



FIRE AND RESCUE DEPARTMENTS
OF NORTHERN VIRGINIA
FIREFIGHTING AND
EMERGENCY OPERATIONS
MANUAL

Truck Company
Book 4 – Search
and Rescue

First Edition

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PREFACE

The fireground search capitalizes on the common mission of the fire service: to protect life and property. Required on all fire incidents, the fireground search is high on the list of task priorities, but comes in different forms and applications. Personnel should conduct a thorough risk assessment understanding that various occupancy types may require different search methods. Coupled with the different stages of fire progression, the incident may require adjusting the speed or timing of the search.

The purpose of this manual is to establish standards and operational guidelines for the Northern Virginia region and to ensure all jurisdictions share a common language during emergency operations and training.

Definitions

The key definitions used in this manual are as follows.

Blind Search: A type of fireground search conducted when the presence and/or location of a potential victim or victims is not known. Typically, the search is slower, routinely starts at or above the fire, and is more methodical.

Flow Path – The movement of heat and smoke from the higher pressure within the fire area towards the lower pressure areas accessible via doors, window openings and roof structures. As the heated fire gases are moving towards the low-pressure areas, the energy of the fire is pulling in additional oxygen from the low-pressure areas. Based on varying building design and the available ventilation openings (doors, windows, etc.), there may be several flow paths within a structure. Any operations conducted in the flow path will place firefighters at significant risk due to the increased flow of fire, heat, and smoke toward their position.

Focused Search – Used when a victim location is known and a plan is established to concentrate on that specific site or area.

Means of Egress – A continuous pathway to exit the building (such as a door, window, ladder, etc.)

Oriented Search – A type of fireground search that uses two or more firefighters to search for victims; one firefighter maintains a central position at a means of egress or hallway/corridor and the second firefighter completes the search of the identified space. The oriented firefighter will maintain voice or visual contact with the other firefighter(s) and may coordinate the search of multiple rooms, monitor air supply, monitor fire conditions, scan the compartment(s) with a thermal imager, and/or control flow path openings in search compartment(s).

Primary Search – An immediate search for life. This search is rapid but thorough and systematic. The primary search will be influenced by the fire, heat, and smoke conditions in a room or area, and may be prior to the application of water. It should be done quickly, with due regard for your personal safety.

Protect in Place – Strategy used to defer immediate evacuation of occupants not immediately endangered by immediately dangerous to life and health (IDLH) conditions.

Rescue – Removal of victims from an IDLH atmosphere.

Search – An orderly and systematic examination of a building or area for the purpose of locating persons swiftly along with locating the location of the fire.

Secondary Search – A thorough and complete search for life of all areas that required a primary search. This task should be handled by a different unit than the one that completed the primary search.

Thermal Imager (TI) – A tool that provides a pictorial representation of temperature differences that are unaffected by smoke. Used to aide firefighters with critical information to size up a fire incident, track fire growth, locate victims, locate other firefighters, and find egress routes.

VEIS – Initialism for Vent, Enter, Isolate, Search.

RISK ASSESSMENT

Conducting a risk assessment and employing a risk management strategy is one of the most critical functions performed on the emergency scene. The task of safety is the responsibility of fire officers and firefighters alike. Threats to personnel safety come in many shapes and sizes. It is the primary role of the fire officer to successfully implement an incident action plan that best mitigates the incident while managing risk levels. The principle objectives of risk management include an internal process to identify and evaluate risks, then develop, select, and implement measures to lessen the probability of a harmful consequence.

On the fireground, fire officers and firefighters use knowledge, skills, training, and experience to successfully evaluate and minimize risk. Primary concerns are issues of safety to fire service personnel followed by the safety affecting the public. The mission of the fire department is to protect life and property. Threats to safety on the fireground primarily come from three categories:

- Advanced fire conditions,
- Ventilation-limited fire conditions, and/or
- Collapse potential.

To assist with the risk assessment, several questions must be answered:

1. What is the life hazard?
2. What are the fire conditions?
3. What is the potential for victim survival (victim survivability profile)?
4. What is the structural stability and potential for collapse?
5. Do I have adequate resources to make a positive impact on the incident?

Life Hazard

Are there civilians trapped or possibly trapped? Sometimes this information is clear because it is coming from a dispatcher or from a family member/bystander located on the scene. Other times, the status of possible victims is estimated based on a neighbor's account, the time of day, or the presence of cars in the driveway.

Knowing the life hazard potential is critical when determining and managing risk; however, information sources are not always reliable under stressful conditions. Even when it is reported that everyone is out of the house, only a completed primary or secondary search can confirm that fact. There have been cases across the country of family members returning home unexpectedly late at night and unknown to the other occupants. When a fire occurred, it was reported everyone was out and the firefighters failed to conduct a proper primary search and quickly attack and suppress the fire. The other family member was then later found dead during the secondary search. We must be cognizant of when a parent almost totally overcome by the stress of the incident reports to firefighter that all her children were out, forgetting that she was watching a neighbor's child. Again, a quick and proper search along with the fire attack was not conducted and the child was later found dead after the fire. Always assume there is a possibility of victims still inside waiting for firefighters to rescue them regardless of any reports. Obviously even when

it is reported that there is someone trapped the speed of the search and the risks taken by members still will be based on the severity of fire conditions and risk of collapse.

Fire Conditions

Current and projected fire conditions, along with the building construction type, give personnel significant information to use when determining the timeframe they have to operate. Large volume fires in combustibles buildings increase the risk and decrease the time to operate, while smaller fires in non-combustible buildings decrease the risk and increase the time to act. Understanding fire behavior and travel, as it relates to the various building construction types, is one of the most important tools firefighters and fire officers can use when assessing and managing risk as it relates to fire conditions.

Victim Survivability Profiling

Victim Survivability Profiling (VSP) is a term that the fire service has used for many years. (It may less commonly be referred to as Occupant Survivability Profiling.) The core concept of VSP is that firefighters have to conduct a thorough size-up of a structure fire to determine the likelihood of a victim's potential to be rescued.

There are several background factors that must be understood regarding the physiology of the human body to conduct the VSP.

- The first is the human body's threshold for heat. The NFPA suggests that the upper range of temperature tenability for humans is around 212° Fahrenheit.
- The second is Carbon Monoxide (CO), the primary cause of fire-related death. At approximately 200,000 parts per million (ppm), the human body is rendered unconscious within 4-12 seconds with death following shortly thereafter.
- The third is oxygen. Earth's atmosphere contains 21 percent oxygen. Percentages of less than 10 result in death rapidly.
- Last is the issue of other toxic fire gases, such as cyanide. Today's fires produce a tremendous amount of toxic gases that can rapidly incapacitate and cause death to fire victims.

Understanding the human body's response to fire conditions, coupled with a size-up of the structure, and location and extent of fire, the officer can determine the best course of action for mitigating the emergency. Modern fire behavior studies also support the fact that the chances of survival can be greatly increased by shutting a door and creating a barrier between the compartments. The 2010 Underwriters Laboratories (UL) study, *Impact of Ventilation on Fire Behavior in Legacy and Contemporary Residential Construction*,¹ demonstrates that during each

1

<https://www.ul.com/global/documents/offerings/industries/buildingmaterials/fireservice/ventilation/DHS%202008%20Grant%20Report%20Final.pdf>

experiment, conditions remained tenable for both temperature and oxygen thresholds in the compartment with a closed door.

VSP provides firefighters with an excellent tool to use during size-up. Caution should be given to drawing absolute conclusions regarding victim viability based on the profile alone.

Structural Stability/Collapse Potential

Is the building going to collapse? If so, how long can crews operate before collapse? Is there a safe zone that crews can operate within to decrease the risk? What part of the building will collapse first? How will operations be affected? These are the questions fire officers must consider throughout each incident.

As a general rule, large spaces and spans are the enemy when it comes to firefighter safety. Large box stores in the commercial arena, large span trusses, and concentrated loads in lightweight building construction present the highest risk to firefighters. Operations should be adjusted as necessary to avoid these high-risk areas. Operating from smaller or adjacent compartments will often times substantially decrease risk and increase firefighter safety.

Resources

Each crew's knowledge, skills, abilities, training, and experience should be considered when determining the amount of time they have left to operate safely inside of the structure, in addition to the visual cues given by the structure itself. Companies must consider what actions can be taken to slow down or keep the incident from escalating until additional resources arrive. Incident commanders must also constantly evaluate the number of resources committed, especially in the active rescue of a civilian, and ensure adequate resources are in reserve quickly.

Size-up Examples

The following are examples of different size-up situations.



Figure 1: Size-up example 1.

	Description
Life Hazard	Probable given time of event and no occupants present on arrival
Fire Conditions	Advanced fire conditions throughout entire structure
Victim Survivability Profile	Low survivability due to advanced stage of the fire
Structural Stability	Lightweight, wood frame construction
Resources	Fire conditions limit ability to safely execute interior operations.
Summary	Establish water supply, exterior fire attack Risk assessment of the building based on the construction type, fire conditions, resource availability, and time of day should all be critical consideration factors before any change in tactics



Figure 2: Size-up example 2.

	Description
Life Hazard	Probable given time of day, vehicle in driveway, and no occupants present on arrival
Fire Conditions	Advanced fire conditions throughout roof structure with spread to the living space
Victim Survivability Profile	Survivability is high—minimal smoke or fire in the living space and a person could still be inside and unaware (asleep, basement area)
Structural Stability	Lightweight, wood frame construction
Resources	Candidate for Blitz attack
Summary	<p>Establish water supply, quick knock-down from the exterior with a large-caliber line</p> <p>An interior attack should only be attempted once the bulk of the fire has been knocked and structural stability is ensured</p> <p>Ground ladders may have to be used to access the upper compartments due to fire in stairwell</p>



Figure 3: Size-up example 3.

	Description
Life Hazard	Probable given time of event and no occupants present on arrival
Fire Conditions	Advanced fire conditions in the attached garage
Victim Survivability Profile	Survivability high—minimal smoke or fire in the living spaces and a person could still be inside and unaware of the event
Structural Stability	Lightweight, wood frame construction
Resources	Blitz attack
Summary	<p>Establish water supply, quick knock-down from the exterior with a large-caliber line</p> <p>An interior attack can be attempted once the bulk of the fire has been knocked down</p>



Figure 4: Size-up example 4.

	Description
Life Hazard	Probable given time of day, vehicles in driveway, and no occupants present on arrival
Fire Conditions	Fire conditions in a lower-level compartment, no obvious fire on first floor, and large volume of smoke throughout the entire building
Victim Survivability Profile	Low survivability due to fire intensity in the basement and smoke throughout all levels; however, do not discount the protection of closed interior door(s).
Structural Stability	Conventional, wood frame construction
Resources	Interior attack on the level of the fire with a continuous evaluation of the structural stability
Summary	Establish water supply, interior fire attack If a report is provided from an upper floor about structural instability (spongy floor) then crews should be notified and a change in tactics may need to be immediately implemented



Figure 5: Size-up example 5.

	Description
Life Hazard	Probable given time of event and no occupants present on arrival
Fire Conditions	Upper floor-multiple compartments
Victim Survivability Profile	Survivability moderate—smoke in the living spaces on upper levels and minimal or absent on the lower levels
Structural Stability	Lightweight, wood frame construction
Resources	Interior attack on the upper levels with a continuous evaluation of fire spread
Summary	Establish water supply, interior fire attack If fire attack is not rapid, personnel will need to consider the possibility of fire spread to the attic space



Figure 6: Size-up example 6.

	Description
Life Hazard	Probable given time of day and occupancy type
Fire Conditions	Throughout box with extension through the roof
Victim Survivability Profile	Survivability low in fire unit—smoke/fire throughout the box Survivability in exposures high
Structural Stability	Non-combustible
Resources	Candidate for Blitz attack
Summary	Establish water supply, quick knock-down from the exterior with a large-caliber line An interior attack should only be attempted once the bulk of the fire has been knocked and structural stability is ensured



Figure 7: Size-up example 7.

	Description
Life Hazard	Probable given time of day and occupancy type
Fire Conditions	Compartment fire with possible extension
Victim Survivability Profile	Survivability moderate—vented room and contents fire
Structural Stability	Ordinary
Resources	Interior attack
Summary	Establish water supply, rapid interior attack should be attempted on the upper level Ground ladders may have to be used to access the upper compartment

SEARCH

A thoroughly planned and executed primary and secondary search shall be completed at all building fires after a solid risk assessment has been conducted to determine the viability of victims. To become proficient in search operations, crews should conduct pre-incident planning and conduct extensive training sessions in search techniques along with victim removal. Communication is paramount. The incident commander must be informed of the status of the



search, any hazards found, as well as fire and smoke conditions encountered. Prior to entering the structure, the officer of the search crew should survey the outside of the building to identify the fire's general location. They should report findings and take action to aid victims at windows or in obvious distress. Victims at windows present a strong indication that there may be other victims still inside the building. During the size-up, crews should quickly scan the area around the fire building looking for victims that have jumped or fallen from windows. If the primary assignment of interior search is delayed by any of these actions, command must be notified.

one company may be able to dwell. If large floor areas are residential high-rise buildings, it companies to search each floor.

The number of companies assigned to search is based on the size and complexity of the structure. If the floor areas are small, such as in a townhouse or small single-family dwelling, rapidly search the entire encountered, as in may require several

Figure 8: fires involving lower floors may affect the structural integrity of the stairwells. Photo credit: [Green Maltese](#).

Crewmembers should maintain verbal contact (e.g., face-to-face voice communication) with each other at all times. When operating above the fire, the integrity of the stairs should always be checked, and crews must minimize time on the stairs. This is especially important when utilizing the stairs from the first floor to the second floor when the basement is involved in fire. The stairwell from the basement to the first floor is often unprotected; therefore, fires involving lower floors may affect the structural integrity of the stacked stairwells, Figure 8. An alternative to the interior stairs is the use of VEIS via ladder.

Crews that are searching above the fire should start operations where the victims are in the greatest danger. This area is generally directly above the fire. It is preferable for these crews to search with a hoseline in close proximity. The truck company officer should closely monitor conditions on the floor above while monitoring the progress of extinguishment on the floor below, particularly when operating without the protection of a hoseline. Personnel shall maintain strict adherence to coordinated ventilation to limit unnecessary fire spread and work in concert with an engine company.

Door Control

When the company officer determines a need to conduct a search before a hoseline can be placed in service for either extinguishment or protection based on the observed conditions, crews should control the air into the building via interior and exterior doors. Door control affords two functions: controlling avenues of flow path and areas of refuge for protection of firefighters and victims.

In rare instances when trucks or rescue squads make entry for a search before an engine company is on the scene, an announcement shall be made that companies are or may be searching in a ventilation-limited environment and that doors and windows should be controlled until a line can be put into service and water applied to the fire. The exterior door can be controlled with a firefighter. To aid in returning to the door, a box light or other means of identification can be left at the door.

“Battalion 404 from Tower 408: Conducting a primary search ahead of a hoseline. All units – ensure strict ventilation control.”

Later arriving companies shall communicate directly with search crew to ensure the search crew is in a position to take refuge in anticipation of changing conditions.

When gaining entry through a window (VEIS) or an interior door, search crews should maintain control of the interior doors to avoid creating an unintended flow path. For example, when operating above a fire in a hallway leading to several bedrooms, close all of the bedroom doors, assign a firefighter or firefighters to search individual rooms. Close the doors during the respective searches and vent as necessary. When the search is completed in the room, close the door behind you. It should be a regular practice for firefighters to close doors they encounter until the fire is controlled.

Generally, search crews enter the structure along with the engine crew through the front door and access the upper floors via the interior stairway. However, search crews may take a different route to the upper floors by accessing the area via portable ladders placed at windows. It is often much safer to enter upper floors via ladders. This method provides a rapid means of egress out of a window rather than down the interior stairs that can act as a chimney for rapid fire spread. Keep in mind that this method also creates a flow path that may pull smoke and heat upward.

When multiple crews are assigned to search one floor or area, the crews must coordinate their patterns so their efforts are not duplicated. Separate search crews should follow standard search patterns such as right hand or left hand search. Do not change directions.

Humans are creatures of habit and they will try to exit the building using the same entrance used to enter the building. The areas around the exits, windows, and elevator lobbies must be checked thoroughly. Victims trying to exit the structure may panic and collapse in an emergency. Children may seek refuge under beds, in closets, and in bathtubs.

Primary Search

The primary search starts with the initial size-up and will be concluded when the companies assigned have expeditiously searched the building. The primary search is often conducted before the fire is under control. This search is conducted quickly and as thoroughly as possible starting in areas of imminent danger. The search begins when entering the IDLH environment. The areas to be searched should include the fire area, directly above the fire, adjacent to the fire, and areas that occupants are expected to be located within the IDLH. A search crew consists of a minimum of two personnel in voice contact.

Personnel conducting the primary search should start a search in a room with the window wall first if possible—victims may try to self-evacuate the structure and become incapacitated at or near the window. When searching a particular room, personnel should orientate with the wall, use a thermal imager (TI) while searching and remain low to the ground to look for victims and obstacles under the smoke. Personnel should remain oriented to any given room and know where windows/doors are in the event that rapid evacuation of the structure is needed or if a victim is found. Understanding where the windows are located and their associated side/quadrant enables a reduction in reflex time for assisting crews (e.g., priority ladder placement, emergency evacuation). While the search is being conducted, personnel should regularly check their air supply and be ready to remove themselves from the structure.

Secondary Search

The secondary search is a more detailed search and is conducted after the primary search of the area is complete. The secondary search is normally performed after the fire is under control. Speed is a less important consideration, permitting a more thorough search. This search should also include areas remote from the fire area; including the entire outside perimeter of the building and all shafts, basements, cellars, elevators, etc. It is the purpose to ensure that no possible victims are overlooked. Time is not as important as accuracy.

A secondary search should be completed before any extensive overhauling of the fire area is attempted. When possible, the secondary search should be conducted by a different crew than conducted the primary search.

Firefighters perform primary and secondary searches to find victims and hidden fire. Sometimes, dispatched information or bystanders may direct the truck company to the last known location of victims, but often their location is unknown. Even with a report that the structure has been evacuated, the truck company must still perform the task of primary search, systematically checking all levels of the structure for victims and fire.

Key Points to Remember:

- ☑ When searching a room and a doorway is found, note the location of the door and finish searching the original room. Return to the noted doorway to continue the search.
- ☑ If the search crew consists of three personnel, leave one person at the doorway to communicate (voice or visual sight/TI) with the other crewmembers, assist in egress, control air flow into the space, and monitor fire conditions.

- ☑ Prioritize search beginning with the fire compartment and the compartment directly above the fire, unless the location of a trapped occupant is known.
- ☑ A hoseline should be placed to protect search teams whenever possible.
- ☑ An area with high heat conditions and no visible fire may indicate an advanced fire below that location.
- ☑ If the fire is not under control, the hoseline crew must know the location of the search crew.
- ☑ When the search crew cannot see their feet due to smoke conditions, they must crawl.
- ☑ If an obvious fatality is found confer with the IC and consider leaving the body in place and continue searching for viable victims. This will also assist the fire investigation.
- ☑ Search crews should limit creating additional flow paths and work in concert with the attack engine company.
- ☑ Report the status of the search along with any fire or smoke conditions in the area.
- ☑ Constantly monitor SCBA air supply.

Initiating the Search

The initial location to begin a search is typically generated by the level of information that is obtained regarding victim potential and location. The two types of searches with a primary search are: focused and blind searches.

A focused search is generally performed when victim potential and/or location are known. When the unit officer receives specific information relating to the location of trapped occupants prior to arrival, they should proceed to that location upon arrival. If on arrival information is received about the location of trapped victims, the unit officer must notify command and proceed to that area/location to initiate a search.

A blind search is generally performed when no information is known about the victim potential or location. When no information is received, search priority should include the fire compartment, compartment on the floor directly above, and compartments adjacent to the fire compartment. Stairwells must be searched, as deceased victims have been found at the top of stairwell while attempting to evacuate the high heat and smoke conditions below.

Search Body Position

Historically, the fire service has taught a body position in search and hoseline advancement where the firefighter was on their hands and knees with their head down. This position promotes staying low in a toxic atmosphere but is not the most advantageous while operating in a deadly environment. The best practice for body positioning in limited visibility conditions is to be in a head-up/leading-leg-out position with most of the weight centered on the back foot and support

hand, Figure 9. This position keeps a firefighter's eyes on the conditions in front of them along with observing the movement of other search team members. Additionally, the leading leg in front aids in identifying obstacles and possible holes in the floor. Movement in this position is shown in Figure 10.



Figure 9: Photo series showing crawling on all fours, head-up/leg-out position, and head-up/leg-out with support hand position.



Figure 10: Photo series showing the head-up/leg-out with support hand position in motion, which can be characterized as a sliding motion.

ADDITIONAL SEARCH TECHNIQUES

Oriented Search

The oriented search utilizes two or more members. One member serves as a focal point and can be used in a variety of applications such as the member at the tip of the ladder during VEIS, positioned in a long hallway during bedroom searches, and/or positioned at a point of egress such as a stairwell.

The officer or oriented lead utilizes a static position to monitor the progress of the search, observe the condition and status of the fire, listen for communication updates, maintain accountability of the crew, and serve as an egress landmark for the crews searching. The oriented lead should use a thermal imager, if available, to verify the efficiency of the search and guide firefighters when appropriate. In some cases, it may be necessary to *sound the floor* to guide the firefighter back to the egress point.

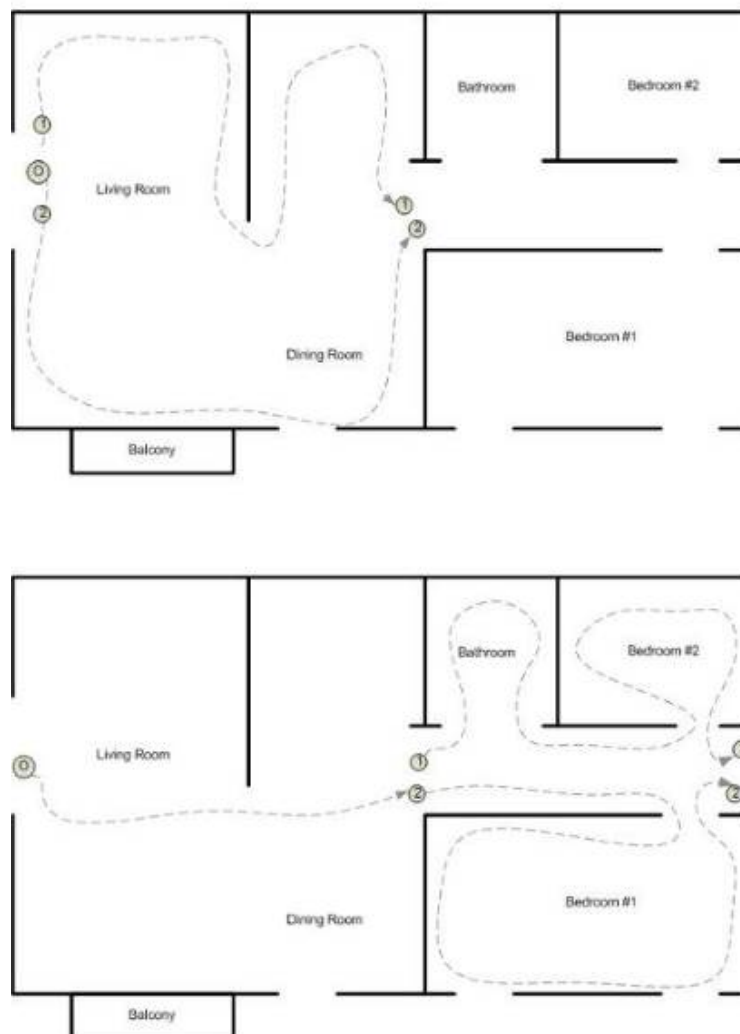


Figure 11: Oriented lead maintain a static position, while FF1 and FF2 complete the search.

Tagline Search

When the decision is made to deploy the tagline for a search, the first priority is to identify an anchor used to secure the fixed end of the rope. This involves tying the rope around a substantial object in an area that is relatively safe and from which the member can easily return to the building's exterior, Figure 12. Depending on the configuration of the structure itself and the type of situation, the rope can be secured in a stairwell on the fire floor or on the floor below, around an object on the outside of the building, or on the entrance door itself.



Figure 12: The fixed end of the rope should be secured to a substantial object.

Members may also consider carrying the rope for a certain distance inside an easily navigated building, and then deploy it when the configuration becomes more difficult. If this method is used, it is important to remain oriented to the location where the rope is fixed and to the egress route to follow from that point. Do not anchor the rope in an area where fire is present or may extend. The egress route will be compromised if fire and extends to this area.

Types of search bags found in the region are shown in Figure 13.



Figure 13: Sample search bags; the first is a RIT Safety Systems search bag with individual retractable rope bags and the second is an FDNY-style search rope.

After securing the rope, members will carry the bag with them and allow the rope to deploy behind them as they search. If the members reach a point at which a significant direction change is required, the rope should be secured to an object at the point where the direction change is made, Figure 14. This can be accomplished by looping the rope around an object or by tying a knot at that point and deploying it further from there. By securing the rope at this point, crew members will ensure that when the time comes to exit the building, they will travel the same route they took when entering. If the rope is not secured, it can change its orientation as it is deployed. This could lead exiting members into dangerous areas that they did not encounter on the way into the building. Taglines must be kept tight to lessen the probability of becoming entangled.

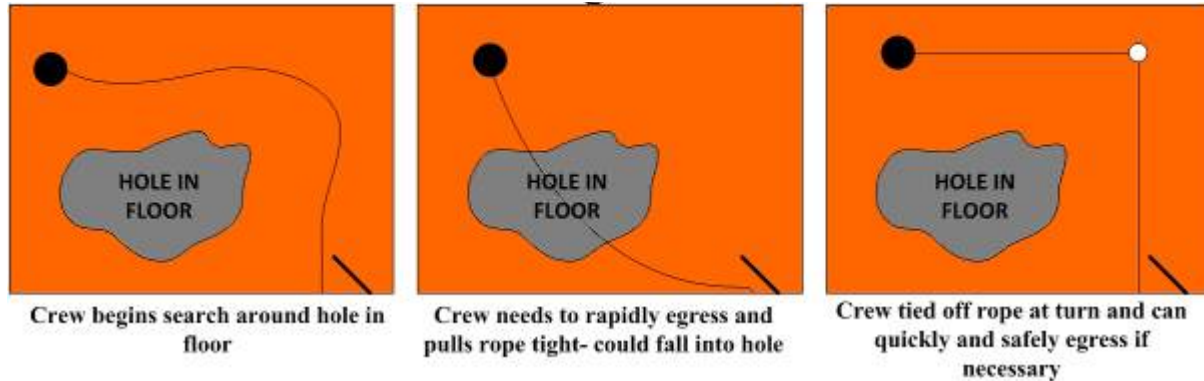


Figure 14: Search rope must be secured at direction change.

When searching wide areas, members can cover the open floor spaces by employing one of several search techniques. One member can remain in a secure location and feed rope to the other searching member, who will venture out into the open floor. When the searching member is ready to return to the secure point, the member feeding the rope should put the slack back into the rope bag, thereby leading the searching member directly back to the start point. Although the members will remain in contact with the rope at all times, verbal communication should also be maintained at all times. The member feeding the rope must monitor conditions at the secure point and alert the searching member of any changes that will require a rapid egress.



Figure 15: Search rope deploying behind searching firefighter.

During the search of a building with cut-up or heavily compartmented areas, the tagline will prevent members from becoming disoriented in conditions that seem maze-like. In addition to deploying the rope throughout the search, members must also maintain a mental picture of the search area. By mentally marking the location of structural features and landmarks, the search crew can orient themselves when it is time to egress, and can predict the layout of the area that has yet to be searched.

In areas that are divided into cubicles by product storage or short partition walls, members must be sure not to disturb or change the configuration of the area during the search. If the

configuration is changed, the mental picture the members have developed will be useless, when the time comes for egress. Fallen storage or partitions can also obscure the tagline itself, and can prevent members from following it to safety.

Because of the size and configuration of many of the buildings common to Northern Virginia, large floor spaces may require multiple search teams to perform a thorough search. One rope can be deployed as a main line, with additional ropes

being used to branch off into the various areas that need to be searched, Figure 16.

The procedures for this operation would be similar to the one followed for a two- or three-member search. The first crew will deploy the main line into the general area that will be searched. Additional crews will follow the main line into the search area, anchor their ropes onto the main line, and then begin to search their assigned area with the main line crew maintaining their reference point.

During a search of this size and complexity, communication and coordination will be critical to ensuring that all areas are properly searched and that all members are accounted throughout the operation.

At the end of the search or rope length, personnel should leave the rope in place as a marker for the continuation of search, if incomplete.

Large Area Search

When searching large buildings with vast floor areas, it is recommended to use a rope/tag line operation. It would be dangerous to search 300' into one of these buildings even if the rope length permits. It is recommended to search 100-150' deep through the door closest to the targeted search area. Once complete, withdraw from the building and enter at a different door close to the target area, Figure 17. In doing this, firefighters can use a main line and tag lines to extend farther into the structure, Figure 18. Firefighters must always practice good air management skills, particularly in these large structures. It would be senseless to commit resources to a blind search under zero visibility conditions in a building of this size. Obtain the best-known location of any persons trapped and focus your search to that area only.



Figure 16: Additional search teams can deploy lines off a main line to increase the area covered by the search.

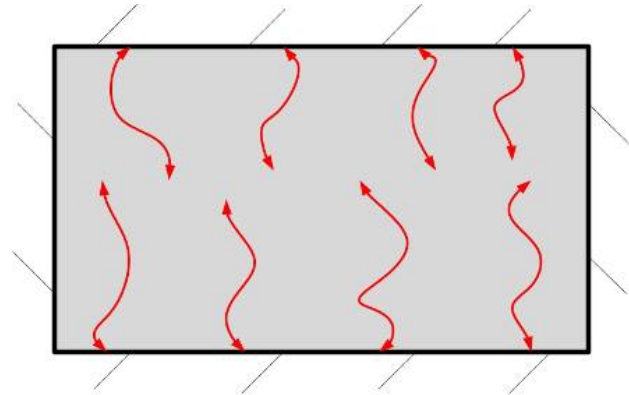


Figure 17: When searching large buildings in zero visibility, search using a rope while moving forward, then exit out of the same entrance and repeat at the next exterior entrance.

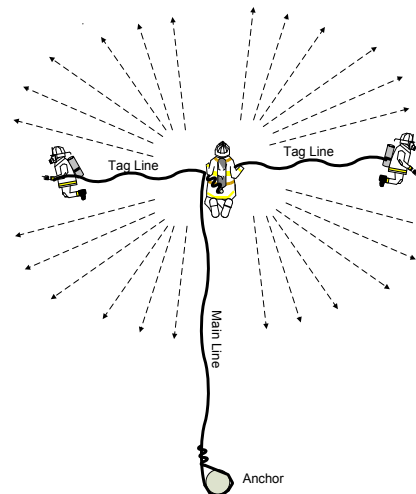
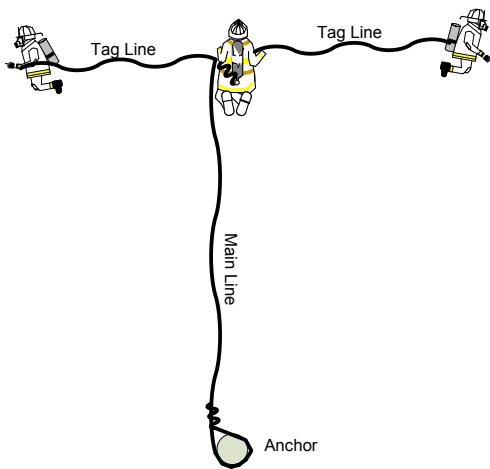


Figure 18: Using tag lines off the main line to extend the search distance.

Recommended tools to conduct search using a rope may include:

- Hand lights
- Tagline
- Two 25-foot ropes/webbing sections with snap hooks (to connect to tagline)
- Portable radios
- Door chocks
- Forcible entry tools
- Hydraulic forcible entry tool
- Thermal imager

Before entering the search area, place a light near the entrance with the light shining into the structure. This will assist the crew in locating the exit.

The main tagline must be secured low to a non-movable object, outside the hazardous environment. The officer of the search team controls the tagline bag. Having the rope attached to the member allows both hands to be free. The rope must remain tight.

The other members use a short section of rope/webbing with snap hooks on each end. As each member enters the building they attach their section of rope to their personal protective equipment and the other end to the main rope or hose. Then begin searching in opposite directions, sweeping in a circular motion.

Open Area Search

Crews should monitor the time and depth of their advance into the structure by developing a means of marking the main rope. One means of identification is to make a bight in the rope followed by an overhand knot. The main rope would be pre-tied in 25-foot intervals. Each knot would be marked to indicate the distance entered (for example, 25 feet would have one knot, 50 feet would have 2 knots, and so on). This frame of reference would assist a firefighter while exiting the structure by verifying that members are proceeding in the correct direction.

If a crew must exit the structure before the search is complete, the main rope is tied off at the last searched location. The relief crew advances to the location where the rope is tied and continues the search from that location.

At no time should any crewmember be left alone. If one member needs to exit, it requires the entire team to exit together.

A crew should be positioned at the entrance to assist with victim removal and to relieve the search crew.

VENT, ENTER, ISOLATE, SEARCH (VEIS)

Vent, Enter, Isolate, Search (VEIS) is primarily used when the main means of ingress are unavailable. This tactic affords the opportunity to quickly search a viable compartment where victims may be located, but one that will soon become untenable. Although second-floor bedrooms are generally considered VEIS areas, first-floor bedrooms can be searched using VEIS methods by entered the ground-level window. Ladders can also be used. By closing the door to the room to be searched first, we are providing protection to the personnel doing the search and also to the victim should conditions outside the room rapidly change. All tactics described shall be completed in a rapid methodical and efficient manner.

After selecting the correct portable ladder for the window chosen, the members should place the ladder with the ladder's tip at, or just below, the sill. The members should take particular care to ensure ventilation is not prematurely initiated during the placement of the ladder. After donning PPE, including the SCBA face piece, members shall climb the ladder to vent the window with hand tools. The 6' metal hook and a Halligan bar are the suggested tools for versatility to aid in the search. To maximize effectiveness in managing the flow path, ventilation should not be initiated until the members are prepared to make entry. When the window and struck with the tool, ensure the entire window is removed. Additionally, ensure that all drapes or curtains are removed as they will become an obstruction.

Immediately upon venting the window, observe the conditions to help determine if the door is open or closed to the common hallway. Limited smoke would indicate the door is closed, whereas turbulent smoke under pressure may indicate the door is open. If fire vents from the window at this point, members should sweep the area directly under the sill for any possible victims, and then, if finding nothing, reposition the ladder to an uninvolved window that can be entered for a search. If no fire vents, the member should sweep the area beneath the sill for victims and floor integrity (sound floor with the tool). The member should then straddle the sill with one leg in the room and one leg outside, their shoulder locked into the window frame and their head on the outside of the window. This position will keep the majority of the member's weight and body mass on the outside the window, as the first foot touches the floor. The hope is that if the floor gives out beneath the member at this point, they will have a better chance of making it back to the ladder. After the integrity of the floor is further verified with a single leg, the member can swing the other leg inside and move to isolate the room by closing the door.

The first action inside the room is to locate and control the door to the hallway after sweeping the common hallway for potential victims, Figure 19. As discussed earlier, closing this door will protect the member and any victims from the conditions in the hallway while the



Figure 19: Control of the door into the hallway should be the first action taken.

search is performed. This can be especially important as the fire is attacked and heat, smoke, and fire spread in the direction of the room being searched, Figure 20. The door in many homes is directly in line with the window to aid in natural ventilation of the home. This is not true in all instances due to changing construction styles stressing the importance of knowing your response area. Personnel should not use the common hallway to move from room to room, this should be completed via the exterior on the ground ladder.

After closing the door, the member can then begin a rapid search of the room. If a victim is found, the primary removal route will be the ladder used to enter the room. Because the member is unaware of the building's interior layout, any attempt to remove the victim via the interior stairs would be difficult and time consuming.

During every VEIS, the second member of the crew should remain on the ladder, at the window with a thermal imager if possible to monitor conditions, alert the searching member of any emergencies, and serve as a reference point if a rapid egress is needed.

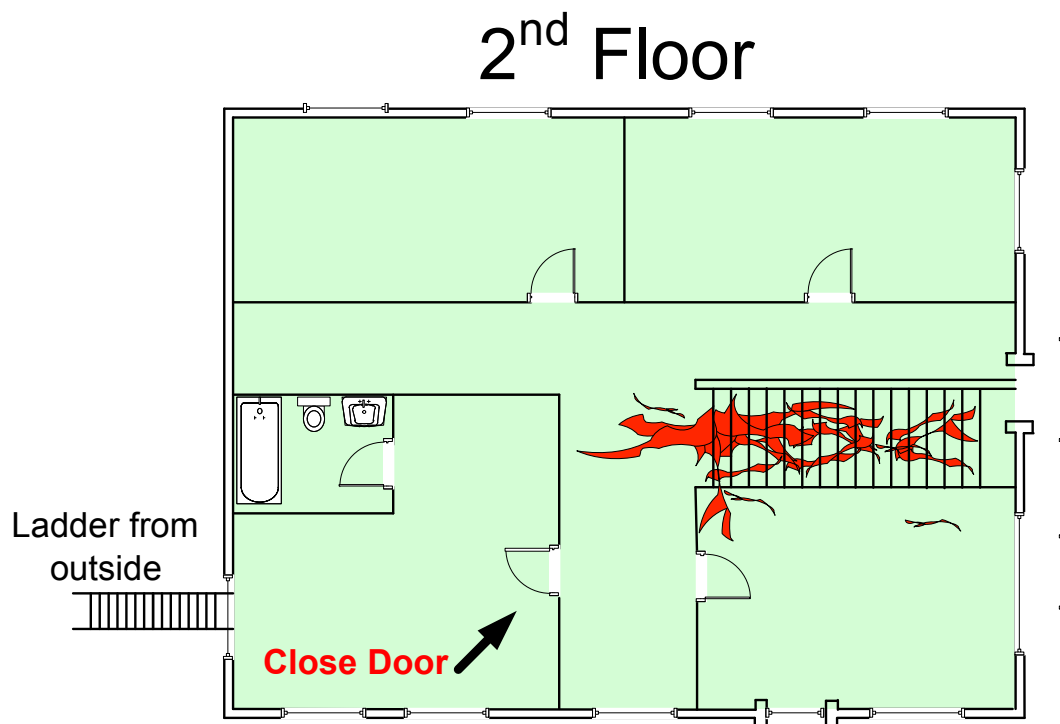


Figure 20: Upon entering the bedroom from the window, secure the hall door and search the entire area including the bathroom.

RESCUE

Rescue must be the primary objective of any fire suppression unit. The rescue may involve the removal of occupants using either normal building egresses or fire department ladders. The entire company will likely carry out rescue operations.

Building occupant(s) exposed to heat, smoke, and gases that cannot exit a structure without assistance are the highest priorities. Occupant(s) that are in a non-IDLH area who cannot exit through normal means may need to protect-in-place for removal at a later time. Examples are those individuals that are in the building or on a balcony free of any immediate harm. The unit officer must determine the most prudent action.

The decision must be made between protecting the occupant(s) in place and removing the victim(s) during firefighting operations.

Factors that must be considered during a rescue size-up may include the following:

- Type of occupancy
- Location and amount of fire or smoke
- Available resources
- Type of construction
- Weather conditions
- Time of day
- Known or potential victims
- Physical and mental state of the victim
- Size and weight of the victim
- Remote areas (alleys, courtyards, side and rear of structures)
- Access points
- Fatalities (leave in place)

A coordinated effort between the truck and engine companies is paramount in occupied structures. It may be more prudent to advance an attack line into the fire area through routes other than the exit normally used by the occupants (interior hallway or stairs).

Rescue may not always be the first task performed. Forcible entry, ventilation, and extinguishment may contribute more to the rescue and the overall success of the rescue than the physical removal of the victim(s).

Rescue of a victim located during a primary search can be a labor-intensive task. Command must be notified immediately upon locating a victim. The report should include the floor, quadrant, and side of the structure, method of removal, intended location to remove the victim, and the need for any assistance. Notifying command will also alert EMS personnel to the presence of a victim.

Removing an unconscious victim as quickly as possible is the primary consideration of the crew that has located that victim. This could be accomplished by carrying or dragging the victim back

the same route the company or firefighter used to locate the victim; however, if the victim is found near a door or window, removal may be accomplished through these alternative openings.

Consider the size and extent of the fire. If it is extinguished or will soon be extinguished, the best means of victim removal may be through the building's interior, especially if the victim is very large. Consider breaching a wall and passing the victim to a safer, adjacent room or apartment.

The size of the victim, and the distance to an exit, needs to be considered. A child or small adult may be quite easy to pass out a window. If the victim is very large, command should be notified immediately. Additional resources may be needed to complete the removal of the victim. Alteration of suppression tactics may be necessary to enable the rescue in these instances.

How to Remove Victims

When a victim is located, command must be notified immediately. The truck company must quickly determine the fastest route to remove the victim from the structure. Those options include:

- Interior stairs, if feasible.
- Horizontally out a window (portable ladder, tower bucket, porch roof).
- Drag victim (blanket, firefighter between victim's legs, using strap around victim's arms).
- Ropes or other lowering devices.

Victim Removal over Ladders

Figure 21 shows two methods for removing an unconscious victim and one for a conscious victim. For the first method, the removal of the unconscious victim will require considerable effort and coordination to get out onto a ladder:

1. The victim should be placed in a sitting position, with their back against the wall, under the window.
2. Place the victim's knees up to their chest.
3. Place your feet against theirs; grab the victim under their arms using leverage to lift the victim up and onto the windowsill.
4. Once the victim is on the sill, the firefighter outside on the ladder should steady the victim.
5. The firefighters inside should swing the victim's legs out through the window by gathering the victim's legs and bringing them up to the victim's chest.
6. The victim is now rotated out towards the ladder.
7. The victim rests on the sill with their back towards the inside of the structure.
8. The firefighter on the ladder will place their knee in the crotch of the victim, slide their arms under the armpits of the victim, and grasp the beams (portable ladder) or the rungs (aerial ladder) depending on the type of ladder.
9. The firefighter and victim should then descend the ladder.

An alternative method for an unconscious victim, similar to the above, can be used when it is easier to get the victim onto the ladder facing away from the rescuer, and then steps 8 and 9 above would apply. Caution must be taken with the victim's head and airway.

Conscious victims should be helped onto the ladder into a normal climbing position and the firefighter should descend the ladder as shown in Figure 21.



Figure 21: Examples of unconscious victim removals (left and center) and conscious victim removal (right).

The tower ladder may be the safest and quickest means to remove a victim from certain situations (i.e., multiple victims, above the reach of ground ladders) if normal egress routes are unavailable. It may be difficult to encourage the victim to leave the building and enter the basket. However, it would be more difficult to move a victim on the tip of an aerial compared to a tower bucket. **As a safety precaution, it is critical that the tower ladder's bucket controls are deactivated while the victim moves into the bucket to prevent accidental movement of the bucket that could seriously injure the victim and firefighters.**

If removal is performed using a tower ladder, the top rail of the bucket must be positioned even with the windowsill. Two firefighters simply need to pass the victim out the window and into the bucket. The victim can then be lowered to the ground.

Placing a victim in a Reeves stretcher prior to moving to the ladder (if time permits) can aid with victim removal, because the Reeves stretcher provides a strong handle to hold onto the victim.

If a Reeves stretcher is not available, use webbing to make a girth hitch around the victim's torso and under their arms, allowing for a more expedient removal, Figure 22. The victim is then removed from the building via the aerial ladder headfirst, provided the angle of the ladder is not extreme (over 45 degrees). Head first removal prevents the victim's limbs from getting entangled in the ladder's rails and rungs.

When multiple people emerge from upper floors windows and balconies during a working fire, the truck company must determine who is in need of immediate rescue versus those individuals whose egress from the structure is blocked but are safe. Truck company members must prioritize rescues in the following manner:

1. Fire area.
2. Directly above the fire.
3. Upper compartments not threatened by fire.
4. Adjacent compartments not threatened by fire.
5. Below the fire area.



Figure 22: Example of webbing girth hitch around victim's torso.

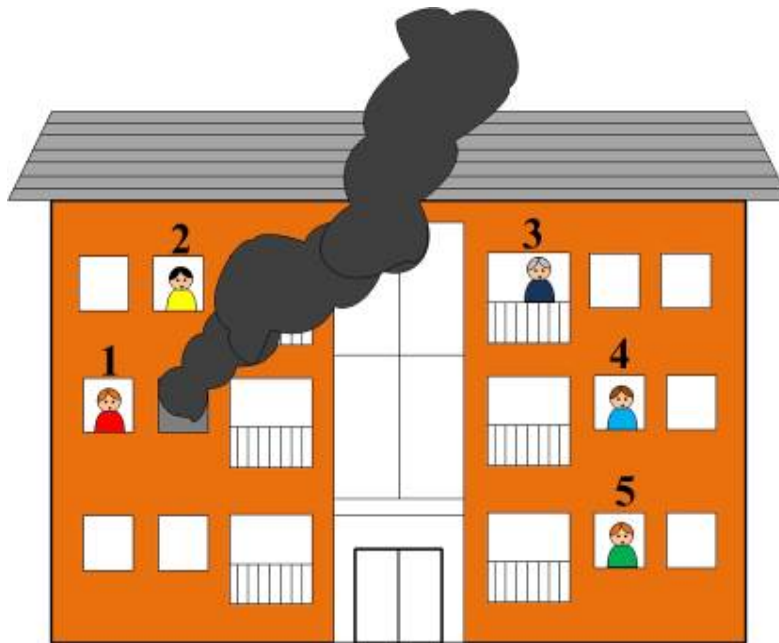


Figure 23: Rescue priority.

Personnel should also consider that the best way to control occupants and maintain their safety may be to protect in place.

If an exit is blocked by fire and there is no other means of egress, breaching a wall to a safe area is a useful tactic. Breaching involves making an opening in the wall and moving the victim to a safer area. A tool will be required to remove drywall and studs to provide enough space. Keep in mind that this tactic may also be used for firefighter survival. Wall studs are generally between 16 and 24 inches on center. Make the opening large enough for a firefighter wearing personal protective equipment and SCBA. Prevent entanglement by removing any wiring in the opening. Remove the drywall first, and then hit the stud at the bottom where it attaches to its bottom chord, marrying two study bays together and creating a large exit hole.

As a last resort, the removal of occupant(s) by a lowering system may be required. This can be performed by one firefighter on the fire floor. In the event that an area is becoming untenable, and portable ladders or the building's stairs are not accessible, rappelling out of a window may be considered as a last resort for escape. This evolution can be dangerous for both firefighters and victims.

Immediately begin patient care once the victim is removed from the structure and continue until the arrival of EMS personnel