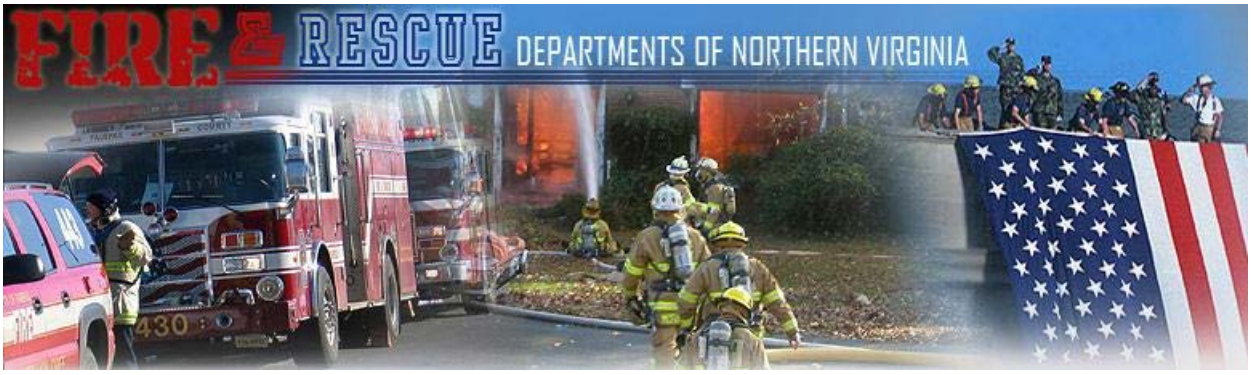

FIRE AND RESCUE DEPARTMENTS OF NORTHERN VIRGINIA FIREFIGHTING AND EMERGENCY OPERATIONS MANUAL

Fires in Residential and Commercial Townhouses and Rowhouses

Third Edition

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PREFACE

Fires in townhouses often present a life safety hazard; they also have attached exposures where fire can spread, whether or not the exposure is separated by a firewall.

In recent years, with the advent of lightweight construction techniques, the life safety hazard has increased because of the potential for early collapse.

Because of the variety of layouts and floor plans involved, a size-up, to include viewing as many sides of the structure as possible (360º lap), must be performed. This will allow the officer to determine the location of the fire within the building as well as life hazards, conditions in the rear, and eventually the attached exposures.

The purpose of this manual is:

- To describe residential and commercial townhouses and rowhouses, which comprise a large portion of the structures throughout Northern Virginia.
- To point out 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 precautions that should be taken.
- To establish standard tactics for fires occurring in such structures.
- To establish tactics for operations for engine, truck, and rescue companies for fires occurring in such structures.
- To reduce the loss of life and property by establishing a standard method of operation for companies combating fires in townhouses.

The following are key changes that are found in the third edition of *Fires in Residential and Commercial Townhouses and Rowhouses:*

- Expanded the definition of size up.
- Changed terminology from backup line to second line.
- Added content on soffit and deck attack.

DESCRIPTION AND CHARACTERISTICS

The term townhouse is a generic term used to describe various styles of attached dwellings. These can range from old row houses, to modern townhouses, duplexes, quads, piggybacks, over-unders, back-to-backs, and hybrid variations, shown in Figure 1 through Figure 8. Each occupancy has a separate address and its own entrance. Regardless of name, the firefighting tactics are basically the same for each style.

Characteristics

Townhouses range from two to four or more floors in height and may be different in height from front to rear (i.e., two floors on the front and three floors on the rear or vice versa). Townhouses may or may not have a garage, which can store one or two vehicles. A garage can be on the lowest level in the front or it can be detached in the rear off of a common alley.

Familiarity with the response district will enable the first-in officer to paint an accurate on-scene picture for the remainder of the assignment as to the style and layout. The importance of accurately defining the different styles of attached dwellings is so all personnel can expect and deal with the additional attached exposures.

Townhouses may have unfinished basements that allow a fire originating in that area to quickly spread to and compromise structural components (floor joists, plywood I-beams, plywood floors, etc.)

Commercial townhomes and residential townhomes are similar to each other in both construction type and firefighting tactics but vary in occupancy type. Commercial establishments can operate in townhouses and may not involve the same life safety concerns.

Figure 1: A townhouse is a multi-story dwelling normally attached to several other units. Typically, adjacent occupancies have rated floor and wall assembly separation. Townhouses most often will have an attic with a pitched roof.

Figure 2: A "back-to-back" is a townhouse consisting of two or more occupancies under one roof connected by the Side Charlie wall.

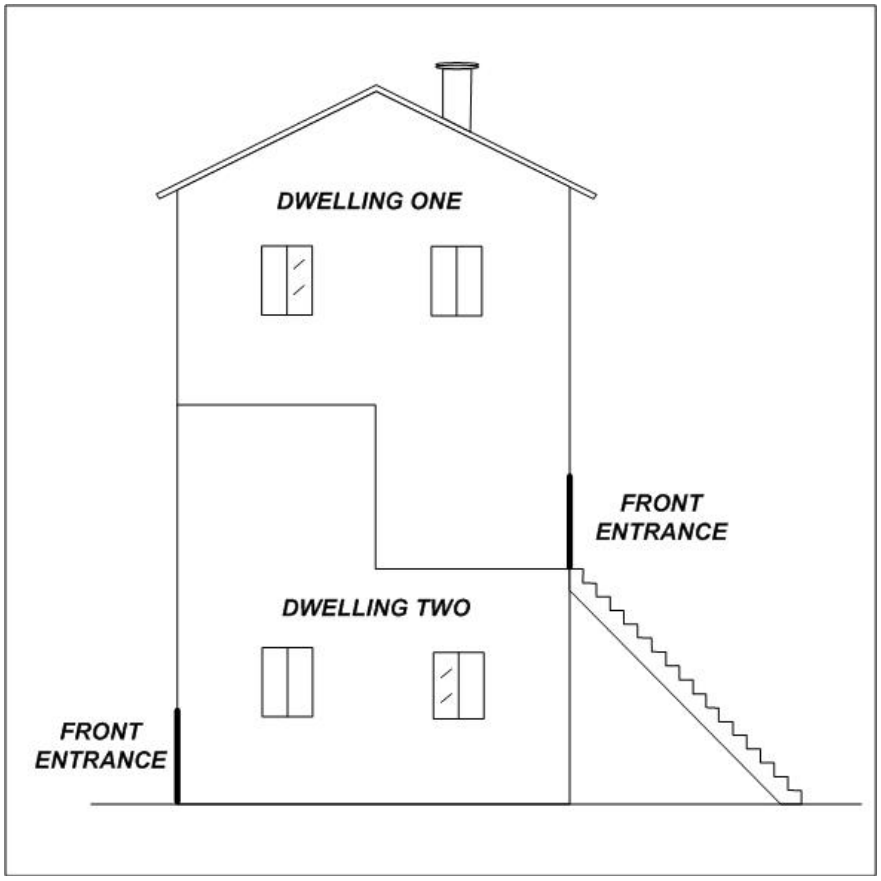

Figure 3: A piggyback townhouse consists of two stacked dwellings (one over the other), each with a separate address and entrance. These occupancies share a common floor separated by a fire wall on that floor. The figure shows the piggyback townhouse from Side Alpha (left upper), Side Charlie (right upper) and a cross-section diagram (lower).

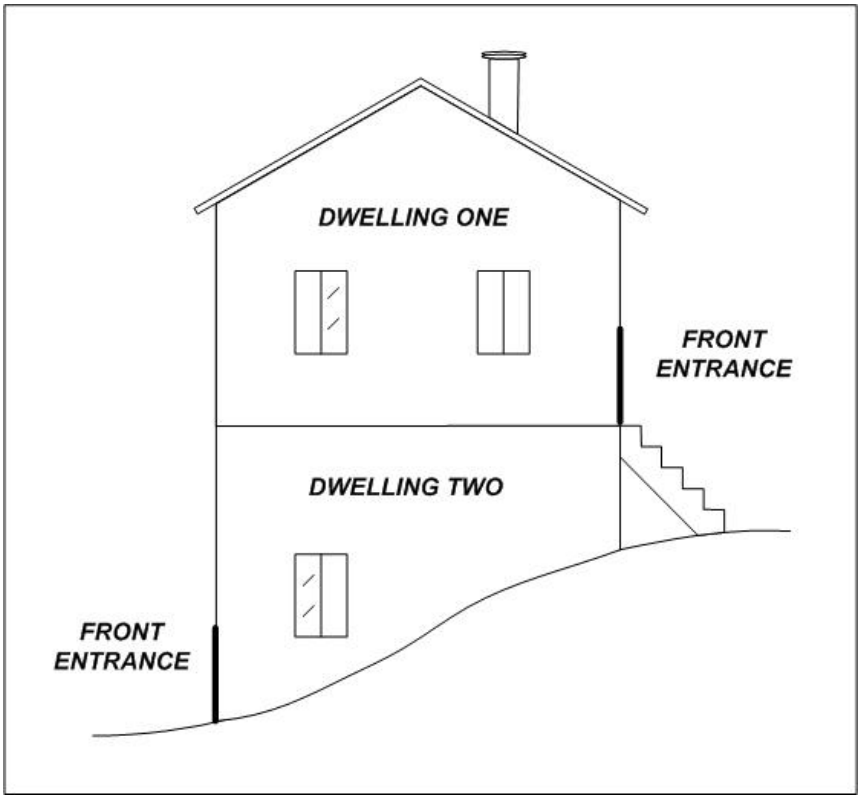

Figure 4: An over-under is a townhouse consisting of two stacked dwellings (one over the other). These are usually two-level occupancies over one-level occupancies with entrances on opposite sides, but other floor plan variations may exist. The figure shows the over-under townhouse from Side Alpha (left upper), Side Charlie (right upper) and a cross-section diagram (lower).

Figure 5: A rowhouse is a multi-story dwelling attached to at least two other dwellings. These dwellings may or may not be separated by fire walls. Typically a rowhouse will have a common cockloft under a flat roof. The figure shows the rowhouse from Side Alpha (top), and Side Charlie (bottom).

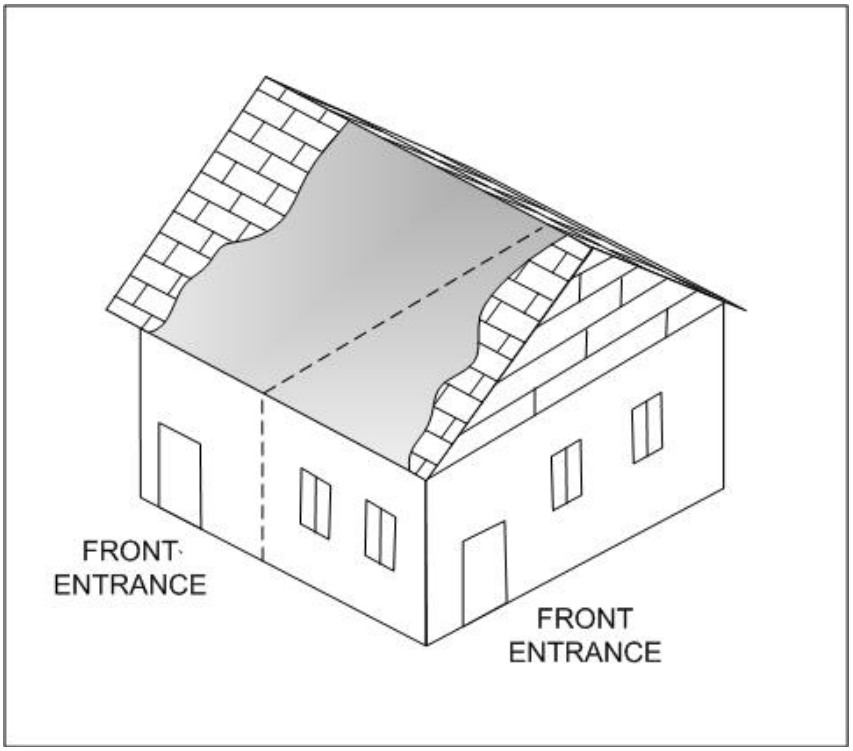

Figure 6: A duplex is two dwellings under one roof sharing a common wall. The figure shows the duplex from Side Alpha (top), and a cross section (bottom).

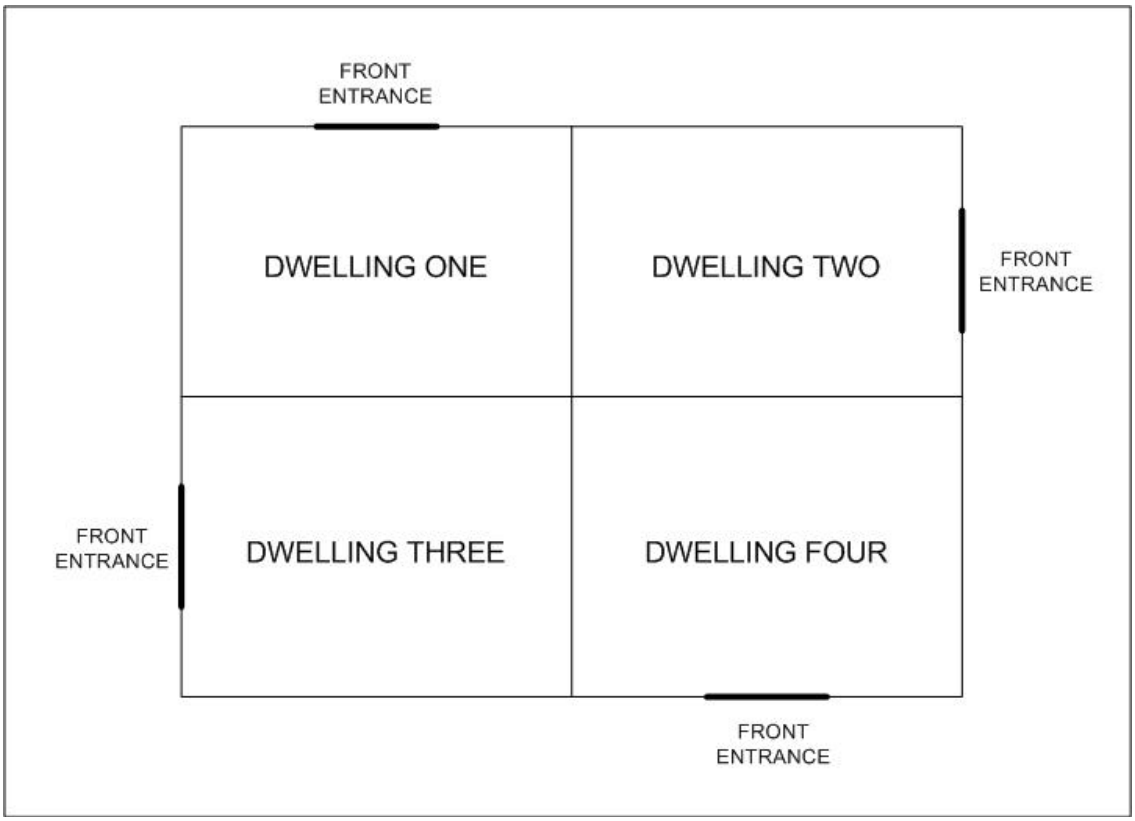

Figure 7: A quad is four dwellings connected together, under one roof, with separate addresses. A quad may have entrances on four different sides.

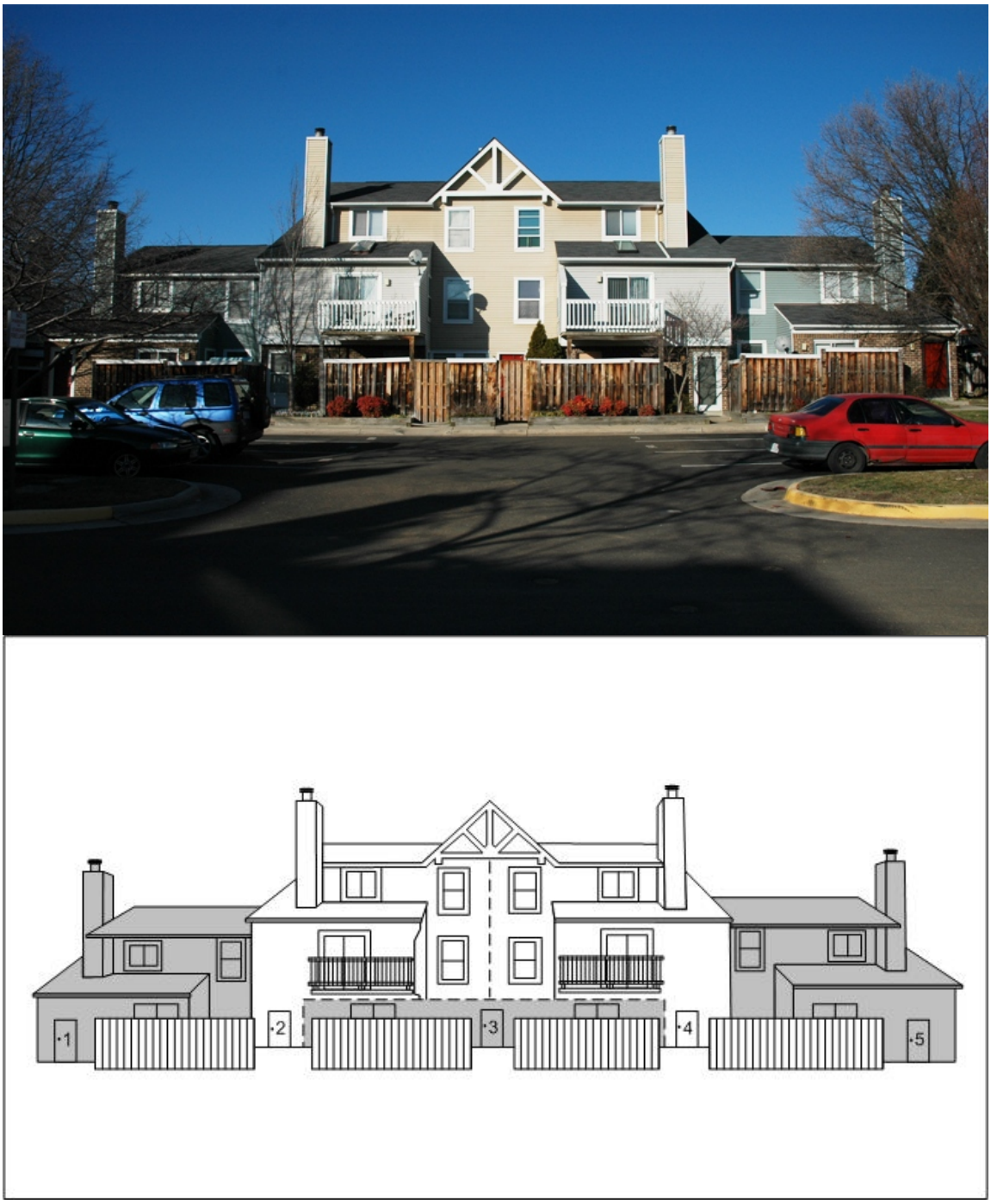

Figure 8: A hybrid is a building construction style that can be inclusive of various types of townhouse styles (piggyback, back-to-back, and over-under) under one roof. The figure shows the duplex from Side Charlie (top), and a diagram showing the five different occupancies (bottom).

CONSTRUCTION

Townhouse construction is typically lightweight frame using the platform frame method, Figure 9. Vertical fire extension in the walls is limited due to the platform frame and fire stopping.

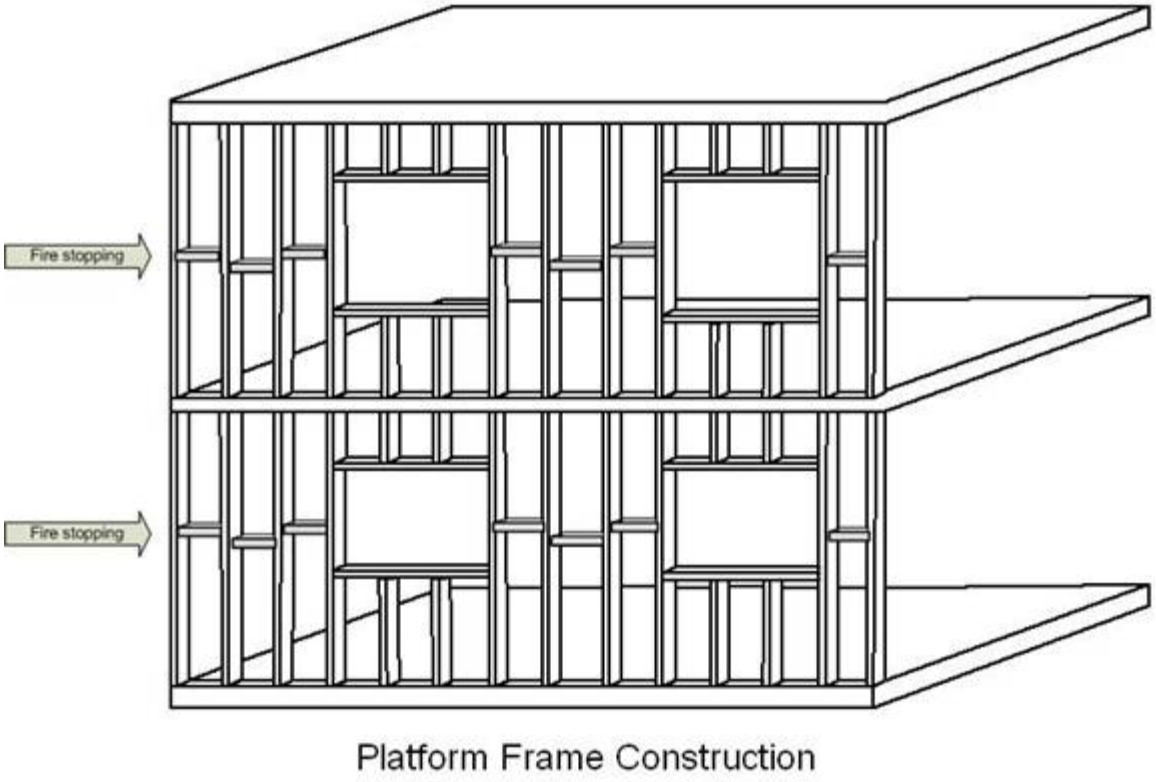

Figure 9: Example of platform frame construction.

Ordinary construction is usually found in duplexes and rowhouses. Many very old townhouses may have balloon-frame construction.

Roofs

The roof frames are of two basic types: lightweight or wood frame.

- Lightweight – Triangular trusses that rest on the top floor load-bearing and non-load-bearing walls, or parallel chord trusses or plywood I-beams forming the peak from the front and rear load-bearing walls to a ridge pole.
- Wood Frame – Sawn wood rafters forming the peak from the front and rear load-bearing walls to a ridgepole.

The roof deck:

- Over the trusses is usually 4’ x 8’ plywood sheathing or particleboard.

- On flat roof townhouses, may be a gypsum roof board that is integrated with fiberglass. (These types of boards are often referred to as Securock or DensDeck boards).
- Over sawn wood rafters is usually plywood sheathing or may occasionally be 1" x 4" or 1" x 6" boards nailed perpendicular to the rafters. The covering will usually be asphalt shingles, slate, and occasionally wood shingles are used.

Many townhouses constructed during the 1980s have fire retardant (FR) plywood sheathing roof deck. Much of this FR plywood was later determined to be defective due to early decomposition. Some was replaced, but companies should suspect the presence of FR plywood and use caution during fireground operations. The integrity of an FR plywood roof should be considered to be unsafe even before a fire occurs.

Roof styles can include flat or mansard but typically they are pitched and occasionally gabled.

The roof is usually steep enough to require working from a roof ladder or aerial device. Crews ordered to perform rooftop ventilation in lightweight construction must be independently supported by the use of a roof ladder or aerial device.

The presence of a dormer does not always indicate a finished attic. The dormer may be false, only attached to the exterior roof surface and not connected to the attic.

Attics

Attics, if present, are usually unfinished and may be used for storage by occupants. Access to this space may be through a scuttle or pull-down stairs located somewhere in the top floor ceiling, including inside a bathroom or a closet. This space may also be the location of water heaters and HVAC units. In some cases, the attic may serve as living space.

In lieu of an attic, townhouses may have a top floor vaulted ceiling or a loft. There may be flooring in the attic that will make application of fire streams from the floor below difficult.

Because of interior compartmentalization, crews may work on upper floors in the presence of lightweight truss construction. Working from a hallway or bathroom provides greater safety than working from large open areas.

Walls

Walls will be constructed of dimensional lumber, 2" x 4" in size, and may be load bearing or non-load bearing. Occasionally, lightweight aluminum studs may be found in non-load bearing walls.

All interior walls are typically covered with gypsum or lath and plaster.

Knee walls will be found in units with lofts and dormers and will contain voids or may serve as a storage area. Knee walls may contain hidden fire, and must be opened early to check for fire extension, Figure 10.

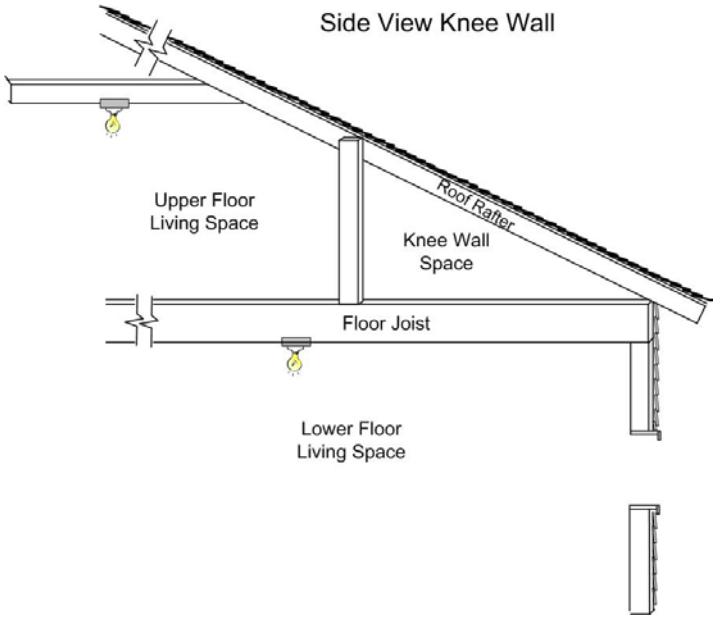

Figure 10: Cross section showing a knee wall.

Exterior walls may be covered with brick veneer, wood, aluminum, or vinyl siding over a thin layer of insulating sheathing. In the case of aluminum or vinyl siding, it can be easily breached. Exterior walls may also be load bearing in ordinary construction.

Foundation walls are either masonry block or a poured reinforced concrete monolithic (cast-in-place) wall.

Insulation

Insulation can be rolled fiberglass, blown-in rock wool, or blown-in cellulose. Insulation will be found in attics, exterior walls and, in some structures, the interior walls.

Firewalls

Depending on when the townhouse was constructed, firewalls will be:

- Non-existent.
- Located between each address.
- Located between every other address.
- Between occupied livings spaces and does not extend into the attics or basements.

Firewalls are constructed of two types:

1. Masonry or
2. Gypsum on both sides of the wall studs.

Masonry firewalls can be seen from the exterior if parapets extend through the roof or may stop at the underside of the roof deck.

Rooflines 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. Firewalls might be penetrated to allow the running of utilities.

Floors

Floor decking is usually wood (boards) or wood composite (plywood or chipboard). The decking may be covered with carpet and pad, tile (masonry or vinyl), or wood.

The decking material will be laid on sawn wood joists, parallel chord trusses, or plywood I-beams. These joists, trusses, or beams will be spaced from 16 to 24 inches on center.

Floor joist direction can be side-to-side or front-to-rear. If front-to-rear, an unfinished basement may have an unprotected steel girder and Lolly columns supporting the floor above, which presents a collapse hazard when exposed to fire. If side-to-side, joists may be supported on the basement load-bearing walls.

Windows

The most common style of window used in townhouses today is a double-hung, sliding sash type. The glazing may be of single, double, or triple thickness. Other styles of windows may be found and should be noted during pre-planning and size-up opportunities.

Casement windows create a special hazard. 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 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. Firefighters should note these windows in their size-up upon arrival at a structure fire. Casement windows should be treated as if they were a barred window and must be completely removed.

Doors

Exterior doors on residential townhouses may be solid wood, composite, insulated metal, or wood panel. In addition, you may find sliding glass or French doors in the rear. Commercial townhouses may have a tempered glass door in the front. Exterior doors are inward opening on residential and outward opening on commercial.

Interior doors are commonly hollow-core wood doors. Inward opening doors are typically found leading to bedrooms and bathrooms. Outward opening doors usually lead to basement stairs or closets.

There are two standard locks on exterior doors: mortise and rim.

Stairs

One of the most notable construction features in residential townhouses is the open stairway. Open stairs allow quick spread of fire and products of combustion to floors above.

Some townhouses have steep, narrow, or spiral stairways to other levels that may inhibit hoseline advancement and rescue operations.

Stairs require hoseline protection to maintain access and egress routes. Firefighters should remember, in most cases, the stairways are stacked.

Storage under basement stairs is common. These stairs can be unfinished on the underside. A fire originating in this storage area can quickly lead to the collapse of the stairs.

In commercial townhouses the stairwell will be enclosed. A door may or may not be found at the top of the basement stairs. If present, this will slow the spread of fire and its products to upper floors.

Fire Protection Features

Townhouses can be found with fire protection features that could include sprinkler systems, fire department connections, and alarm systems.

Chimneys

Chimneys can be either masonry with a tile flue, or wood-framed with a metal flue.

The metal flue, also known as a zero clearance or pre-fabricated chimney, is a galvanized metal pipe in a wood-framed chimney with siding on the exterior. The wood-framed chimney can be non-fire stopped and interconnected to adjoining floor/ceiling voids. Fire spread to attached occupancies is likely where occupancies use a common chimney (duplexes, quads, piggybacks).

Garages

The interior walls of the garage that are attached to the living space of the townhouse must be rated including the door, doorframe, and hardware. The area above the garage is normally finished living space. A vehicle or contents fire in a garage will allow for rapid-fire extension to other areas of the structure. The presence of a finished living area over the garage presents a serious 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.

HAZARDS

Life Hazards

Life safety is our number one priority. Regardless of the time of day, townhouses may have a significant life hazard. Life hazard includes those in attached exposures.

Occupants can be found on any level of the townhouse.

In commercial townhouse occupancies, transient occupants unfamiliar with the means of egress may create a life safety hazard.

Security measures may also negatively affect life safety by not only blocking exits, but also by impeding entrance by fire companies.

Fire Hazards

The use of combustible interior finishes and the type of furnishings found within these structures, contributes to the fire loading. Generally, these types of occupancies 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, attack lines should be 1¾ inches in size.

The presence of highly combustible siding can greatly affect the fire hazard. Vinyl and asphalt siding may contribute to vertical and horizontal fire spread and can create a severe exposure problem.

The presence of interior void spaces may add to fire spread. Vertical and horizontal openings allow smoke and fire to enter and attack the structure itself. Fire that has entered these voids will necessitate the opening of floors, ceilings, and walls. This is especially crucial in balloon-frame construction.

Fire spread to attached exposures is a major concern.

The presence of fireplaces and chimneys may create a potential for fire extension to other areas of the structure. Improper installation or time may compromise the integrity of the components, allowing fire or heat to escape and ignite surrounding combustible members.

Fire can spread horizontally to adjoining townhouses, even though a firewall is present, by passing through penetrations made in the firewall or by spreading over the firewall.

Fire can quickly spread over combustible exterior siding and be drawn into the attic vents on the attached occupancy around the firewall.

Collapse

In general, most modern townhouses are constructed of lightweight materials and methods that do not withstand degradation from fire exposure for long periods of time.

Collapse of the roof members (trusses) onto the top floor can occur in an attic fire or second floor fire, where fire has extended to the attic. Much of the collapsed roof assembly may be supported by the top floor, non-bearing walls which will create voids in the top floor. This can provide firefighters operating on the second floor with an area of safe haven and continue firefighting and not require an evacuation of the area. Structural and fire conditions should always be constantly monitored.

Fires in unfinished basements will rapidly attack the exposed structural members of the floor above. This will rapidly cause weakening of the structural members supporting the floor above.

If fire is in the floor void immediately below operating firefighters, and the 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 commercial occupancies, the installation of suspended ceilings creates a void space that can spread fire over the heads of attack crews. If this advancing fire condition is not observed the fire can travel past the advancing crew or cause the collapse of the suspended ceiling cutting off their exit.

A masonry veneer wall can fall outward the distance of the height of the wall.

FIRE OPERATIONS

Life safety is the highest priority at all structure fires. However, the potential for life loss is most prominent in residential occupancies. This objective should be achieved through interior fire containment and extinguishment with a thorough primary search. All operational tactics should be assigned to support this strategic goal.

When it has been confirmed the occupants of the structure are accounted for, the strategic goal should then focus on firefighter safety and fire extinguishment.

In most cases, fire extinguishment should be achieved through an interior fire attack. At times, size-up will indicate otherwise; however, personnel should anticipate an interior attack.

The conservation of property should be a strategic goal throughout the entire incident.

The rescue problem should be addressed through an interior primary search for victims focusing on the area near the fire, as well as the bedrooms and means of egress.

Ventilation in this type of structure is critical in facilitating a primary search. This may be achieved through the opening or removal of selected windows where occupants might be located.

The interior exposure problem should be addressed through rapid containment of the fire. This must include advancement of an interior attack line to protect any occupants within the structure, focusing on the interior stairway if present or other vertical voids.

The exterior exposure problem must also be addressed.

The need for roof openings typically will only be required when the fire has entered the attic area or has gained access to vertical void spaces. Wood frame construction provides the needed support to accomplish rooftop ventilation.

Lightweight construction does not provide the support necessary and may result in early collapse. Crews ordered to perform rooftop ventilation in lightweight construction must be independently supported by the use of an aerial device or a roof ladder.

Adequate size-up is a must to determine the fire's size, extent, and location before deciding on a course of action. When it is impractical for the first officer to personally view all sides, the officer should assign this task to another first alarm unit.

As a general rule, certain situations should cue the officer-in-command to request a second alarm such as:

- Known rescues
- Fire in two separate occupancies
- Fire on more than one level of the townhouse
- Fire in attic space

RESOURCES FOR FIRES IN TOWNHOUSES/ROWHOUSES

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

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

The assigned resources for fires in townhouses in areas without hydrants should be modified to include a Tanker Task Force early into the incident:

3 Tankers
1 Engine Company
1 Battalion Chief

When reports of occupants trapped are received, the assigned resources should be modified to include ALS units, if not already dispatched. When multiple victims are reported additional resources shall be considered.

Utility-fueled fires will require the assistance of the involved utility company and the IC should request these resources as early as possible when the need is determined.

The rehabilitation of companies that have been operating may require additional resources for relief as well as to staff the medical unit that performs rehab.

Units encountering delays in responding should communicate this immediately, along with changes in arrival order that will affect assignments. This should be addressed on the tactical channel so incoming units can be made aware. The dispatcher shall notify the responding chief officer of these changes. The chief officer should be advised of and acknowledge companies becoming available and being added to the incident. Personnel adding to calls should evaluate if their addition to the call will positively impact the overall outcome of the incident.

Reserve resources should be available in staging to meet contingencies as they occur until the fire is declared under control.

APPARATUS POSITIONING FOR FIRES IN TOWNHOUSES/ROWHOUSES

Typical positions and initial actions are described in this section.

First engine – After viewing as many sides as possible, the first engine company should park in a position to allow for rapid advancement of hoselines into the structure, leaving priority position for the truck company. In most cases this will mean the first engine pulls at least two addresses past the involved unit. If the truck is entering the block from the opposite direction, it is imperative that the engine stop at least two addresses short of the involved unit. The following shall be communicated via radio: on-scene report, layout, size-up, 360˚ lap, and situation report. Primary actions will be deployment of initial attack line, search as the line is advanced.

Second engine – The second engine should ensure a water supply, ensure first line is operational, and deploy the second line.

Third engine – The third engine shall position to allow the crew rapid access to the structure while maintaining access and egress to the incident for additional resources. The engine should take a position to prepare for providing a secondary water supply and visual inspection of side Charlie and report findings to command, check for fire extension, and possible exposure line. If rear access is not available, the third-arriving engine should position at the end of the row closest to the involved unit to ensure hoselines can be placed to the rear. Allow space for the second-arriving truck if needed.

Fourth engine – The fourth engine shall position out of the way, so as to not block access for incoming trucks and assume the position of RIT. If needed, the driver may be assigned to supply water to the third engine.

First truck – The first truck should position at the most strategic location that will allow for rapid placement of ladders 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. Other duties will be to force entry, conduct a primary search, and coordinated ventilation.

Second truck – The second 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 Alpha in front of the uncovered exposure. Ground ladders and truck operations in the rear will remain a priority.

Rescue squad – The rescue squad should position that affords rapid access to the structure, but does not block other companies. Primary responsibility is search and rescue, however if that task is being accomplished by another unit they may be needed for forcing entry, coordinated ventilation, or ground laddering.

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The primary role for responding Emergency Medical Service (EMS) units during firefighting operations is a routinely a support role. For this reason, placement of EMS apparatus should allow firefighting apparatus primary access to the incident scene but also allow for easy access and egress should treatment and transport capabilities become necessary.

Once on scene, the Incident Commander (IC) should assess the need for additional EMS units and request as necessary. An initial wave of casualties during a structure fire can quickly overwhelm responding EMS resources.

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. The crews should also canvas the crowd for injured victims. During townhouse fires, EMS apparatus should position down the street or on an adjacent street with a clear egress path should transport become necessary.

If the EMS unit is staffed with members trained as firefighters, the crew should have their protective clothing and SCBA with them.

A dedicated EMS unit should be considered for the treatment of responders early in the incident. This unit should be positioned in a manner that will provide access to equipment and emergency egress should transport become necessary.

In some jurisdictions, it may be necessary to use the initial EMS unit personnel for initial firefighting operations. The IC should understand the firefighting capabilities of their responding units. As necessary and properly trained, these personnel can be utilized to make a coordinated exterior fire attack while initial crews are preparing for coordinated interior operations. This can include deploying a hand line or master stream device to the fire area for a quick knock down of heavy fire, protection of exposures, etc.

If assigned rehabilitation responsibilities, see the *Emergency Incident Rehabilitation* Manual for more defined procedures.

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

The second chief officer should position the vehicle without blocking firefighting units in a position to support command and report to the Incident Commander with their full PPE including SCBA.

ENGINE COMPANY TACTICS

Water Supply

When dispatched for a fire in a townhouse, the first-arriving engine will lay adequate supply line(s) to establish the water supply for fire attack. The location and method of the hose lay should be communicated to the second-arriving engine company.

Often, the forward lay of a supply line is sufficient. If the street is wide enough, the officer shall ensure the line is laid on one side of the street to maintain apparatus access. Often, however, the line must be laid in the center of a narrow street, as is often found in townhouse complexes, so the truck company can straddle it while moving into position.

When the hydrant is in front of the fire unit, using LDH (or two 3-inch supply lines) to connect directly to the hydrant allows the first due engine to position either two addresses past or two addresses short of the involved unit.

A common problem in townhouse complexes is the water supply engine blocking access to the street when spotting the hydrant. This can prevent other units from gaining access to the scene. When the second engine is connecting to the hydrant, consider the use of a section of LDH to connect to the hydrant (or two 3-inch supply lines).

Third- and fourth-due engine officers must be cognizant of the need for a secondary water supply and identify the location of additional hydrants and alternative sources of water.

Size-up

The size-up is a continuous process which contains various benchmarks and decision points where information is obtained during an incident. Size-up info is provided on an ongoing basis and is included in:

1. Pre-incident (know what needs to be on a pre-plan, barriers, layouts, etc.)
2. Pre-arrival
3. On-scene report
4. 360° lap or walk around
5. Situation report
6. Interior size-up
7. Ongoing size-up

Pre-Incident Size-Up

Pre-incident planning is paramount to successful fireground operations. Knowing the building layout, construction type, hydrant locations, specific building features, locations of fire protections systems (standpipes, ventilation points), occupancy type, and building access options will expedite fireground operations.

Pre-Arrival Size-Up

Pre-arrival size-up is somewhat of a natural instinct for fire officers. Pre-arrival size-up considerations include: occupancy type, time of day, class of construction, weather conditions, and water supply access. Much of the pre-arrival size-up information can be known by company officers through pre-incident planning.

On-scene Report

The on-scene report gives the initial arriving company officer the opportunity to gather more detailed information. The on-scene report should paint an image of the building type and conditions upon arrival to other incoming units. The on-scene report should be concise, but provide sufficient information to incoming units to permit for proper apparatus placement and crew deployment. Information provided in the on-scene report should include: position of first-arriving apparatus (side of the building), what is evident upon arrival, occupancy type, and exposure concerns. (Refer to the *Command Officer Operations Manual.*)

360° Lap

The 360° Lap, or building walk around, will allow the all officer to view all sides of the building (if possible), and further paint a picture of the incident to incoming units. The lap will allow the initial arriving officer to determine the possible location of the fire, the presence of victims, best location for initial line deployment, and any obstacle present that may impede smooth fireground operations. The first-arriving engine officer shall conduct a thorough 360˚ lap of the structure prior to implementing interior firefighting tactics. For middle units, consider entering the Side Bravo or Side Delta exposures to view Side Charlie. If physical barriers make the 360˚ lap impractical, the lap may be assigned to another unit; however, interior tactics shall not commence until a report from Side Charlie is received.

In situations where a reported life hazard exists, and the initial company officer identifies the need for immediate interior firefighting actions, a radio report shall be transmitted identifying the need to bypass the size-up from Side Charlie.

Situation Report

The initial arriving officer will compile all of the information that was gathered through the pre-incident, pre-arrival, on-scene, and 360˚ lap. This compilation of information provides the tools to allow the first due fire officer to make the decisions necessary to mitigate the situation that is at hand. All information that is gathered is then relayed to units either on the scene or still responding, and dictates the actions necessary to bring together responding units and design a plan of action.

Interior Size-up

Interior size-up comes from all units that are working inside of the structure. This information can include: location and amount of fire, interior building layout, location of victims, hazards encountered, positioning of hoselines, and prioritization of search areas. With the continued

effort of fire suppression activities and changing conditions, ongoing size-up is the next phase of fireground size-up.

Ongoing Size-up

It is incumbent on the officers that are involved in an interior fire attack to keep the IC informed on the outcome of the fire attack. The IC needs to know the progression of fire extinguishment, number of victims and progress of removal, status of the building (holes in flooring, collapse potential, etc.), and the need for additional resources to mitigate the incident. Ongoing size-up will continue after the fire is knocked down with the intent of informing the IC of overhaul and salvage operations, CO levels in the structure, and any other pertinent issues that the IC may require.

An easy way to answer or transmit a progress report is the CAN report; CAN stands for Conditions, Actions, and Needs. By using this report model, the person giving the report easily identifies how well the team is doing, the conditions faced, and any support or resource needs.

C – Conditions
A – Actions
N – Needs

In order to use these principles, the engine company officer must have a comprehensive understanding of the size-up process and all elements. The elements of a size-up encompass the potential variables the engine company officer must factor into the decision-making process. During size-up, information and intelligence on the following elements should be obtained whenever possible:

- Building
  - Occupancy type
  - Residential vs. commercial
  - Location of points of access and egress
  - Ventilation access points
  - Fire protection features

- Construction type
  - Fire Resistive allowing for limited fire spread
  - Ordinary Construction, concerns for collapse potential
  - Lightweight Construction, issue of rapid fire growth and increased collapse potential

- Occupant Interview
  - Fire location (basement, upstairs, main floor)
  - Occupant report (rescue potential, location of fire)
  - Location of utilities

- 360° Lap
  - Elevation of structure (front vs. rear)

- Location and extent of fire(identify the lowest level of smoke and fire)
- Ventilation status
- Access and egress points
- Victim location

The information obtained during size-up will assist the engine company officer to determine, develop, communicate, and implement the initial incident action plan.

Initial Line

The initial attack line for most fires within this type of structure will be the 1¾-inch hoseline, allowing for the needed speed, mobility, and fire flow. The first engine crew will usually be responsible for deploying this line. An exception might be when the unit arrives alone, and an obvious need for an immediate rescue is indicated.

The placement of the initial line will be the most advantageous location for attack (i.e. – deck fires, vinyl siding fires, etc.) on the seat of the fire and may not always be the front door.. The first-arriving engine will normally accomplish entry on its own. However, the forcible entry task, when needed, remains the responsibility of the first due truck or rescue.

The purpose of the initial attack line is to protect occupants, the interior stairway, and, if possible, advance to the seat of the fire for confinement and extinguishment. The conditions found upon arrival and the information gained during the size-up may dictate changes in these tactics.

Second Line

The second line for most fires within these types of structures will be the 1¾-inch handline, allowing for the needed speed, mobility, and fire flow. The line should be of sufficient length to reach the location of the initial attack line or to be advanced to the area above the fire, if required.

The second line will generally be stretched from the first-due engine company apparatus. In most cases, the second-due engine company will accomplish this task.

This line shall be capable of delivering at least the same amount of water as the initial line. In the case of a 1¾-inch line, adjustments will have to be made to produce the higher flow. The need for advancement will be determined by the progress of the initial attack line. If the back-up line is not needed to support the attack line, it may be used as the line above the fire. Command must be informed.

An additional consideration for the second line is to protect the crew searching above. The best way to ensure the safety of the search crew is by placing this line at the base of the stairs on the fire floor. From here, the hose crew can observe fire conditions and prevent fire from spreading up those stairs.

Line Above the Fire

Officers should consider an additional hoseline for operations above the fire. There are two purposes of the line above the fire. The first is to protect the company doing the primary search of the floor above and the second is to extinguish vertical extension.

No more than two hoselines shall be stretched through any one entrance into a building. The advancement of additional lines should incorporate alternate means of entry.

The line assigned to the floor above the fire in these types of structures will generally be the 1¾-inch handline, 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, if required. The second or third engine company will be responsible for this task. The unit this line is deployed from will be determined by the unit officer assigned this task.

Sweeping the Eaves Prior to Entry

Eaves are a common structural feature of townhouses that extend the ends of rafters or trusses of a pitched roof over exterior walls. Eaves are often enclosed by nailing a fascia (board) to the ends of rafters or trusses and a soffit to the underside. Enclosed eaves are usually an extension of the attic, making it very vulnerable to auto exposure. Fire burning out of the top-floor windows or up combustible siding is very likely to impinge on and penetrate the soffit, spreading fire into the attic. Fire extension by way of eaves is hastened when they are enclosed with lightweight vinyl or sheet metal soffits. Soffits are commonly penetrated by attic vents to reduce temperatures and prevent condensation between the roof and the top-floor ceiling.

Soffit vents provide a direct path for fire to enter the attic. Smoke pushing from soffit vents of an overhang is an indication that fire may have extended to or exist in the attic. Personnel must be proactive to prevent fire from impinging on the underside of eaves and spreading to the attic. Hoselines should be positioned in anticipation of fire threatening the eaves. It is entirely possible for one firefighter to stretch a 1¾-inch hoseline and position it at a corner to protect the soffits on two sides of a building. Wash the underside of the soffit by directing a straight stream close and parallel to the wall. This will provide maximum protection to soffits and prevent the stream from entering the window and striking the firefighters engaged in an interior attack. Directing a stream from this position will also protect soffits from a deck or rear porch fire. Additionally, water striking the underside of the overhang will cascade down the wall to extinguish burning exterior siding.

Put master stream devices at corners of the building and not directly at the building, utilizing a sweeping motion when flowing water.

Soffit Attack

Attic fires can be rapidly knocked down from the exterior upon arrival using the soffit attack, Figure 11. To employ this method, the engine company will match their stream with the angle/pitch of the roof and flow under the gutter and through the soffit. A 2½-inch smoothbore provides an effective reach and penetration from the exterior of the structure. It may be necessary

to use ground ladders to gain access to the soffit to provide a more effective means of extinguishment.

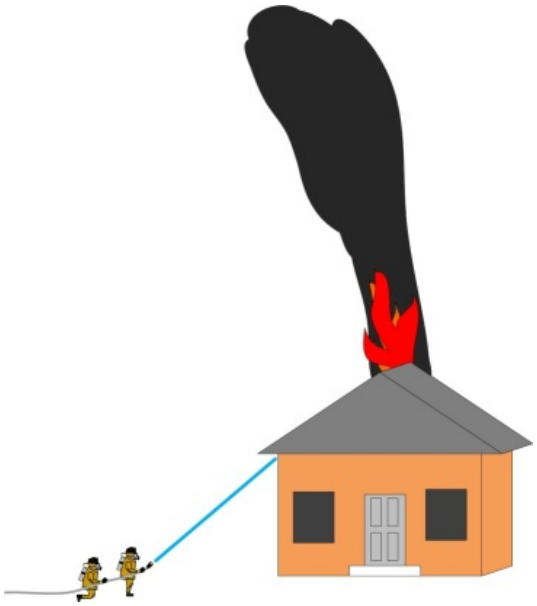

Figure 11: The Soffit Attack must be employed early into the incident, preferably by the first arriving engine company.

Deck Fire

In the event of a deck fire, the priority should be to get a hoseline on the deck side of the structure to extinguish the deck, the soffit, and eaves. If it is found that the deck is still structurally sound, the first engine may access the fire building through Side Charlie with the handline to check for extinguishment and fire extension investigation. It is okay to go from the burned portion of the structure to the unburned portion in this situation.

Exterior Fires Extending into the Dwelling

Due to recent building construction trends, the use of vinyl siding on lightweight wood construction dwellings has increased tremendously. Vinyl siding has become more prevalent as an exterior covering on homes due to its lower installation and maintenance cost, along with the longevity of use. The combination of vinyl siding and lightweight wood construction has shown to have a significant impact on firefighting operations, especially in fires originating on the exterior of the home. These exterior fires quickly ignite the vinyl siding and exterior sheathing then extended up the building and into the dwelling. Fire can enter the structure into the attic space through the soffit or into the home through a window or void space in a truss construction floor.

Many line-of-duty deaths and close calls have been the result of fires originating on the exterior of the dwelling involving the vinyl siding, the combustible sheathing, and/or environmental factors, such as high winds. The potential for rapid fire progression into the structure on multiple floors and the recent history of line of duty deaths and close calls in the United States, mandate that consideration be given to proper size-up, strategy, and tactics. The incident actions must be

communicated by the first-arriving officer, and carried out by the subsequent crews, in order to safely and successfully extinguish this type of fire.

Mandatory actions for exterior fires extending into the dwelling:

1. The first hoseline is deployed to the fire location on the exterior of the structure to perform a quick knockdown of the fire in a sweeping fashion. Crews must use caution not to flow water into windows or doors whenever hoselines are operated from the exterior. This tactic may force fire and the products of combustion into the dwelling toward the occupants.

2. Once the first hoseline is in place and operating effectively, the second line should be deployed to the interior of the dwelling. The crew must inspect the ceiling area and the floor condition at the point of entry. The use of a thermal imaging camera is highly recommended, Figure 12. This line will extinguish any fire within the dwelling and protect the occupants and the companies operating on the interior. In order to be successful more than one handline may be required.

3. Once fire is knocked down on the exterior of the dwelling, the hoseline may be re-deployed to the interior to assist the interior line or progress to upper floors to attack any fire.

4. The coordination of tactics and operations between the first engine and the special service units or additional engine companies must be completed before the special service units can enter the building.

Figure 12: Use of a thermal imaging camera to check ceiling area.

Basement Fires

Basement/below grade fires pose unique hazards and challenges. Two key characteristics make basement fires particularly challenging:

1. Limited access points and
2. The potential exists to have immediate, unimpeded fire impingement on the structural support for the floor above.

This exposure of structural elements is somewhat mitigated in the case of finished basements where drywall or some other barrier has been placed over structural beams or joists.

As with any fire event, size-up at a basement fire is critical. Initial arriving units must determine the location and extent of the fire, building construction, hazards, and points of access to the basement. If the fire is known to be in the basement, the officer must quickly determine if an exterior access to the basement is present. This exterior door most often will be in the rear.

Early determination must be made, if at all possible, whether the basement is unfinished. If so, fire has unimpeded access to the unprotected structural supports of the floor above.

The objective is to prevent the fire from extending vertically through containment and extinguishment. This will require two lines. **The need for both lines to be coordinated and rapidly get into position is of utmost importance.** Effective and coordinated ventilation of the basement and upper floors is necessary to support the fire attack.

It is incumbent on the first arriving engine company officer to identify where the handline will be deployed in a manner that best addresses the immediate needs of the incident. The location of the initial handline may be:

1. To the rear/exterior basement access to commence fire attack, or
2. To the front door to protect the interior stairs and upper floor(s).

The decision of where to deploy this line must be communicated on the operations channel.

The preferred point of attack for the initial handline is an exterior access point that leads directly into the basement. This stream should be a straight or solid stream to avoid forcing heat, products of combustion, and steam up into the first floor.

A line must be stretched to the front door to contain the fire and protect any occupants and searching firefighters. This line can cover the first floor and protect the interior stairs. Crews should not operate above the basement without the protection of this handline unless there is a confirmed life hazard, Figure 13.

The crew must ensure there is not fire under the floor and determine its stability before proceeding. If the integrity of the first floor is compromised, the line should be positioned in a position of safety close to the entrance door. This change in hoseline and crew position should be communicated to command.

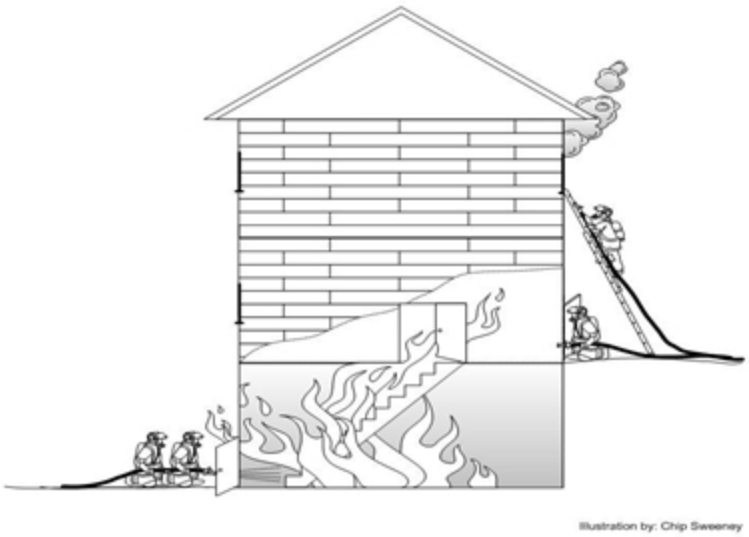

Figure 13: Attacking a basement fire.

The door to the basement should be closed, if feasible. If the basement door cannot be closed, is non-existent, or burned through, use a narrow fog pattern **aimed at the ceiling** over the stairway to contain the fire. It is imperative that this narrow fog stream is NOT directed downward into the stairwell. The main objective of this line is to stop vertical fire extension.

When advanced fire conditions are encountered and an exterior entrance is not present, the fire should be knocked down from outside the basement. This can be accomplished by:

- Applying a fire stream into the basement through a window opening, Figure 14.
- Removing the band board on the exterior. In most cases, this stream should be a straight or solid stream. The band board area is where the floor joists for the first floor meet the exterior wall. In the case of a well-involved basement, dark smoke may be pushing from this area. Opening this area in buildings of lightweight construction can normally be accomplished with hand tools or a chainsaw.
- Extend a window cut down an additional foot or two, the same band-board access point will be provided. This also creates another access/egress point which may be used later in the fire.
- Deploying a Bresnan Distributor Nozzle (may also be known as a cellar nozzle) from the exterior into the structure, placing the nozzle through a hole over the immediate fire area is preferred and most effective. Personnel must be proficient in the deployment and operation of this nozzle if it is used.

Officers must ensure that no firefighters have entered the basement. The primary purpose of the steam generated through the aforementioned methods is to extinguish the fire. If extinguishment is not possible, the fire must be knocked down so entry can be made from the interior stairs.

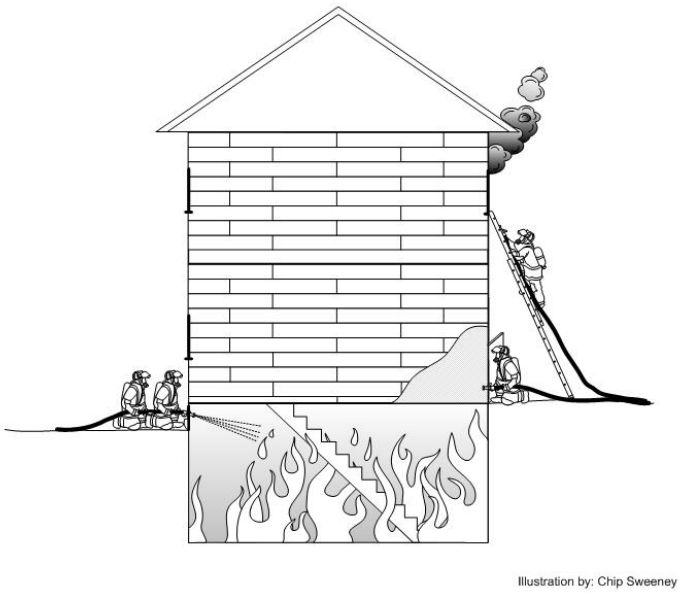

Figure 14: Hoseline placement for advanced basement fire conditions in a basement with no exterior entrance.

If no exterior basement entrance or opening exists, and all other methods have been considered, an attack via the interior basement stairs may be the only option. Again, if the basement is well involved, every effort should be made to knock down the fire. Under these circumstances, the officer will need to determine if it is safe to attempt going down the basement stairs for a direct attack on the fire. The officer must carefully evaluate the structural stability, life hazard, and the fire and heat conditions at the top of the stairs. Good judgment must be exercised in deciding if it is safe to proceed down the stairs. In this case, a second handline must be in place and ready before fire attack, Figure 15.

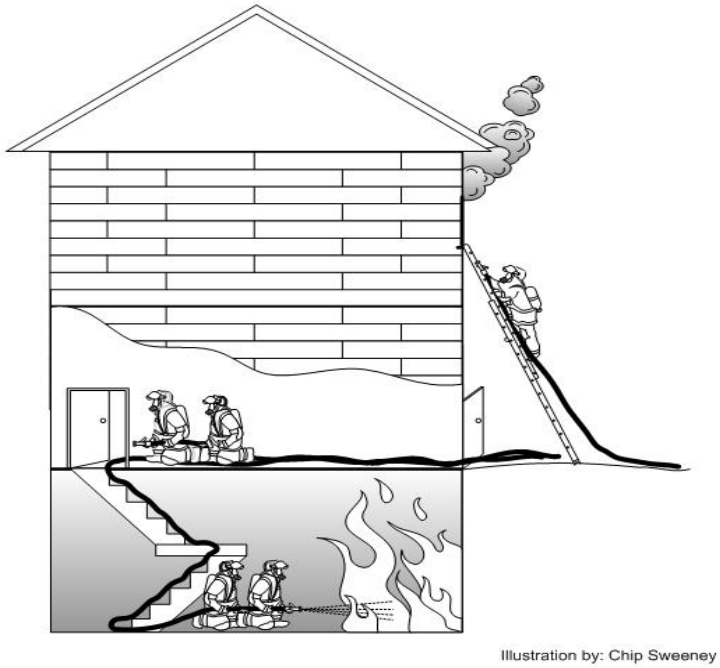

Figure 15: Hoseline placement for a basement fire in a basement with no exterior entrance.

When attempting to access the basement stairs in some townhouses the proximity of the basement door and the rear door can prove to be a hindrance. When the rear door is opened it swings towards the interior basement door. Conversely, if the basement door is opened first and companies attempt to enter the rear door their access will be blocked, Figure 16. Personnel should remove one of the doors to aid in the movement of the hoselines.

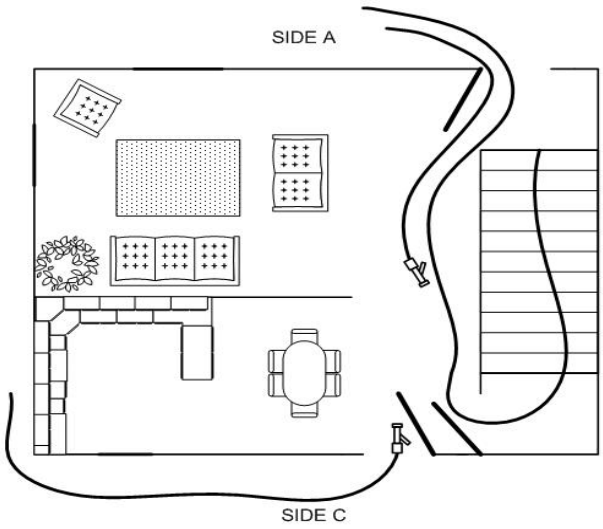

Figure 16: One of the doors (exterior or basement) needs to be completely removed to allow crews unimpeded access to the basement when entering from Side Charlie.

Should the fire building be of balloon-frame construction, early attention should be given to checking for vertical extension through the stud bays in the exterior walls. Fire should be expected to extend to all floors and the attic. Early attention should be given to the removal of siding as well as deployment of additional hand lines to upper floors to check for vertical extension.

Garage Fires

Knock down visible fire from the exterior and a coordinated interior attack may be initiated to extinguish the fire and any extension. Water streams do not push fire through a building, a misconception that has been disproven by national scientific studies.

The need for quick assessment of extension into the living area and attic is imperative. The attached garage fire is known for its ability to extend to upper floors and the attic. The need for companies to check these areas and have charged lines to support them is crucial.

The garage may be located under a living area. This area must be quickly checked for smoke and fire spread. Companies operating in this area should be cautious, as the fire below them has direct access to the floor members supporting them.

When the initial line is advanced through the overhead door, the status of the door leading to the living area must be known. This door must be closed and protected to prevent the spread of fire and/or smoke to the interior of the house. A hoseline must also be advanced through the house to the interior garage door to prevent extension. The fire attack through the overhead door must utilize a straight or solid stream to lessen the products of combustion from being driven into the main portion of the house.

If the decision is made to advance the initial line through the living area of the structure for the attack, the engine company must be ready to operate the line when the door is opened. If this door was left open at the time of the fire, the advancing engine company should anticipate encountering fire in the living area near that door. A second line should be advanced to back up the first or to proceed to the upper floors.

Many times the fire will have originated in a vehicle parked within the garage. Standard precautions associated with all vehicle fires, such as exploding bumper cylinders or ruptured fuel tanks, should be observed

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.

Attic Fires

Attics are considered the space under the gabled roof. Cocklofts are considered the space under a flat roof. In both instances the size of the area will vary. Company officers should evaluate the area of involvement and gauge their tactics accordingly, Figure 17.

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 in the living area or basement that have extended into the structural components and entered the attic via void spaces.
- Interior fire that has vented through a window and exposes the vented soffit area.
- Fire that has originated on the exterior of the dwelling and has involved the siding and exposed the soffit area.
- Electrical fires that originate from ceiling fans, exhaust fans, and recessed lighting.
- Fire that has originated in the attic itself by natural occurrences, such as lightning strikes.
- Current or prior work done by roofers, plumbers, and/or painters.

Figure 17: An attic fire and a fire in a cockloft area (smoke showing from cockloft vents).

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 lightweight wood frame construction.

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 18. This option is usually the most effective. 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, dresser, bed, etc.)

2. Hooking the ceiling and directing the stream from below into the attic area. This method is 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 and the roof does not have a ridge vent. (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.

Figure 18: Gaining access to an attic fire.

In Figure 19, several truss or joist bays have been exposed in the diagram 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 19: 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, 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.

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 20. In general, if not quickly extinguished, this roof design tends to "burn away." It represents a relatively low catastrophic collapse hazard. Companies should consider operating in areas of the structure without large dead loads above such as hallways, bathrooms, and bedrooms because the interior walls will give some protection of falling ceiling materials. Units should avoid working under open areas such as foyers due to the long, unsupported span of the truss. 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 20: Gable roof attic fire.

Another hazard associated with the well-involved attic fire is the collapse of the overhang (soffit), Figure 21. 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 21: Attic overhang (soffit) collapse.

In more modern occupancies, due to the presence of water heaters and HVAC units in the attic space, as well as cosmetic dormers, Figure 22, the collapse potential is significant when fire is in possession of the attic space. Companies should not be operating directly under the involved area in these instances.

Figure 22: 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 23.

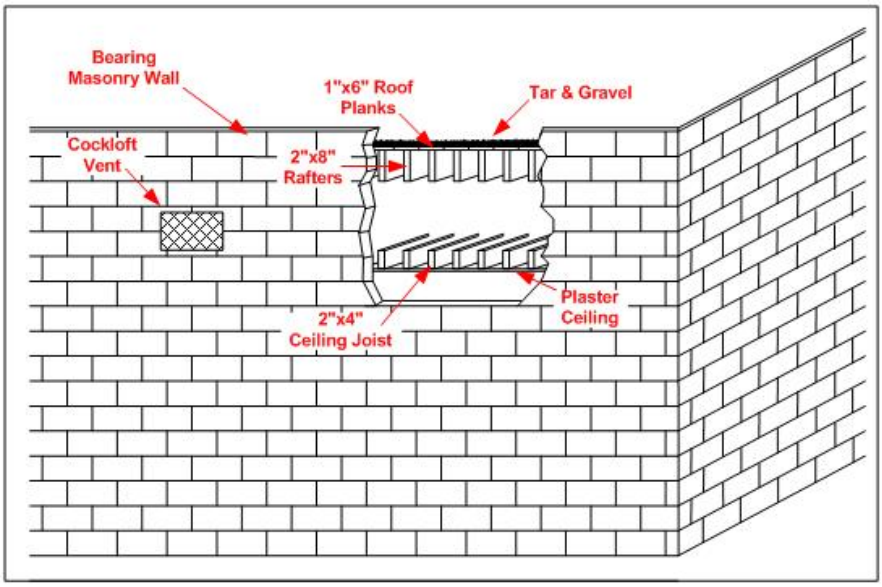

Figure 23: Cockloft.

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. 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 24.

Figure 24: Opening into an attic for a hose stream.

Additional Fire Attack Considerations

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

- Master stream devices are very effective on large volume fires in garden apartments. Unfortunately, apparatus positioning on arrival is usually for offensive operations and may not be conducive to positioning for defensive townhouses 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.
- 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.
- 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 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.

Wind-Driven Fires

Along with the possibility of a backdraft or flashover, there is the threat of wind-driven fires in residential structures where the windows have been compromised. These fires may burn with such intensity that they can destroy fire barriers, posing a serious threat to firefighter safety. Numerous firefighters and civilians have been killed or injured in this type of fire. Most wind-driven fires occur in the upper stories of high-rises, but have also been documented in lower levels down to the third floor or in residential structures. Additionally, these hazardous conditions can exist with exterior winds as low as 10-20 mph.

Five conditions must exist for a wind-driven fire to occur:

1. Fire in the structure.
2. Failed or open window to the outside in the fire area.
3. Presence of wind on the exterior of the structure.
4. Failed or open door to living area.
5. An unobstructed path to an outlet for the fire to vent. Example: Fire in the rear of structure venting through the front structure or fire originating outside the structure and traveling via siding into the attic space or compromised windows.

Recognition of a wind-driven fire from the street level along with proper tactical deployment of resources is critical for personnel safety. To aid in size-up of a wind-driven fire, personnel should be aware of the following:

- Presence and direction of the wind from street level.
- Failure of windows to the area of the fire.
- Lack of smoke and flames and/or intermittent smoke or flames pushing from the failed window (depending on wind/gusts).
- Presence of a large volume of fire within the fire area.

Once personnel arrive and conduct a 360˚ lap, they must ensure that they communicate the fire conditions to Command. The situation report should include the volume of fire, intensity of heat felt, and temperatures observed through the use of a thermal imaging camera. Additionally, the first due truck should advise immediately if they can close the door to the fire area or able to isolate the volume of fire. Closing of an open door will interrupt the flow of the wind driven fire and may allow companies to advance a hoseline.

The National Institute of Standards and Technology (NIST) demonstrated several alternative tactics that showed positive results when personnel cannot make entry. They involve using an exterior attack:

1. Using elevated master streams through the fire room window.
2. Via portable ladders.

3. With a large caliber stream and the wind at the back of the crew.

If any of these tactics are employed, communication is paramount and must be coordinated between interior and exterior companies. The exterior personnel preparing for attack must ensure that no fire department personnel are present in the structure prior to flowing water.

Coordinated ventilation is also critical to the suppression of a wind-driven fire given the intensity and behavior of these fires. ***If wind-driven fire conditions are present, no horizontal ventilation should be performed until directed by Command.***

Large Volume Fires

A large volume fire is a situation where the volume of fire is such that fire spread to adjoining exposures is a major concern, Figure 25.

It may be necessary for the first engine to perform a holding action or a quick knockdown on the townhouse of origin by using a master stream device or 2½-inch hoseline.

The next line shall be stretched into the most severely threatened exposure, most likely, downwind. Based on fire conditions consider placing a line in the opposite exposure.

The third engine is still responsible for rear coverage.

In the situation where a heavy volume of fire is encountered in the townhouse of origin, it may be appropriate for the first arriving officer to address the attached exposures first.

Figure 25: Large volume fire.

This situation may require an elevated stream for extinguishment. Officers shall keep this in mind while positioning apparatus and establishing a water supply. Water supply is paramount in the quick control of a large volume fires and must be a priority of arriving engine companies. If a tower ladder is not on the assignment, consideration should be given for special calling one. Remaining companies shall preserve access to the scene for truck companies.

Exposures

The purpose of the exposure line(s) is to prevent or extinguish fire spread into any attached exposure.

Areas to be checked are all floors to include the attic and basement. Any separate unit attached to the occupancy of fire origin must be checked, any indication of fire spread, advance a hoseline.

In the case of the rear exterior exposure, stretch the line via the shortest route. However, if wind is a factor, consider stretching the line through the upwind, attached exposure, or around the upwind end of the row. This adds protection for operating personnel with the wind being at their backs.

TRUCK AND RESCUE COMPANY TACTICS

Positioning

There are three general locations for turntable placement at townhouse fires. These are determined by degree of fire extension and location.

- If it is a contents fire with an aggressive interior attack, place the turntable in front of the involved unit. This will facilitate the best placement of the aerial to windows, if needed. The aerial will be able to be raised to the roof of the involved unit or to either exposure easily from this position.

- If there is an attic fire, place the turntable in front of the upwind exposure.

- For a heavily involved situation that may require the use of elevated streams, the turntable of the first truck should be in front of the most threatened exposure. The second truck should be in front of the next most severely exposed unit. If possible, both turntables should be able to rotate back to the original fire occupancy to assist with the completion of extinguishing the main body of fire.

If elevated streams become necessary, a tower ladder is the most effective unit to accomplish the task and should be requested by the Incident Commander. An attempt to maintain access for later arriving trucks should always be an objective of all companies.

It is considered good practice to have trucks positioned in both front and rear on row structures. This is seldom possible in townhouse complexes. Even though the apparatus cannot get to the rear, rear coverage is necessary for ventilation, ladder placement, etc.

Initial Actions

The initial actions of the first arriving truck or rescue squad will be determined by the plan of action developed from the size-up. After ensuring entry, these initial actions will generally be tactics focusing on primary search, ventilation and laddering. Ventilation must be done to support the search as well as the advance of the attack.

The initial actions of the truck and rescue will depend on their arrival sequence. Should the rescue squad arrive at the same time as the truck, the rescue squad will generally be assigned the task of entry and primary search, and the truck is responsible for ventilation and laddering.

Upon arrival of the other unit, this officer is responsible for ensuring laddering and outside ventilation is accomplished.

Certain size-up factors (untenable conditions, signs of a backdraft, or smoldering stage, etc.) may indicate the need for ventilation prior to entry into the structure. When these conditions are observed, the structure shall be vented prior to entering into the structure. Before venting, the initial charged line must be in place and ready. In most cases, ventilation should occur from the top down using the removal of windows as the avenue for hot gases to escape. If ladders are used

to remove upper-story windows, consideration should be given to leaving them in place. This allows the interior crews the advantage of seeing the ladder placement prior to entrance into the structure.

Forcible Entry

The purpose of forcible entry will be to initiate a primary search and allow access for the advancing engine company.

The task of gaining entry into townhouses will generally be easily achieved using conventional methods. Personnel should remain cognizant that forcible entry is ventilation and can have adverse impact on the path and intensity of the fire.

The access point for the engine company will almost always be the front door. This location may be altered due to the location of the fire, in an effort to attack from the unburned part of the structure. In situations where the front door is not the primary access point, it should still be forced, but left closed.

Attached exposures will need to be accessed. These may require forcible entry as well.

Rescue and Primary Search

The area closest to the fire on the fire floor and the area directly above the fire, are considered to be the two most dangerous areas. Means of egress and sleeping areas are generally considered to be the most critical areas to search. The objective in a primary search will be to check these areas first. Various means may be used to arrive at these locations. The task of executing the primary search should be accomplished quickly due to relatively small areas within most townhouses.

Support for the primary search should include ladders to upper-story windows and hoselines engaged on the fire.

When accessing the fire floor, crews should begin the search while making their way to the fire area. Crews going to the floor above the fire must also begin searching immediately, but with the objective of quickly getting to the area over the fire first, and then searching outward from that point.

Should the tactic of Vent Enter Search (VES) be used, the IC must be notified to avoid duplication of effort.

The outcome of the primary search must be reported to the incident commander because this is the primary strategic focus of the operation.

Ventilation

Ventilation is performed either to support a search (venting for life) or support the fire attack (venting for fire). This strategic decision will determine the method, location, and timing of ventilation.

Venting for life will be accomplished through the aggressive removal of windows where appropriate. The areas of reported or suspected occupants should be addressed first.

In most cases, ventilation is accomplished simultaneously with search and is sometimes required PRIOR to the commencement of the search. Therefore, ventilation must be coordinated with the interior crews. Coordinated ventilation can improve the survivability of victims because it:

- Reduces heat and smoke on the interior.
- Reduces potential for flashover.
- Allows firefighters to search faster and more effectively.
- Allows for locating the fire more rapidly.

Venting for fire will be accomplished through the coordinated and limited removal or opening of windows in the fire area. The areas where fire can be seen or are showing the highest concentration of smoke should be opened when the attack line is in position to confine the fire.

The roof will not need to be ventilated unless the fire has entered the attic area, extended into the structure walls, or has considerable hold of the top floor. The discovery of a lightweight, trussed roof should be made known and reacted to appropriately. Crews ordered to perform rooftop ventilation in lightweight construction must be independently supported by the use of an aerial device or a roof ladder. A viable and safer option is to vent the ends of a gable roof.

Mechanical and positive pressure ventilation (PPV) works well for smoke removal in these types of structures. PPV shall NOT be used in balloon-frame construction.

Ladder Deployment

The purpose of ladder deployment is to provide access into the townhouse and an escape route for firefighters operating within.

Laddering at a fire in a townhouse should be done to all available sides of all floors above ground level with attention given to the bedroom windows. This can generally be accomplished with ladders of less than 35 feet that are found on most apparatus on the incident scene

The need to ladder the roof at a fire in a townhouse will depend on the extent and location of the fire. Generally, the roof will not need to be laddered unless the fire has entered the attic area or has considerable hold of the top floor. Ladders should also be placed to the roof of exposures for access if there is fire in the attic.

Basement Fires

The interior crew will provide support for the initial line regardless of where the attack begins. If the initial line is to enter from the front, this crew will force entry, locate the basement stairs, and assess severity of fire. The truck shall carry out the tasks of venting and search in support of the attack. The crew must monitor radio traffic to ensure they are aware of the direction of the attack as well as any information transmitted regarding fire extension and structural stability.

Priority should be given to the sleeping areas and consideration for VES must be given if fire has possession of the stairs or the first floor is untenable.

Attic Fires

The majority of townhouse roofs in Northern Virginia are of truss construction. Take appropriate safety precautions. Crews ordered to perform rooftop ventilation in lightweight construction must be independently supported by the use of an aerial device or a roof ladder.

The interior crew should be working with hooks opening the ceiling as needed by the attack crew. Salvage covers should be taken in at the time of this operation to cover contents. The top floor should be searched prior to pulling down the ceiling.

Crews will also need to check the attics of attached exposures.

Large Volume Fires

In large volume fires, the effort shall be to defend the firewalls of the involved unit with the elevated stream. Defending the firewall means to apply heavy caliber streams to the fire side of the firewall to prevent horizontal spread of fire to the attached exposure.

Appendix A: References

The following sources were used in the development of this book in addition to the personal contributions of the committee members.

- Brannigan, Francis L. (1993). *Building Construction for the Fire Service*. (3rd ed.). Quincy, MA: National Fire Protection Association.

- Fire Department of the City of New York (n.d.). *Row Frame and Brownstone Building Fires*.

- Gaines, Glenn A. (1978). *Firefighting Operations in Garden Apartments and Townhouses*. Bowie, MD: Robert J. Brady Company