be. Studies have indicated that in a high-rise building, for example, occupants take up to five minutes in this process alone even before they come to a decision on what to do about their situation.

The type of building involved in a fire or an emergency will also influence an individual's decision making and reaction time. A person will take more responsibility for an incident in his own home. As an example, an individual is likely to immediately investigate the source of a smoke condition in his residence (photo 1). However, the same person in a public building such as a museum or shopping center, will be more likely to wait for an employee or staff member to provide directions (photo 2). A firefighter who understands these tendencies will have a clearer picture of both the scope of his evacuation challenges as well as the level of specific direction he must provide.

GROUP THINK

When people start to evacuate a building, they will not tend to leave in a steady pace like a flowing stream of water. Instead, they form and move in groups. Group forming can actually slow down the evacuation speed as the group will tend to stay

together and maintain the pace of the slowest member. Family members in particular are likely to move as a group rather than individually.

These groups can create their own momentum and, once committed to a path, will not easily change course. Group leaders will emerge, usually those same individuals who were workplace managers or held other responsible positions.

An awareness of group dynamics can be an aid to firefighters managing large-scale evacuations. People will not necessarily move rapidly and directly out of a building. Groups will have to be located and encouraged to move efficiently. They will expect and require clear and specific guidance and instruction from fire personnel. This information can often be best disseminated through the leaders in the group hierarchy.

CONVERGENCE CLUSTERS

When performing searches in certain types of buildings, firefighters should consider the possible formation of convergence clusters. These are occupants who, in unsuccessfully attempting to escape or in seeking more guidance, will form



to 30 feet. In certain situations, if it is absolutely necessary, firefighters can move civilians through smoke if they provide clear information about the location and distance to the exits (photo 4). When searching corridors or other areas of limited visibility, firefighters should consider that people will tend to walk alongside walls for guidance in a smoke environment. Give these areas priority when performing primary searches.

RESPONSE TO FIRE ALARMS

Occupants often ignore building fire alarms. An alarm signal alone is usually not sufficient to initiate a building evacuation. Often a second cue is required to accomplish this. The presence of smoke or fire apparatus will certainly provide a second cue, but ideally specific verbal communication from building management or emergency personnel should supplement the vague warning an alarm alone presents.

People tend to lose confidence in alarm systems because of numerous false and nuisance alarms they experience. Certain occupancies, such as schools, will tend to have a high degree of alarm compliance and initiated evacuation because of their frequent fire drills and legal requirements.

However, this will not be the situation in many other buildings that contain large numbers of people. In shopping centers, office buildings, airports, and cinemas, you can expect there will either be a very slow response or no response at all to a building fire alarm system. Often, the milling process is the best that can be expected as occupants seek out others to get their input on what is happening and what they should do.

A firefighter's best course of action is to provide specific verbal guidance and information either directly to occupants or through a public address system. If possible, reduce the volume of the alarm system to facilitate communication, but

do not stop the sound completely if an evacuation is underway. If the alarm is totally silenced, many occupants will tend to go back to their apartments, workspaces, or other previous locations.

STAIRWAY MOVEMENT

Several factors will determine the speed of occupant movement in a stairway evacuation. The number of people, the smoke condition, the stairway's size and design, the amount of guidance provided, as well as the counterflow of emergency personnel walking up the stairs will all play a part.

When evacuating a high-rise building, it is important to consider that the stairs are an alien location for many occupants. It is likely that most residential or business tenants have never actually been in the stairways, even if fire drills were regularly con-



groups in rooms or other areas of refuge. Often, the clusters will be composed of individuals who do not know each other but have banded together to feel less anxious about their situation.

Convergence clusters will typically be found in rooms that are near balconies. Such a location may provide some relief from smoke conditions, along with a better chance of being seen by and communicating with emergency personnel. High-rise and hotel fires are scenarios where these clusters are likely to occur (photo 3).

Firefighters involved in prolonged search operations should be aware that once occupants gather in convergence clusters, they may maintain their positions for a considerable length of time. At the 1980 MGM Grand hotel fire in Las Vegas, Nevada, some guests remained in areas of refuge for up to three and a half hours.

MOVEMENT THROUGH SMOKE

Smoke will not necessarily stop people from evacuating a building. For example, in the 1993 World Trade Center bombing, many occupants walked down stairways all the way to street level despite worsening smoke conditions. An individual's capacity to deal with reduced visibility will depend on a number of factors. Familiarity with the person's surroundings is important, as is the person's role in the building. Movement through smoke is more likely to occur in a home rather than a work environment. A person's emotional makeup, prefire training, and physical abilities are also influences.

The extent of visibility is another key. Studies have consistently shown that people will turn back if they can't see beyond 10 feet but are likely to continue moving if they can see up

ducted. Here again, emergency personnel must provide specific guidance and direction.

Firefighters can use a number of tactics to facilitate a stairway evacuation. First, advise occupants not to carry bags or other items that can slow their descent and to leave cell phones in apartments or offices—people will tend to stop and call friends or family rather than moving immediately. Advise women not to wear high heels in the stairs since that will also slow their progress. Consider the possibility that occupants may have also attempted to walk up the stairs to gain access to the roof. Search roof bulkheads and upper floors as early as possible. If operating a hoseline from a standpipe, do not direct the occupants down the attack stairway but through one that is smoke-free and reserved for evacuation only.

If at all possible, guide and assist physically impaired individuals to stairways dedicated for their use or have them shelter in place in safe locations within the building. Placing them in the commonly used stairs will make their escape more difficult and slow down the overall evacuation.

When firefighters are required to walk up numerous stairs to gain access to the location of a fire or another emergency, they may have to occasionally stop and rest. Establish recuperation areas *outside* the stairway to avoid creating bottlenecks that slow the flow of people walking down the stairs (photo 5). Based on the NIST study of the 9/11 World Trade Center evacuation, a good rule of thumb for estimating the amount of time required for stairway movement is about one minute per floor for occupants going down the stairs and approximately two minutes per floor for firefighters walking up. However, when estimating staffing needs, an incident commander (IC) should keep in mind that a firefighter's capacity to perform work will be somewhat limited after a long stairway climb.

PERSONAL OBSERVATIONS

The science of human behavior in fire continues to evolve as formal academic research continues. However, all members of the fire service can continually add to their practical knowledge by noting occupant behavior in their day-to-day activities. Following are some behavioral characteristics I have observed at my fire operations.

Most civilians have never experienced a fire and are often uncertain of just how threatened they may be if one occurs in their building. When you arrive at a fire in a large structure, particularly an apartment house, it is not uncommon to see numerous occupants at the windows and on the fire escapes, even if they are remote from the fire location. Smoke and anxiety can cause civilians to unnecessarily pursue means of



egress that may actually place them in more danger than just remaining in place (photo 6).

Firefighters confronted with this scenario will have to carefully prioritize their rescue and evacuation efforts. You must remove occupants in danger; if you cannot, you must reassure and encourage them to shelter in place.

People who have evacuated may also attempt to reenter the premises despite the presence of a moderate smoke condition. They are often concerned about the security of their possessions. Pets will definitely be a factor. A civilian fatality at one of my fire operations provides an example. The victim initially escaped from the building but then reentered in an attempt to locate her dog. ICs should routinely request a police presence for both vehicle and people control.

I have often noted that once a fire is extinguished, a “herd” instinct among large numbers of occupants can result in their attempting to reenter the building prematurely. Wet stairs and hoselines can cause injury. Building security and arson evidence can be compromised. Allowing one resident to return

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COURSE EXAMINATION INFORMATION

To receive credit and your certificate of completion for participation in this educational activity, you must complete the program post examination and receive a score of 70% or better. You have the following options for completion.

Option One: Online Completion

Use this page to review the questions and mark your answers. Return to www.FireEngineeringUniversity.com and sign in. If you have not previously purchased the program, select it from the "Online Courses" listing and complete the online purchase process. Once purchased, the program will be added to your **User History** page where a **Take Exam** link will be provided. Click on the "Take Exam" link, complete all the program questions, and submit your answers. An immediate grade report will be provided; on receiving a passing grade, your "Certificate of Completion" will be provided immediately for viewing and/or printing. Certificates may be viewed and/or printed anytime in the future by returning to the site and signing in.

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COURSE EXAMINATION

- 1) Standard fireground tactics are based on which of the following?
 - a. Building construction
 - b. Hydraulics
 - c. Fire chemistry
 - d. All of the above
- 2) The Human Factor guides our decision making and facilitates rescue efforts through knowledge of decision-making process and _____ capabilities of the people we protect.
 - a. Mental
 - b. Physical
 - c. Reactionary
 - d. Movement
- 3) When evaluating the human factor, first consider that people to display _____ type of behavior at different types of disasters.
 - a. The same
 - b. Different
 - c. Varying
 - d. None of the above
- 4) Behavioral analysts commonly accept that panic is not the likely initial response to an emergency.
 - a. True
 - b. False
- 5) What is the usual human behavior demonstrated first during an emergency?
 - a. Panic
 - b. Apathy
 - c. Lethargy
 - d. Defeat
- 6) Studies have indicated that groups under stress will display how many types of responses?
 - a. One
 - b. Two
 - c. Three
 - d. Four
- 7) The majority of humans in a group tend to become _____ like during an emergency.
 - a. Scared
 - b. Maniacal
 - c. Angry
 - d. Sheep-like
- 8) Denial and _____ tend to characterize group behavior during emergencies.
 - a. Apathy
 - b. Inactivity
 - c. Panic
 - d. None of the above
- 9) The 1977 Beverly Hills Supper Club fire in Kentucky led to how many deaths?
 - a. 12
 - b. 47
 - c. 167
 - d. 33
- 10) A 2005 NIST study of World Trade Center survivors revealed that they had waited an average of _____ minutes before deciding to head down the stairs.
 - a. Ten
 - b. Twenty
 - c. Five
 - d. Six
- 11) When determining how long it will take occupants to evacuate, you can generally figure that two-thirds of the total evacuation time will be spent on preparation, not movement.
 - a. True
 - b. False
- 12) People moving around and seeking-out coworkers to discuss what might be happening is called the _____ process.
 - a. Milling
 - b. Movement
 - c. Decision
 - d. Fleeing

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Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 1.

- | | | | | | |
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INSTRUCTIONS
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