

# Fire Engineering

## **SITUATIONAL AWARENESS, DISORIENTATION and IMPROVING FIREFIGHTER SURVIVAL AT STRUCTURAL FIRES**

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Within the modern day fire service at structural fires firefighters are faced with an ever changing and dynamic fireground. A firefighters situation awareness concepts and understanding of what it means to be situational aware at structural fires has become vitally important. Understanding what personal and high risk aggressive firefighting could lead to injuries and death along with knowing the rules of engagement for a given situation are all parts of a firefighters situational awareness. The term situational awareness has long been used within the military and most recently within the fire service for those involved in situations that require a rapid and quick decision making process under extreme stress. If there was one mental mindset in establishing the presence of situational awareness it would be the perception of elements in the fireground environment that are evolving through space and time while realizing the comprehension of their meaning and being able to project the status of the moment along with its projected status in the near future or next moment. Another word what is the perception of elements in the current situation along with a firefighters understanding of the physical environment that he is presently in from moment to moment. A firefighter must also be able to comprehend the situational development of the fireground. The dynamics of the fireground and its physical elements along with the actions of other firefighters in a given situation must be clear regarding their movement and purpose as they relate to their assignments, tasks and the overall objective at structural fires.

It must be realized that situation awareness by firefighters requires constant vigilance over the time of an incident involving the moments of current events as well as their effect on the near future. Being able to encompass an awareness of all the elements of a given incident through comprehension and interrelationships of the operational goals that will enable one's self to predict the future states of the fireground.

Each firefighter's abilities in maintaining situational awareness on the fireground can differ dramatically which can affect their functional capabilities in complex fast paced environments. Being able to have accurate real time information of a fire grounds dynamic will provide a more relevant and accurate view of the battlefield just as it does in military campaigns. In order for firefighters to make good decisions on the fireground it becomes necessary that they can attain an accurate assessment of a given situation in order to prepare to make split second decisions that can save lives and property, including their own. When this is attained we can then recognize a plausible course of action that will be considered as a first effective safe choice in an environment which is controlled by time constraints, changing conditions, physical demands and mental stress. Usually when good decision making and solid situational awareness are present the first choice of action is better than a second choice or change in decision.

It should be noted that the individual firefighters or teams of firefighters involved in aggressive firefighting tasks such as interior fire attacks or civilian searches are incorporating situational awareness and decision making in split second timing while Commanders are overseeing and preparing the overall courses of action at a given incident. Another word the quick decision making process slows up slightly for those in Command. When firefighters are in a firefight it is characterized by the requirement to make decisions quickly while Commanders are juggling large amounts of incoming information from an incident and forming a model situation as a basis for a slightly slower decision process. This is why it is so important that firefighters and their officers on the fire line are skilled decision makers with sound situational awareness in their decision process as to enable Commanders and Chief Officers to make the proper decisions in a fire grounds overall course of actions and probable outcomes. We can now see how the first course of action by a firefighter using situational awareness and a decision making process can set the tone for incidents successes and its failures.

It is obvious that gaining superior skills in situational awareness and decision making must come from experience which fills the tool box of our minds with references of previous assessments of given situations which help us perceive probable outcomes for the better not the worst. Also we must realize that fireground experiences need to be critique after each incident to provide to all the actions positive and negative that occurred at any given incident so as to enhance situational awareness and the decision making process for possibly another future incident with similarities. One other very important tool in acquiring good situation awareness and sound decision making is training. Experienced gained through repeated training is invaluable and is one of if not the most important responsibility of any fire department to its members.

Situational awareness along with risk assessment analysis is comprised of key elements such as building construction, incident command risk management and fireground safety. The lack of situational awareness and risk assessment are the major contributors to firefighter injuries and deaths.

### **Factors and Related Deficiencies in Situational Awareness and Risk Assessment**

- **Unaware of incident scene information, events and personal actions.**
- **Negative actions affecting operational goals in the moment and future states.**
- **Poor communications, interrupted information and poor decision process.**
- **Lack of dynamic risk assessment in changing environments by Command and Company Officers.**
- **Continued conflicting incident priorities, demands outweighing resources.**
- **Lack of effective informed decisions throughout the duration of the incident.**
- **Lack of understanding of the structure, the occupancy type and the changing fire conditions within a structure.**

As we can see by the above criteria's that it is essential that Commanders and company officers alike must be looking at the incident with the same concerns and priorities to support good communications and actions that will provide a battle plan to mitigate the incident while providing safety to those on the fireground. This is no easy task, it takes discipline through continued training to attain these high levels of competencies and most importantly experience. Everyone must be engaged in the vigilance of situational awareness and risk consequences from moment to moment.

### **Vigilance of Situational Awareness Required By Fireground Personnel**

- **Alertness to any and all changing conditions.**
- **Alertness to any and all escalating fireground factors.**
- **Quick identification, understanding with appropriate actions and responses.**
- **Environmental surroundings in and around you.**
- **Possible consequences and reactions of the structures construction and make-up.**
- **Fire development and the structural effects within and upon it.**
- **Your personal safety, your team's personal safety.**
- **Maintaining the highest mental awareness at all times.**

On the fireground a situation or threat can approach a firefighter from any direction. Firefighters should be aware of the possible threats which can be numerous at structural fires. We should think of the fireground as Action Areas that are occurring at different times through varying degrees of potential threats that may cause injury or death as well as these areas producing Maydays. If we think of ourselves working on the fireground within a boxed or sphere area that has possible threats coming in from its sides and above and below we can see how important it is for firefighters to have situational awareness and to avoid tunnel vision at all cost. Not only should the firefighter be aware of his presence and purpose within the immediate box or sphere area but he should also realize and attempt to establish situational awareness regarding his relationship to the entire fireground operational areas as well, another words the big picture. What is the structural relationship to the task and assignments and the seat of the fire? What is the progress of tasks and assignments to the seat of the fire? Is the communication highway on portable radios flowing clearly with accountability?

Fire departments and firefighters need to establish good foundational training in situational and disorientation awareness by looking into the elements and building blocks of what it means to be aware of oneself and incoming threats on the fireground. Helping firefighters through training mentally and physically in the art of perceiving and understanding the threats that they may be facing at structural fires is essential in recognizing the potential effect it may have not only on themselves but also their team members as well its effect on the entire fireground. The ability of firefighters to maintain situational awareness on the fireground depends on many factors and common denominators that need to be realized. One of the most common denominators that affect a firefighter's ability in mentally maintaining situational awareness and their departments are our involvement with low frequency high risk structural fires.

Every fire should be considered a high risk event but when you add a low frequency response to these fires it increases the likely hood of the loss of situational awareness because of an experience deficit creating possible deficiencies in perception, understanding, judgment and being unable to predict future events. Another word when we don't perform our craft enough we can't analyze and compare one event to another which may create a lack of competencies which can create unfocused actions. In order to make up for the response to low frequency events which involve high risk actions training is our only salvation in providing us better judgment, increased understanding along with sound awareness of our actions and future states at any given incident. In order to effectively train firefighters to acquire instincts in situational awareness training programs should be based through the following training areas.

### **Acquiring Instincts in Situational Awareness through Training**

- **Fire Behaviors at Structural Fires**
- **Building Construction**
- **Critical Thinking**
- **Tactics and Fireground Operating Procedures**
- **Realistic Based Scenario and Hands-On Training**
- **Fireground Communications**
- **Team Based Coordinated Actions**
- **Shared Experiences**

The key concepts involved with training firefighters is the dynamics of sound team coordination when performing tasks within the fireground action areas which in turn will increase situational awareness. Team members as well as their commanders must also be able to see, hear, communicate and evaluate the entire applied strategies from one company to the next; and then to the overall operation and its progress as well as its imposing threats.

Another area attributed to the loss of situational awareness is firefighter disorientation. This should not be confused or associated necessarily with a deficit in situational awareness but rather should be viewed as two separate components feeding into each other. The loss of situational awareness can lead a firefighter into a state of disorientation while realizing that being in a state of disorientation progressively decreases situational awareness the longer we are disoriented. Disorientation to firefighters at structural fires are attributed to predominately the following areas of study.

## **Attributions of Study in Disorientation of Firefighters at Structural Fires**

**Structural Features:** Recognizing the type of structure, design features, few windows and doors in relation to structural size, basements, irregular hallways, irregular exterior walls, multiple floors, multiple additions, age and construction type.

**Fire Conditions:** On arrival, during operations, smoke and fire conditions that increase disorientation and prolonged zero visibility, flashovers, backdrafts, rollovers, sudden and violent changes.

**Tactics and Strategies Used:** Aggressive interior attacks, searching above and below fires, searching without hose line advancements, searching in prolonged zero visibility and unrecognized strategy changes by members.

**Interior Actions:** members separated or working alone, separated from hand lines, loss of water in hand lines, hand lines unable to advance or slow moving, primary searches with sudden zero visibility, sudden rollovers or flashovers, falling down stairs, falling through floors, collapse of floors or roofs, unable to identify and locate multiple hand lines through the structure during evacuations, sudden evacuations, fire officers not with their members, stairwell confusion and unmonitored air consumption.

By reviewing some of the above attributions of disorientation at structural fires we can see that disorientation especially within structures during aggressive firefighting can happen in almost any type of structure. The potential of disorientation occurring to firefighters at structural fires is reliant on 3 prominent features.

- 1. Is the structure open?** Does the structure provide for adequate ventilation as well as it providing adequate points of egress? For a structure to be considered open it should have multiple windows and doors within reasonable distances to each other. Residential structures usually provide for adequate openings where as industrial or commercial may provide limited openings within unreasonable distances.
- 2. Is the structure enclosed?** Many structures should be considered enclosed which can precipitate the presence of disorientation to a firefighter working within its walls. Any structure with the absence or little existence of doors and windows should be considered closed. A structure may not only have few windows or doors but they may not be of adequate size for ventilation, egress or sudden evacuations.
- 3. Is zero visibility present?** Zero visibility can be present on arrival or can occur at anytime throughout the incident at structural fires. Members should be aware of prolonged zero visibility when it occurs. Prolonged visibility should be a warning sign in creating possible low air alarm issues due to the limited amount of working air time that firefighters have. Any disorientation factor that may occur to members within the structure with prolonged zero visibility is extremely dangerous especially if members are not monitoring their air supply. Early evacuation of the structure prior to low air alarms activating should be within all fireground procedures.

By reviewing the above listed principles fire departments can help first-in officer decision making by establishing a short standard operating guideline that would enable them to recognize the potentials for a disorientation problem to exist at structural fires incorporating offensive strategies. The first-in officer's initial size-up is probably the first hint that offensive strategies at enclosed structural fires could present disorientation to its members. Once members cross the IDLH plan into near zero visibility especially with inadequate ventilation as well as conducting primary searches in these conditions disorientation could escalate while the advances for both tactics are attempted. It should be realized that there are no guarantees or specifics when it comes to structural types regarding the possibilities of disorientation to members operating within offensive procedures.

### **Structural Types Attributing To Disorientation Events**

- **Enclosed Structures Small or Large**
- **Structures Enclosed With Basements**
- **Structures Opened Above Grade but Enclosed Below Grade**
- **High Rise Firefighting Involving Compromised Stairwells**
- **High Rise and Multi Dwellings Involving Compromised Hallways**
- **Structures Opened or Closed Producing Near Flashover Events**

We can see the importance for fighters to recognize the potential for disorientation and also the ability to warn all others on the fireground including commanding officers. As stated early operating procedures especially during size-up and the decision making process to conduct interior firefighting may be unsafe until we can confirm a more accurate assessment by taking a few more seconds in recognizing the potential for a disorientation process to exist or begin on the advances of firefighters into the interior of a fire. What will help recognize these potentials is the company officers utilizing thermal imaging for better interior assessments of fire conditions and specific fire locations within a structure before full commitment of firefighters on advancing lines as well as firefighters conducting primary searches either off of hose lines or searches conducted through VES procedures. Also once a decision is made to commit into advancing on interior fires that back up crews are present with an established water supply and a secondary hose line. An additional recognition is to be able to think outside the box when necessary at times to consider additional areas from other directions when attacking fires with back up hose lines from other companies but always avoiding the potential for opposing streams.

The longer the distance to the seat of the fire by advancing hose lines increases the risk of both enclosed and even open structures to produce heavy smoke raising the threshold potential for interior members to encounter a disorientation process. Sometimes concentrating on advancing to the fire through the shortest distance may be more of an advantage than following the usual premise that we attack from the unburned side. Hose lines advancing into zero visibility to the seat of a fire by the shortest distance increases the safety of interior members, but we should always weigh the outcomes of the civilian potentials for rescue or recoveries affected by this action. Attacking fires from the shortest distances also improves in our ability in providing safer air management principles regarding a firefighter's air supply. The bases of this realization is simple; getting to the seat of the fire as well as other tactics such as VES or ventilation through the shortest distances uses less of an air supply leaving more in reserve to help combat the potential of a disorientation process as well as providing in more time for those in Mayday situations to be rescued.

*NOTE: The above article is an excerpt from the fire service manual and seminar program by retired veteran of the fire service Lt. Mike Mason director of the not for profit organization RICOFIRERESCUE INC. Entitled **IN THE REALM of RISK: Surviving the Modern Day Fireground***