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

FIRES IN GARDEN-TYPE APARTMENTS

Second Edition

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PREFACE

This manual is designed for use as a resource and reference for all fire department personnel in Northern Virginia for response to fires and emergencies in garden-type apartments.

Garden apartment living in the Washington-Metropolitan area developed predominantly after World War II when housing was needed for a rapidly growing population. Construction of these units placed multiple families under one roof, in a setting that provided for courtyards, large grassy areas, and playgrounds. These setbacks separated the actual buildings from the parking lots providing an atmosphere of openness as compared to multi-family city dwellings, hence the name "garden apartments."

Statistically, the fatalities in garden-type apartments in Northern Virginia seem to mirror the national average. Most fires and fire fatalities occur in residential occupancies. Garden apartment-style buildings have been the stage for many large fires in this area.

The objectives of this manual are:

- To describe multiple-family, garden-type apartments, which are prevalent in the Northern Virginia area.
- To identify the construction features of such buildings with regard to protecting life and extinguishing fires.
- To describe the hazards associated with these types of structures and recommend actions that should be taken to overcome these concerns.
- To reduce the loss of life and property by establishing a standard method of operation for companies combating fires in garden-type apartments.
- To establish operational responsibilities for engine, truck, and rescue companies at fires in these structures.

The key changes in the Second Edition of *Fires in Garden-type Apartments* are as follows:

- Minor wording and graphics edits without substantial content alteration.

OVERVIEW

Garden apartments vary by construction type and the number of units contained within the structure. The type of construction is dependent on the year it was completed. The number of units on each floor varies based on the physical layout of the structure.

The exterior of garden apartments can be constructed of various materials. These include: solid masonry, brick veneer over wood frame, wood only, and various types of siding. Garden apartments typically have a common stairwell and entryway which may be open or enclosed. This design precludes long corridors. The stairway may exit to the front or both the front and rear of the building.

The term ‘garden apartments’ applies to a specific group of buildings, anywhere from two to five stories in height, with each floor housing one to four units. The buildings may be attached and consist of multiple addresses (making access to the rear difficult) or may stand alone. The buildings are usually set back from the main street carrying the address and often have a maze of parking lots somewhat removed from the structure itself.

Depending on the terrain, floor levels above ground can vary from front-to-rear and side-to-side. Landscaping, fencing, and setback can limit access for apparatus in some circumstances.

Depending on the era of construction, many garden apartments may have a balcony that extends from the unit and can be made of combustible or noncombustible materials. These balconies can be extended or recessed.

A majority of the roofs are gable or flat, but you may find mixed varieties. Newer roofs often have large cross gables and dormers. Some buildings use the attic space as living area.

Often the lowest floor may contain occupied apartments, storage areas, utility rooms, laundry facilities, trash rooms, or any combination of these. Many newer building are constructed on a concrete slab and do not have the traditional basement storage and laundry rooms.

Garden Apartment Characteristics

The characteristics of construction are driven by the time period in which the particular complex was built, Figure 1. There were three distinct building periods in which complexes were constructed. In the 1940s and the 1950s the buildings were predominately ordinary construction with masonry walls. 1960s through the 1970s buildings were predominately wood-frame construction with masonry veneer walls and a masonry and concrete stairwell. The building boom beginning in the 1980s and extending to present day produced almost exclusively lightweight wood-frame construction containing wood stairwells and some form of combustible materials for siding.

Companies may find buildings that have a combination of construction materials.

Figure 1: Changing construction methods.

Apparatus access may be simple or complex. Fire lanes may provide direct access to the front or rear. Access may also be gained by removing a section of fence or security gate. The parking lot, when full, may impede access to the building. Complexes that have limited vehicle access require deployment of equipment over longer distances. Pre-incident knowledge is the best means of planning vehicular access to garden apartments. A common garden apartment configuration consists of a stairwell, foyer and four apartments, Figure 2.

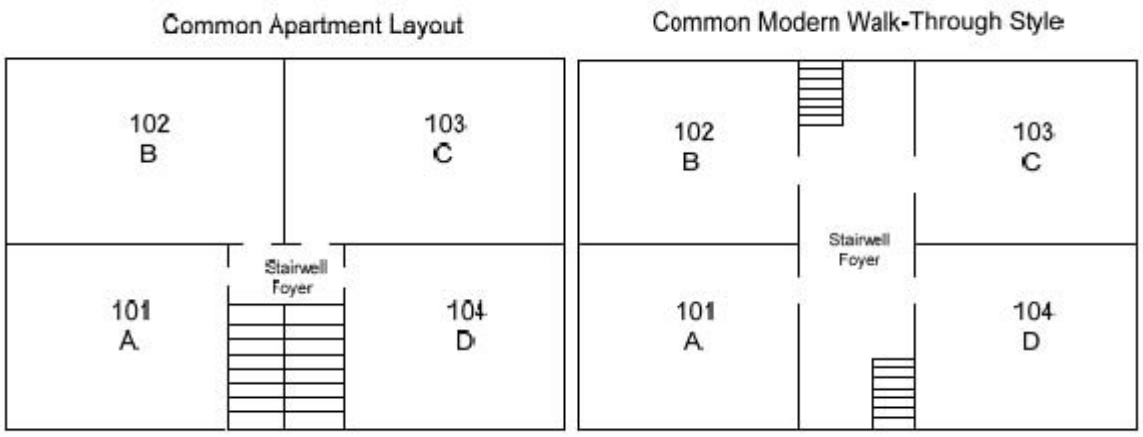


Figure 2: Common garden apartment configuration.

Typically the front door and balcony door lead to the living, dining and/or kitchen areas. Normally, a short hallway with a bathroom leads back to the bedrooms. The lowest (terrace) level is usually laid out differently than the rest of the building, while the upper floors are usually stacked (kitchen over kitchen, bathroom over bathroom), the basement contains storage rooms, utilities and perhaps terrace level apartments, Figure 3 and Figure 4.

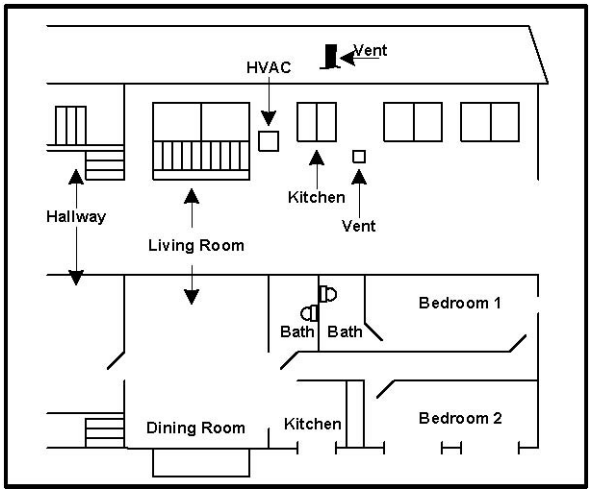


Figure 3: Typical floor plan.

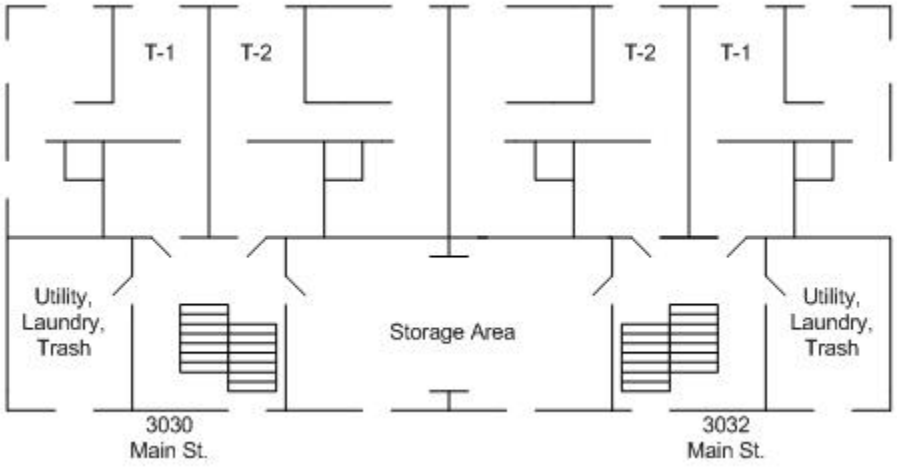


Figure 4: Typical terrace-level floor plan.

Another significant floor plan that might be encountered is the “wrap-around” style apartment. This is where large three or four bedroom apartments occupy portions of quadrants A, B, and C, while smaller efficiency apartments occupy part of the B and C quadrants. Fire issuing from a rear window in the B quadrant would lead personnel to believe the fire was in the B quadrant apartment while the fire would actually be in the A quadrant apartment, Figure 5.

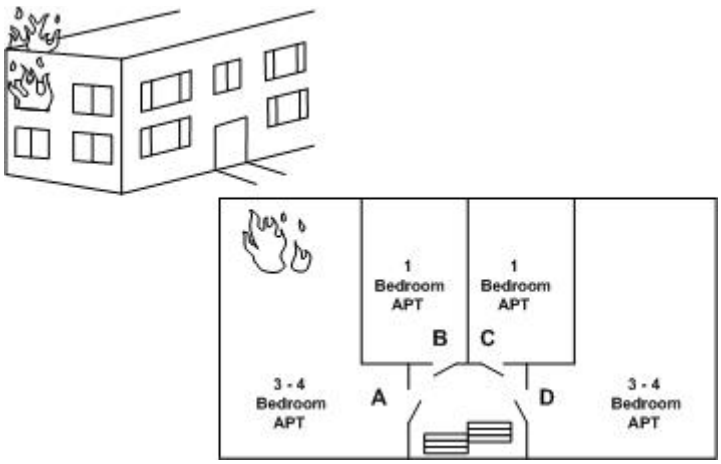


Figure 5: Typical wrap-around floor plan.

Grading of the building site may provide for a greater number of floors on one side than on another. An example, as seen in Figure 6, is a garden apartment building with three floors on the front (or side A) and four floors on the rear (or side C). It is critical that every company/command officer is aware of this when transmitting location information. Using phrases like “third floor balcony on the rear (or side C)” or “second floor level on the front (or side A)” is appropriate for identifying location.

Figure 6: Garden apartment building viewed from front and rear demonstrating differences in the level of floors visible.

Apartments will be in a configuration of one to four per floor. The lowest level is usually different from the rest in that it may incorporate terrace level apartments, storage rooms, trash rooms, laundry rooms, and/or utility accesses. Another significant feature is the layout in which the lowest level apartment has its sole entry/egress point in the rear or side of the building. These apartment units are separated from the rest of the building above by having no access to the public stairwell, Figure 7.

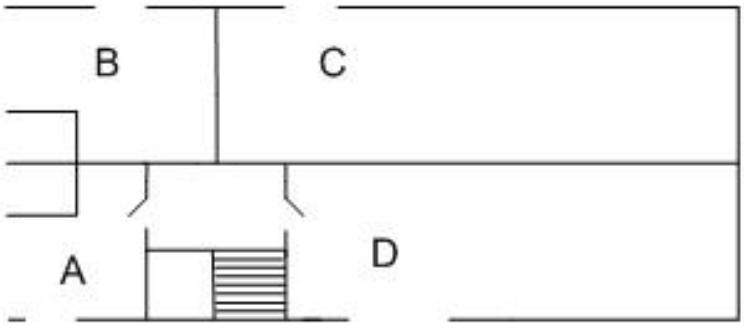


Figure 7: Isolated apartment.

It is quite common to find storage, laundry, trash, and utility rooms in the basements of the garden apartment building. Storage rooms create a unique hazard in that storage bins may only be 2"x 4" studs using wire mesh to separate the units and they can contain many flammable or hazardous materials. The basement may be inaccessible from the exterior or have limited exterior access via a window well. In some garden apartments, a smaller storage and/or laundry room may be found on each floor.

It is common for the building engineers and maintenance staff to maintain offices, workshops, and storage areas in the basement area of the garden apartment building. Consider additional fire loading consisting of PVC pipe, combustibles, and flammable liquids associated with maintenance and repair.

A garden apartment floor plan increasing in popularity is the two-story apartment. Most often, a top floor apartment uses the attic as a loft or bedroom.

Another garden apartment layout is where the lowest level runs the entire length of several addresses above it. Firefighters can pass from one building to the other without going outside. There is usually a fire-rated separation containing a door between the addresses. The fire separation is defeated when the doors separating the addresses are propped open.

Garden apartment dwellings will be serviced by several utilities. Water, sewer, gas, oil, electric, TV, cable, and telephone services are found within these occupancies. Both inside and outside gas meter installations will be found. Oil tanks may be found inside or outside of the buildings. Bottled gas utilities are essentially non-existent as permanent installations but may regularly be found on balcony grills and in storage bins.

From the 1940s until the 1970s, garden apartment buildings consisted of primarily rental units. The utility fees were included in the monthly rent. A large main electrical room and gas meter could be found in the basement with a smaller electrical or fuse panel in each individual apartment.

During the 1980s and 1990s, many of the older apartments were renovated and converted to condominiums and made available for sale. Accompanying this conversion to private ownership

was the inclusion of independent utility meters in a bank located in the basement of the building. Some buildings may have meters in each apartment, or on exterior walls.

Garden apartments can include parking garages on the lowest level. The parking garage and building above it may have sprinklers.

GARDEN APARTMENT CONSTRUCTION

Garden apartment structures demonstrate different construction characteristics. This section details the types of construction that firefighters may find in different types of garden apartment structures.

Ordinary Construction (Early Construction 1940s to 1950s)

Ordinary construction has masonry bearing walls with wood floors and roof components. The most prevalent floors in this type are wood with 2"x 6" or 2"x 8" wood beams for joists covered with 1" x 3" plank board subfloor and tongue-and-groove hardwood, or parquet, floor. Concrete may also be found in these older structures, but in no way makes the structures fire resistive (Type I) or non-combustible (Type II) construction. Upward extension may be minimized with concrete floors.

Garden apartment buildings of ordinary construction typically do not exceed four stories and 50 feet in height on the addressed side.

The interior walls in older units may have 2" x 4" wood studs with a lath and plaster coating. The plaster walls tend to hold heat but are typically more resistant to extension than modern assemblies. (Firefighters should note that the older plaster walls and ceilings are labor intensive to open with hooks). Openings through the floors around pipes and vents are generally limited. General workmanship was of a higher standard; a 3-inch pipe went through a $3^{1}/_{8}$-inch hole.

Roofs and Attics (Ordinary)

The roofs of ordinary construction apartment buildings are typically flat or pitched. They are considered conventional construction (as opposed to lightweight) in that it has 2"x 6" or 2"x 8" supports with ¾"x 6" board sheathing covered with tar and gravel or tarpaper and shingles. Some complexes may even have slate instead of shingles. Plywood may be found where repair or replacement of the roof was necessary.

In flat roofs the beams normally run from the front of the garden apartment building to the back, typically with no parapets at the firewall separations. If the void space is the depth of the beams, fire in the cockloft area will have minimal spread from side to side but considerable spread from front to back. Some of these structures have no firewall separation and may have a void space between the roof beams and the ceiling of the occupancy, Figure 8. In these cases, fire in the void space will spread rapidly under the roof. The void space in flat roof construction is commonly referred to as the cockloft.

Figure 8: Attic void space.

In some buildings you may find a thin layer of concrete separating the top floor ceiling from the attic or cockloft space, Figure 9.

Figure 9: View from scuttle hole showing layer of concrete ceiling.

Sometimes a pitched roof is constructed over a flat roof because the flat roof is in disrepair. Lightweight wood trusses are laid front to back on top of the bearing walls and covered in the standard lightweight format. Ventilating the pitched roof may have little effect on the fire in the cockloft of the old flat roof. Conversely, hooking ceiling from the top floor to access the cockloft will have little effect on fire in the area under the pitched roof. HVAC units may also be placed on top of the flat roof, under the gable roof. This add-on roof situation requires prior knowledge of such a condition but may be characterized by a new lightweight roof over bearing exterior brick walls. At times, the addition of the new roof can be identified by the difference in siding at the gable ends of the building or a building with a pitched roof that has cockloft vents (Figure 10).

Figure 10: A renovation showing gable over flat roof; vinyl over brick may be an indication of renovation.

Walls (Ordinary)

The exterior walls in the 1940s and 1950s are usually brick (load bearing) with two separate walls (two Wythes) tied together with a header course. The 1960s ordinary construction used a combination brick and block wall with brick veneer covering the block-bearing wall. The exterior walls usually have parapets above the flat roofline. Rain scuppers above the roofline and cockloft vents below the roofline identify the roof level. Figure 11 shows a flat roof rain scupper and cockloft vent.

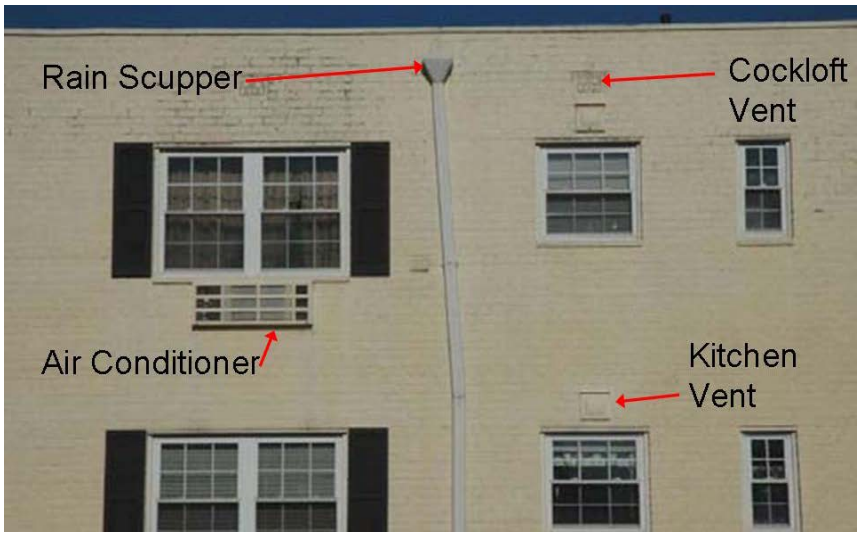


Figure 11: Rain scupper.

In a majority of the buildings, the front and rear (sides A and C) walls are load bearing while the sides (sides B and D) are not. Obviously, in the case of the hip style roof, all four walls are load bearing. The center wall (the wall separating the A and D apartments from the B and C apartments) may also be load bearing.

Insulation (Ordinary)

Insulation may be rolled fiberglass, rock wool, or blown-in cellulose. Insulation may be found in attics, exterior walls and, in some structures, the interior walls. Fiberglass being non-flammable can help slow the spread of fire into the attic space around lights, wires, and other access points. Blown-in or shredded and treated newspaper or cellulose could add to the fire spread as much as it creates a smoldering rekindle hazard.

Firewalls (Ordinary)

Depending on when the garden apartment was constructed and what edition of building code was in effect at the time, firewalls may be: located between each address, located between every other address, non-existent, or only between the livings spaces (on occupied floors) and may or may not extend into the attic or basement.

Firewalls are constructed of two types: masonry or gypsum board (two ½-inch layers on both sides of the wall studs.) The firewall may stop at the exterior bearing wall (leaving the soffit or overhang unprotected). Solid masonry firewalls can often be seen from the exterior if the parapets extend through the roof. Masonry firewalls may stop at the underside of the roof deck.

Rooflines (the ridges) may be offset at each address to accomplish separating the attic spaces.

Familiarity of buildings in each respective response district, especially during construction, will provide knowledge of the type and location of firewalls.

Floors (Ordinary)

The most prevalent floors in ordinary construction are 2” x 6” or 2” x 8” wood floor joist. 1” x 3” boards typically cover the floor joist at a 30 to 45 degree angle finished flooring normally hardwood is applied on top. Bathroom floors were frequently leveled with several inches of concrete before the tile was applied. Floor joists will normally be spaced 16 inches on center.

Floor joist direction can be side-to-side or front-to-rear. If side-to-side, one may find steel girders and columns supporting the floor. These could present a collapse hazard when exposed to fire. If joist run front to rear, they will be supported on the mid-line basement load-bearing walls.

Basements (Ordinary)

Many buildings were built into the side of a hill or slope. The fronts of many buildings (quadrants A and D) are below grade and house the storage, utility, trash and laundry rooms. The rear of the building (quadrants B and C) is frequently at ground or terrace level housing two apartment units. You may also find that quadrants A and D are apartments while quadrants B and C house the storage, utility, trash and laundry rooms. Cinder block and/or concrete walls are common in the basement area.

Windows and Balconies (Ordinary)

The use of old style steel casement windows was very prevalent in the 1940s early construction and these windows pose their own unique hazards, Figure 12. The windows have steel frames set in concrete or masonry. While breaking all the glass in the windows will ventilate the affected area, entrance and exit through the remaining window frame is physically blocked. The window must physically be opened by lifting a latch and rotating a crank. Removing the frame with force will be very difficult under adverse conditions and would require the use of heavy forcible entry tools (such as a sledge or power saw). Firefighters and officers should make note of these windows with pre-fire planning or in their size-up upon arrival at a structure fire. A flashover in a building with this type of windows creates an extremely dangerous situation in which members would be unable to quickly bailout of the area.

Figure 12: Examples of casement windows.

Double-hung or horizontal sliding type windows may also be found, particularly after being remodeled. Openings made from breaking out the glass are usually large enough for egress.

Balconies in garden apartments are of two general types, extended and recessed. The floor of the balcony, its support system and the railings can be constructed of wood, metal, concrete, or a combination of these materials. Recessed balconies are typically supported on two or three sides by bearing walls. The balcony is open on one or two sides.

Some corner units have balconies supported on two sides by bearing walls and columns on the corner from the ground to the roof, Figure 13. Older ordinary constructed buildings frequently used regular hinged doors on the balconies rather than the more modern sliding glass or French style doors.

Figure 13: Corner unit balcony with hinged door.

Doors and Means of Egress (Ordinary)

Doors to individual apartments in ordinary construction originally were solid wood with a wood frame and swing into the apartment. The significance is that hydraulic forcible entry tools may fail to open these as it just tears away the wooden rabbetted jam. This is quickly overcome with other conventional forcible entry tools. As these buildings have been renovated, doors have been replaced with more modern metal and metal covered doors with metal jambs. The locks used to be exclusively doorknobs and add-on rim locks but, after renovation, it is not uncommon to find mortise deadbolt-and-latch locks. The safety chain was also standard equipment. It is an indicator that a unit is occupied if it is in use.

Stairs and Stairwells (Ordinary)

Typically the stairwells in ordinary construction buildings are enclosed masonry with concrete or steel steps and risers. Windows in the stairwells are typically casement or double-hung, Figure 14.

Figure 14: Ordinary construction enclosed stairwell.

Interior floors are usually open, each floor is not separated from another by a fire rated assembly like a door or wall.

There may be a scuttle at the top of the stairs that goes directly out onto the roof (flat roof) or into the attic (pitched roof), Figure 15.

Figure 15: Scuttle hole.

HVAC (Ordinary)

In older construction, if it has not been renovated, the central heating unit may be located in the basement of the center address and consist of a large oil or natural gas boiler with hot water heat transfer.

The only access to the boiler area may be from an outside entrance in the rear of the building. Another configuration may have the boiler in its own separate building with heat being plumbed to the rest of the addresses in the complex.

Size-up of the chimney at the roofline may be a good indication of the location of the boiler room, Figure 16.

Figure 16: Boiler room.

It is not uncommon to find window air conditioning units in these older style buildings that have not undergone renovations or mechanical upgrades, Figure 17. These represent a falling object hazard and block the windows entry and egress potential.

Figure 17: Window air conditioning unit.

Chimneys (Ordinary)

Chimneys found in ordinary construction (1940 – 1950s) are normally all masonry and originated in the boiler room of the building. Individual fireplaces in the apartments were typically nonexistent.

Garages (Ordinary)

The swinging door from the common area or stairwell to the garage may be a rated assembly. A vehicle or contents fire in a garage may allow for rapid fire/smoke extension to other areas of the structure. The presence of a finished living area over the garage presents a serious life hazard, Figure 18.

Figure 18: Garages under apartments.

The overhead entrance door to the garage and its mounting hardware may not be fire-rated. These types of doors are known to collapse when left open and exposed to fire.

Fire Protection Systems (Ordinary)

Most alarm systems in garden apartments are local alarm systems. Manual pull boxes are typical. Early buildings may only have individual apartment smoke detectors.

An alarm in one address may activate alarms in adjoining buildings/addresses. In buildings that are monitored, the entire building may be monitored or just the common areas. There may be one or two sprinkler heads in the storage room fed by a domestic system. Most are designed to hold the fire in check, but rarely completely extinguish the fire. This causes an increase in cold smoke and disruption of the thermal balance.

Ordinary, Wood Frame, and Lightweight Wood Frame Construction

The 1960s and 1970s were transitional years for building construction. Garden apartments built during the early and mid-1960s were typically ordinary construction with masonry bearing walls, wood floors, and wood roofs. Although similar to buildings constructed in the 1940s and 1950s there are some notable differences. Thin plywood floors replaced the 1”x 6” hardwood flooring common to buildings of the 1940s and 50s. Roof truss assemblies replaced the ridge pole and joist roofing, plywood replaced the 1”x 6” roof decking and gang- nails replaced standard nails. The inner block wall is typically the bearing wall while the outer brick wall is usually veneer (non-bearing). The floor joists are usually dimensional lumber 2” x 8” or 2” x 10”.

During the late 1960s and early 1970s many builders began using all wood frame construction. The bearing walls, floors, and roof are all wood. The platform method was the most common type of wood frame construction. The floor joists are typically dimensional lumber.

By the mid to late 1970s, lightweight construction became the standard. Dimensional lumber floor joist were replaced with lightweight truss joist.

Roofs and Attics (Frame/Light Frame)

The roofs of these wood/lightweight frame apartment buildings are typically flat or gable. Although not as common, firefighters may find mansard, hip, or other style roofs. Cathedral interior ceilings are also popular. These roofs are considered lightweight construction (as opposed to conventional) with 2"x 4" trussed supports with gusset plates as attachment joints, Figure 19. Sheathing is plywood with tarpaper and shingles. Trusses typically run from front to back. Trussed roofs, both flat and gable, present a problem of rapid-fire spread throughout the attic space because of the open area created by the trusses.

Figure 19: Common attics from 1960-1970s construction (left) and 1980s to the present construction (right).

In the late 1970s and early 1980s plywood used in roof construction was treated with a chemical to make it fire resistive to meet code requirements. The plywood is referred to as Fire Retardant Treated (FRT). On garden apartments, this plywood was normally only used near the firewall outward for a distance of two to four feet. As these construction materials age, the fire retardant chemical treatment degrades the wood and the glue used to hold the plywood together, thus making the roof's plywood unstable and subject to very early failure.

Many roofs constructed in the 1980s or later have an additional hazard of dormers and cross gables. The windows in these dormers may not serve living areas of the building (false dormers). This creates a concentrated load on the roof in the area of the dormer and can accelerate a collapse, Figure 20. If they are dormers that serve as living areas they may create a 'knee wall' void space.

Figure 20: Dormer collapse.

Soffit (roof overhang) vents allow fire issuing from windows to extend into the attic area, which is a cause of extension by exterior means, Figure 21. Attics may or may not be separated by firewalls.

Figure 21: Example of soffit.

In buildings where sprinklers are provided, upright heads may be located in the attic space. The presence of sprinklers in no way replaces the need for aggressive firefighting attic operations.

Walls (Frame/Light Frame)

The interior walls have wood studs with gypsum coverings. Significant voids may be found in interior walls, especially in the kitchen area behind the cabinets.

The top floor ceilings, particularly over the stairway, may be double-layered drywall in accordance with fire codes. This is most likely the case in buildings without residential sprinkler systems.

Cathedral ceilings frequently found in newer construction, may be 12 feet or higher from the floor.

The exterior walls in the 1960s-1970s construction are wood frame with brick veneer walls using light metal connectors. Firewalls with parapets through the roof in this construction are non-load bearing brick and block. Windows in the exterior walls may not have brick veneer over or under them. They may have plywood or some other type of combustible siding over windows, which extend to the windows above and all the way up to the soffit overhang (called a Spandrel space), Figure 22.

Figure 22: Spandrel space.

Many of the 1960-1970s buildings are of a blended construction. The foundation, stairwell, and walls supporting heavy concrete balconies and HVAC units may be bearing brick and block while the remaining non-bearing walls are veneer brick. Firefighters may find a concrete floor between the basement and the first floor while all remaining floors are made of wood.

The exterior walls in 1980s and later construction are wood frame with aluminum, vinyl, wood, or brick veneer siding on the exterior. As mentioned earlier, the lighter weight siding (excluding brick) and 2”x 6” wall studs have allowed four- and five-story heights to be constructed. The combustible siding and insulating material adds the dimension of rapid vertical extension up the outside of the structure as well as extension to exposures via high radiant heat. In some of the newest construction firefighters may find light steel 2” x 4” load bearing walls and light steel attic truss systems.

Typically the roof truss system is supported with the front (side A) and rear (side C) load bearing walls. Obviously the hip roof design is the exception as all four walls are load bearing.

Insulation (Frame/Light Frame)

Insulation can be rolled fiberglass, rock wool, or blown-in cellulose. Insulation may be found in attics, exterior walls and, in some structures, the interior walls. Fiberglass being non-flammable can help slow the spread of fire into the attic space around lights, wires and other access points.

Blown-in or shredded and treated newspaper or cellulose could add to the fire spread as much as it creates a smoldering rekindle hazard.

Firewalls (Frame/Light Frame)

Depending on when the garden apartment was constructed and what edition of building code was in effect at the time, firewalls may be:

- Located between each address;
- Located between every other address;
- Non-existent;
- Between the livings spaces (occupied floors) only and does not extend into the attics or basements;
- Between each apartment and over each apartment in the attic; or
- May stop at the bearing wall leaving the soffit overhang unprotected.

Firewalls are constructed of two types: masonry or gypsum board (in multiple layers). Solid masonry firewalls can often be seen from the exterior if parapets extend through the roof. Masonry firewalls may stop at the underside of the roof deck. Rooflines (the ridges) may be offset at each address to accomplish separating the attic spaces. Firewalls might be penetrated to allow the running of utilities, or significantly compromised during construction, renovations or following an event in the building such as an explosion, Figure 23.

Figure 23: Breach in firewall/draft stop.

Familiarity of buildings in each jurisdiction during construction will provide knowledge of the type and location of firewalls.

Masonry firewalls extending beyond the roofline are typically very effective. The roof over-hang, as seen in Figure 24, can be a source of extension. Combustible trim located on the firewall may reduce its effectiveness, Figure 25.

Figure 24: Exterior clues to the location of a firewall.

Figure 25: Ineffective firewalls.

Floors (Frame/Light Frame)

The typical wood frame floor consists of 2”x 8” or 2”x 10” joist covered with plywood. The plywood is normally covered with carpet, tile, vinyl, or hardwood. More common in the light frame constructed (1980s to current) garden apartments are wood-trussed floors. These are tongue-and-grooved plywood and 2”x 4” chord beams known as factory, manufactured, or engineered wooden “I” beams. Another type truss is the manufactured 2”x 4” parallel chord truss. Both truss systems are typically covered with plywood or particleboard. Floors may have numerous vertical openings for utilities and plumbing. Joists may have numerous horizontal openings for ductwork and electrical wiring. The potential for rapid fire spread and early collapse of lightweight floors is great if fire enters the truss floor space, Figure 26.

Figure 26: Collapse of light frame truss floor.

Smoke issuing from the band board area of an exterior wall may indicate that fire has breached the truss floor space, Figure 27.

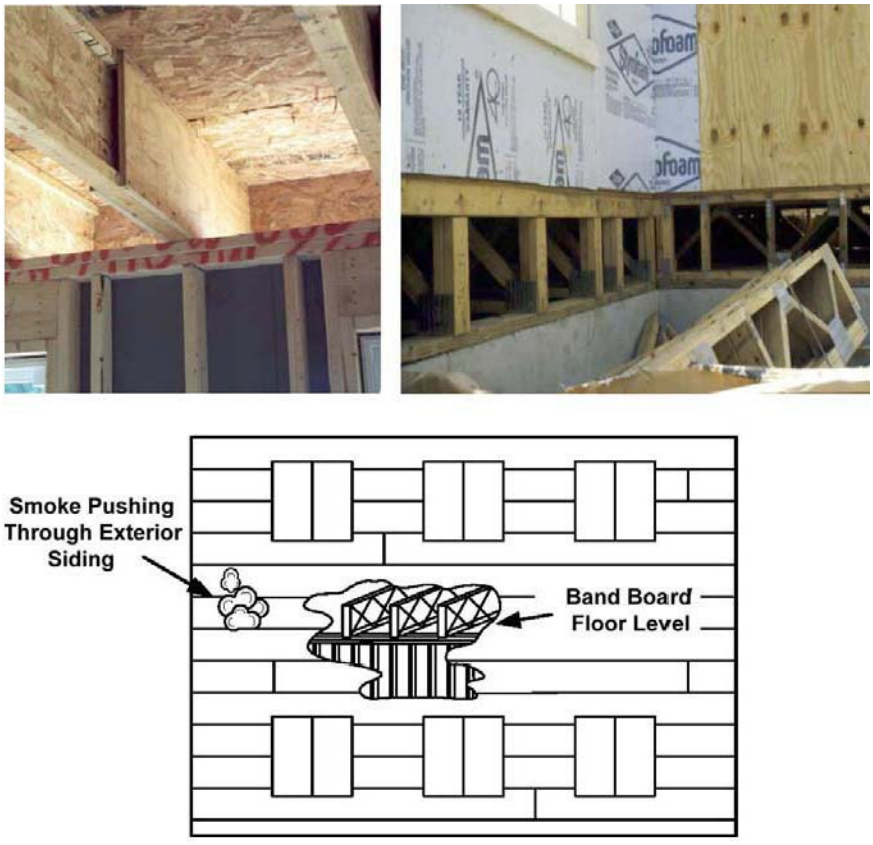


Figure 27: Smoke issuing from the band board area can indicate fire has breached the truss floor space.

In many buildings the ceiling of the terrace-level storage room is concrete while the remainder of the buildings floors and ceilings are wood frame.

Basements (Frame/Light Frame)

Basements of the 1960s and 1970s constructed buildings are similar to the 1940s and 1950s buildings. Quadrants A and D are below grade and house the storage, utility, trash, and laundry rooms. Quadrants B and C house two apartment units and are typically labeled “T1” and “T2.” Buildings constructed in the 1980s or after (light wood frame era) construction costs began to skyrocket. Builders had to eliminate basements and began building on flat concrete slabs.

Windows and Balconies (Frame/Light Frame)

Windows in the 1970s and newer type of construction are commonly double-hung or horizontal sliding type with aluminum frames. However, other types may be found. Openings from breaking out the glass are usually large enough for egress. Windows in 1980s or newer construction are typically double- or triple-layered insulated glass with vinyl frames.

Balconies in garden apartments are of two general types, extended and recessed. The floor of the balcony, its support system and the railings can be constructed of wood, metal, concrete, or a combination of materials. Extended balconies are usually extended over the bearing walls in a cantilever fashion, Figure 28. The balcony is open to the exterior on three sides and extends out from the building. These balconies will weaken as supporting interior floors and walls deteriorate under fire conditions.

Figure 28: Extended balconies.

The most common balcony door found during the 1960-1970s period was the aluminum framed sliding glass door. The glass may be plate, safety, or tempered. Modern assemblies are typically vinyl framed, insulated tempered glass units that are either sliding or French opening, Figure 29.

Figure 29: French and sliding style balcony doors.

Doors (Frame/Light Frame

Doors from the 1970s and newer range anywhere from hollow metal to insulated metal covered. Some units may even have expensive wood panel doors. Windows in the doors are usually not present. Almost all of these types have one thing in common, a metal doorjamb. This metal jamb lends itself to the use of the hydraulic forcible entry tools for which these tools were designed. Locks may be rim or mortise depending on the door. It is not uncommon to encounter multiple lock cylinders or both types of locks in one door. Doors may be equipped with some sort of self-closing device.

Stairs (Frame/Light Frame)

Many stairwells constructed during the 1960s and 1970s were enclosed with glass. This glass usually ran from the ground height up to the top floor. This glass may be heavy plate and capable of causing serious injuries if broken.

Interior floors are usually open, each floor is not separated from another by a fire rated assembly like a door or wall. An exception to this may be terrace level (lowest level) apartments and storage/utility areas where a door is located at the bottom of the stairs to access that floor. This door would be in addition to the individual apartment door/storage room door.

Stairwells in 1980s and later construction are typically non-enclosed/open to the outside and constructed of wood. Some disadvantages may be that the stairwell itself is combustible. Steel or wood framing with open risers and concrete treads may be found in the open stairwell environment. These stairwells also have the inherent feature of being accessed from front and rear. Some buildings may have a dry standpipe.

Figure 30: Wood frame enclosed stairwell and light frame open stairwell.

HVAC (Frame/Light Frame)

Heating and cooling units in these structures may be located in a closet off of the balcony, often stacked one over the other from the terrace level to the top floor, Figure 31. In buildings with no balcony, HVAC units may be located in a closet adjacent to the kitchen sharing the same common vertical shaft that the kitchen utilities use. In some cases, you will find a common heating and cooling plant in the basement of one address or in a separate building altogether.

Figure 31: Stacked HVAC.

In recent years the hot water and/or HVAC units have been located in the attic space and/or on the roof, particularly over the stairwells, Figure 32. These units are supported by wooden lightweight systems and pose a significant collapse hazard.

Figure 32: HVAC in attic space.

Chimneys (Frame/Light Frame)

Apartments with zero clearance fireplace systems are present typically during the latter part of this building period. Firebox venting is via double or triple lined metal piping into a common shaft system to the roofline or short vertical piping directly to the closest exterior wall of the structure. The exhaust stacks are frequently decoratively boxed in with combustible materials.

Garages (Frame/Light Frame)

Many new garden apartment buildings are offering attached garages, Figure 33. These garages are typically on the terrace level. They may or may not have an entry directly into the common stairwell or private apartment. If available, the swinging door from the common area or stairwell to the garage may be a rated assembly.

Figure 33: Light wood frame with garage.

A vehicle or contents fire in a garage may allow for rapid fire/smoke extension to other areas of the structure. The presence of a finished living area over the garage presents a significant life hazard.

The overhead entrance door to the garage and its mounting hardware will not be fire-rated. These types of doors are known to collapse when left open and exposed to fire.

Fire Protection Systems (Frame/Light Frame)

In newer construction, the alarm systems may be a local alarm system or may be monitored. This includes the smoke detectors in the individual apartment units. An alarm in one address may activate alarms in adjoining buildings/addresses. In those buildings that are monitored, the entire building may be monitored or just the common areas. Total or partial sprinkler coverage may be found in these buildings.

Loud stairwell bell alarms are effective at removing the occupants if activated early in the incident. These same loud bells can create difficult communication problems for firefighters operating in the stairwell. Removing the bell with a tool or shutting off the power can increase emergency communications abilities in the foyer and stairwell. (The power shut off is usually a small, stand-alone panel, painted red and located in the basement/utility area.) Newer buildings often have a closet located on the terrace level that contains the alarm and sprinkler controls. This closet may be accessed with a Knox Box system.

Modern garden apartments can also have 13R sprinkler systems. These are required due to height, access, or large floor area. These are wet systems fed off of domestic water with no fire pump. They may be equipped with a single outlet fire department connection (FDC), Figure 34. Upright sprinkler heads may be located in the attic under the roof sheathing.

Figure 34: Sprinkler connection.

HAZARDS IN GARDEN APARTMENTS

Fires in garden apartments present numerous hazards to occupants and responding firefighters.

Life Hazards

Life hazard is the number one priority for firefighters. Regardless of the time of day, garden apartments of all construction types may have a significant life hazard. Life hazard includes those in attached exposures. Security measures such as locked entrances to the stairways, while not necessarily impacting occupants egress, may impede entrance by fire companies.

Each level of the garden apartment may contain between one and four apartments with one to four bedrooms each. Therefore, the occupancy load per floor should be considered substantial.

In garden apartments there are limited means of egress. Fires in the lower floors of the building increase the life hazard, as the sole interior means of escape is the central stairwell.

The term garden apartments can represent many different arrangements. Some of the less conventional configurations can be confusing for the responding units. Valuable time can be wasted attempting to locate the apartment on fire. Company officers are responsible for ensuring that members are familiar with their response district. Lack of familiarity increases the hazard for those crews attempting to locate, confine and extinguish the fire, as well as the search and rescue of trapped occupants.

Central air conditioning in older buildings was not available or not provided. Hazards associated with these buildings include the presence of window unit air conditioners. Firefighters should avoid arbitrarily shoving window air conditioners out of the windows for ventilation. Outside vent crews should cautiously push window air conditioners in from the outside as many fire victims have been found at the base of windows.

Fire Spread

The use of combustible interior finishes and the type of furnishings found within these structures contributes to the fire loading. Generally garden apartments are considered to have a relatively low fire loading. Fire flow estimates will be based on a flow rate of 10 GPM per 100 square feet of involved area; therefore, 1¾-inch attack lines should be adequate.

Fire spread to exposure apartments adjacent to and above is a major concern. Fire issuing out of a window may quickly be communicated up the exterior traveling floor to floor and into the attic via the soffit vent (which may be located directly over the top floor window), Figure 35.

Figure 35: Exterior fire spread.

The presence of combustible siding can greatly affect the fire hazard, Figure 36. Vinyl and wood siding may contribute to vertical and horizontal fire spread and creates a severe exterior exposure problem.

Figure 36: Combustible siding.

Fire can spread over combustible exterior siding and be drawn into the attic vents. Exterior extension by this means can occur on the attached occupancy around the firewall. Fire spread from the contents to the structural members can cause weakening of the structural members causing a collapse.

There has been a significant increase of fires that have originated on the exterior of garden apartment buildings in mulch beds or from other sources. If left uncontrolled, these fires will quickly enter the structure. A quick exterior knockdown of combustible siding, insulation, or wooden balconies may prevent the fire from entering through the roof soffit, windows, and

doors. An additional line must be quickly placed into the building to check for fire spread with emphasis on the attic and upper floor, Figure 37.

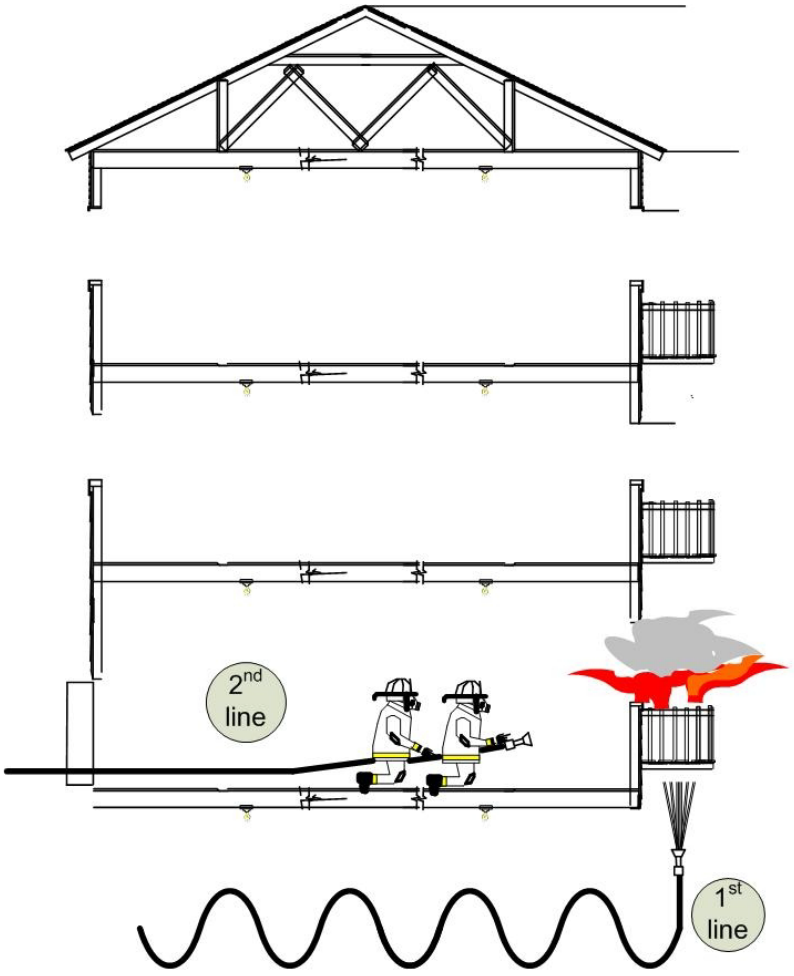


Figure 37: Additional inside hoseline on exterior garden apartment fire.

Barbeque grills, smoking materials, candles and fireplace ashes have been the cause of fires where the fire originated on the patio or balcony and spread upward and into the building and attic.

Interior vertical fire extension to the attic, cockloft, or apartments above is common in this type of occupancy. Vertical voids such as pipe chases in kitchens and baths are one of the primary means by which fire extends in garden apartments. Vertical and horizontal openings allow smoke and fire to enter and attack the structure itself. An additional vertical void exists in buildings when the apartments have their own individual utility closet. Fire that has entered these voids will necessitate the opening of floors, ceilings, and walls. Fire in the void space will frequently extend to the attic regardless of the floor of origin.

In the cases of fire involving the top floor apartments, the drywall on the ceiling may drop off, exposing the attic or cockloft.

Natural Gas

The presence of natural gas in apartment buildings creates some unique hazards. The utility areas are often unsecured and susceptible to accidents or sabotage. Large commercial size meters can often be located within the basement of these buildings.

Laundry rooms equipped with gas dryers have multiple gas lines suspended from the ceiling area. Un-designed loads on the pipes have caused significant gas leaks that have resulted in catastrophic explosions leaving the buildings in various stages of collapse. This factor is directly related to at least one firefighter fatality in the Washington Metropolitan area. This situation is exacerbated when the pressure in the pipes is 5-10 psi as opposed to the 0.5 psi after the meter regulator, which generates a leak with a higher pressure; this is identified by in-line regulators at each appliance.

When the explosion occurs, collapse and flying debris become greater hazards than the flash fire, which may burn itself out. When confronted with this situation the action of the first arriving unit shall be to turn off the gas at the meter. In the case of inside gas meters that have their own unique set of hazards, crews should simultaneously control the gas at the meter and the curb box. Pre-incident knowledge of meter location, gas appliance installation configuration, and curb box locations cannot be over emphasized.

Collapse

Generally, ordinary construction has less potential for early collapse than the newer wood frame and light wood frame buildings. Should a frame or light frame constructed building collapse, it may bring the veneer masonry walls down with it or leave them standing in a dangerous unsupported cantilever position.

Light wood frame construction is subject to early failure and has two distinct factors with regard to potential for collapse: the presence of lightweight trusses, and fire entering the void spaces degrading the structural members.

The presence of gas and electric furnaces and hot water heaters in the attic area is becoming more prevalent in many multi-family, garden apartment type occupancies throughout Northern Virginia. Air conditioning units are also being installed on the roof areas over the common stairways. The concentrated or added dead load to the roof assembly or trusses can contribute to early collapse. This weight may or may not have been considered during the engineering or design phase of the construction process.

Collapse is always a concern, Figure 38. However interior crews must realize that localized collapse of the roof members (trusses) onto the top floor may occur during an attic fire. Due to the level of compartmentalization, the top-floor walls may support the section of a collapsed roof assembly. Rather than abandoning the entire building, a tactical withdrawal from the collapsed area may be all that is required.

Figure 38: Light wood frame collapse under fire conditions

A fire in the kitchen of ordinary, frame or light wood frame construction may spread behind cabinets and into the void space, Figure 39. It can then spread into the ceilings, to the floor above, or vertically to the cockloft/attic and weaken structural members in all locations in between.

Figure 39: A minor kitchen fire extends into void space.

If fire is in the floor void immediately below operating firefighters, and fire consumes structural members, the floor covering may be the only thing supporting the weight of personnel. The importance of sounding or testing the stability of the floor cannot be overstated. In light wood frame construction, with combustible exterior trim, smoke may be seen issuing from the band board area indicating that the fire has entered the floor truss void area.

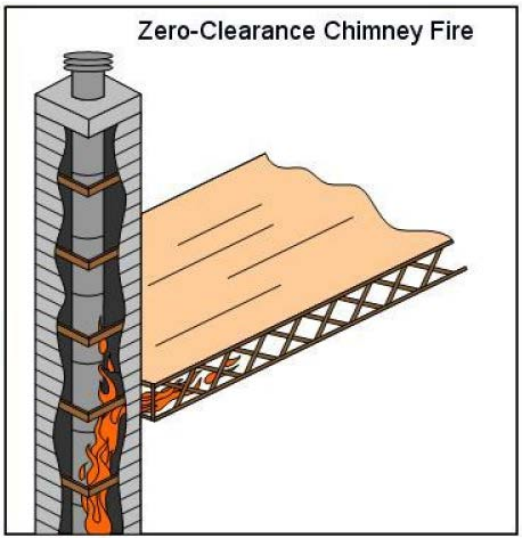


Figure 40: An example of fire spread between the floor and ceiling void space.

Fire spread between spaces of dimensional lumber and closed plywood "I" joists will typically be confined to that space within the two joists. If the floor and ceiling void are parallel chord trusses, the fire spread may be throughout the entire floor or ceiling void space. The discovery of fire in this construction feature should immediately be communicated to command. Opening the voids should be a priority. Firefighters must recognize the potential for rapid fire spread, early collapse, and possible void space backdraft.

A masonry veneer wall can fall outward the distance of the height of the wall. When establishing the collapse zone, a factor of 1½ times the height of the wall should be considered. The area should be identified with barrier tape.

Renovations/Alterations

Many of the garden apartments in the area have exhausted their originally intended life spans. It is not uncommon to witness an entire building being gutted of nearly all of its original contents and being updated with modern conveniences. It is not unusual to discover that void spaces and utility shafts have been created during this remodeling process or that some of a building's original structural components have been altered or removed. This can significantly contribute to the rapid spread of fire resulting in collapse.

Buildings with sprinkler systems typically have "traded off" many other fire code requirements. A fire in one of these buildings, when the sprinkler system is out of service, may spread very

rapidly. These sprinklers are normally only required in living areas, so a fire that starts in a closet or attic space will get a foothold on the building prior to the activation of any sprinklers.

FIRE OPERATIONS

This section will cover the recommended response actions when operating on the scene of a garden apartment fire or emergency.

Strategic Factors

Life safety is the highest priority at all structure fires. The potential for life loss is prominent in residential occupancies. Life safety is typically achieved through aggressive interior fire attack and primary search. All operational tactics should be assigned to support this priority. It is important to account for all occupants of the structure. This can be accomplished through an effective secondary search in the areas that *were* involved or exposed to the fire or smoke. Occupants found should be removed from the building or taken to an area of safe refuge until removal is possible. The closest exposed addresses also need to be checked early in the incident.

An emphasis should be placed on property conservation throughout the entire incident. Many apartment dwellers do not obtain renters insurance and may lose everything in the event of a fire. This strategic goal should be a high priority.

The attic, cockloft and void spaces (utility spaces) are particular areas of concern regarding fire travel.

The term “extended reflex time” is generally associated with high-rise firefighting. With many garden apartment buildings being several hundred feet from the apparatus, it can take a great deal of time to set up and maintain operations, Figure 41.

Figure 41: Distances from apparatus to apartment buildings can cause extended reflex time.

General Tactics

The five basic firefighting strategies are Rescue, Exposures, Confinement, Extinguishment and Overhaul (RECEO). Ventilation and salvage are carried out in conjunction with these strategies. The greatest factors that will drive the tactical decision-making process are the *location and extent of the fire*.

Sometimes the location of the fire is obvious upon arrival, although, many times it is not. The right tactics can be implemented when an accurate and rapid size-up or reconnaissance is

performed to locate the fire. The only tactic that should delay locating the fire is an obvious critical rescue. Someone standing on a 3rd floor balcony during a terrace level fire may indeed need assistance, but it is not typically considered a critical rescue.

'Reading smoke' is an essential skill for situational awareness and predicting fire behavior. Nothing is absolute! When applied to a building fire, the process of reading smoke assists officers and crew members understand the fire's exact location, size, and potential for rapid spread. (Reference "Fire Behavior" in the Engine Company manual).

The interior rescue problem is typically addressed through an aggressive primary search for life and rapid extinguishment of the fire. To support the rescue effort, maintaining the integrity of the stairwell, along with effective ventilation, will be necessary.

Apartments are typically not large in terms of floor space. Due to the limitations of space and ability to operate, two companies, typically one engine and one truck or rescue assisting the engine, are sufficient to handle the tasks in any one apartment.

The initial attack line is typically advanced through the stairwell and into the apartment from the floor landing.

In the case of enclosed stairwells, engine companies may consider using alternate means for advancing hose lines (such as a balcony or terrace-level door) rather than using the apartment's stairwell landing door. This tactic may help reduce the smoke and heat contamination of the stairwell.

Ladders for rescue and egress should initially be placed in the front and the rear at the fire floor and every floor level above. The section of the building containing the fire between the stairwell and the firewall should receive priority for laddering. For example, a fire in quadrant A on the ground floor of a three-story building shall have ladders thrown to quadrant A on the second and third floors, and then ladders would be thrown to the quadrant B on side C.

Ladder placement is based on the location of the fire and/or location of occupants in immediate danger. If fire is showing from the bedroom windows, crews should ladder the balcony. In the absence of balconies, ladders should be thrown to the largest window not showing fire. If fire is showing from the balcony, ladders should be placed to the bedroom window(s).

Ventilation in this type of structure is critical in facilitating a primary search and fire attack. Ventilation at garden apartment fires is most often accomplished via windows and balcony doors. This is achieved through coordinated removal or opening of selected windows.

Vertical ventilation may be warranted when the stairwell becomes charged with high heat and smoke, the fire is on the top floor, or fire has entered the attic/cockloft.

The interior exposure problem should be addressed through rapid containment of the fire. This should include advancement of an interior attack line to protect any occupants within the structure, focusing on the interior stairway and other vertical voids. The interior fire will involve contents or contents and structural members. Fires involving the structural members allow for extension throughout the building.

The exterior exposure problem should be addressed through a combination of a coordinated interior attack, exterior attack, or protecting the exposures with a hose stream cooling application or defensive attack.

Fire extinguishment should be achieved through the proper selection, placement, and application of the attack line(s). The compartmentalization and the fire loading generally found within garden apartments suggest that the 1¾-inch attack line should be effective in extinguishing most contents fires. Fires involving this type of occupancy may require the support of several equally effective and mobile lines.

Resources

The resources assigned to incidents of reported fires in these types of structures are:

- 4 Engine Companies
- 2 Truck Companies
- 1 Rescue Company
- 1 EMS Unit
- 2 Battalion Chiefs
- 1 Command Aide
- 1 EMS Supervisor

Apparatus Positioning for Fires in Garden Apartments

Typical positions and initial actions are listed below:

- First-due engine – pull past the involved structure or stop short, allowing room for the truck to have the front; on-scene report, layout, size-up, situation report, initial attack line, search as the line is advanced.* Engine should still be parked close enough to advance hose lines to the most remote point of the building.
- Second-due engine – water supply for the first engine, second attack line, while moving into the building check the floor below the location of the first engine.
- Third-due engine – secondary water supply, check for fire extension, visual inspection of the side opposite first due engine, line to the floor above.
- Fourth-due engine – Complete a secondary water supply, if necessary. If the vehicle is not needed for water supply, position out of the way. Assume the role of RIT. The equipment and procedures to follow shall be obtained from the *NOVA Rapid Intervention Team Command and Operational Procedures* manual.
- First-due truck – position on fire front with the first engine; proceed to fire floor, force entry if needed, search, ventilation, ladders.
- Second-due truck – opposite the position of the first truck (typically the rear or side C of the building); proceed to floor above, force entry if needed, search, ventilation, rear laddering, possible roof operations, check attic.
- Rescue – position away from structure; force entry if needed, search, ventilation, ladders.
- EMS – The EMS unit should park away from the building in an area that allows for rapid egress if a patient needs to be transported. The crew should assemble their EMS equipment on a stretcher and report to Command. If the EMS unit is staffed with personnel trained as firefighters, the crew should don their protective clothing to include

SCBA. If an EMS supervisor has responded and will not function as the command aide, he or she shall report to the Command Post in full protective clothing and SCBA as well.

**Note: Given the diverse layout of many garden apartment buildings, in particular the buildings of the last decade, it will be imperative for the first in units to clearly establish the best means of access to the fire area. Therefore the first engine may elect to initiate the fire attack from a position other that side Alpha. This must be clearly communicated in the initial on scene report to the units on the box assignment.*

After viewing as many sides as possible, the first-due engine company should park in a position to allow for rapid advancement of hose lines into the structure, leaving priority position for the truck company, Figure 42. If the truck is entering the block from the opposite direction, it is imperative that the engine stops short of the involved unit. The goal is to have the first arriving ladder truck in front of the fire occupancy with access to its ground ladder bed. Always allow clearance behind the truck's ground ladder bed for removal of ground ladders.

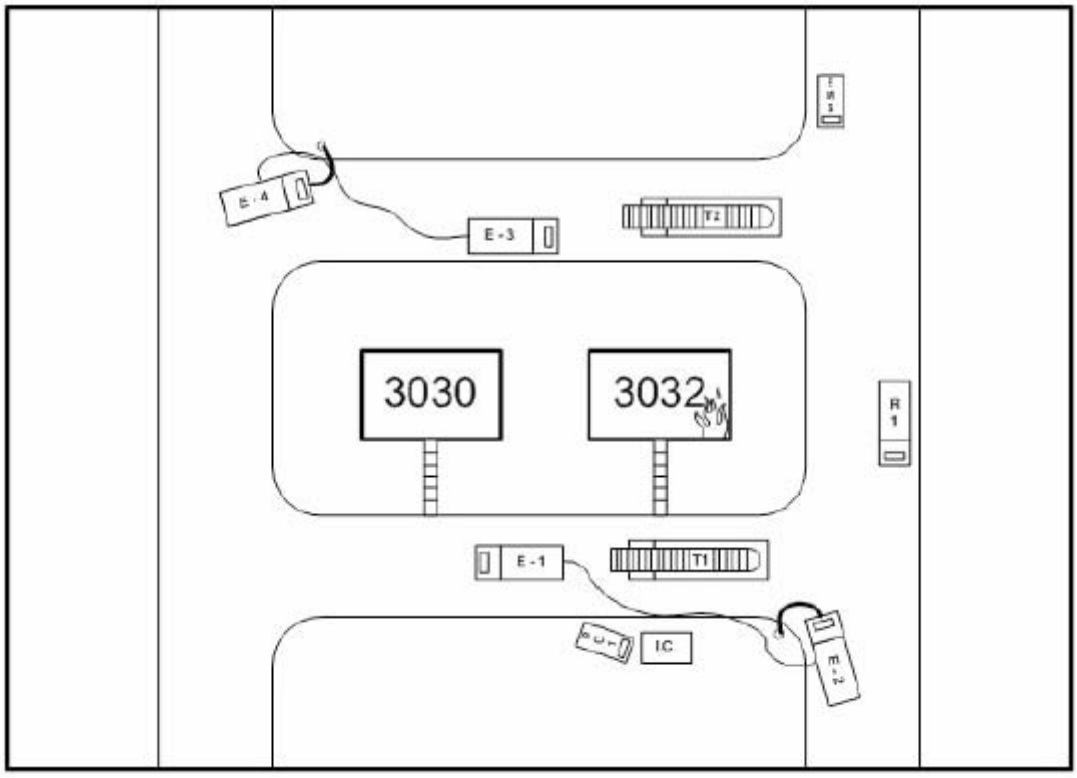


Figure 42: An example of apparatus positioning for a garden apartment fire.

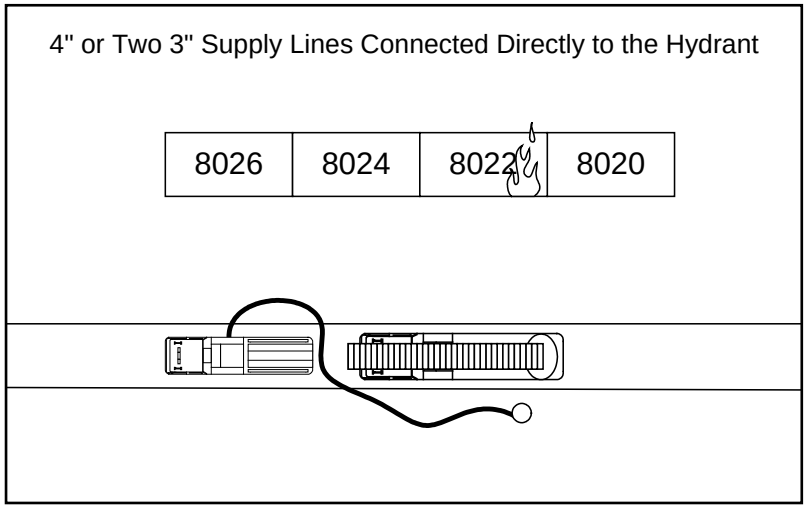


Figure 43: Direct connection to hydrant.

The first-due truck company shall take a position at the most strategic location that will allow for rapid placement of ladders (front and rear) and entry into the structure. Use of the aerial should also be anticipated, and the turntable positioned either directly in front of the involved unit or upwind from the involved area.

The second-due engine shall ensure that a water supply is established.

The third-due engine shall position to allow the crew rapid access to the structure to cover the floor above the fire while maintaining access and egress to the incident for additional resources. The engine should take a position opposite the first engine and establish a secondary water supply. If the opposite side access is not available, the third-due engine should position at the end of the row closest to the involved unit. This is to ensure that hose lines can be placed and access apartments on the rear.

The fourth-due engine shall position out of the way, so as not to block access for incoming trucks, and assume the position of rapid intervention team (RIT). If needed, the driver may be assigned to supply water to the 3rd engine.

The rescue company should position to allow rapid access to the structure while maintaining access and egress to the incident for additional resources.

The second-due truck should position in the rear or in a position to cover the rear. When there is no access to the rear, the additional truck should position on side A in front of the uncovered exposure. Ground ladders and truck operations in the rear will remain a priority.

The EMS crew should be assigned to initial EMS duties. The crew should assemble their EMS equipment onto a stretcher and proceed to an area that provides rapid access to potential civilian or uniformed members needing treatment. If the EMS unit is staffed with members trained as firefighters, the crew should have their protective clothing and SCBA with them. The EMS unit should position in an area that will not block fire apparatus and allow for unimpeded egress from the scene in the event patient transport is necessary.

The chief officer shall position the vehicle without blocking firefighting units, but in a position that will allow effective command of the incident.

In general, apparatus should position in single file, preferably on the “fire side” of the street. This allows additional apparatus to pass and take a position later in the event if required. This also prevents vehicles from possibly running over attack lines.

ENGINE COMPANY TACTICS

This section discusses the role of engine companies in garden apartment fire incidents.

First-due Engine

When dispatched for a fire in an apartment building, the first-due engine will normally lay supply line(s) to establish the water supply for an offensive interior attack. The location and method of the hose lay should be communicated to the second-due engine company.

Many garden apartment complexes have restrictive access, poor hydrant placement and limited water volume. Water supply plans should be developed during pre-incident planning.

A large water main may feed into the complex, but the size of the pipe is reduced the deeper you travel into the complex. A dead end hydrant at the deepest part of a complex may only provide a few hundred gallons of water per minute. Firefighters should keep in mind that many of these 6-inch pipes are as much as 50 years old and may have an interior diameter closer to 3 inches.

On-Scene Report

Elements of the on-scene report should follow current version of the *Command Officer Operations Manual*.

Size-Up

The first-due engine officer should attempt to view multiple sides of the structure as the apparatus approaches the scene, noting fire location, extent of smoke and obvious rescues. It is not always practical for an officer to see all sides of the building. The first arriving officer may get a look at the rear by using the balcony or window of an uninvolved unit or proceeding to the rear via the open walk through stairwell if available. Officers from other units should communicate conditions found in other tactical areas of responsibility.

The information gathered from the size-up will dictate the mode of operation and tactics used. The most important items in size-up (aside from rescue) are identifying the location of the fire and potential for extension in relation to building layout and construction.

Garden apartments may have fire evident in an apartment different from the location where it originated. The company officer must also make sure they have identified the lowest floor of fire involvement. Failing to identify the lowest fire floor may result in fire department operations being initiated in an apartment and then realizing the fire is originating from below.

As companies begin to carry out their assignments command needs to be advised as early as possible of the unit number on fire and its relation to the rest of the apartments in the building. This can be done in a simple radio transmission such as, “fire is located in apartment 201, which is in quadrant Alpha on the second floor of the building.” Also, units going to the floor above can report, “the apartment over the fire is apartment 301 which is in quadrant Alpha on the top floor of the building.”

The tactics listed below may extend past the resources of the first alarm depending on personnel assigned to command functions, RIT, location of the fire and other positions. Therefore, it is imperative that during size-up, enough information is gathered to make the decision to call for a second alarm.

Situation Report

Elements of the situation report should follow current version of the *Command Officer Operations Manual*.

Initial Line

The initial attack line for fires within this type of structure will typically be 1¾-inch hose line allowing for the needed speed, mobility, and fire flow, Figure 44. The first-due engine crew will almost always be responsible for deploying this line.

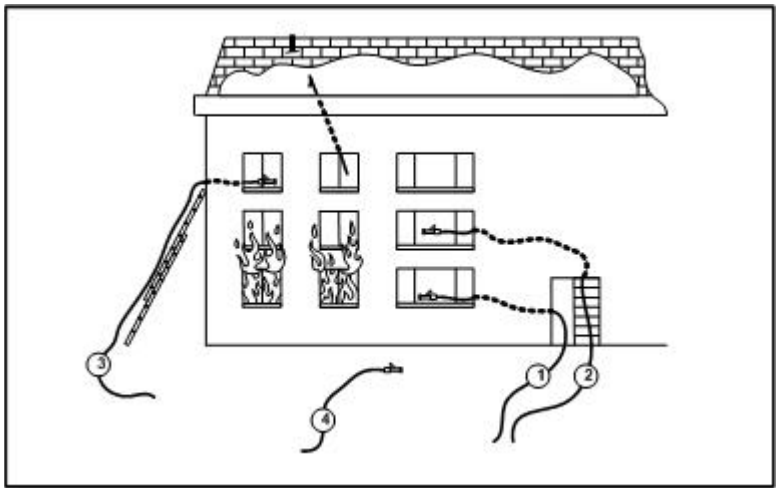


Figure 44: Typical initial hoseline deployment. Line 1 is the attack line. Line 2 is the back-up line/line above the fire. Line 3 is the top floor/attic line and Line 4 is the RIT/standby line.

The primary purpose of the initial attack line is typically to advance to the seat of the fire for confinement and extinguishment. Protection of occupants, other crews, and the public stairwells are objectives of the hose line as well. The initial size-up of fire conditions will determine the actual tactics employed. Options for stretching hose lines include but are not limited to:

- Stretching up the stairs through the well hole.
- Stretching the uncharged hose line as far as practical without undue risk to firefighters.
- Stretching a hose line via a ladder.
- Using a rope to hoist the line up several stories from the exterior or interior stairs.
- Lowering a standpipe pack with gated wye out the window or balcony to connect to a supply line on the exterior.
- Stretching a pre-connected or made-up leader line.
- Using the standpipes where applicable.
- Sweeping exterior combustible materials prior to entry.

In most cases, the initial hose line enters the building through the front entrance door of the involved address. Officers have several alternatives regarding access when the location of the fire in the apartment is known.

Many buildings are remote from the parking areas requiring long hose stretches. Initial arriving companies may want to extend their long, gated wye leader lines, Figure 45. This enables the next company to hook into the leader line with additional hose or high-rise packs, thus getting additional lines into service faster.

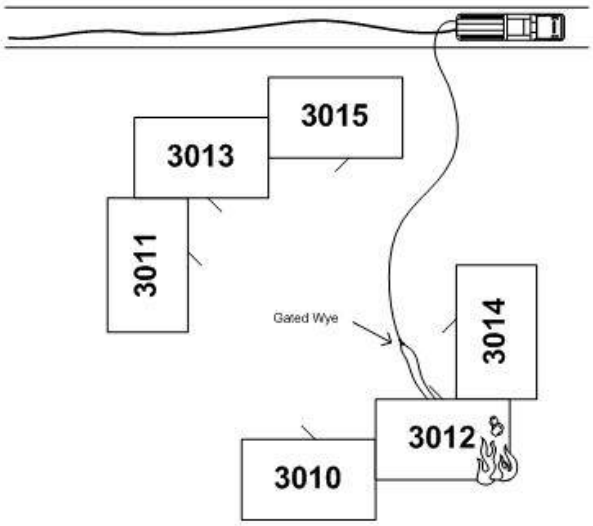


Figure 45: Example showing use of leader line.

Typical hoseline routing includes:

- Entering the involved apartment from the common stairwell.
- Entering the involved apartment through the ground-level patio door, Figure 46.
- Entering the involved apartment over a ladder to the balcony.
- Entering the building via a rear entrance, Figure 47.
- Entering an adjoining apartment to gain access to the involved apartment.
- Entering the apartment through a large window. (Avoid casement windows.)
- Traversing through an adjoining building to gain access to the rear.
- Traversing through the fire buildings stairwell or terrace apartment to gain access to the rear.

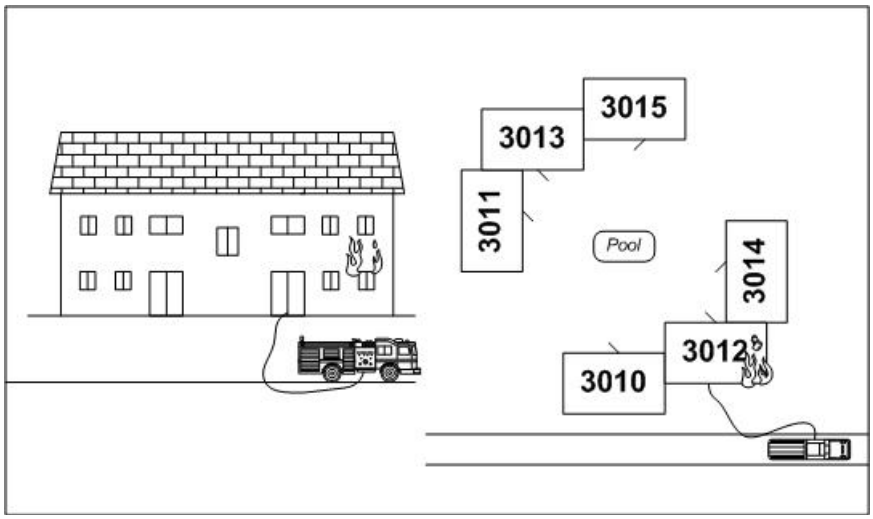


Figure 46: Entering through ground-level patio door.

Figure 47: Access through a rear entrance.

Advancing the attack line in the enclosed stairwell through the front door should be delayed if occupants of the building are actually in the stairwell. The door to the fire apartment should remain closed and the stairwell cleared of occupants. The apartment doors across from and above the fire apartment should be quickly checked for closure. Once the fire apartment door is opened, allowing heat and smoke into the stairwell, conditions in the common stairwell may change suddenly and drastically. Any crew operating in the stairwell above the fire floor apartment shall be notified and prepared to seek refuge before the door to the fire apartment is opened. Remember that civilians and firefighters alike may be exposed to smoke and high heat conditions at the top of the stairwell.

When the building has the feature of an open stairwell, the primary means for advancement of the initial attack line is the door of the apartment. The area (walkway) of the open stairwell

immediately above the door of the fire apartment shall be checked to ensure no one will become trapped from the smoke and heat.

Officers and hose-line crews should evaluate the width of the stairwell railings before committing to well-hole style hose advancement. Although this technique is effective under many circumstances, narrow railings can catch the hose couplings making the hose-line advancement very difficult, Figure 48. Engine crews should ensure that extra hose is available on the fire floor landing prior to opening the door and advancing into the fire apartment, Figure 49.

Figure 48: Hose coupling jammed during hoseline advancement.

Figure 49: Extra hose on landing/foyer.

Firefighters will frequently find that the individual and common stairwell doors are self-closing. Although they usually keep the fire contained, they can create problems with hose lines if not controlled, Figure 50. An uncharged hose line that is suddenly charged under a door has created

severe problems at more than one fire. Take control of the door to eliminate it from closing; strap or chock it open, Figure 51.

Figure 50: Hoseline jammed under doorway.

Figure 51: Control doors.

Hose line crews must recognize that firefighters need to be placed strategically along the hose to help advance it up steps, landings, hallways, and turns, Figure 52.

Figure 52: Assisting hoseline advancement.

An important factor influencing attack line deployment is whether the main stairwell to the building is enclosed or open to the outside. When the building has the feature of an enclosed stairwell or partially enclosed stairwell, the advancement of the initial attack line may be accomplished through means other than the apartment's common stairwell door. One method is through the balcony (or patio on terrace level) doors. This is to prevent smoke, heat, and fire from entering the stairwell through the open door of the fire apartment and trapping the remaining occupants. To be effective, the door to the hallway must remain closed.

When examining the balcony/terrace door option, consider the following:

- The fire should typically be in the rear bedroom area.
- The fire should typically be on the 1st or 2nd floor apartment.
- The apartment should be accessible via no more than a 24-foot ladder.
- The apartment door to the common hallway must be closed.
- The apartment has a safe balcony or terrace entrance.

The balcony/terrace door alternative should not be used if any of the following conditions are present:

- Smoke, heat, or fire has already compromised the stairwell.
- Balcony is crowded with furniture, bicycles or other items, Figure 53.

Figure 53: Crowded balcony.

If the fire is confined to a rear bedroom, and if conditions permit, the hose line may be hoisted using a rope from the balcony of the affected apartment. The engine company should be capable of deploying a hose line unassisted. If the sliding glass door is broken to gain entry, when flushing the hose line use the stream to wash the glass from the balcony. If the method used to deploy the line (over a ladder or hoisting with rope) requires the assistance of another company, it may take away from the overall operation and should be discouraged. Figure 54 shows the typical common stairwell hose line advance and the alternative terrace-level hose line advance.

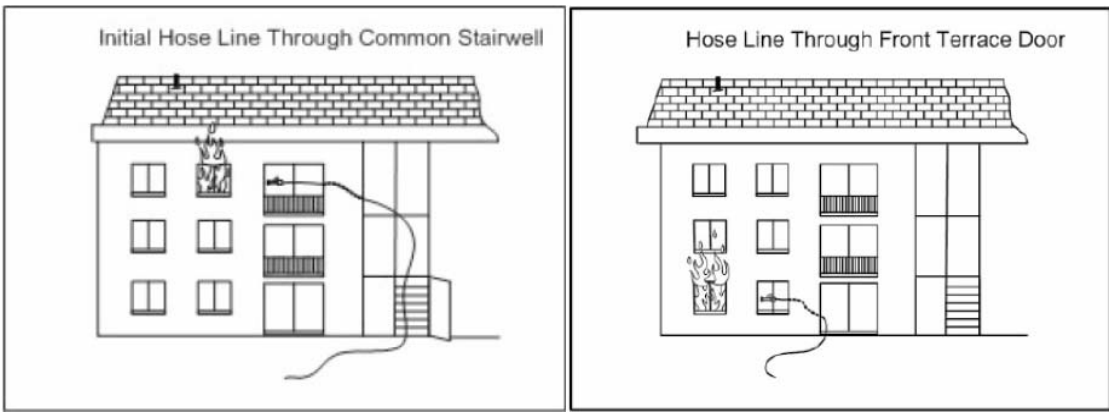


Figure 54: Common stairwell hoseline advance versus terrace-level advance.

Second-due Engine

The second-due engine company has the responsibility of assuring that a water supply is established for the first-due engine. When considering water supply options and challenges, remember that water main size is frequently reduced the further the piping goes into a complex. The second due engine should also remember not to impede access for later-arriving units.

Second Line

The second-due engine will typically have the responsibility for advancement of the second (or back-up) hose line. When the officer on the attack line has indicated that the back-up line is not required, it may be re-deployed.

If the initial line was deployed over the balcony, the second line may enter the stairwell and stand by at the apartment's door, Figure 55. This is one of the few times the second line may not follow the same path as the initial line (only one line shall be advanced over a ground ladder). The reason for not taking the same path as the attack line is so it can be re-deployed quickly to the floor above.

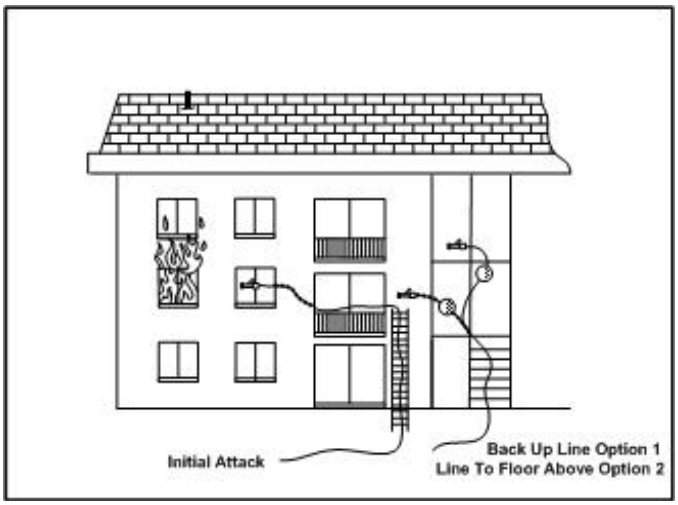


Figure 55: Example of the placement of a back-up line.

When the back-up line goes in via the stairwell, the door to the fire apartment must be unlocked and closed to prevent products of combustion from entering the common stairwell. The officer of the second line must monitor the progress of the initial attack line.

Third-due Engine

The third-due engine company typically acquires a secondary water supply, performs a visual inspection of the side opposite the first-due engine, and advances a hose line to the floor above the fire floor.

Many garden apartment complexes have very limited or no rear vehicular access. There are several options for placing hose lines to the rear of the structure. Crews can advance a hose line down the rear alley, sidewalk, or breezeway, or they can go through the fire building or through an exposure building, Figure 56. Keep in mind that if the terrain and weather conditions permit, vehicles may be driven off road in emergency circumstances.

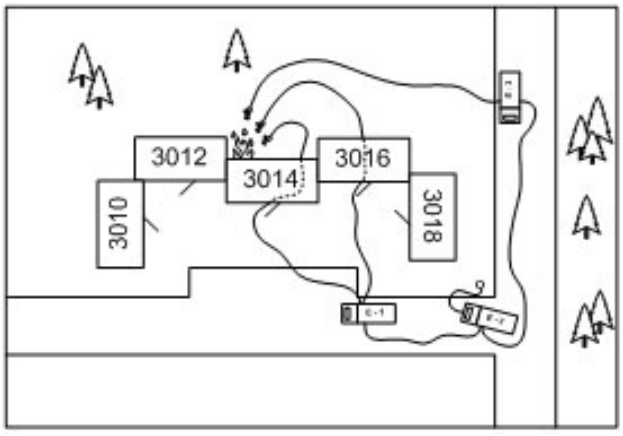


Figure 56: Options for hoselines to the rear of a structure.

Line Above the Fire

The line assigned to the floor above the fire in garden apartment structures will typically be an l¾-inch hose line, allowing for the needed speed, mobility, and fire flow. This line should be of sufficient length to reach the area above the fire and into the attic or cockloft, if required.

The need for additional lines to operate above the fire, independent of the previously required lines, should be planned for. The third line shall be deployed by the next available engine company and shall go to the area or floor above the fire if the second line was needed for back up.

Ideally, no more than two hose lines should be stretched through any one entrance into a building. The advancement of additional lines should incorporate alternate means of entry (such as rear doorways, over ladders, or over balconies.) This prevents the stairwells from becoming overcrowded with personnel and hose lines.

Back-up lines will typically be "of the same size" as the line to which they are providing the back-up (normally the attack line.) Although credited with greater flow capacity and reach, the 2½-inch attack lines are very difficult to manipulate in apartments. The many sharp turns, the steps, the weight, and limited staffing make these lines of limited use for interior garden apartment firefighting. Pressures can be increased in the 1¾-inch attack lines to subdue most contents fires in these buildings.

Fourth-due Engine

The fourth due Engine Company shall complete a secondary water supply, if necessary. If the vehicle is not needed for water supply, position out of the way. The crew shall assume the role of RIT. The equipment and procedures to follow shall be obtained from the *NOVA Rapid Intervention Team Command and Operational Procedures* manual.

Greater Alarm Engines

The first engine on the second alarm will report to the staging area and be responsible for those duties unless otherwise ordered. All other incoming units, unless otherwise directed, should report to staging.

Exposure Lines

The purpose of the exposure line(s) is to prevent or extinguish fire spread into any attached exposure and to also be used to prevent exterior spread or auto-exposure. Areas to be checked are the attic, basement, and intervening floors. Basically, any separate unit that is attached to the occupancy of fire origin must be checked. If evidence of fire spread is found, call for a hose line. The 1¾-inch hand line is normally sufficient for this task because of its flow and mobility. This line should be of sufficient length to reach the exposure.

Narrow fog streams are more efficient in exterior exposure protection. The narrow fog pattern offers moderate reach, additional surface area coverage, and is not as damaging to the structure as smooth bore nozzles may be. High wind conditions will negatively affect the fog stream. The officer and nozzle person must assess conditions and deploy and/or adjust the stream accordingly.

With limited access to many of these buildings, the rapid deployment of master streams will be difficult. An effective tactic is to rapidly deploy a hand line to the affected exposure and begin cooling the building while additional firefighters setup the master stream, Figure 57.

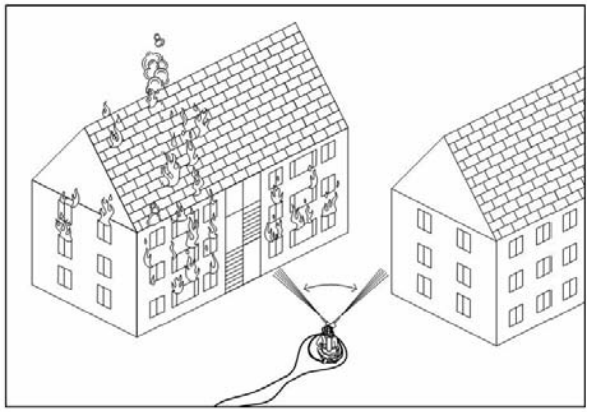


Figure 57: Master stream protecting exposure.

Another issue with closely spaced buildings under heavy fire conditions is the limited area personnel have to work. It is difficult to escape the high radiant heat when personnel are confined to a 50-foot area.

When buildings are closely spaced, the streams deployed for exposure protection may typically be used for fire control as well. Working the stream back and forth from the burning building to the exposure can be effective. Even when operating outside of the collapse zone, due to high radiant heat, it may be necessary to apply cooling streams to firefighters, apparatus and exposures. Since many local garden apartments have been constructed with combustible siding and stairwells, Figure 58, the surface area burning on the exterior of the building has increased significantly. This condition can contribute to high radiant heat.

Figure 58: Combustible siding.

Basement Fires

Basements in garden apartments may contain any or all of the following:

- Residential occupancies (sometimes referred to as the “terrace” level).
- Storage rooms.
- Laundry rooms.
- Electric and gas utilities for the entire building.
- Commercial floor space such as a hair salon, dry cleaner, rental office, etc.
- A parking facility.

Below grade fires in garden apartments are not unlike those in other buildings. It is normally preferable for firefighters to enter the building at or below the level of the fire. Doing so helps eliminate the punishment firefighters would endure had they advanced down the “chimney like” interior stairwell. On scene crews need to evaluate several conditions:

- Is the stairwell already endangered upon arrival?
- Can a line be quickly placed into service from the rear?
- Will a rear-based attack have any negative effect on firefighters, civilians, or the building?

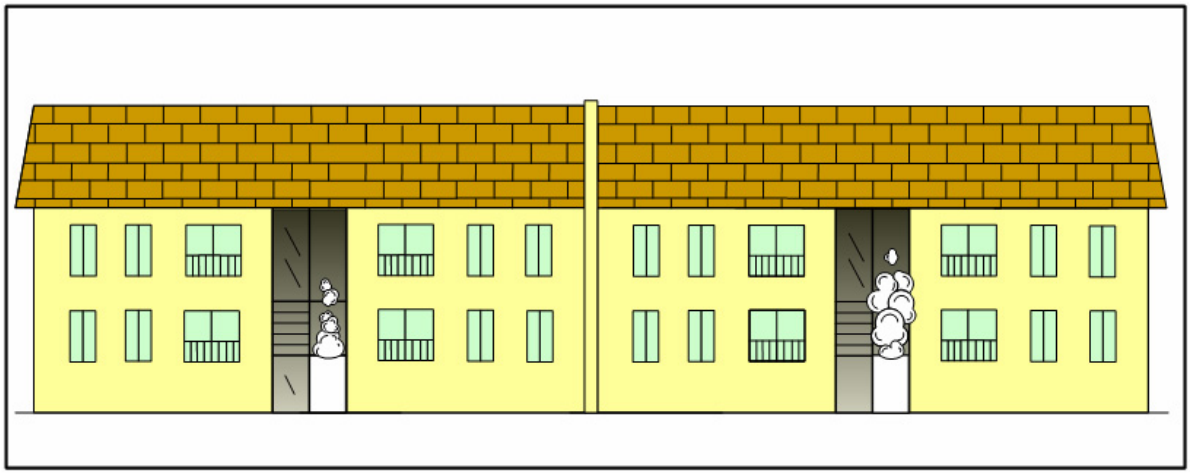


Figure 59: Smoke showing from more than one stairwell is an indication of a basement/terrace-level fire.

If fire, heat, or smoke has already spread into the stairwell upon arrival, firefighters would normally advance the first line directly into the stairwell from the front door in order to protect the stairwell, occupants and remaining building above. While considering alternative, reduced risk attack methods, firefighters should keep in mind that our primary goal is to protect as many lives as possible. Rapid fire extinguishment has proven to be one of the very most effective means of protecting life and property.

If firefighters are met with high heat conditions in the stairwell, an option would be to place a straight stream through an opening to knock down heavy fire prior to entering the basement.

Firefighters may also consider the use of a cellar nozzle. Keep in mind that many ceilings of utility/ storage rooms can be concrete or reinforced to provide fire protection.

In Figure 60, firefighters are confronted with a simple bedroom fire in a rear terrace level apartment. Rather than advancing down the interior stairwell, the initial attack line (1) is taken to the rear and advanced through the fire apartment into the bedroom. This method will help reduce the amount of heat and smoke pushing up the interior stairwell. A second line, marked as 2 in the figure, should be quickly placed into the stairwell from the front. This line can protect the stairwell as well as provide backup to the initial attack line. The apartment's stairwell door would normally remain closed.

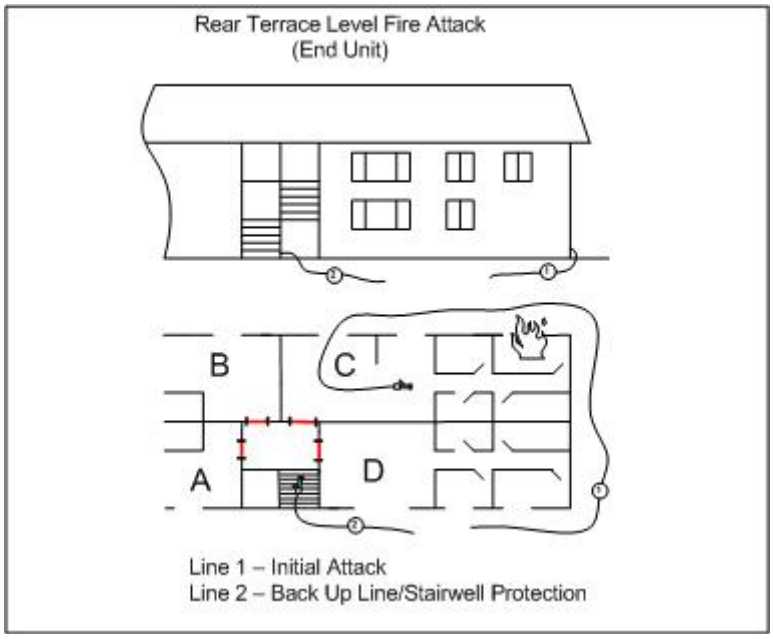


Figure 60: Rear terrace attack.

When confronted with a terrace level fire from the stairwell, firefighters often have the option of entering from the exterior and keeping the stairwell door shut. Personnel may force the door to the adjoining apartment, advance through that apartment to the exterior, and then enter the fire apartment from the exterior. This rapid operation quickly extinguishes the fire without polluting the public hallway.

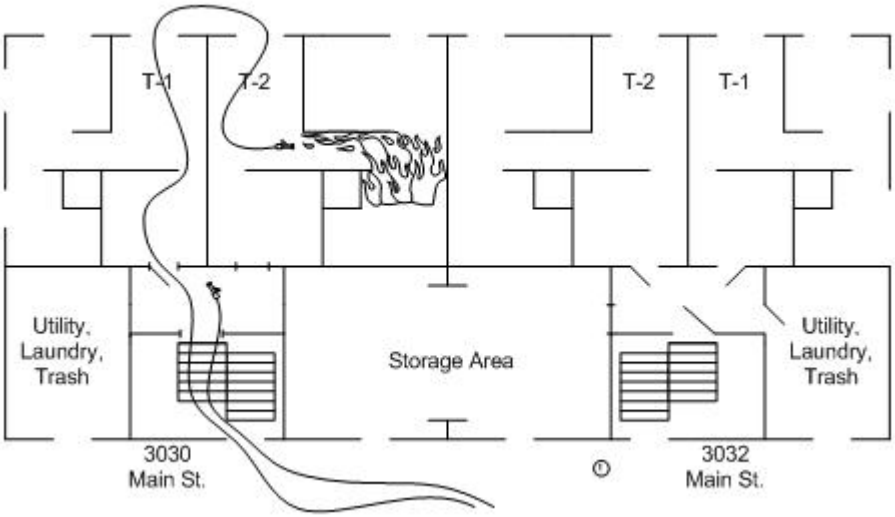


Figure 61: Alternate terrace fire attack.

In Figure 62, firefighters are confronted with an "isolated" terrace level apartment fire. The second or backup line, marked as 2 on the figure, must be advanced to the rear, following the same path as the initial attack line, marked as 1 on the figure. A third line, marked as 3 on the figure, needs to be placed into the stairwell/above the fire from the interior stairwell or over ladders.

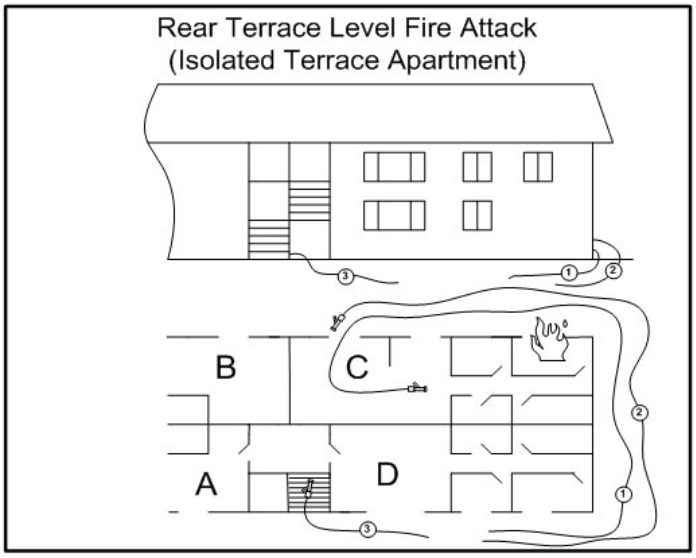


Figure 62: Rear terrace-level fire attack.

Basements in garden apartments have various configurations. Some have apartments that open to the outside in the rear quadrants, with storage and laundry rooms in the front quadrants. Others have apartments in the front quadrant with storage and laundry rooms in the rear quadrant. Terrace level apartments are required to have a means of egress leading to the exterior. Some buildings may have the entire basement below grade. This configuration will not find occupied

apartments below grade, only utility and storage rooms. Many of the newer buildings do not have below grade apartments or basements at all.

Fires in the terrace/basement level pose the greatest danger to occupants of the building due to the introduction of fire, heat and products of combustion to the entire building and common stairway. As always, but especially in these applications, pre-incident planning and size-up are imperative prior to committing resources. The location and extent of fire must be determined and clearly communicated to all incoming units.

An entirely below grade basement (on all sides) will not normally have residential occupied areas; they only have utility and storage areas. These create additional hazards because of gas and electric utilities, storage of bicycles, tires, gasoline, etc.

Fires in below-grade areas are difficult to ventilate with efficiency or speed. Fires in the basement may have direct access to the void spaces in the building, which may ultimately spread to each floor and the attic or cockloft Figure 63. This is due to the utility chases originating at the basement level.

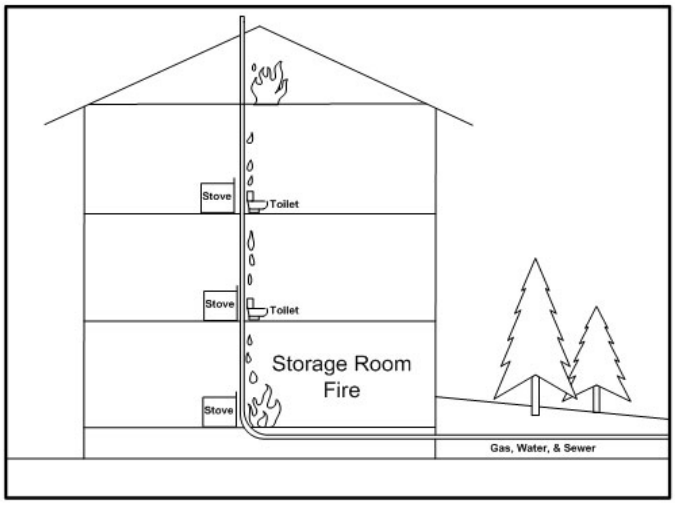


Figure 63: Fire may travel in hidden void space.

A unique situation is where the lowest level runs the entire length of several addresses above it. When fires occur in these areas, crews should be assigned at both ends of the basement to close one door and initiate a coordinated attack from the opposite door. No opposing streams!

The most common attack line deployment is down the interior stairwell into the involved area. Firefighters should realize that opening the doorway from the involved basement area into the common stairwell would contaminate the stairwell with smoke and heat.

Storage rooms frequently have two entries, one at each stairwell. Attacking fires in this area requires good communications and coordination. In Figure 64, line 1 confines the blaze, line 2 is used for extinguishment, and line 3 is a backup protection for line 2.

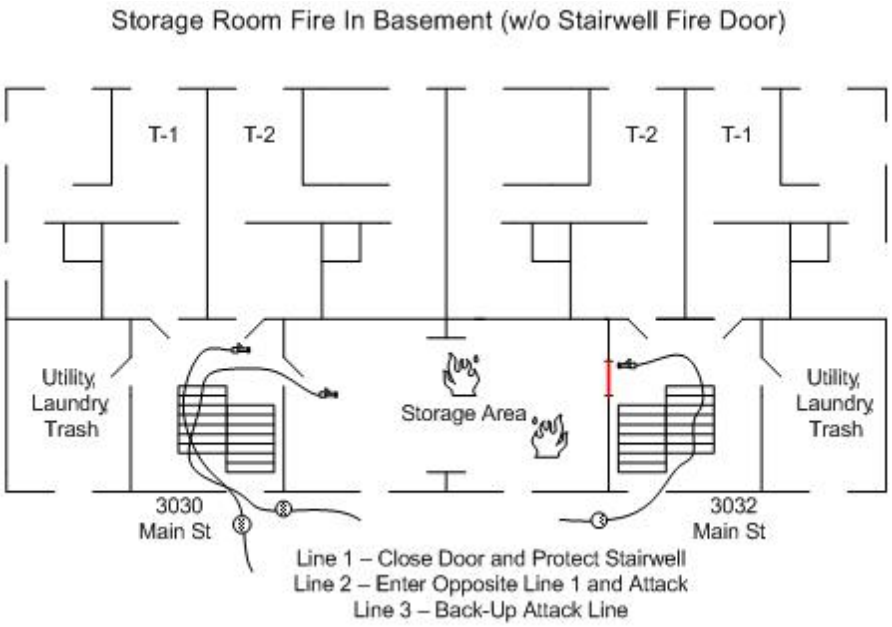


Figure 64: Storage room fire in basement without stairwell fire door.

When fire has taken possession of a large area in a below grade basement with no exterior entrance, another tactic that may be employed is the indirect attack introduced from the exterior via the basement window. The door(s) between the basement and the stairwell(s) should be located and closed.

Coordination with and notification to other companies on the scene is essential to prevent entry into the basement until initial knockdown is complete. Once initial knockdown is complete, a line should enter from the stairwell to effect final extinguishment.

Should the basement area be completely underground without windows, the use of a cellar nozzle or advancing down the interior stairs may be the only options. In the case of the cellar nozzle, the volume of fire, construction type, and integrity of the floor assembly must be rapidly assessed prior to committing to this tactic.

Entering the floor above and deploying a cellar nozzle on basement fires can be very effective. This attack method would normally be avoided in lightweight frame construction.

Taking the attack down the stairs will require the same rapid assessment of conditions. The officer and crewmembers must be cognizant of the fact that there will be high heat conditions as the attack is taken down the stairs into the basement. A straight/solid stream with sufficient fire flow will be imperative to make the advance.

Special attention should be given to pre-planning fires in basements of garden apartments. The configurations of layout are too numerous to list in this document. Companies should visit all the complexes of garden apartments in first- and second-due response areas and discuss tactics particular to basement fires. Prior knowledge of the basement layout cannot be overemphasized.

Garage Fires

Enclosed parking areas/garages in garden apartments are rare, but do exist. Many older garden apartments in Arlington County and some of the newer buildings recently constructed in other jurisdictions also have garages. More often firefighters will find parking spaces located under the building with access from the rear and no garage doors. Fires that occur in these areas will most likely involve automobiles, dumpsters, or storage rooms.

The location of the first hose line will depend on the results of pre-incident planning and the size-up. The objective is to keep the stairwell and apartment clear of smoke, heat, and fire.

If confronted with significant fire, the best tactic may be to apply a straight stream to knock down the bulk of the fire. Following the initial knock down, a hose line will need to advance into the building to secure the door and stairway.

Many building codes required a fire rated separation between parking areas and living areas. This will greatly reduce the likelihood of fire spread; however, ceilings and walls in the fire area should be opened up and checked for fire extension, as should the living area directly above the fire. Openings for utilities and plumbing should be thoroughly checked.

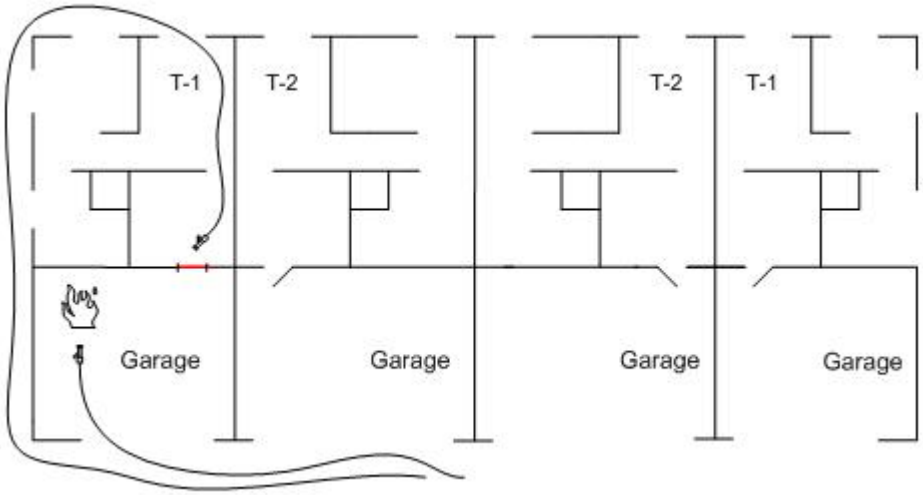


Figure 65: Fire in attached garage.

Attic Fires

Attics are considered the space under a pitched roof. Cocklofts are considered the space under a flat roof. In both instances the size of the area can be varied. Company officers should evaluate the area of involvement and gauge their tactics accordingly, Figure 66.

Figure 66: An attic fire.

When selecting tactics for combating an attic / cockloft fire, officers must evaluate the location and extent of the fire, the type of construction and how the fire originated or extended into in the space.

The most common scenarios are:

- Fires originating in the attic/cockloft
  - Lightning strikes
  - Electrical malfunctions
  - Bird nests
  - Roofers/Plumbers
- Extension from lower floor apartment(s)
  - Via pipe chase
  - Via auto exposure (from the exterior)
  - Failure of the ceiling drywall

To assist in containing the fire and slow the lateral spread, early roof ventilation should be considered. The location and extent of fire, along with construction type, must be considered. Truck positioning and the ability to vent from the aerial device or tower bucket are also factors for consideration, especially in Type 5, lightweight wood frame construction.

Some garden apartment attic fires can be managed from the interior. Crews should be sent well ahead of the fire to remove the ceiling and directly attack the spreading flames. Personnel must be cognizant of collapse hazards due to exposure of structural members to fire, lightweight construction, over-sized decorative dormers and cross gables, water heaters, and HVAC systems in the attic along with double layered drywall. The officer must recognize these hazards and make a reasonable risk assessment.

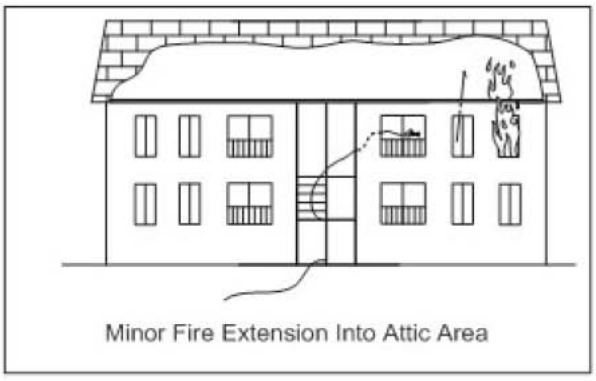
Deployment of resources is going to be dictated by the type of construction and the degree of fire involvement. Several methods have proven successful:

1. Gaining access and placing a hose line at the level of the fire into the attic, Figure 67. An attic ladder needs to get to the top floor early when the officer has suspicion that fire has entered the attic space. When time is critical, consideration should be given to using available means/options of access to the attic until a ladder is available (use of a kitchen counter etc.)

Figure 67: Gaining access to an attic fire.

2. Hooking the ceiling and directing the stream from below into the attic area, (not as efficient as the previous method of placing the hose stream at the level of the fire.)
3. Placing a wide fog stream into an access hole is an effective method when the fire has not self-vented. (Mass steam production.)
4. Access to the attic area by cutting an access through the gable end.
5. Distributor/cellar nozzle deployed through a hole cut in the roof while member is independently supported on a ladder or tower.
6. Access through the cockloft vent or man-made opening.

Figure 68 depicts several methods for addressing fires in the attic. In each case there must be an ongoing risk benefit analysis of maintaining an interior attack by both the Incident Commander and unit officers as to the progress of the fire and the structural integrity of the roof assembly.



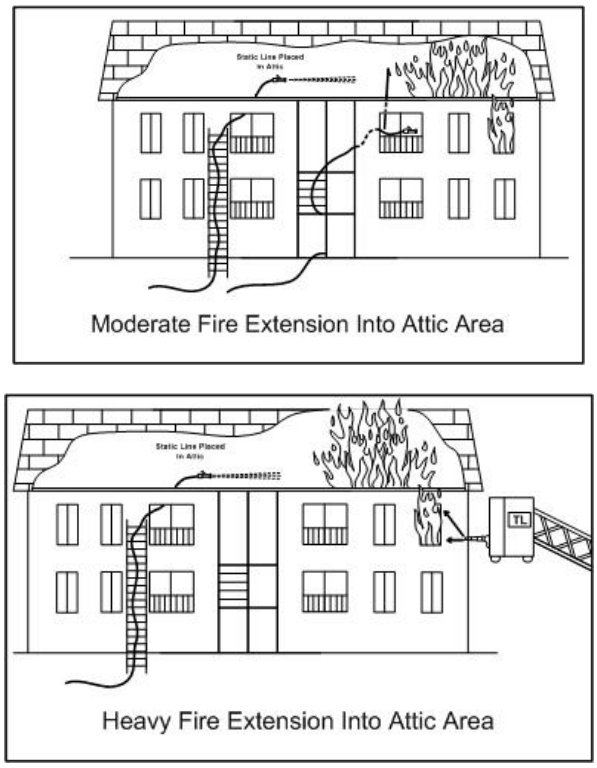


Figure 68: Attacking attic fires.

In Figure 69 several truss or joist bays have been exposed in the diagram below to provide the firefighter area to project the hose stream into the attic. Projecting straight up into the space is not effective. The hose stream should be placed ahead of the fire to cut off the advance. This line is typically static, the stream is played toward the fire but the line is not normally advanced. (The stream angle is often hampered by the 24 inches or less spacing of the roof joist).

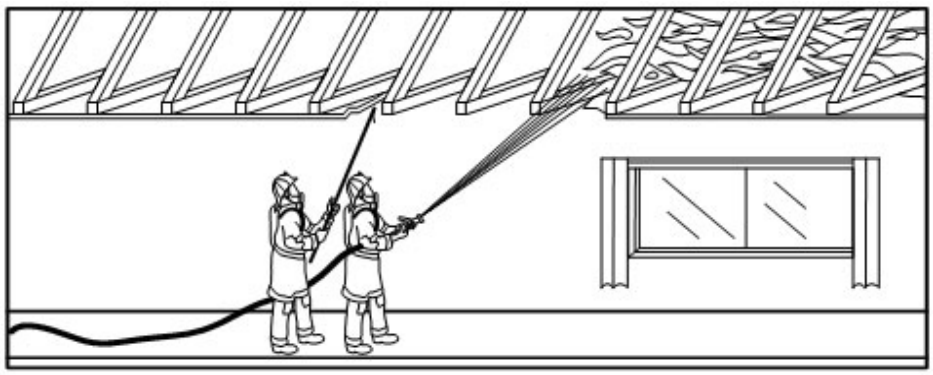


Figure 69: Projecting a hose stream into an attic.

Attic fires can be very fast moving. It is important to get a hose line ahead of the fire and into the attic as quickly as possible. Opening the ceiling and attacking the fire at the level of the fire must be accomplished in short order.

If there is active fire in the attic or cockloft, multiple lines are preferred. Multiple companies will be needed to gain access to the attic area. The location of the access to the attic area must be appropriate to the situation regarding the percentage of fire involvement and structural integrity of the roof.

Company officers need to communicate the conditions in the attic to command. Command needs to keep companies on the top floor advised of changing exterior conditions. Fires in this particular area have a tendency to show differently, meaning that conditions on the interior do not “match” the exterior, and vice versa.

Figure 70: Smoke showing from the cockloft.

The IC must have an understanding of the “big picture” so the correct tactics can be employed or maintained. If the fire has overwhelmed companies operating lines on the top floor, or structural stability is questionable, crews should transition to an exterior attack. Consideration should be given to using heavy streams (preferably from a tower). Officers must consider the construction type and method of the roof assembly when weighing options for combating the attic fire.

The standard gable roof has been the stage for many spectacular fires, Figure 71. In general, if not quickly extinguished, this roof design tends to “burn away.” It represents a relatively low catastrophic collapse hazard. Keep in mind that with platform construction, the roof itself adds structural support to the top floor walls. If the roof has burned away the walls will be inherently weakened.

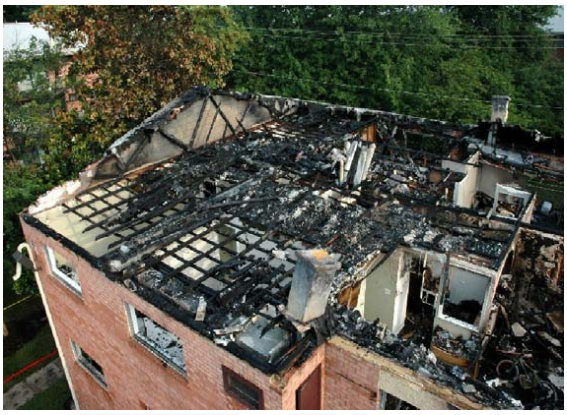


Figure 71: Gable roof attic fire.

Another hazard associated with the well-involved attic fire is the collapse of the overhang (soffit), Figure 72. The exterior wall acts as a fulcrum. As the majority of the roof burns away, the remaining overhang may collapse downward to the balconies or ground. Firefighters must be aware of the risk when operating on balconies, Towers, ladders or the ground below this collapse hazard area.

Figure 72: Attic overhang (soffit) collapse.

The concentrated load of HVAC units positioned over the stairwell is a particular collapse hazard concern to firefighters when fire has taken possession of the attic space, Figure 73. The main route of egress is endangered.

Figure 73: A concentrated load over the stairwell. Notice it is not evident from the front of the structure.

In more modern occupancies, due to the presence of water heaters and HVAC units in the attic space, as well as cosmetic dormers, the collapse potential is significant when fire is in possession of the attic space, Figure 74. Companies should not be operating directly under the involved area in these instances.

Figure 74: Dormer collapse.

Most flat roofs don't have the cubic feet or fire loading of the pitched roofs. Most of the earlier buildings have either 2" x 8" or 2" x 10" wood joists. When fire gets above the ceiling of the top floor, it will usually run in one or more "bays" (area between joists). This inherently confines the fire and provides time for crews to access and extinguish the fire.

Some flat roofs may have several feet of space between the flat roof and the ceiling of the top floor; this is commonly referred to as the cockloft, Figure 75.

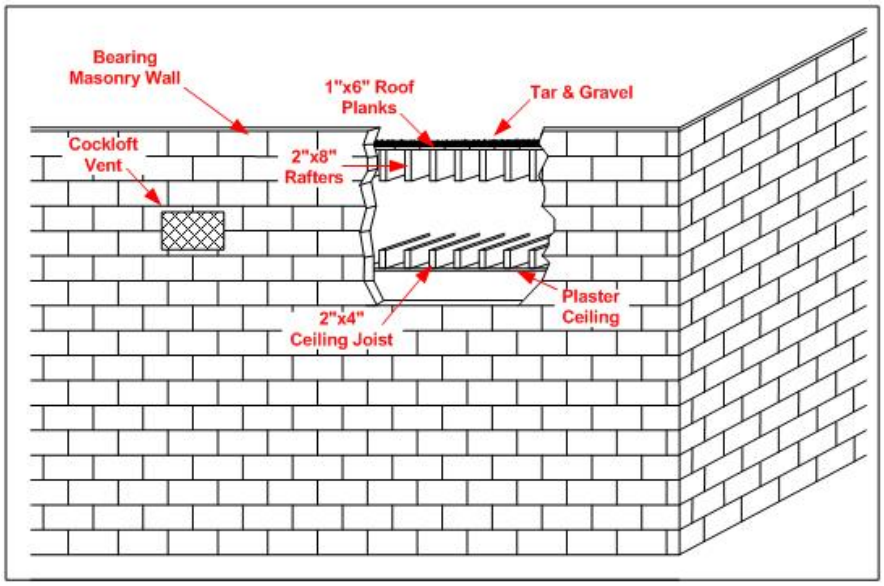


Figure 75: Cockloft.

One attack line on the top floor is usually sufficient to handle a cockloft fire. The exception is when there is a significant void of several feet. Tactics for pitched roofs would apply in those cases.

Streams may also be directed into the cockloft through the exterior cockloft vents or openings created by hand tools. This has proven effective with both hand lines and master stream devices. Keep in mind that interior personnel should be removed from the affected areas when streams are being applied from the exterior.

If a new gable-style roof has been placed over a flat roof, firefighters are faced with a multi-layered cockloft and attic fire within the same building, Figure 76. Fires involving the cockloft and newly created attic space simultaneously are very challenging and difficult to extinguish. The application of streams through the gable ends and/or through the cockloft vents or openings made by firefighters have proven to be effective.

Figure 76: Fire involving a gable roof placed over an existing roof.

Additional Fire Attack Considerations

The following are miscellaneous fire attack considerations engine companies should think about in garden apartment fire incidents:

- Master stream devices are very effective on large volume fires in garden apartments, Figure 77. Unfortunately, apparatus positioning on arrival is usually for offensive operations and may not be conducive to positioning for defensive operations. It is difficult, if not nearly impossible, to re-position apparatus when switching from offensive to defensive operations. With the common narrow streets and parking areas, greater alarm vehicles should be staged as soon as possible.

Figure 77: Large volume fire.

- Additional and/or alternative water supplies may be necessary to conduct large volume

flows. Additional supply lines and engine companies will be indicated to initiate and sustain the operation. A water supply officer should be designated early in the incident.

- Although tower ladder and ladder pipes are preferred in most instances, engine mounted master stream and 2½-inch hand lines can be used effectively as well. Keep in mind that a majority of these buildings are three floors in height.
- Garden apartment buildings are typically about 50 feet deep. A 2-inch smooth bore with a nozzle pressure of 80 PSI has very strong penetration ability. Remember, if you do not need reach or penetration, use a narrow fog master stream nozzle because it will extinguish fire more rapidly than a smooth bore nozzle.
- With the exception of the ordinary construction, most of the brick on these buildings is veneer. This single layer of brick may easily collapse under fire and master stream conditions.
- Tower ladders are generally preferred over deck guns and straight ladders for their greater scrub area and rapid mobility.
- With many garden apartments being built very close to each other, streams may be applied to the fire from the balcony, roof or windows of exposed buildings.
- New lightweight portable monitors are an excellent choice to get large streams rapidly into place with limited staffing.
- Personnel should monitor the amount of time our master streams are flowing. In many circumstances, particularly with attic fires, the streams continue to flow thousands of gallons per minute well after the fire has been knocked down.

TRUCK AND RESCUE COMPANY OPERATIONS

Company officers are required to make quick and effective decisions based on a myriad of factors. It is the experienced truck company officer that recognizes the important visual cues indicating the rescue problem, location and extent of the fire, and significant structural features of the building.

First-due Truck Company

The first-due truck company should take a position at the most strategic location that will allow for rapid placement of ladders, access to the roof, and entry into the structure. Therefore, the first due truck should position on the side of the building with fire showing if it is accessible. If nothing is evident from the exterior of the building, the first-due truck reports to side Alpha. Spotting the turntable at the center of the fire quadrant will often provide the ability to scrub that entire side of the building and cover multiple tasks.

Weather and terrain conditions permitting, vehicles may be taken off of the hard road surface in order to accomplish their assigned task, Figure 78. Keep in mind soil conditions may change as master streams saturate the area.

Figure 78: Ladder truck positioned off road.

Placing the truck company turntable at the corner of the building may also prove advantageous, being able to access two sides with one ladder. Keep in mind that many garden apartment buildings do not have windows on sides Bravo and Delta.

Recognizing fireground conditions and anticipating smoke and fire spread should affect truck positioning.

Once arriving on the appropriate side of the structure based on your assignment, several questions need to be answered regarding fire location prior to committing:

- Is the fire generally located in the front or the rear?
- On what side of the stairwell is the fire located?
- How many floors are above the location of the fire?
- Is the fire located in the living room/kitchen area or the bedrooms?
- Is the fire located in the terrace/basement area?

Additionally, several questions need to be answered regarding fire spread such as:

- To where are the smoke and fire spreading?
- Is the stairwell heavily charged with smoke?
- Is the roof gabled or flat?
- Is smoke pushing from the attic, cockloft, or plumbing vents?
- What is the color of the smoke?

Basically, the decision for apparatus positioning is based on tasks that will or may be performed during the incident. If staffing levels permit, it is crucial to leave the driver outside with the aerial apparatus. This leaves the driver in the best position to report conditions on the outside of the building, identify victims that appear after the initial size up, and perform outside truck duties.

If the first-due truck or rescue (special service) arrives with or before the first-due engine company, they will be responsible for: positioning on the fire side if possible (truck or tower, not rescue company), forcible entry, locating the fire, primary search of the fire apartment/floor, ventilation, laddering, checking for extension, and salvage and overhaul.

The first-due truck will have the duties of laddering and ventilation on the side of the building where the fire is located. This will typically be the driver.

If the first-due special service is a rescue company, the entire crew will normally enter the building together. The rescue company shall be responsible for locating the fire, forcible entry, primary search, ventilation, and checking for extension in the fire apartment and the remaining apartments on the fire floor if they are the first arriving special service unit.

The officer should notify command when the primary search of the fire apartment is completed and after the primary search of the remaining apartments on the fire floor are completed.

Second-due Truck Company

The second-due truck should take a position in preparation for operations on the opposite side of the building from the first truck. The truck companies should communicate to each other, coordinating the placement of their apparatus and sharing information. If there is no vehicle access, it may require parking the vehicle at one end of the building (side B or D) enabling portable ladders to be deployed to the inaccessible side. Removal of fences or trees is an option to gaining vehicle access to these locations when necessary.

The second arriving truck will be responsible for positioning opposite the first arriving truck. They may be responsible for forcible entry, searching of the remaining apartments on the fire floor, searching the floors above the fire, ventilation, laddering (opposite side), roof ventilation (if required), and attic access (if required).

The crew or driver of the second due truck will have the additional duties of laddering and outside ventilation opposite from the side of the building where the fire is located. In certain situations, the second due truck may be ordered to the roof for ventilation before laddering the opposite side.

The officer should notify command when the primary search of the apartment over the fire is completed and after the primary search of the remaining apartments on that floor are completed.

Rescue Company

The rescue company must position to allow the crew rapid access to specialized tools and the fire structure, while also maintaining vehicular access and egress to the incident for other units, particularly trucks and water supply.

The third-due special service will be assigned by the IC based on the immediate needs at that point in the incident. These tasks may include: primary searches on remaining floors and stairwells, forcible entry, ventilation, extension checks of upper floors and the attic, utility control, roof ventilation, checking for extension, and salvage and overhaul.

Forcible Entry

The purpose of entry will be to perform primary search, allow access for attack lines and to check for extension. In the case where an engine company arrives without a truck or rescue with them, they shall be obligated to locate the fire and provide their own entry to the fire apartment.

Hydraulic-style door forcing tools, Figure 79, were developed and designed for inward opening metal frame doors and works very well on them. Crews should still take conventional entry tools with them (Haligan bar/axe). Hydraulic tools may not be effective on older wooden doors with wood frames.

Figure 79: Hydraulic forcible entry tool.

Storage room areas and terrace-level apartments are frequently secured with barred windows and doors.

A forcible entry challenge that may be encountered in this type occupancy can result from occupants of the lowest level apartments using their sliding glass door rather than walking around to the courtyard/stairwell door. Forcing a terrace level door from the stairwell may reveal a couch, china hutch, or even that the door has been boarded and dry-walled over from the interior, Figure 80.

Figure 80: Terrace-level apartment foyer blocked off from the common stairwell.

Ventilation

Ventilation of the fire apartment and the apartment above the fire apartment is a high priority. The primary means of ventilating these two areas will be accomplished using horizontal methods. Ideally, ventilation will occur from the outside, when this is not possible it will done

from inside by search or hose crews. Inside crews should not wait for ventilation to occur from the outside. Flashover of an apartment is a serious threat to the safety of inside crews.

When crews enter the fire apartment for a primary search, normally an additional objective is to open up (vent) as they proceed. Opening balcony doors or living room windows will provide rapid relief as they make their way back towards the bedrooms along the exterior wall. Coordinating this ventilation with hand line operations must be accomplished in order to prevent an increase of fire and its rapid spread. If the fire has not been controlled, search crews should refrain from ventilating the building too early.

Ventilation of the enclosed stairwell is the next priority, Figure 81. This can be accomplished by several means:

- Rooftop ventilation over the stairwell.
- Opening small windows in the stairwell.
- Through a top floor apartment after it has been cleared of occupants.
- Through a top floor apartment assisted by positive pressure ventilation (PPV).

Stairwells that are enclosed in glass from the main entrance to the soffit are dangerous to ventilate using the technique of breaking glass. The panes of glass on the entrance door and the sides of the entrance door may be safety, tempered, or plate glass. The large panes of glass above this point up to the soffit are typically heavy, thick plate glass. When these windows are broken, large heavy shards of glass can shower down on civilians and firefighters below. These large pieces of glass can also sever hose lines. The glass near the top becomes difficult to clear because of poor visibility from exiting smoke. Large wet sheets of glass can be similar to ice on the front entry steps.

There is a serious hazard from falling glass. For this reason, breaking of large panes of glass is the least preferred method of clearing the stairwell. The most effective method of clearing stairwells enclosed in glass is by cutting a hole in the roof over the stairwell and punching out the ceiling below (vertical ventilation). Keep in mind that there may be multiple layers of drywall.

When using vertical ventilation on pitch roofs, the hole should be cut directly over the stairwell and not at the top of the gable. When opening a slate roof, this hole may be offset so that dangerous falling slate will not impact firefighters or occupants near the entrance below. Use a long pike pole to remove the drywall over the stairwell.

Some stairwells do not extend to the center of the building. In cases where they do, there may be considerable depth (16 inches or greater) from the peak to the ceiling below. In general, the ceiling below should be able to be reached with the 6-foot or 8-foot pike pole (carried at the tip of most aerials). The sidewalk leading to the entrance should be used for orientation. Ideally, the hole should be 5 to 8 feet from the eave.

In flat roof construction, the hole should be 5 to 8 feet from the edge of the roof on the side of the building where the entrance is located. Again, the sidewalk should be used for orientation. Some stairwells in flat roof construction have a hatch over the stairwell that leads to the top floor. Opening this area will vent the stairwell but not the cockloft.

Figure 81: Venting an enclosed stairwell.

An alternate means of venting or removing smoke from stairwells is through ventilation via a top floor apartment, Figure 82. Wind direction should be noted and a front or rear apartment is selected on the leeward side of the building. The apartment is confirmed to be clear of occupants. The balcony doors or the large living room windows (where the balcony is absent) are opened or removed first. Then the door between the apartment and the stairwell is chocked open to allow the heat and smoke in the stairwell to escape to the outside through the apartment. This operation

is especially effective when a fan is placed at the bottom of the stairwell. The location of the fire has to be known and must be coordinated with the fire attack.

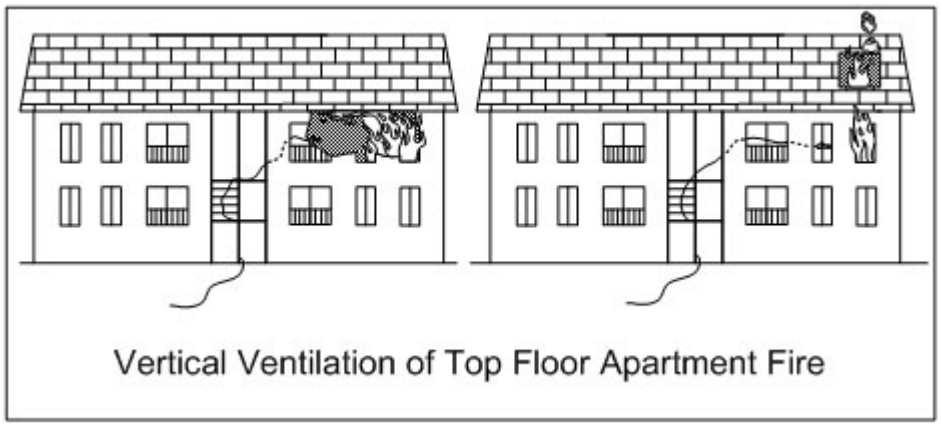


Figure 82: Vertical ventilation of a top floor fire.

Some stairwells have small double hung or casement windows. One of the fastest methods of clearing smoke and heat in these stairwells is by removing the glass or opening the stairwell windows. Opening this window usually cannot effectively ventilate the top floor. The area below the window shall be checked to ensure no one is going to be hit by the falling glass.

Ventilating a top floor apartment fire would be the same as ventilating any other roof of the same design and height.

- Access the roof
- Use support if conditions warrant (roof ladder, tower, aerial)
- Open vent shaft caps, fan caps, skylights.
- Cut a 4-foot x 4-foot hole.
- Push out the ceiling below (two layers).
- Report status to command. (Any other roof duty while crew is there?)
- Get off the roof!

Rooftop ventilation, Figure 83, may depend on whether the roof support system is of conventional or lightweight construction. Conventional construction may allow a hole to be cut in the roof without fire department members being independently supported. The location and intensity of the fire must be evaluated along with the integrity of the roof itself.

Figure 83: Venting from a tower and a roof ladder.

On a pitched/gable roof supported by lightweight trusses, serious consideration should be given when deciding to deploy crews for roof top venting. If fire has not broken into the attic but it is anticipated to occur, early ventilation will be necessary. If fire has entered the attic but not gained complete control, several factors come into play when considering roof top ventilation:

- The roof support system: lightweight or conventional.
- The height of the building. (Operating on roofs on buildings above four floors without aerial assistance in lightweight construction is questionable.)
- The actual pitch of the roof support system.
- Extent of fire in the attic space.
- Availability of support equipment (hose lines, ladders to the roof front or rear, etc.)
- Progress being made on the top floor below the involved attic.
- Condition and integrity of the roof structure.

When roof top venting is ordered, someone should be assigned to a safety watch. Their job is to do nothing but watch the crew doing the work and the progress of the fire (to or in the attic space). They should be afforded the authority to stop the operation immediately and order the crew off of the roof. This of course must be immediately communicated to command. The entire operation should be completed quickly so assignment of a roof group or safety watch is going to be a temporary short-term task.

If fire has entered the attic in lightweight truss construction, fire department members should be supported or tethered via aerial device or tower ladders, to avoid falling through the roof, Figure 84.

Figure 84: Venting from an aerial device while tethered.

Many newer buildings are using the attic space as living space. Ventilating this area may require opening the area next to the dormer window. Opening this area will ventilate the "knee wall," Figure 85.

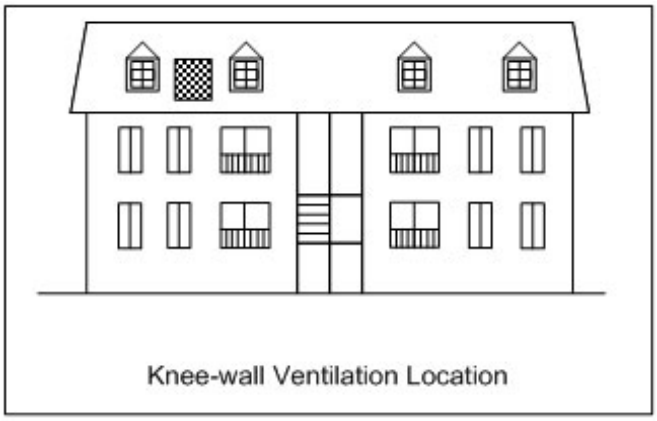


Figure 85: Venting the knee wall.

In situations where there is fire involvement in the living room and kitchen, the tactic of vent, enter, and search (VES) is effective for searching the bedrooms from the exterior. The crew performing this task needs to ensure the bedroom door is closed and that command is notified of their VES location. Command should ensure the officer on the attack line is aware of the VES activities. If victims are found, the incident commander will be notified immediately.

A crew performing VES are creating a ventilation opening drawing heat, smoke, and fire towards the opening. This is why closing the door to the hallway is imperative to prevent unintentionally drawing heat, smoke, and fire towards the room to be searched.

Some effective means of removing or protecting victims in these occupancies include:

- Taking victims to an uninvolved apartment or balcony.
- Removing victims via the interior stairs.
- Removal of victims over a ground ladder or aerial device.
- Drywall breach to an uninvolved area.

The apartment(s) below will need to be checked and evacuated. The objective is to have the entire (address) building, and any exposures, evacuated should significant fire progression occur.

Search companies entering from the common stairwell should consider their direction of travel when entering an apartment. Most garden apartments have a center wall which divides the A and D apartments from the B and C apartments. This wall usually does not have windows for ventilation or escape if necessary. A search crew entering the A apartment would want follow the left wall into the apartment while a crew entering the B apartment would want to follow the right wall, Figure 86.

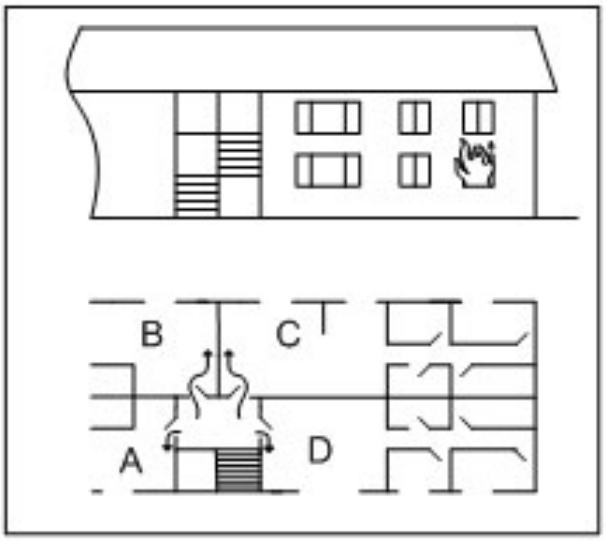


Figure 86: Search patterns.

Many windows, particularly in buildings constructed during the 1960s and 1970s, have windowsills that are about 5 feet from the floor. These are hard to locate from a crawling position. It is difficult to climb into and out of these types of windows.

Locating the Fire

Often, the location of the fire is obvious. This knowledge, gained during size-up, establishes the action plan and tactics used. Many subsequent decisions are based on the location of the fire. If it is not obvious and there is no known rescue, locating the fire is the first task undertaken.

The first-due special service may be responsible for locating the fire. Once found, the truck or rescue shall communicate the location of the fire and best access for the hose line to incoming units.

Crews attempting to locate the fire may feel the tops of each apartment door for heat, look for smoke or black stains around the doorframes, and/or listen for each apartment's smoke detector.

Garden apartment buildings have been notorious for being misleading during the initial size-up. Many hose lines have been stretched to an area where smoke or fire was visible only to find out the seat of the fire was located in a lower apartment or storage area, Figure 87.

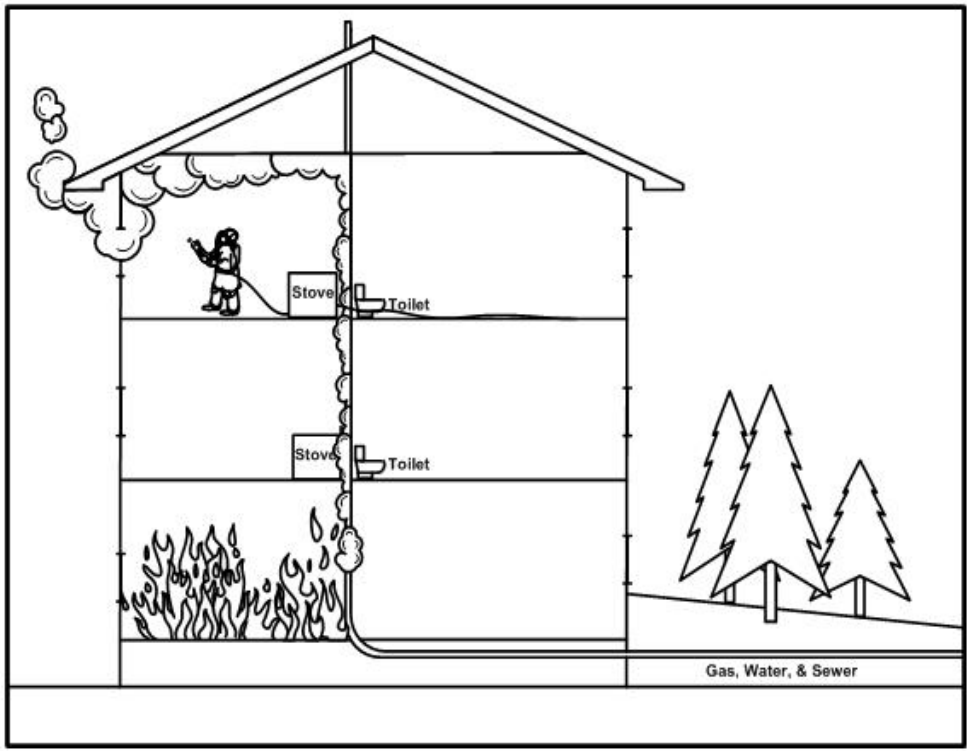


Figure 87: Smoke and fire can travel in voids and utility shafts.

A thorough check of extension must be made in garden apartment buildings. The fire may often travel from floor to floor to attic via utility shafts and hidden voids. Look under sinks, behind kitchen and bathroom cabinets, and around the HVAC, Figure 88.

Figure 88: Examples of plumbing voids.

Ladder Deployment

Other than obvious rescues, the purpose of ladder deployment at garden apartment fires is to provide access into an apartment or establish an escape route for firefighters. Stairwells, in general, will not be laddered.

Ladders for egress at apartment buildings will normally be thrown to the bedroom windows *first*. Firefighters searching these areas are most likely to become trapped or cut-off from the main exit out of the apartment and cannot access an area of refuge such as a stairwell, balcony, or uninvolved apartment. Laddering to bedroom windows shall be done to the front and rear of all floors at and above the level of fire involvement. Priority shall be given to the side of the building in which the fire is located.

There are two exceptions to laddering bedroom windows: when fire is showing from the window or if the ladder would be exposed to flame impingement from below. In that case, the balconies or living room windows (in the absence of balconies) will be used for laddering. Kitchen and non-bedroom windows may not be appropriate primary targets due to their small openings.

Bedrooms with windows on the front and one side, or the rear and one side, will still require ladder placement to the front and rear. In instances of difficult terrain ladder placement to the sides (B and D) should be avoided, Figure 89. Firefighters should consistently look for ladders on the front or rear from the interior during fire operations. This does not preclude ladders being thrown to side windows for a specific purpose or request.

Figure 89: Ladder on uneven terrain.

Balconies may be laddered for hose line deployment, rescue, entry, escape, ventilation and/or as a backup to laddering windows, Figure 90. Consideration should be given to the integrity of the balcony and railing when ladders are deployed. It may be safer to place the ladder on the wall

next to the balcony instead of directly on the railing. By using a steeper climbing angle, firefighters may access several (cantilevered) balconies. The tip should be secured when using this method.

Figure 90: Ladder next to balcony.

The roof should be laddered over the stairwell with an aerial device, if possible. This can still be accomplished with the turntable in the center of the fire quadrant. This allows the aerial to be in place and ready for rooftop ventilation.

If rooftop ventilation is necessary and the roof can only be accessed by ground ladder, the area in front of the main entrance shall be avoided.

The aerial device may be used to ladder windows and/or balconies that are out of reach of ground ladders. This may take priority over laddering the roof.

Basement Fires (Truck/Rescue)

In many cases the available openings to ventilate a basement level fire are limited. Placing an exhaust fan over an existing window well hole may assist in venting these areas, Figure 91.

Figure 91: Venting basement through window well hole.

A basement fire may involve smoke contamination to several stairwells. The IC may want to consider assigning a Ventilation Group to this task.

Garage Fires (Truck/Rescue)

Truck or rescue companies may be tasked with locating the fire and identifying the best means of accessing the fire and forcing entry for the engine company.

In large open garage areas, consider using search lines due to the large expanse and potential for separation of crew members.

Approaching the fire from the exterior entrance is preferable when the interior of the building is protected (fire door, hose line, no direct access).

When entering through the exterior roll up, or tilt up door, secure the overhead door in the open position to maintain the means of egress for crews.

Breaching the overhead door in the center about three-quarters of the way up from the bottom can at times provide access to the overhead door manual release. If the manual pull cord is still intact, it may be within reach of the opening made in the door. Pull the cord to disengage the door from the motor allowing the door to then be raised. If the fire is in the area of the garage door it may be more prudent to remove the door instead of rolling it up to eliminate the possibility of it collapsing later in the event.

Attic Fires (Truck/Rescue)

Although notoriously fast spreading, many attic fires in these buildings can be managed from the interior. Hose lines should be sent well ahead of the fire to remove the ceiling and directly attack the spreading flames while ventilation crews open the roof to reduce the horizontal fire spread. Keep in mind the hazards of lightweight construction collapse, over-sized decorative dormers, water heaters and HVAC systems in the attic, along with double layered drywall. Firefighters must recognize the hazards and make a reasonable risk assessment.

If fire has taken total possession of an attic or cockloft, it should be stopped at the adjoining exposure(s). Rooftop ventilation of the heavily involved attic should not be undertaken without independent support by an aerial/tower device.

Large caliber streams from aerial/tower devices need to be directed through or at the top floor/attic level, into the involved space. Avoid the urge to have streams flow down onto the roof or through the fire area, Figure 92. It will not only fail to extinguish the fire, but it may cause the roof to collapse. The trucks and towers normally do not need to be extended upward to 100 feet for a fire located at the third floor/attic level. The area should be evacuated of personnel prior to initiating a master stream operation.

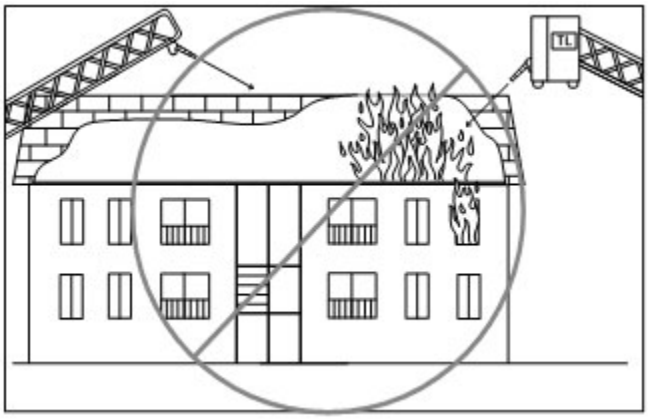


Figure 92: Avoid having streams flow down onto the roof or through the fire area

Avoid using the wide fog master stream. Wide fog stream patterns push large amounts of air. This large volume of air can push an open attic fire across an entire attic, Figure 93.

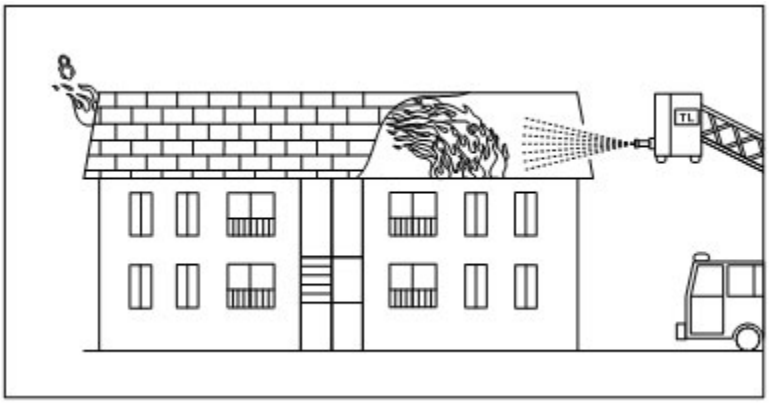


Figure 93: Wide fog pattern pushing fire across open attic.

Tactical efforts should be concentrated on preserving the exposure(s). One option to consider for exposure control is trench cut ventilation. The trench cut is a viable technique, which can be applied to help stop a running attic fire. The trench cut method may also be applied to running attic fires where the fire stopping has been compromised or does not exist at all. The key to the operation is based on safety and speed. Knowing that attic fires spread very rapidly, officers must evaluate whether members can get far enough ahead of the fire, complete the trench cut and return safely to the ground. It is important to place hose lines in the attic to support its function, Figure 94.

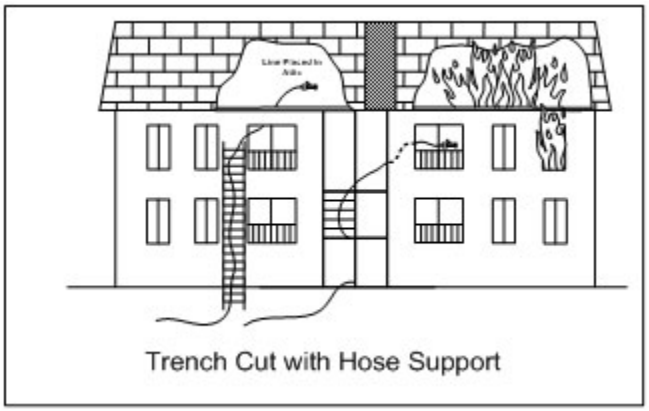


Figure 94: Trench cut with hose support.

The objective is to cut a trench significantly ahead of the fire or at the unburned side of the fire wall(s) parallel to the wall. Risk to firefighters (from collapse) will be minimal if fire has not already entered the attic area where the cut is being performed.

In addition to the truck crew(s) on the roof affecting the cut, other crews will be operating on the top floor hooking the ceiling. If the fire occupancy is a middle building, this will have to be duplicated on both sides if conditions necessitate this action.

Many top floor apartments may have cathedral ceilings. If assigned the task of pulling the ceiling a long hook will be required. These ceilings can be 12 feet or more in height. Fire may easily spread to other areas of the structure due to the amount of built-up roof materials above the ceiling in older construction. The bathroom, hallways, or other areas of the apartment may not have a cathedral ceiling, eliminating the long ceiling hook requirement.

Many newer building use flexible plastic HVAC ductwork in the attic. This plastic melts away quickly. Looking up through an HVAC vent may tell you if there is fire in the attic and the vent hole may provide a rapid access point for water application.

Additional Truck and Rescue Company Considerations

Master stream devices are very effective on large volume fires in garden apartments, Figure 95. If the truck is originally positioned for offensive operations, the turntable will be in the center of the fire quadrant. If the fire extends past the capabilities of hand lines, the aerial device can begin defensive operations from that position. **Before any water is allowed to flow from a master stream, evacuate the involved area and account for all personnel.**

Figure 95: Large volume fire.

With fire conditions advancing vertically, initiate attack at the top working the stream down to the seat of the fire, Figure 96.

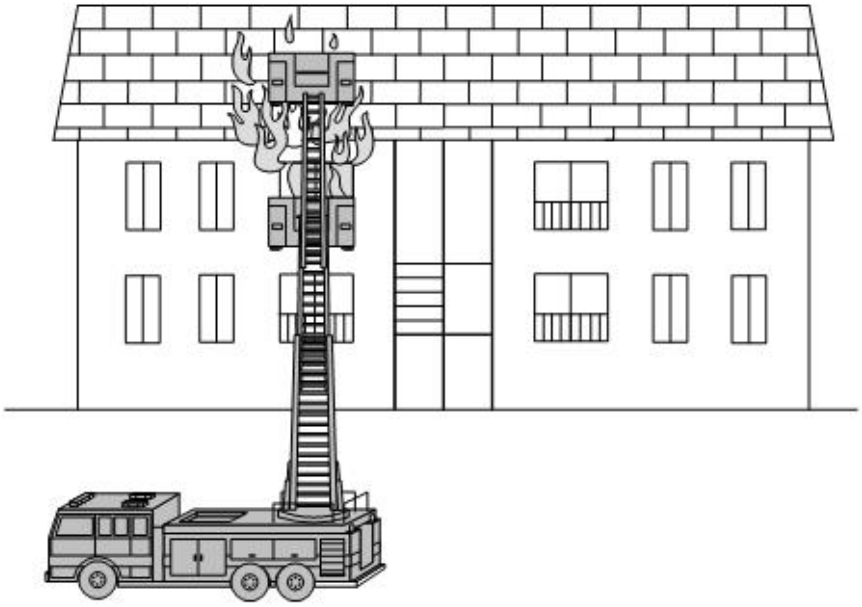


Figure 96: Top down attack.

Considering that most apartments are no more than four floors in height, the stream can multi-task and provide extinguishment as well as exposure protection, Figure 96.

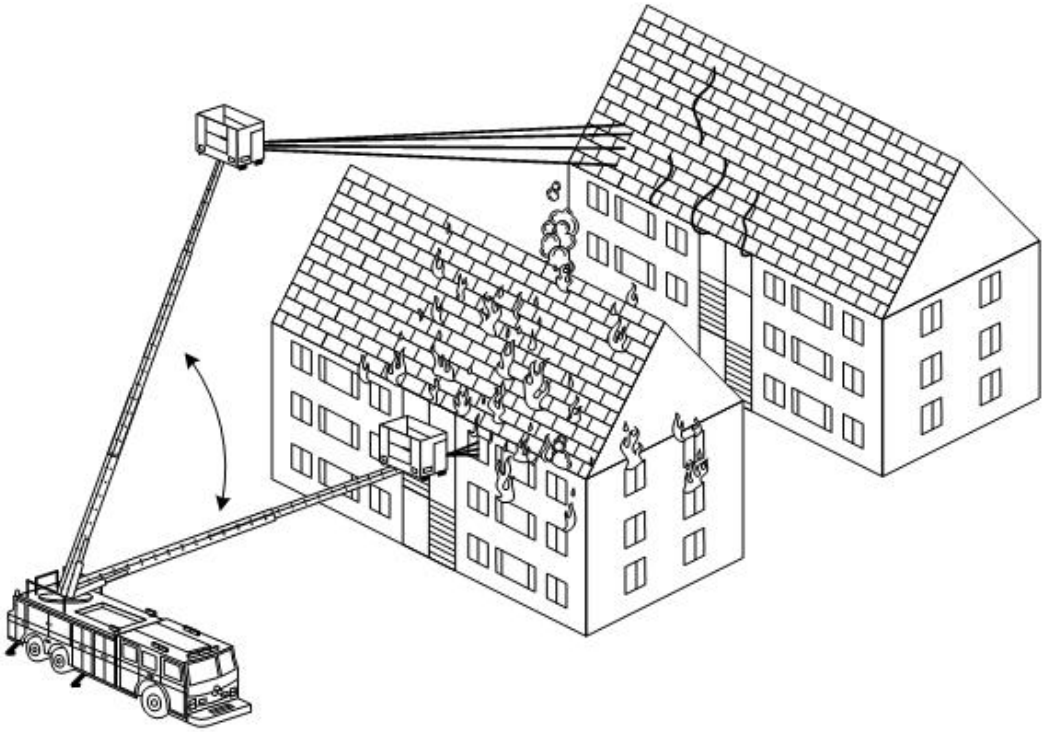


Figure 97: Over the top to protect exposure.

The incident commander will have to direct another aerial device(s) to get into position to stop extension in the adjoining structures.

Utilization of master stream devices from an engine company (portable or fixed) can provide adequate reach and penetration. Additional water supply may be required from sources a considerable distance from the initial supply.

Fire streams need to apply water directly to the fire area. A crew member needs to be assigned to a safe position to supervise the effectiveness of the stream.

Master streams may pose a serious safety hazard to crews operating on the exterior of the affected side. A safe zone should be established (with banner tape) opposite from these streams and personnel should be required to stand guard to keep everyone out. If possible, apparatus should be cleared from the area opposite of the stream before it is allowed to flow.

Exposure protection duties for the truck company may include:

- Opening voids, attics, and other areas for hose-streams to be applied.
- Elevated master stream applications (ladder-pipe, tower).
- Evacuation of exposures.
- Closing windows and removing combustibles from radiant heat exposure.