Rescue & Search

CLACKAMAS FIRE DISTRICT #1

Training Division

15990 SE 130th Ave

Clackamas, OR 97015

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CHAPTER 6 OVERVIEW

Saving lives is the primary mission of Clackamas Fire District #1. The best lifesaving tactic on the fireground, is a systematic search plan and rapid water on the fire with coordinated ventilation. This chapter will cover the foundation of Rescue and Search on the fireground.

THEM

Every year approximately 3,000 civilians die inside structure fires. We are their last and only hope. When we respond ,"their emergency is our emergency".

From January 1, 2008 to December 31, 2018: There were 10 Line of Duty Deaths (LODDs) while performing residential search. One LODD while performing a rescue (This was a ground ladder rescue). Zero LODDs while performing residential search initiated from a window . No LODDs while performing search in a "vacant" residential structure. (NIOSH/FEMA)

Where are the victims being located (see chart below)? According to NFPA & www.FirefighterRescueSurvey.com, victim locations are as follows:

42%	Bedrooms
17%	Family Room
11.5%	Hallway
42%	Room Adjacent to Fire
23%	Room of Origin
36%	Trying to Escape

Who is Locating Fire Victims (Source: www.FirefighterRescueSurvey.com)

- *28% of victims were located by Fire Attack, with a 51% survival rate.*
  The higher survival rate can be deduced from a reduced time for Fire Attack to locate and remove the civilian.
- *60% of victims were located by Primary Search with a 49% survival rate.*

Time is of the Essence

Victim survival rate drops 10% every 60 seconds between cardiac arrest and CPR.
Survival rate of fire victims vs. Time to victim once on scene.

- *66% survival rate when located within 2 minutes*
- *36% survival rate when located within 6-8 minutes*

By reducing our time to the interior, we effectively increase our civilians' survival chances.

- ***We set up our turnouts for fire, after every run.***
  Setting up our gear, keeps our gear together and gives us order. We can pick up our bunkers and throw them in the cab for an EMS run in seconds. If we stow them in the cab and need them for a fire run, it increases our turnout times in critical moments.
- ***Set our radio to OPS 26 (the working fire channel) with the scan off***
  When tapped out to a fire, having our radio on the working OPS channel and not on scan, reduces the chances of missing radio traffic for an assignment when transitioning from the apparatus to the fireground and allows us to get to work.
- ***The Fire District has a 90 second turn out standard, our company pride can take us to 60 seconds turned out with wheels rolling.***
  These critical seconds can take us from third due to first due. More importantly, reduces the size of fire on our arrival and increases the survival rate of our civilians.
- ***Mask up with gloves on, under 20 seconds.***
  Mask up with your crew everyday, for time. Get off the apparatus with fire gloves on.

- ***Assign search early & add additional crews often.***
  Maximize our efforts for search, to ensure civilians are quickly located & removed.
- ***Coordinate our search efforts with Fire Attack***
  Once the line is placed, Fire Attack can peel off and search the adjacent area. Fire Attack will typically search the fire room.

KEY CONSIDERATIONS

- Time is of the essence: How do we reduce our time to THEM
- Rescue: Having a plan
- Search: Types and decisions to make while searching
- Search Size-Up
- Search Position

TOOLS & EQUIPMENT

Tools taken to the interior will typically be minimal, to allow us to search with our hands.

- ***Personal Flashlight***
  A flashlight may cause reduced or improved vision, depending on smoke conditions. Start with having your chest light on and if you are getting back-splatter (bright lights on in fog), turn your chest light off for improved vision. Keep your helmet light off, it can reduce your ability to locate the glow of the fire.
- ***8lb. Flat Headed Axe***
  Residential: Typically left at the front door after forcing entry
  Commercial: Can be taken to the interior when anticipating forcible entry
- ***Halligan***
  When each member has a Halligan it gives them the ability to split search and still be able to force doors, take glass or force exit. Place your Halligan in walls or at thresholds during a room search so you can use your hands to search. If the conditions warrant you to take the glass, bring the Halligan into the room.
- ***Thermal Imaging Camera (TIC)***
  Ideally a member of each two person team will have a TIC to aid in quick scans of a

room for orientation and detection of heat signatures. These are merely a tool and can not rule out a room as being empty. **We search with our hands**.

- ***The Can***
  When entering ahead or without a line, remember a 2 1/2-gallon extinguisher can knock down fire; more importantly it can hold fire till you are able to pass or close a door or remove a baby! (Mike Lombardo) The can will spray 50' for 50 seconds. When searching with the can, place it in the hallway by the door that was isolated, then search from the seat of the fire back. The can will assist fire attack to locate the fire room or apartment.

- ***Hook***
  Typically will be brought to the interior and buried into the wall of a main throughway, to be easily accessed when needed. The 6' hook hinders the search.

- ***200' Search Rope***
  For Large Area Search

OPERATIONS

Rescue

Definition: The act of intervening and/or removing a person from danger.

When we locate a victim and have the air to continue searching, hand off the victim to another crew when possible. It is easier to hand off a victim, then to try and communicate what has or has not been searched. Critical victims remain our responsibility until we hand them off to another crew or EMS.

We do not perform an EMS assessment, they are either obviously dead and we are leaving them or we are pulling them out. Can or do we need to isolate and/or vent the area we are in? When a victim is found make contact with our team and let them know by calling out "Victim, Victim, Victim". Evaluate, can our team make the rescue ourselves? Do not delay the rescue by waiting for radio time; get them moving. When radio time is essential, keep radio traffic to a minimum "Command, Truck 316 bringing victim out Alpha side". If we need assistance with ladders, a window conversion, a hoseline or additional personnel, then request it from command. If in this situation, consider, can or do we need to isolate and/or vent the area we are in to reduce the exposure to the victim.

When deciding to take a victim out a window or back through the structure, consider time spent making the rescue and the conditions the victim will be exposed to.

"Exposure duration is as important of a factor, if not more than dose"- Zevotek, Underwriters Laboratory

Grips

The Gable and Kimura Grip techniques for victim drags and carries are traditionally used for grappling. Both are 'thumbless' grips where the thumb is on the outside of the grip going the same direction as the fingers not trying to wrap around in the opposite direction as we would normally use when we pick up everyday objects. A general rule that whichever arm wraps the body part, the opposite hand is the top grip. The goal is to think of our hands as big hooks rather than a hand with independent fingers. The Gable and Kimura grips are not only stronger than traditional grips but they are also easily performed with structure gloves on and in zero visibility.

Whether we are grabbing a victim's legs for a double leg drag, their torso or an arm, we should squeeze them close to our body and utilize one of these grips to give us our best shot at keeping a grip on our victim which is a difficult task in the fire environment.

Drags

Carrying a victim out is typically used for light weight victims, such as a child. When carrying children, keep them low in the elements. If waiting with a baby at a window for rescue, hold them low to the ground in the cleaner air.

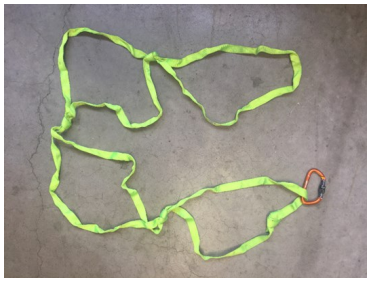
The purpose of a drag is to "Grab and Go." The weight of an adult victim will take time and energy. Adults will typically take a crew to complete the rescue.

Quick *simple* drags will keep the victim moving. Head first drags can be done by one or two firefighters performing a "wrist lock" or a "single arm lock." Head first drags elongate the victim/rescuer combo more than feet first.

Feet first drags are the preferred drag, it keeps the victims head low in the elements and keeps the victim and rescuer's overall body length shorter than head first. Feet first drags can be performed by crossing the victim's legs, putting the victim's feet in each armpit or by two firefighters. Brace your arms behind the victim's knees for an improved hold. Victims can be spun around by crossing their ankles, lifting their feet in the air and spinning on their back. When pulling victims down stairs, to protect their head we will try to drag head first.

Long webbing with knots moving victim up stairs.

Webbing can be complicated and time consuming, so should be used as a last resort. Webbing is considered with very large victims or with victims that need to be brought up stairs (typically from a basement). The strap of choice is a 22' webbing tied in a loop (water knot) and then knotted three times at equal distances, creating four holes. The two middle holes for the legs and the two outer holes for the arms. (See picture)



22' webbing loop with three knots.

7' looped Prusik.

A 7' looped Prusik can be girthed around a victim's appendages. This type of webbing drag will elongate the victim and decrease difficulty when navigating in small spaces and turns.

Victims that are found on a bed, can be rolled up on the sheet they are lying on. If a victim is on the ground, we can grab a blanket and wrap them in it as well.

The arm bar drag, (photo to the right) take the victim's wrist and put it in your armpit. Take your hand and place on the bicep of your opposite arm and apply pressure to victims arm. Then, use your other hand to press against the victim's arm and secure the hold. This will complete the arm bar positioning for the drag. Do not grab for clothing when training, as not all victims will be clothed. Apply pressure to victims arm for a good hold.

Ladders for Rescue & Search

Throwing Ladders for Access, Egress & Rescues: Access, egress, and rescue ladders that are thrown to windows, will have the tip at the window sill (figure 2). Ladders thrown to a balcony or fire escape will extend 2-4 rungs above the railing on the wall (figure 1, to provide a good handle for victims and firefighters. Angle will vary when throwing ladders for rescue. Ladders should land between 60 and 75 degrees but other angles will work.


figure 2

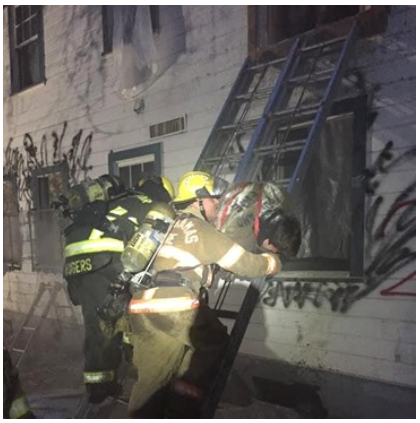
Ground Ladder Rescues: When civilians are hanging out windows, two firefighters can carry the ladder flat and throw the tip below the victim and raise it up and under the victim.


Figure 4

During a window rescue, a second ladder is recommended to create "parallel ladders". This "parallel ladder creates a wider base and the ability for additional firefighters to assist in the rescue.

We prefer to take victims out of the window head first. When the victim's torso is being brought out the window to the ladder, as the ladder rescuer. place your arm under their armpit and grasp the back of the beam. Guide the victim's legs to one side of the ladder, then reach your other arm between the victim's legs and grasp the

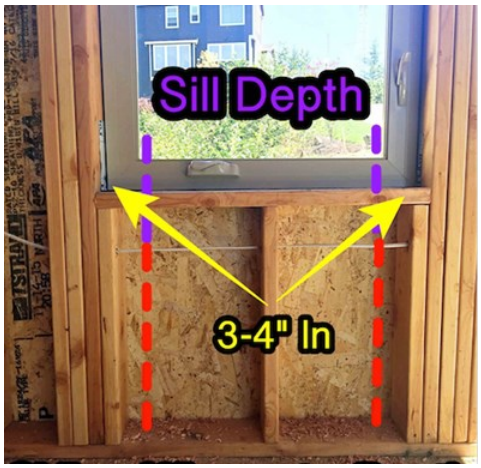
back of the other ladder beam. Slide your hands along the beams during the rescue. A shallow ladder angle will assist in carrying the weight of the victim where a steep ladder angle will place more of the victim's weight on the rescuer.



Ground Ladder Assists: At times victims presenting in windows are capable of assisting in their own rescue. If able, climb up and make entry to assist the victim on to the ladder from inside the room. Another firefighter would then ascend the ladder and assist them from below. Putting a firefighter inside allows us to isolate and search the room after assisting the civilian on to the ladder. Placement of a second ladder can allow us to pass other firefighters and civilians coming down.

Window- to- Door Conversion for Rescue

After a victim is located, a decision is made on how to rescue the victim. When the option is chosen to remove a victim by way of a window, a window-to-door conversion should be considered. Especially since one of the most difficult parts of a civilian rescue by window, is getting them from the floor to the window sill. Some reasons to consider a window-to-door conversion are: large victims, short staffed crews, firefighter rescues and access/egress in hoarder homes .



Remove the lower sash of window, start vertical cuts 3-4 inches from edges of window to avoid jack studs supporting the window, continue down to the floor. Only allow the bar of the saw to go deep enough to penetrate the sheetrock on the interior, take caution or confirm there are no victims or items that could bind up the saw on the interior.

After pulling down the wall section, roll the ladders in together. This allows for multiple firefighters to help with the rescue, and creates a "two way street" and increases stability.



Building Construction for Window-to-Door Conversions

Platform frame construction consists of studs running from the bottom plate to the rough sill (window sill) or to the top plate of that story. This will allow for a natural hinge at the bottom plate when cuts are made vertically along the window Jack studs when trying to convert floor one or upper story windows into a door.

From the 1880's to the 1930's, balloon frame construction was common. There are components of this building style that drastically affect the ability to perform a window to door conversion. It is important to be able to recognize and understand balloon frame construction.

Example of balloon frame construction.

Balloon frame construction has studs from the foundation to the attic, except at locations of windows and doors. Floor one windows are installed similar to platform construction. For upper floor window conversions on a balloon frame, stud knowledge is imperative. Look at the open stud wall balloon frame picture (purple circle): Notice the floor one window studs circled in the first picture (red circle) sit on a bottom sill, this will allow for a natural hinge when removing the section below the window. Within the box in the second picture, the studs run from the top of the floor one window, up past the 2nd floor joists and to the bottom of the second floor window. This solid stud does not allow for a natural hinge. A lateral cut that is stud deep will be required to remove the section below the window.

Example of platform construction.

The type of siding on the exterior can affect how the section of wall is removed as well. Horizontal lap siding creates a natural hinge, where some vertical siding or T-111 may need a lateral skim cut to ease the pulling of the under window section.

In 2017 Clackamas Fire responded to a house fire. HR305 arrived first, with reports of a civilian trapped on floor two. While no other apparatus was on scene, team B made-entry with a water can. They located the victim in a bedroom on floor two, isolated the room by closing the bedroom door. Broke out the window and bailed out the window with the victim. The lady is alive today because of their ability to make it happen. When there is no time for a ladder and fire has cut you off, bailing out with a victim, is an option.

Aerial Ladder Rescues

Our preferred way to move a victim down an aerial ladder to the ground is to have the victim remain at the tip of the ladder and lower the tip of the aerial to the ground or foot of the building. When this is performed our concerns are retracting the bed sections and causing injury to the rescuer or victim on the tip of the ladder. On our Tractor Drawn Aerials (TDAs), we only have perpendicular options for reaching the ground, we are unable to lower the tip of the ladder to the ground over the front cab or tiller cab due to clearance. Last resort which is labor and time intensive is to bring them down the aerial in a basket or drag them down the aerial.

Aerial Ladder Assists

Escorting conscious victims down aerials will take time, civilians have never been on an aerial ladder. The length the aerial is extended and the degree of the angle will affect the speed of descent.

Rescue Tips:

- During a rescue, call out “Victim, Victim, Victim”. There are only two things that we call out in multiples of three “Victim” and “Mayday”. This reduces the chances of missing critical information.
- Call for “window to door conversions” early, especially with the obese.
- Keep victims low in the conditions. Do not stand up with babies/children.
- If the victim is obviously dead, leave them and continue searching, otherwise pull them out.
- When it is possible, one firefighter can lead and clear a way out.
- Do not delay victim removal to transmit over the air.

- Carrying victims puts us in an awkward position increasing our odds of tripping.
- During ladder rescues, when we use one, throw up two for parallel ladders.
- During window assists bring a halligan up the ladder with you. The civilian may go back inside and you may need to start your search.
- Dirty grabs are our go to because they are quick and easy. Webbing should be plan C or D.
- When dragging a victim by their shirt, scrunch the shirt up to give it more strength.
- In the event we can hand off the search or the victim and have enough air to continue searching, hand off the victim. It's easier to hand off a victim, than a search.

SEARCH

Search: An orderly and systematic examination of a building or area for the purpose of locating persons, or locating fire and extension of fire.

Searchable Space: Any space within a structure that we can occupy with our training, experience and PPE.

Primary Search: Immediate and rapid yet thorough and systematic search through all affected areas, to locate victims or verify the removal and/or safety of possible occupants.

Secondary Search: A thorough and painstakingly complete search for life, of all areas that required a primary search; the outside perimeter of the building, all shafts, elevators, roofs, etc.

Targeted Search: Starting a search at a place within the structure that has the highest potential for civilians. Typically bedrooms, paths of egress and within 6' of an exterior door.

All Clear: A benchmark made by command, when a primary and secondary search has been completed on the entire structure.

CFD #1 always strives to conduct an immediate primary search, followed by a painstakingly complete secondary search. Every building has the potential to be occupied, at any time.

Search may be performed in front of or in absence of an operating hoseline on the fireground. Members shall be constantly aware of the environment, including the status, location and operation of hose-lines or lack of.

What are we searching for?

Searching inside a structure with an unknown fire location is the most dangerous position to be on the fireground. The assignment of search has two objectives, locate fire and locate life. Locate - Isolate - Communicate the fire. We confine the fire to create the best opportunity to search the largest area and then communicate the fire location to fire attack. This allows fire attack to properly stretch a more direct route. When searching ahead of the hoseline and we locate the fire, we must communicate to fire attack not only the fire's location but the best known access to the fire. Announcing the stair location can save seconds if not minutes.

Search Priority

- 42% of victims are located in a bedroom
- 11.5% of victims are located in a hallway
- 10% of victims are located within 6' of an exterior door.

Our search priorities are the bedrooms and paths of egress as we enter the structure. Victims higher in the elements have a lower chance of survival, such as victims on beds vs floors. We search top bunks first, down to the bed, and lastly under the bed. Check between the bed and the wall and closet floors. Victims in a room behind a closed door will have a greater chance of survival. If we are working down a hall and come upon two rooms, one with an open door and one with a closed door, we prioritize the open door room.

The fire apartment or room is the priority, with Fire Attack typically searching the immediate fire area. Adjacent apartments and rooms are the next priority, with another crew searching the floor above in the same pattern.

Consider how the heat, smoke and fire will extend within the building. Occupant egress from the building (interior stairs, fire escapes, etc.) can be quickly impacted by the fire conditions, negating their use and endangering occupants. Gaining access to the fire area, or area to be searched, will usually be through the main door that the occupants use.

The “Close before you doze” campaign is asking citizens to “shelter in place”. This may increase the odds of bedroom rescues and increase the need to prioritize bedrooms and window entry search.

SEARCH SIZE-UP

The residential search size-up takes place in three phases; pre-arrival/pre-planning, exterior, and interior. The pre-arrival size-up includes factors such as occupancy type, time of day and knowing your first due. The exterior size-up will include smoke/fire conditions, a 360, building construction, era and residential building styles. The interior size-up includes human behavior, smoke/fire conditions, and construction features such as doors, windows, and floor coverings. With our experience, training and PPE, can we occupy the space? If yes, then we search.

Below we will address the primary search size-up for single family, duplex and low-rise multi-family dwellings. Knowing and understanding building layouts and fire behavior is paramount for an effective, efficient and aggressive primary search. The following are notes and considerations, not the “end all, be all” document.

On Scene Reports

Bystanders can be a useful source of information for LIFE, FIRE and LAYOUT. This can aid in prioritizing the primary search, but this information should be taken as guidance and not fact. According to www.FirefighterRescueSurvey.com, structure fires with victims, with bystanders reporting “people are inside,” had a 67% accuracy for location of the victim. When receiving bystander reports, repeat if and only if the report is “positive.” Examples: “My baby is inside”, “They are home”, etc. Try to get any information that can aid in our search: How many people? Where might they be? Age? Do not take much time with them, get the info you need and get inside. Consider sending the informant to the Safety Officer or someone else who has more time to probe them for information. At this time, we will declare “Rescue Mode” over the radio and disregard two out.

On the contrary, if there are any negative reports such as: “no one is home”, “everyone is out”, “the building is abandoned or vacant”, we can acknowledge this input only to the reporting party. We will not repeat this information to anyone, nor over the radio. On scene reports hold the same validity no matter who the source is: police officer, home owner, son, neighbor, mom, etc., they are under stress. They most likely have never had their house catch fire, let alone even seen a structure fire. They will most

likely not be able to recall recent events, such as their in-laws are in town or their children had friends spend the night. Even if they look calm, everyone acts differently under stress. Negative reports are never repeated, they may cause a loss of life. If we repeat the information, we may be responsible.

- ***5% of structure fire victims, had reports of "Everyone is Out"*** (Firefighter Rescue Survey)
- ***28% of structure fire victims, were not reported at all*** (Firefighter Rescue Survey)
- ***75 civilian fatalities & 200 injuries inside "Vacant" structure fires every year*** (Source: USFA)

Clackamas Fire will not allow the presence or absence of cars in a driveway to affect our search priority. Civilians may bike, bus, park in the garage or take other types of transportation, making this "clue" irrelevant. 1/3 of the American workforce work the graveyard schedule. 6.1% of Americans are under 5 years old (the napping age). 18 of 24 hours in the day, bedrooms are the number one type of room that our structure fire victims are located (Firefighter Rescue Survey). Bedrooms always have a high probability for victims, not just at night.

Philosophy

Civilian LIFE is the primary reason for our professional existence. It is, and always will be our first priority. Firefighters should not perform victim survivability profiling (VSP). We decide if it's a go or no go, based on if the space's conditions are tenable for a firefighter in full PPE. We must make every effort possible to occupy the space and search for victims. From the outside, we are unable to know the conditions of each room or area on the inside of the structure. Closed doors provide for isolated survivable space, certainty of this can only be achieved by completing a thorough search.

This backs Clackamas Fire's culture of occupying the interior for search and not looking at the conditions from the outside and thinking "no one can survive those conditions".

"Survivability is a very complex thing" (Robin Zevotek)

Case Study:

On June 1st, 2015, the Muncie City Fire Department arrived at a well involved two story residential structure. On scene firefighters were aware of victims and were aggressively making a push and searching, when the east bedroom floor collapsed. "That's when we decided to go defensive. I didn't feel there was really any real chance anybody could survive this," Chief Baty said. Dispatch then received two hang up phone calls and then a successful phone call where dispatch could hear Pam and Tom Price inside the structure, alive. Dispatch relayed this information to incident command, who then changed the strategy from defensive to offensive. The Muncie City Fire Firefighters then breached through the outside wall on the second story and rescued two unconscious victims 38 minutes from dispatch. Both Pam and Tom Price survived.

Keypoint: A search size-up is intended to locate searchable space, not chances of survivability.

PRE-ARRIVAL/PRE-PLANNING

Occupancy Type

The occupancy type may indicate the number and demographics of victims, floor layout, types of rooms, priority entrances, and also influence tool selection.

Number of Victims: There is an increased potential number of victims in elderly care homes, rehab facilities and hotels. This is due to large occupancy loads and the characteristics of the occupants themselves. Geriatric residents travel at a slower pace and have difficulty hearing, which may cause a delay in awareness of a fire. The sick and disabled may be physically unable to evacuate. Hotel guests lack the familiarization of the floor plan and the nearest egress.

In emergencies humans typically flee the building the same way they entered. Upper floor egress may lead to inoperable elevators, resulting in incapacitated victims in the hallway. The potential for an increased number of rescues and/or decreased ability to self-rescue, increases the resources required for primary search, the need for shelter in-place options, and aggressive fire attack with coordinated ventilation.

Demographic of Victims: Knowing who the potential victims are will help us identify; their ability to self-rescue, the resources needed, and where they may be located within the structure. Be cognizant that infants may be in cribs and can not self rescue,

and children might be hiding in their "safe" places such as; bedrooms, beds, under beds and in closets.

Priority Entrances: The occupancy type can indicate how familiar occupants are with the structure and how they may evacuate, which can influence search access.

A behavioral evacuation study of 300 personnel of varied gender, age and mobility was conducted (Behavioral research performance, www.iafss.org). The study showed that 95% of the occupants in an elderly care home were evacuated by the main staircase during unannounced fire drills. The other three emergency staircases were not used at all. This information may dictate the entrance/staircase the Search and/or evacuation crews use to make entry.

Tool Selection: Each occupancy type in a common geographical area will share a similar need for security and fire protection. This will influence the appropriate tool selection for the job. Single family dwellings have differing forcible entry and egress needs than a hotel. Being aware of the occupancy type can lead to bringing the appropriate tools to the interior. A set of irons may be beneficial for structures with doors that have double keyed locks (such as a bank), which will produce a need for forcing from the interior for egress if the structure has not been softened. Long hooks may be necessary for structures with anticipated high ceilings that may need breached. The single family residence may only require a light, Halligan, TIC and water can (a can is situation dependent).

Victim Location	By Hour
Bedrooms	2101—0500
Bedrooms, Bathrooms,	0501—0600
Bedrooms	0601—0800
Bedrooms & Hallways	0801—0900
Bedrooms	0901—1000
Family Rooms	1001—1200
Bedrooms, Family, &	1201—1300
Bedrooms, Bathroom,	1301—1400
Bedrooms & Kitchen	1401—1500
Bedrooms	1501—1700
Family & Hallway	1701—1800
Family Room	1801—2100
Hallway	2101—2200

Time of Day

Is the time of day as critical for primary search prioritization as we once thought? NFIRS reporting indicates 46% of civilian fire fatalities occur between midnight and 7a.m (http://nfirs.fema.gov). According to FirefighterRescueSurvey.com, 40% of our victims are located in bedrooms, more than

any other single location within a residential structure. The survey website also reports victims being located in bedrooms, 17 of the 24 hour day cycle. This can be attributed to varying sleep cycles, and that bedrooms are not just used for sleep but also play time, watching television, folding clothes and other activities.

Your First Due

Understand the economy, codes, placards, the civilians and nature in the area you provide service to. Understanding special hazards in your first due can aid in your crews safety during search. Pre-planning and a 360 can locate hazard placards that the city or fire department have posted on the side of a structure. These placards indicate structures that are “vacant”, had previous fires, partial structural collapse, missing structural members, holes in the floor or other dangerous characteristics.

Some would argue that they are able to size up a vacant house vs. a house that is lived in. This argument can prove more difficult than it appears, for example, in Toledo, Ohio neighbors kept the “vacant” house’s grass cut due to rat problems. The house on the right is a “Code Red'' house and has a placard, this means the house has been identified as vacant and has structural problems that could injure firefighters operating inside. On the left, a house with a roof crumbling around a vent hole from a previous structure fire and garbage bags over the windows, is still occupied.

Performing a 360, knowing the economic status of your first due, noticing the placards, boarded up windows and conditions prior to search is imperative in these structures. These indicators may dictate how a search is performed and should increase the awareness of hazards for firefighters.

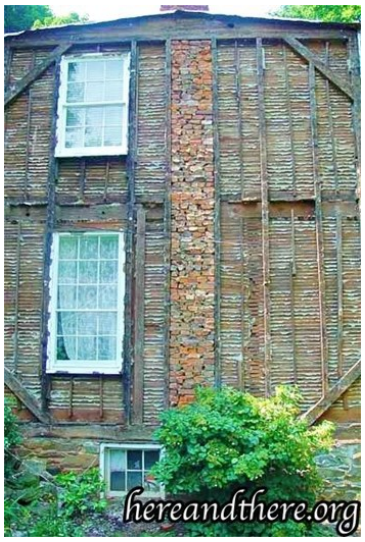
The Building

Sizing up the building itself is beneficial to every assignment on the fireground. Be knowledgeable of building codes and construction in your area. Note the buildings construction type, era, number of floors and footprint. Observe the roof, exterior walls, exterior doors, windows, and indicators of interior stairwell location. Having this knowledge prior to committing to the interior will assist your crew in performing an efficient and effective search, finding egress and staying oriented.

TGI beams used in newer lightweight construction can pose a threat to firefighters since their failure rate occurs drastically quicker than dimension lumber used in legacy construction. Knowing local construction methods is valuable.

Construction Type

Each type of construction, heavy timber, lightweight, unreinforced masonry, etc., has identified fire behavior characteristics due to structure members and materials. Resident actions or modifications to members and materials can lead to unpredictable fire behavior, such as fire doors being blocked from closing or open windows. Knowledge of the structural members used on each type of construction assists in estimating how much time you may have before structural failure. Each type of construction has a "typical" set of materials used for the walls, jambs, and doors. This information along with occupancy use, can dictate which tools may be needed to force entry or egress and assist with the interior search.



Example of balloon framing using full dimensional lumber. Note windows that are vertically aligned.

Construction Era

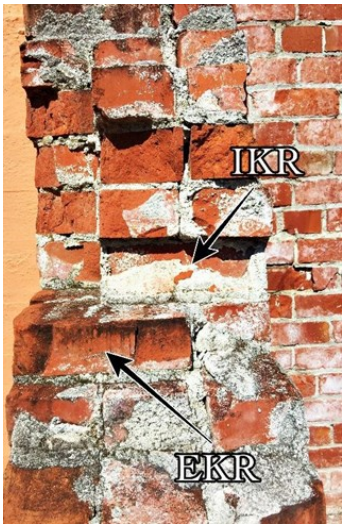
Knowledge of building eras can indicate differences in building materials, special hazards, fire behavior, floor layout and structural integrity under fire conditions. Structures built prior to the "new" national wood standard (1924) used full dimensional lumber studs, rafters, floor joists, and tongue and groove (T&G) floor decking. These

materials held up considerably longer under fire conditions compared with engineered wood products of the mid 1980s.

1880s-1930s: This era is typified by balloon frame Type V construction. Balloon frame construction is easily recognizable due to narrow windows that align vertically with each other. In colder climates the chimney is in the middle of the house/roof. In balloon frame construction there are no fire blocks within the walls, which leads to rapid fire extension from basement to attic or vise versa. The attic is commonly converted into living space. Window entry search should be considered to access upper floors due to narrow and difficult to locate staircase access. When searching, expect narrow windows, doors and stairs.

Note tie plates in place as well as the arched spandrel above the upper window. A lintel can be noted above the double windows to provide reinforcement and serve as a small header.

Pre-1933: Unreinforced Masonry (URM) To search aggressively, you first must be aware and recognize the structure's dangers. URM has the potential for early collapse, due to no rebar, no lime in the mortar and fire cut beams. These structures are recognizable by King Rows (Both interior & exterior) every seventh brick stack, tie plates (Star Shaped), deeply recessed windows, arched and flat spandrels, and window lintels which can be wood or steel.



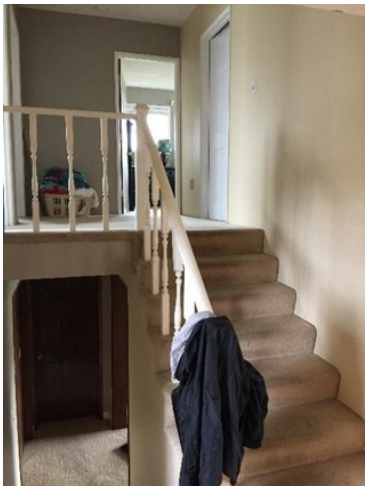
Post 1945: Post war construction. During this period interior wall coverings transitioned from lathe and plaster to drywall. Lathe and plaster creates a bigger challenge for both wall breaching (for refuge) and wall anchoring (axe handle or Halligan) for bailouts or victim belays.

Late 1950s: Hollow core doors were introduced in the late 1950's. This eased interior forcible entry but also affected interior isolation for search. A UL analysis of changing residential fire dynamics study showed a hollow door will

burn through in approximately 5 minutes when isolating a room with a well vented fire.

Mid-1980s: The introduction of engineered trusses has allowed for larger spans and the "open concept" of homes. Performing the traditional left/right hand wall search to maintain orientation in "open concept" homes will leave large areas not searched, compared to the legacy compartmentalized homes which have smaller rooms. Staying on the wall in these structures can potentially increase fire fatalities due to missed victims

Residential Styles



Split-level (tri-level): These homes will have two sets of stairs parallel with each other, oriented from Bravo (side 2) to Delta sides (side 4),one going to floor two and one set going to the basement. The stairs are typically to the left or the right within a few feet of the front door (dependent on door orientation to the two story section). A tri-level home will have a garage that leads into the kitchen, dining, or living room on the main floor. The daylight downstairs will have a family room, bedroom, laundry and a bathroom. The upstairs can have a large landing with three bedrooms and a bathroom.

Size-Up the below tri-level from just the Alpha side (side 1). Main Level: Due to the small front window - suspect the kitchen (most likely the sink) and a dining area off the

garage towards the front. Likely, a living area on the main towards the rear, due to knowing tri-level layouts and chimney location. Floor Two: the window size and

layout indicates the top left window leads to a bedroom and top right window leads to a bathroom, a fogged window and plumbing vent pipe being the indicators. Basement: the window size and knowledge of floor layouts indicates the bottom left window leads to a bedroom. The bottom right window is clear but has a dryer vent near by (which cannot be seen in the picture), and knowing tri-levels generally have a bathroom downstairs which is stacked for ease of construction, indicates a bathroom with laundry built in.

Split-entry (bi-level): This type of home will also have two sets of stairs that are parallel, these are usually oriented from the Alpha (side 1) to Charlie sides (side 3) . The front door opens to a small foyer with the stairs starting from here. One set (typically the side towards the garage) leads downstairs while the other set leads to the main living area on floor two. The downstairs will have access to the garage with a short hallway, laundry room, bathroom and medium sized room that could be used as a bedroom, office or family room. The upstairs typically has a living room, dining room, kitchen (on one side of the structure) and three bedrooms and a full bathroom (on the opposite side of the structure.)

Size up the above split-entry home from the Alpha side (side 1) only. The single chimney and large window with a low sill height, will tell you that the living room is toward the Bravo side (side 2) of the structure. The clear windows on floor two, which would meet code for egress and a lack of a plumbing vent on the roof indicates bedrooms toward the Delta side (side 4). The Alpha side (side 1) basement window, due to its size and operability does not provide proper egress, this indicates it is a probably a living or family room.

The Exterior

A 360 will assist in locating civilians presenting from decks and windows that may need immediate rescue. It

will reveal yard, building, layout, smoke and fire conditions, possible fire location, and gives the ability to size-up the building itself.

Understanding common building layouts, and being able to identify them from the exterior will assist in formulating a search pattern; if and how the crew will split and clues to search priority, i.e. bedroom locations. Layout can also indicate firewalls, fire doors and stairway locations. The greater the footprint and number of floors, the greater the need for resources to be assigned to primary search. Firefighters staying oriented during search is dependent on understanding the layout of the structure you are searching.

Yard, Porch & Deck

The condition of the exterior is a good indicator of likely conditions of the interior. If you encounter hoarder conditions in the yard, or neglected building maintenance, you can expect the interior to have hoarder conditions and poor building maintenance as well. Hoarder conditions may include beds in the front room, high piles of storage, garbage throughout the house, and no working smoke detectors.

With the likely hoarding conditions on the interior, the conventional search access, patterns and techniques may see a drastic decrease in efficiency. Access through multiple doors and windows to target high probability areas should be considered. When performing window entry search in these conditions, be aware that doors may be missing or hoarding conditions may not allow for the door to be closed, making the room difficult to isolate. Hoarding behavior should also prompt the crew to identify window and door locations for emergency egress.

An outside ramp to a door can indicate a disabled or bariatric occupant is trapped inside. Raised front steps or small light windows in the foundation can be signs of a basement.

Smoke & Fire

Reading smoke and understanding fire behavior is paramount for an effective, efficient and aggressive primary search. Being able to read interior and exterior smoke characteristics will assist in locating the seat of the fire and increase crew safety. Primary search priorities can be identified by predicting fire progression and finding the most hazardous areas for potential victims. (Read David Dodson's: Art of Reading Smoke)

Roof

A pitched roof that can easily be seen from the ground can indicate room location and layout of a structure by allowing the visualization of ques such as plumbing vents, chimneys, skylights and/or dormers.

Plumbing Vents: 1 1/2” - 2 1/2” diameter black pipe coming from the roof (Red Boxes) can indicate bathroom and kitchen locations.

Chimney: A house with only one chimney will indicate where the family or living room is and a one story house with dual/tri flues can indicate a basement. Confirm this with a 360 (Yellow Box).

Skylights: Skylights can be found in most types of rooms to increase natural light but are not common in bedrooms due to the need for controllable light for sleeping.

Roof Pitch: A steep pitched roof along with gable windows or dormers can indicate living space above, exterior access by way of a ladder can decrease the time for victim location.

Exterior Walls

Determine the number of units, building layout and room locations by indicators from the exterior wall. There are many large residences across the country that have been converted to multi family dwellings. From the street side of the house there may be no indicators of multiple residencies until the utility meters are spotted. Each unit would have its own power meter. Locating and counting the mail boxes, electrical/gas meters and addresses or room numbers are indicators of the number of units in the structure. A dryer vent indicates laundry or utility rooms.

Garage Location

The garage in ranch style homes are typically located on the opposite side of the structure than the bedrooms.

Exterior Doors

Front doors typically swing towards the bedrooms and enter into a foyer. The main entrance typically leads to the stairs, the family room, kitchen or a hallway which leads to the bedrooms. Garage man doors open into kitchens, utility, laundry, and family rooms. Slider doors open into either kitchens, family or master bedrooms.

Windows

Windows can be one of the prime indicators of building layout, room location, and access/egress. Noting security bars on windows and doors prior to your search can determine rescue and emergency egress locations. When windows are on corners, look on the adjoining wall for another window in the same room, which can help confirm room type and layout.

Window Accessories: Windows with either blackout blinds or air conditioning units which both comfort people during sleep, can be evidence of bedrooms. Seeing hair products, kids toys, or dish soap in the window sill can also be indicators of the room type.

Bathrooms: Bathroom windows are typically smaller, have a higher window sill and are fogged for privacy, they are not governed by code for an egress window. A single family multi-story home with evidence of two or more bathrooms on the first floor can indicate a master being on the main.

Basements (over 200 sq./ft) and All Bedrooms: The bottom of the egress window opening can't exceed 44" from the finished floor. The minimum egress window opening height is 24" high, and the minimum egress window opening is 20" wide.

Bedrooms: Typical window sill to floor height is 24" - 36" depending on code. Building codes in response areas can differ and require various egress window sizing and distance from floor. The size and floor the window is on is easily identified from the exterior. Window sill to interior floor height is also identifiable and is good to note prior to head first window entry.

Living Areas: Family/Living room windows are typically larger in size (60" in height) and have sills lower to the floor (20") to increase the view and light.

Windows : Windows aid in sizing up rooms that are isolatable (having a door - bedrooms and bathrooms). The ability to isolate the room can be crucial, for the civilians, firefighters on the interior, and the flow path. A non-operable window on floor two, that is inline with the front door can be a warning that it is a vaulted entry, breaking this window and attempting a window entry search can negatively affect the entire fireground.

Prior to window entry search, be efficient and size-up for interior door location. In bedrooms, doors are in or within a few feet of the corners. Bedrooms that are on outside corners of the structure will typically have interior doors on the inside corner. Midspan or non-corner bedrooms will have interior doors that are typically placed on the far side of a wall from the living areas. This knowledge can decrease the time for room isolation.

Prior to performing window entry search on a McMansion, understand that the bedrooms are typically grand and may have two sets of double doors. One set is the main entry to the room and the other to the master bathroom. Master bathrooms in these large homes can have multiple doors themselves, his and her closets, toilet, single or double to the bedroom itself and possibly a powder room.

Stairs

Having prior knowledge of building construction, type and era within your area, along with sizing-up windows can assist in locating interior stairwells. A window that is not in line with the others and seems to be in between floors can indicate location of the stairs (this only happens on outside wall stairwells and typically on the Bravo (side 2) and Delta sides (side 4). This finding tends to span multiple eras.

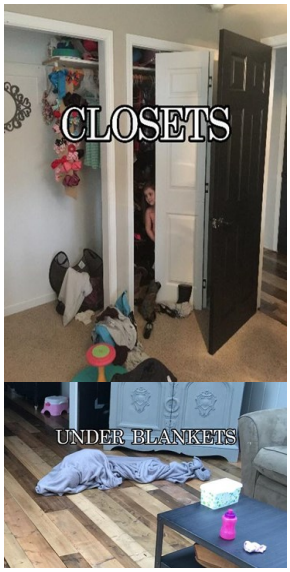
The Interior

Above we covered the importance of a Search 360 and how it can decrease time to locate victims. We also discussed how yard, building, smoke and fire conditions may influence our search. The importance of sizing-up the building itself and to pay attention to the details. Knowing specific building styles in your area can lead to a successful search. Below will focus on the interior. Specifically, it will go over human behavior sizing-up interior conditions, construction and floor plans.

Civilians and Victims

Victims' survivability is dependent on search priorities, techniques and actions. According to a report at www.FirefighterRescueSurvey.com, 40% of structural fire victims are found in the bedrooms and 17% are in major arteries including stairs and hallways. NFIRS reports that 3% are attempting some sort of rescue, 3% are trying to extinguish, 36% are trying to escape (usa.fema.gov).

Human Behavior: Civilians tend to head directly towards the main routes of egress during general departure or emergency escape. Victims that are unaware of the fire or trying to self-evacuate can be overcome by smoke, leaving them slumped over in chairs, lying in bed or on the floor near windows, doors or in the main pathways to egress.



Children tend to go to their “favorite” spots; bedrooms (own, siblings or parents where it’s safe), under or in their own bed or closets. If they cannot retreat to their room, they tend to stay at ground level and hide in other familiar spots; low large cabinets, in blankets or clothing piles and places they play and spend most of their day.

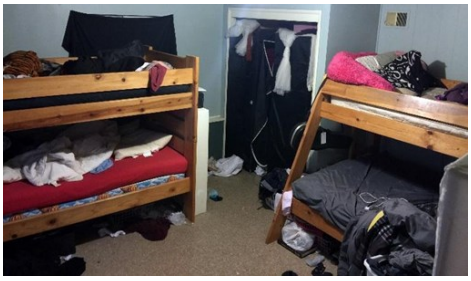
When responding to buildings in your area that have had multiple false fire alarms, the crew should have a heightened suspicion for increased victims due to resident complacency to the frequent false fire alarms.

Victim Body Orientation: When the search company finds an adult occupant, observe the body position which may indicate direction of travel. A victim that has become incapacitated and was heading away from the main entry or egress, was potentially heading to rescue loved ones.

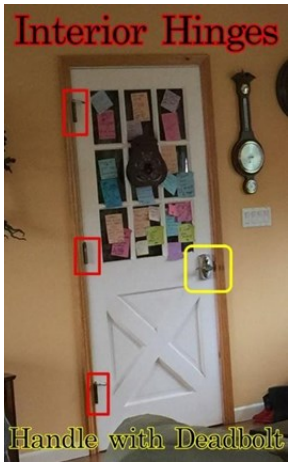
Interior Conditions

Conditions need to be continually sized-up, observe the behavior of the fire, heat and smoke. The search position height is dictated by heat, but the position is chosen, due to its ability to amplify sound, maximize visibility and remain efficient (search position will be covered below). Getting below the neutral plane can allow the search crew to see; LIFE, FIRE, and LAYOUT.

Rooms: Finding objects in a room such as small furniture or toys can indicate that children may be present or you're in a child's playroom or bedroom. This information can assist in where you may look or be more diligent in sweeping, such as under beds and in closets.



Furniture: Bunk Beds typically have a bottom twin (38 inch wide) or full size (53 inch wide) mattress with a twin size mattress on top. When you come upon a twin or full size mattress, reach up and in for bunk beds.



Construction

Knowledge of interior building construction (i.e. doors, windows, and floor coverings) can assist firefighters in search prioritization, orientation inside the fire building and locating areas of refuge or egress.

Interior Doors: Characteristics of interior doors can indicate the type of room you are about to enter. Knowing what type of room you are about to enter, is relative to how you will search and if it has a potential egress window or door.

Doors that swing towards the main interior of the structure typically lead to stairs, closets, pantries, a garage or the outside. If it also has a deadbolt or lock it is likely opening to the outside or a garage. These can warn the crew of an elevation change on the other side of the door threshold.

Basement doors can swing inward or outward.

Doors that swing away from the main interior and into the room, are usually bedrooms and bathrooms. This can indicate rooms with windows for a place of refuge or egress.

McMansion (5,000 square feet or larger home): A set of double swinging interior doors down a hallway or on an upper floor can indicate a master bedroom. A master bedroom that could be 600+ square feet including a master bath and closet. The large square footage may lead to the decision to do an oriented search or to have two firefighters search the room.

Windows from the interior perspective: Operable residential windows with greater than 72 inch outside grade to sill height, have a code minimum interior floor to window sill height of 24 inches (IRC)/ 36 inches (IBC). Building code knowledge can assist in estimating outside sill to ground height, in case of victim rescue or emergency egress.

In low visibility conditions finding a floor HVAC register can indicate a window above. When in front of a sliding glass door the register is placed on the non-operable side. Being aware of windows and doors assists in crew orientation, rescues and egress.

Floor Coverings: Understanding typical room flooring can assist search crews in staying oriented. Being aware that you are entering another room and the type of room you are entering, will assist you in staying oriented and how you search the room. Feeling a floor covering change will give you a heads up that you're transitioning into another room.

A concrete floor or subfloor in a residence can indicate you're on floor one, in a garage or basement. Sizing up the structure before entry and knowing your area's building construction norm, will

assist in knowing if there is a slab foundation or a basement. Bedrooms, living and family rooms are typically carpeted. Foyers, kitchens, laundry and bathrooms are expected to be wood, tile or linoleum to hold up to heavy traffic and damp conditions.

Floor Plans: Building layouts are comparable with one another within a region, occupancy type, and era. If you're searching above grade floors in multifamily structures, preview the floors below to get an idea of the layout. This will assist in search efficiency and orientation.

Multifamily dwellings typically have common walls between units, this leaves minimal outside wall real estate for each unit. Per window egress code requirements, every bedroom is required to have an egress window. This pushes bedrooms to the outside walls, leaving little to no outside wall space for other rooms to have windows. Family or great rooms will be the next most common rooms to get a window or slider door in multifamily dwellings that do have more outside wall space. This knowledge will assist search crews to identify high probability entry points and the floor plan of each unit.

Stairs: When in low visibility and you come upon a "coat" closet, reach up and feel (tool or hand). A sloped ceiling can indicate your actually in a stairwell location.

Residential Search Size Up Summary

The purpose of this document is to convey the diversity on what a systematic and complete residential search size-up may include. The information in this document should assist our crews to search based on educated decisions, resulting in rapid victim location and removal. We should have the knowledge and ability to perform a continuous size-up, identify search priorities, locate access and egress, and increase our crews orientation within a structure fire.

SEARCH TECHNIQUES

Making Entry for Search

When making initial entry, do an interior size-up. Sweep wall to jamb (touch the jamb behind the door, this will ensure a complete sweep) extend your full body length into the structure to evaluate for LIFE - FIRE - LAYOUT. This sweep and size-up starts our search. If the door is obstructed from opening all the way, reach around it with a hand to determine if there is a victim behind the door. When making entry ahead of the hoseline, the search team will make entry and control the door.

LIFE

- Call out “Fire Department, anyone in here” and hold your breath & listen
- Scan for victims with your eyes
- Sweep for victims with your hands

FIRE

- Look for the glow
- Which way is the smoke moving?
- Listen for the crackling of fire

LAYOUT

- Look for signs of the layout; stairs, hallway, furniture, etc.

Search Position

Ray Lewis (Baltimore Ravens - Retired) was one of the NFLs all-time greatest linebackers. Ray’s success was due to his ability to size-up his rivals, adapt his position and overcome his enemies strengths, and prey on their weaknesses. Primary search is influenced by the ability to size-up our enemy. Capitalize on our known strengths, our enemies weaknesses and adapt our body positioning.

Our civilians' survivability is dependent on time, in which time is determined by us and our actions. To be both efficient and effective, the search must be hasty yet thorough. Exploit the known characteristics of fire behavior, and occupy the space below the neutral plane to size-up LIFE, FIRE and LAYOUT. Your body position should place the ears where sound is farthest traveled, the eyes where it is most visible and place the hands where the victims are. The lower we are, the thinner the smoke and the easier it

will be to see and hear our victims, along with communicating with our crew. Within our own department, we have walked during a moderately smoked out environment and stepped on victims, only to be found later. Get on the ground!

"*Inches of visibility are worth miles of work*" - Brian Olson.

Body Positioning Matters

The search position *height* is dictated by heat, but the *position* is chosen. The position is chosen for its ability to amplify sound, maximize visibility and remain efficient.

The denser the smoke the eyes and ears are occupying, the more suppressed the senses become. These suppressed senses decrease the crews' ability to locate an egress, communicate and to see, locate or hear victims and downed firefighters.

Down On All Fours (Crawling): This technique has traditionally been the "norm" and what the textbooks and our recruit academies taught and engrained in us. So why did they teach us this? Because, it's an efficient way to stay low and move throughout a low visibility, high heat structure. It's just not always the most efficient and effective way to search.

The number one priority on the fireground is LIFE. Even though crawling is an efficient way to stay low and move, this position forces the eyes down and is counterproductive to the assignment. You are unable to monitor conditions above, causing the searcher to stop and sit upright to visualize overhead. To make the primary search a success, we need to move with haste and be thorough.

Crawling is dependent on all four appendages to continually hold up and balance the body. When one is crawling and lifts a hand to sweep, the balance must be adjusted or the body will tend to follow. Opt to not sweep, and the ground covered in one pass becomes inefficient. If you come upon below-grade stairs or a compromised floor while on all fours, the center of gravity can lead you into the hazard. Crawling tends to open up the palms for burns and trauma, which we need for ourselves and THEM. There may be times we crawl, typically in more cluttered homes, small spaces or over beds.

Upright On Two Feet (Walking): When the conditions allow, this can be a quick, sturdy and effective position to use. Ever heard, "If you can see your feet, then walk". It isn't my feet that I am worried about, it's what is beneath them that matters.

The distance of vision in a standing position is greatest when looking straight down towards your feet, it decreases as the eyesight rises. Being able to see 5 feet down to your boots, does not equate to the same visibility as 5 feet in front of you. In low to zero visibility, firefighters that are standing are slow and use their hands to navigate walls and furniture and concentrate on not tripping on objects, which hinders them to be able to effectively search for victims. If you can visually identify all objects in an approximate 10' area around you, then walking upright is typically performed. Walking during moderate, low or zero visibility is jeopardizing civilian lives.

The Tripod-Position: A firefighter that trains with this technique can be efficient and search a structure with nearly the same speed yet is more effective than one can on their feet.

The tripod position keeps your center of gravity low and to the rear, which creates a stable and balanced stance. The position leads with a foot and a tool (typically a Halligan) which increases stability and situational awareness. The foot and Halligan head (adz & pike) can give warning and increase time to react, to compromised floors and step downs such as below grade stairs.

The tripod position can cover more square footage per pass and increases efficiency. The position allows the use of both hands to search. If the conditions warrant, transitioning from the tripod to a body sweep can be fluid and maintains an efficient search. Visibility is maximized for the environment by getting low and naturally keeping the eyes up to scan for victims, egress and monitor the conditions.

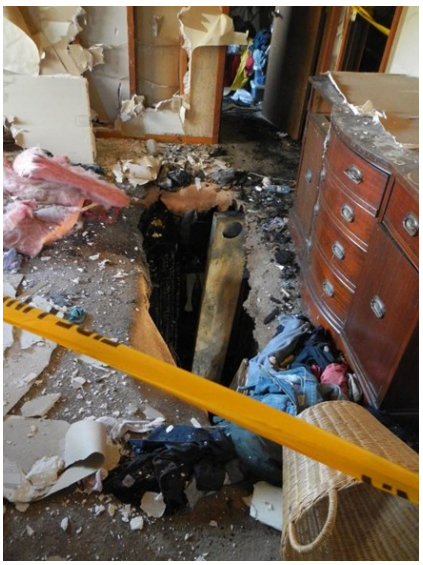
Body Length Sweep/Search

In low to zero visibility, high heat searches, sweep the entry and egress to do an initial check for victims. This will increase the probability of finding the 42% of victims that collapse in the immediate path of egress. *(NFIRS Data - Fatalities Only)*. Ten percent of all structural fire victims are within six feet of a door according to a study by

www.FirefighterRescueSurvey.com. We want to look at avenues of egress, hallways, doorways, behind doors, etc. Adults will try to escape or save their children. If you find an adult, always sweep around to make sure they were not carrying a small child.

Upon forcing access or egress, complete the assignment and perform a full body length sweep and size-up; assess LIFE, FIRE, LAYOUT.

Observe the floor plan of your own home and all the homes you have been through. What are the chances of being able to perform a full length body and arm sweep in the bedroom, bathroom, kitchen or laundry room, and not hit anything? The probability is low, within that space is a bed, nightstand, dresser drawers, a clothing pile, tables, chairs, couches, or another wall. If rooms are typically crowded with furniture and debris and can be reached with a body length search, why sweep with a tool that has no feeling? What if there is something soft or hard struck by your tool, what then? Be efficient, stay oriented, come off the wall and use both hands to feel for victims.



On March 3rd 2015, we were searching above the fire on floor two in low visibility. As I lightly forced an interior door, I was walking and took two steps. The carpet was initially intact and the floor gave way beneath me. I landed on the floor below. It happened so quickly, my partner did not know what happened. If I were on the ground searching, I may have felt that the floor was compromised. See picture above.

Swinging a tool to search for humans is not acceptable. When you strike an object, you still need to go investigate with your hands. The more sweeping performed with a tool, the quicker and greater the shoulder fatigues, which results in less control. To be proficient, you must have realistic training. Every firefighter knows what a human feels like with gloved hands, second nature matters when seconds count. We will not sweep our tools for victims, we search with our hands.

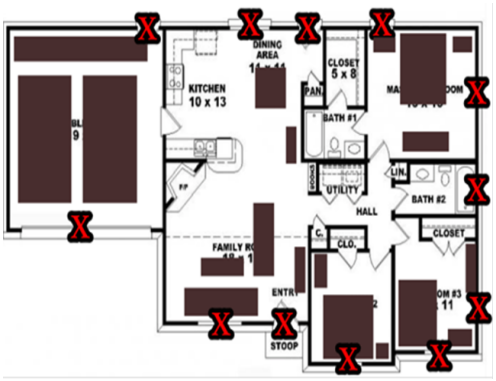
Maintaining Orientation - Getting off the Wall

While searching, it is imperative to get off the wall and search into the room and cover more area with our hands. Our eyes, ears and hands are the most effective way to locate a victim. Civilians do not just stay on the wall, so it is imperative to search the whole area. We stay oriented with a continuous size-up, staying aware of the

occupancy, layout, era, square footage, type of furniture, and all other relevant factors.

We do not maintain physical contact with one another while searching. Our training, experience and environment, dictate how and why we spread out and cover the room/ hall/floor as a crew. By spreading out, we reduce the time it takes to locate the victims and complete the search. We stay "SAFE" by staying oriented.

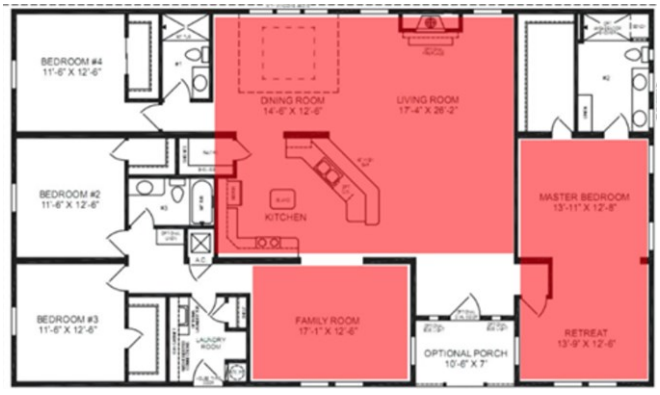
Residential structures have multiple access/egress openings on most sides and on every floor. In a residence we are typically only a few feet from a window or door from which we can make egress when in trouble or with a victim (see diagram below).



Learn how to be oriented and teach other firefighters that when searching they shall not be in contact with one another physically. A rope is typically not the answer for orientation (it's more of a hazard) and firefighters don't have to keep a hand on the wall at all times. This can slow our search and can confuse our egress when trying to make a rescue.

Fire departments teach to keep a hand on the wall to locate doors and windows, if we are oriented we will locate them without a constant hand on the wall and we can use that 2nd hand to search for victims.

The average single family home being built by contractors in 2013 was 2,886 square feet (source: census.gov). The house plan below is for a 2,700 square foot single family dwelling. There are 3 specific areas within this floor plan that require search crews to leave the wall to complete a search for civilian life. This area is approximately 1591 square feet or 52% of the structure. A small percentage of this area would be searched if you were to maintain contact with a wall, and there are large areas that would not.



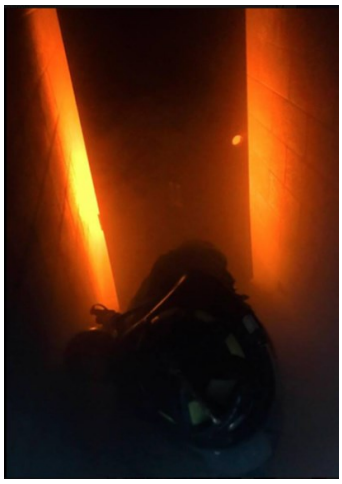
Companies of four firefighters may elect to split the crew into two teams (Team A/ Team B). Splitting the company will allow for two tactical objectives at once, or completing the same objective in less time.

"All in for Search" with a 4 Person Crew

When "All in for search", the crew typically splits into Team A/Team B. The two crews must formulate a plan to coordinate their search efforts, to reduce the possibility of redundancy or missed areas. One team will identify as the "inside" crew and the other the "outside" crew.

When searching *ahead* of the hoseline - The "inside" crew searches for the fire, isolates and communicates location to fire attack (Locates - Isolates - Communicates). In unison, the "outside" crew performs a targeted search.

When searching *behind* the hoseline - The "inside" crew makes their way to fire attack, typically communicating that fire attack has the fire area for search and then searches back. In unison, the "outside" crew performs a targeted search.



Isolate (Rooms or Fire)

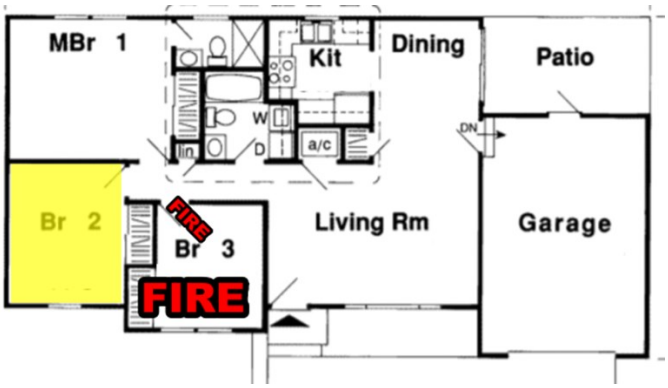
While performing search, fire may be down the hallway coming from an adjacent room. Our objective would be to confine the fire to the room of origin, accomplished by isolating the fire from the rest of the structure.

When initiating a search by window and are met by fire in the hallway, making the hallway untenable for search, isolate the room from the fire. Isolation can be accomplished by closing a door, removing a door from another room or closet or using a mattress. When isolating with a removed door or alike, we must hold the door up so the pressure does not knock it down. We can accomplish this with a hook.

From our experience and research conducted by UL Firefighter Safety Research Institute, we know that isolating fire can be beneficial to civilian lives, their property and firefighters.

Example: We arrive at the following one story single family dwelling and are assigned to search with a crew of four. We split the crew with Team A going through the front

door (the main path of egress) and Team B starts their search through a window of bedroom 2 (a targeted search).



Team A decides to start a search at the front door because they are making access for Fire Attack, searching the main egress and working in unison with Team B to complete a search on both sides of the fire.

Team B initiated a search through the window of bedroom 2, targeting the bedrooms where 42% of our victims are. On their size-up they saw that the fire was in bedroom 3 and could be cutting off the egress for victims beyond the fire. The first firefighter goes straight to the hallway threshold and performs a sweep for victims and assesses LIFE-FIRE-LAYOUT, while the second firefighter searches bedroom 2. As the firefighter is sweeping the hallway, they confirm the fire location in bedroom 3.

What is the priority after locating the fire?

The firefighter isolates bedroom 2 or may decide not to so they have improved communication within the crew. The firefighter grabs the hook, reaches bedroom 3's door (the fire room) with their hook and isolates the fire. If the fire room is searchable, then do so. This isolation slows the fire's progress and hinders it from reaching the hallway and spreading further for a short amount of time which buys time for Fire Attack to stretch their line to the interior for extinguishment. The isolation of bedroom 3 increases the searchable space within the structure, improves conditions for possible civilians and firefighters and decreases property damage from smoke and fire.

Key point: When we initiate searches from windows, it is imperative to teach and learn that we don't always just isolate the room we are in but we isolate the fire when possible. If that firefighter did not isolate the fire in bedroom 3 and instead only isolated bedroom 2, the fire would grow into the hallway and beyond. The "Close the Door for Life" and "Close Before You Doze" campaigns are telling our civilians to isolate, therefore, we should do the same.

"If we are going to educate the public to isolate themselves, we must fulfill our promise and prioritize search and be able and willing to."- vententersearch.com

Vent for LIFE

Venting as we search, can improve our efficiency and effectiveness. Venting during search improves the conditions, gets lift and reduces the toxins for our victims. If a victim is missed during a search, the ventilation will help them. When we vent while searching, we need to know how it will affect the fire. Either *isolate* the room or *know* the fire has been knocked down. Maintaining situational awareness as we move throughout the building is vital. Listen to radio traffic from Fire Attack. Is the fire being overwhelmed? Is the fire making a run? Are our masks getting condensation due to Fire Attack putting water on the fire? Are we able to isolate the room we are searching?

There are no absolutes but here are some loose guidelines for venting windows while we search:

High visibility: Leave the window intact.

Moderate visibility: If the lock mechanism is easily visible and manipulated, open the window and push out the screen.

Low to zero visibility: Break out the window and the screen. When venting while we search, we will typically leave the sash intact.

Search is all about reducing our time to our victims. Search puts a high demand on our energy and cognition. If the sash is wood, then it is easily taken while we take the window and takes up little to no more time nor energy. A metal sash distorts and can be removed, but with more energy and time. Vinyl windows are tough and take a good amount of time and a lot of our energy. If we were to take every sash, it would take up too much time. Our purpose of taking/opening windows is to vent for LIFE and get lift to improve our search. If we are in a situation where our comfort levels are being met, due to the fire intensity, then by all means take out the sash. But if we continually monitor conditions, the fire, and fire attacks' progress, we will not be in situations that cause us take every sash. We bring the Halligan into the room to break a window. We leave the Halligan outside the door when conditions are good enough to just open the window. Look out a window that you vent to orient yourself and note ladders that have been thrown.

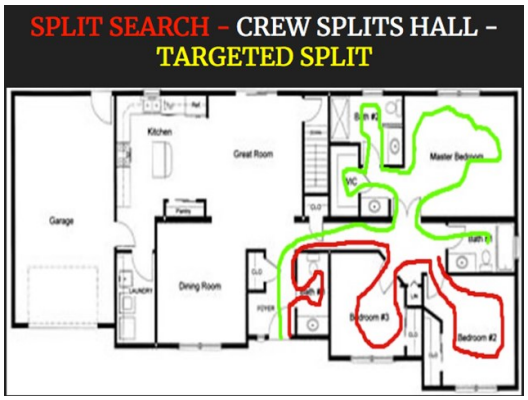
Clear communication within the crew and coordination by the search group can improve efficiency of our search. Communicate before and during to identify which rooms have been searched. The idea of marking doors has problems. The chalk in your pocket is hard to grab with gloves, the chalk breaks, it takes up time to mark a door. Even if the crew was able to accomplish this task, 77% of our victims are located in low to zero visibility, making it nearly impossible to even read a marking on a door.

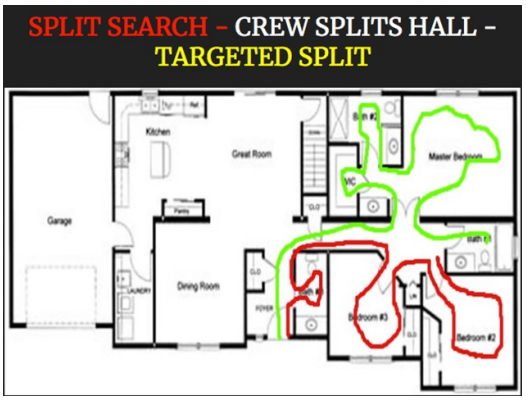
NON-ANCHORED SEARCH

Split Search

This is a common practice and the preferred type of search. Split search is typically performed when at least one of the following three factors are present: favorable conditions, good crew continuity, or fire attack is in place. Splitting the crew cuts the search time in half and allows civilians a greater chance of survival. Split search provides the highest percent of survival rate out of all the types of search (41%).

Rarely would a crew send one member to one floor and another member to a different floor, this does not save time and if a member is in need of assistance or finds a victim, the crew is too far apart to be efficient. (Reference the two diagrams for a visual on what a split search looks like).





Example: Fire attack stretches a line through the front door and through the main path of egress, instead of pulling lines to the Charlie side. This line placement allows fire attack to start a search for civilians and protects potential victims and the search crew. They place the line between the fire and the searchable space. As the Fire Attack team gets the hose in place and a knock on the fire, the heel can peel off and search the adjacent area (yellow) with the protection of the hoseline. As the fire gets further knocked down, Fire Attack will then search the fire area (red).

The Search crew (FF1 & FF2) have the experience and knowledge that the hoseline is their protection and is between them and the areas to be searched. This allows them to perform a split search off of the hallway. They target the bedrooms due to the high probability of civilians (42%). The firefighters simultaneously search the two bedrooms and stay oriented by their initial search size-up.

They will enter the bedrooms independently, isolate the room and ventilate. If visibility is low/zero they will bring their Halligan in and take out the window, yet leave the sash intact. If the visibility is moderate to high, they can manipulate the window lock, open the sash and push out the screen in seconds. They will leave their Halligan in the hallway so they can search with both hands. The search will start on the bed due to those victims having a higher risk in the elements. When they finish searching the room, they will exit and isolate the rooms by closing the door. They will then meet in the hallway continuing to split search the house.

Oriented Search

Oriented search is when one member is coordinating the search. All members need to stay oriented, but during "oriented search," the lead is "oriented" to the progress of all members searching, fire conditions, and is responsible for any radio traffic for the team. The traditional oriented search would keep one firefighter at the threshold of a room that is being searched, while another member searches the room/apartment. Oriented Search is ideal during a large area search of adverse conditions coupled with an inexperienced crew.

The diagram shows a public hallway apartment building with a three firefighter crew. The red represents the "oriented" firefighter, while the green is firefighter one and the purple is firefighter two which are searching simultaneously.

Window Entry Search

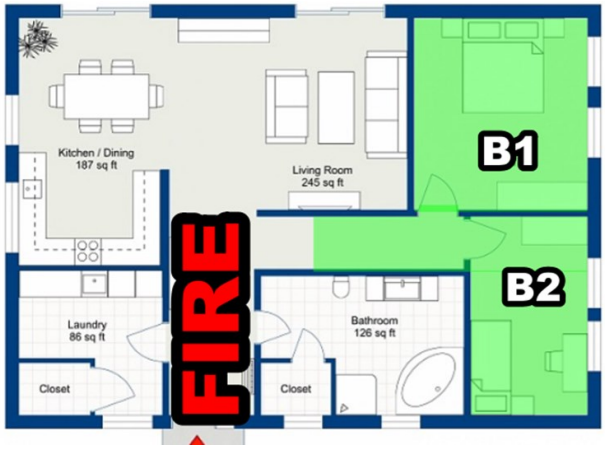
Firefighters are placed in an advantageous position within the building when entering through a window. This can increase the probability of victim location, while reducing the time of rescue. Stairs can be difficult and time consuming to locate, while windows can be quickly accessed and assist in identifying the type of room we are about to enter. Stairs can be burnt out, dropped power-lines or fire can block access, increasing the need for searches initiated from windows. When searching from windows is favorable to our search, then the crew will make that decision to do so.

Clackamas Fire expects firefighters to initiate searches from windows anytime it is advantageous for the search, we do not need reports of victims to perform this tactic. (See Window Entry Search CPS for the specifics).

Typically both firefighters make entry into the window. Two in the window improves communication when we find a victim and decreases our time to rescue and removal of civilians. When the room we are entering is abnormally large, to reduce the time to complete the search the firefighters can split the room. Searching "Beyond the door" is our goal, we will continue the search beyond the initial room when possible. If unable to enter through the window due to severe smoke and heat conditions, probe the floor area immediately inside the window with your hand for a victim and communicate conditions with command.

We will enter any opening for any type of room that is advantageous to the assignment. Size-up the window and look for other clues, to assist in identifying the type of room we are about to enter.

Example: Engine 301 is assigned Fire Attack, Engine 302 is assigned search. As Engine 301 is pulling lines and making a push, search is being delayed. E302 decides to split the crew and send Engine 302 Team A to initiate a targeted search. Team A initiates a search by window on the delta side, to target search the bedrooms (victim probability of 42%). There are two bedrooms on the delta side, one that it



is likely the master (B1) due to it being towards the Charlie side. We prioritize B1, because in our experience, if a bedroom is going to be occupied, the master is typically used first, as in if it's a house lived in by a single person or a couple.

Team A makes entry with two. Why? If they locate a victim, they will most likely need help. If we leave one outside and it's low to zero visibility, then yelling directions from the window will fall on deaf ears, due to the density of the smoke, preventing or mumbling your voice and adding confusion.

When assigned to Search, it is implied that a search of the structure will be *complete* - our plan is to go beyond the door. The first firefighter will go to the hallway and assess LIFE-FIRE-LAYOUT, isolate B1 and remain in the hallway if they can. The 2nd firefighter makes immediate entry and searches B1. When the 2nd FF finishes searching the room, they meet up with their crew in the hallway. They cannot extend the search beyond the hallway due to fire which Fire Attack is starting to apply water to. The crew or one firefighter searches B2, isolates and ventilates. Prior to exiting the structure to find another way in to complete the search conditions are noted to have changed when Fire Attack gets a knock on the fire. This allows them to continue down the hallway and coordinate their search efforts with Engine 302 Team B.

Keypoint: The search crew was oriented as a crew by having a good search size-up, monitoring conditions and were efficient due to only having to make entry once and were able to extend their search throughout the structure because they took the time to notice Fire Attacks progress.

Large Area/Disorienting Search

This style of search is performed when our size-up shows adverse conditions, and unusually large building or a difficult or bizarre floor plan. A rope or a hoseline can be used to “anchor” our search, but in most cases it will be a rope that will be secured to a point outside the IDLH.

The search size up should lead you to the high probability areas first. In large areas the locations of victims can vary drastically. A good search size up, knowing occupancy type, human egress nature and building knowledge will be paramount in doing the most good for the most people.

When searching in large areas, crew management is key. If resources have allowed for multiple search crews, communication between the crews is important to avoid searching the same areas and getting a complete search accomplished. Making entry

on multiple sides and entrances of a large structure will reduce the chance of "getting too deep". If this is the case, consider a Search Group Supervisor.

Secondary Search

The secondary search is a thorough and painstakingly complete search for life in all areas that required a primary search. In addition, the secondary search must also include the entire outside perimeter of the building and all shafts, basements, cellars, elevators, roofs, etc. Its purpose is to ensure that no possible victims are overlooked. Time is not as important as accuracy. This search shall be completed before any extensive overhauling of the fire area is attempted. It must be performed by a different company than the company which performed the primary search.

SEARCH TIPS

- When calling out for victims, hold your breath, listen and don't move. (approx. 3 sec.)
- When using a TIC, scan and then search. Do not move while looking through the screen, you have a narrowed view and poor depth perception. Tunnel vision can happen when continually looking through the TIC, which can delay us from noticing a change in smoke conditions.
- TICs can not see all victims. They do not see heat of victims under blankets, drywall, etc. Do not over rely on the TIC to clear an area, unless the area is wide open without obstructions, such as a gymnasium.
- When you locate a victim, sweep for other victims around the area.
- When a victim is located and removed, complete searching the same area that you located the victim. ex: When we locate a victim on a bed, go back and continue the search with researching the bed.
- Try not to move furniture. Furniture can assist in orientation and if moved may cover a victim, threshold or door.
- Locked doors get forced and the room gets searched, bring a tool.
- If the night latch chain is in place, this indicates a strong possibility of victims.
- Sweep under beds with an arm and your eyes.

- When you locate a bed, reach above to check for bunk beds. Search beds high to low. The higher they are, the worse the conditions.
- Roll cribs to the ground to search.
- Thoroughly search and sift all piles of clothes (do not move), draperies, or bed linens.
- Get on top of beds, sweep and sift from corner to corner, stem to stern (do not pat). We are feeling for weight and contour. Sweep between the bed and the wall.
- Ventilate while searching if: coordinated with fire attack, fire is under control or you can isolate the room.
- It is imperative when searching in anything less than high visibility, that the search crews get down on the ground, where the victims are.
- No one should say "that room is searched, you don't have to go in there."

"Don't let our EGO get in the way of a good search. I don't care how many teams the chief wants to search an area, I am never going to say I am positive that there is no baby in that smoke-filled room." - Mike Lombardo

- When searching in hoarder conditions. Stay in the pathways and on top of the clutter. On a Primary search we must prioritize time and not sift through and move all the clutter.
- When searching for victims, feel for contour and weight.

IN SUMMARY

The purpose of this document is to convey the diversity on what a systematic and complete residential search size-up may include. The information in this document should assist our crews to search based on educated decisions, resulting in rapid victim location and removal. We should have the knowledge and ability to perform a continuous size-up, identify search priorities, locate access and egress, and increase our crews orientation within a structure fire.

Resources:

1. Search Culture Facebook Page
2. Firefighter Rescue and Survival Richard Kolomay and Robert Hoff
3. FEMA Civilian Fire Fatalities in Residential Buildings 2007-2011
5. Fire Engineering Size Up Before you Search
6. Clackamas Fire District#1 SOP, FRP, CPS
7. FDNY Probationary Firefighter Manual - Chapter 16 Search
8. LA County Search and Rescue
9. census.gov
10. Mike Lombardo
12. Grappling grips: Brian Olson
13. Firefighter Rescue Survey (www.FirefighterRescueSurvey.com)
14. Firefighters across the United States
15. International Building Codes (IBC)
16. Fire Nuggets
    September 2016 (Pages 10-13)
    November 2016 (Pages 8-17)
    January 2017 (Pages 10-15)
17. Brothers In Battle LLC. (VES Beyond The Door: Lecture & HOT)

Continuing Education for Search:

Clackamas Fire D1NET

FRP

- Search

CPS

- Window Entry Search
- Large and/or Disorienting Search
- Primary Search
- Secondary Search

YouTube

- https://youtu.be/jHmT0kgFQ0I (The Mission, THEM & Me)
- https://youtu.be/m5d02m1UVI0 (Why We Go Inside)
- https://youtu.be/IxVgr4shsIw (Search Culture, Know Your First Due)
- https://youtu.be/PABRKsh-etc (Search, Getting Away from the Anchor)

www.youtube.com (“Search Culture Know Your First Due” & “Search Getting Away from the Anchor”)