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

Fires in Residential and Commercial Townhouses and Rowhouses

Fourth Edition

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- City of Alexandria
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The NOVA Fire Operations Board and a group of subject-matter experts developed the first edition of this manual (released in 2002). The Technical Writing Group revised the manual in March 2009 and 2013, and the NOVA Fire Operations Board approved and published the second and third editions. The NOVA Fire Operations Board oversaw the production of this fourth edition with content developed by the Technical Writing Group.

PREFACE

A townhouse or rowhouse fire can occur in buildings with residential or commercial occupancy and can often present life safety hazards due to their particular interior layouts and construction features. Townhouses and rowhouses also have attached exposures where fire can spread, whether or not the exposure is separated by a firewall.

In recent years, the advent of lightweight construction materials and techniques has elevated the potential for early collapse in these buildings, increasing the life safety hazards they pose.

The variety of layouts and floor plans found in town- and rowhouses requires a size-up that includes viewing as many sides of the structure as possible (i.e., a 360-degree lap). This allows the officer to determine the fire's location within the building as well as potential life hazards, rear conditions, and the involvement of attached exposures.

The following key changes were made to the fourth edition of the NOVA *Fires in Residential and Commercial Townhouses and Rowhouses* manual:

- inclusion of the Glossary,
- expansion of the townhouse styles discussion,
- expansion of the flow-path considerations discussion,
- inclusion of content related to hoarding situations, and
- significant content reorganization to improve document structure.

INTRODUCTION

The purpose of this manual is to describe the construction features of residential and commercial townhouses found throughout Northern Virginia.

This manual identifies:

- construction features,
- inherent firefighting problems,
- operational priorities, and
- known risks and hazards.

The manual also establishes a standard operation method for fighting fires in these types of structures.

GLOSSARY

The following key terms and definitions were used in this manual:

Attic – The attic is a room or space just below the roof of a building that is often used for storage. This space may be unfinished or finished and may consist of a living space.

Back-to-back – This term refers to a townhouse consisting of two or more occupancies under one roof that are connected by a common wall.

Band board – A band board is the material covering the area where the first-floor floor joists meet the exterior wall.

Cockloft – This term refers to a void space created between the top-floor ceiling and the building's roof decking.

Duplex – A duplex is a structure with two dwellings located under one roof that share a common wall.

Flow path – Flow path refers to the movement of heat and smoke from the higher air pressure within the fire area to all other lower air pressure areas both inside and outside the fire building.

Hybrid – A hybrid building construction can include various types of townhouse styles (piggyback, back-to-back, and over–under) under one roof.

Lally column - A Lally column is a round or square, thin-walled structural steel column used to support beams or timbers stretching over long spans.

Over–under – An over–under townhouse consists of two stacked dwellings (one over the other). These usually involve a 2-level occupancy over 1-level occupancy with entrances on opposite sides, but other floor plan variations may exist.

Piggyback – 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 and are separated by a fire wall on that floor.

Quadplex – Also called a "quad," a quadplex involves four connected dwellings under one roof, each with a separate address. A quadplex may have entrances on four different sides.

Rowhouse – A rowhouse is one multistory dwelling attached to at least two other dwellings. These dwellings may or may not be separated by firewalls. Typically, dwellings in a rowhouse have a common cockloft under one flat roof.

Townhouse – A townhouse is a multistory dwelling normally attached to several other units. Typically, adjacent occupancies have fire-rated floor and wall assembly separation. Townhouses most often have an attic with a pitched roof.

Two-over-two – A two-over-two, also called a "stacked townhouse," is a 4-story townhouse with two separate addresses and entrances. One address occupies the first two floors, and the second address occupies the third and fourth floors.

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DESCRIPTION

The differences between a rowhouse and a townhouse are minimal. The terms are often used interchangeably to describe various styles of residential and commercial attached dwellings. Builders, real estate professionals, and other housing-related organizations may note distinctions and refer to the structures by different names, but for the purposes of this manual, all such structures are referred to as townhouses.

General Characteristics

Townhouses range in height from two to four floors and may differ 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 rear, or it can be detached.

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

Commercial and residential townhomes resemble one another in both construction type and firefighting tactics but vary in occupancy type. Commercial establishments can operate in townhouses and may not present the same life safety concerns in the event of a fire.

In many sections of Northern Virginia, builders have constructed new townhouse communities in space previously occupied by single-family homes or garden apartments. This shift has resulted in new streets, alleys, and parking areas, which may affect access to involved buildings. Company officers should understand that access by apparatus may be severely limited, or impossible. Access challenges can result in long hose stretches and the exclusive use of ground ladders to gain roof access. Companies should conduct a thorough preplan of these areas to note access issues.

Townhouse Styles

Traditional townhouses (see **Figure 1**, Figure **2**Figure 3) exist in large numbers throughout Northern Virginia; however, several less common townhouse styles also exist in significant numbers throughout the region.

Figure 1. Typical residential townhouses.

In Northern Virginia, the term "townhouse" describes a multistory dwelling attached to at least two other dwellings. A firewall may or may not separate these dwellings. Typically, a townhouse has a common cockloft under a flat roof. Figure 2 shows the townhouse from side Alpha, and Figure 3 shows the townhouse from side Charlie.

Figure 2. Typical townhouse from side Alpha.

Figure 3. Typical townhouse from side Charlie.

Less common townhouse styles include duplexes, quadplexes, piggybacks, over–unders, back-to-backs, two-over-twos, and hybrids. The specific design features and interior layouts of these townhouse styles significantly impact interior firefighting operations. Familiarity with these townhouse styles enables personnel to anticipate and overcome the challenges they may encounter in these unique layouts during limited visibility interior firefighting operations.

A duplex-style townhouse consists of two attached living units that share a roof and a common wall. Figure 4 and Figure **5** show a duplex from side Alpha and from a cross-section, respectively.

Figure 4. Duplex from side Alpha.

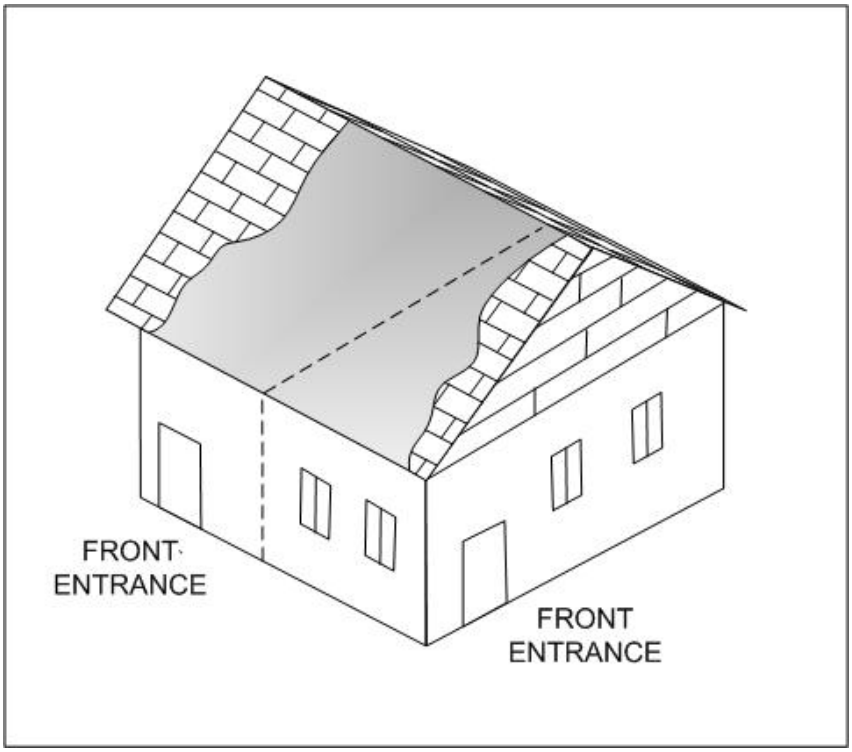

Figure 5. Duplex cross-section.

A quadplex, or quad-style townhouse (see Figure 6), consists of four dwellings connected under one roof with separate addresses. A quadplex may have entrances on four different sides.

Figure 6. Example of a quadplex with entrances on four different sides.

A piggyback-style townhouse consists of two stacked dwellings (i.e., one over the other), each with a separate address and entrance. These occupancies share a common floor and are separated by a fire wall on that floor. Figure 7 shows the piggyback townhouse from side Alpha and side Charlie. Figure 8 shows a cross-section of the structure.

Figure 7. Piggyback townhouse from side Alpha (left) and side Charlie (right).

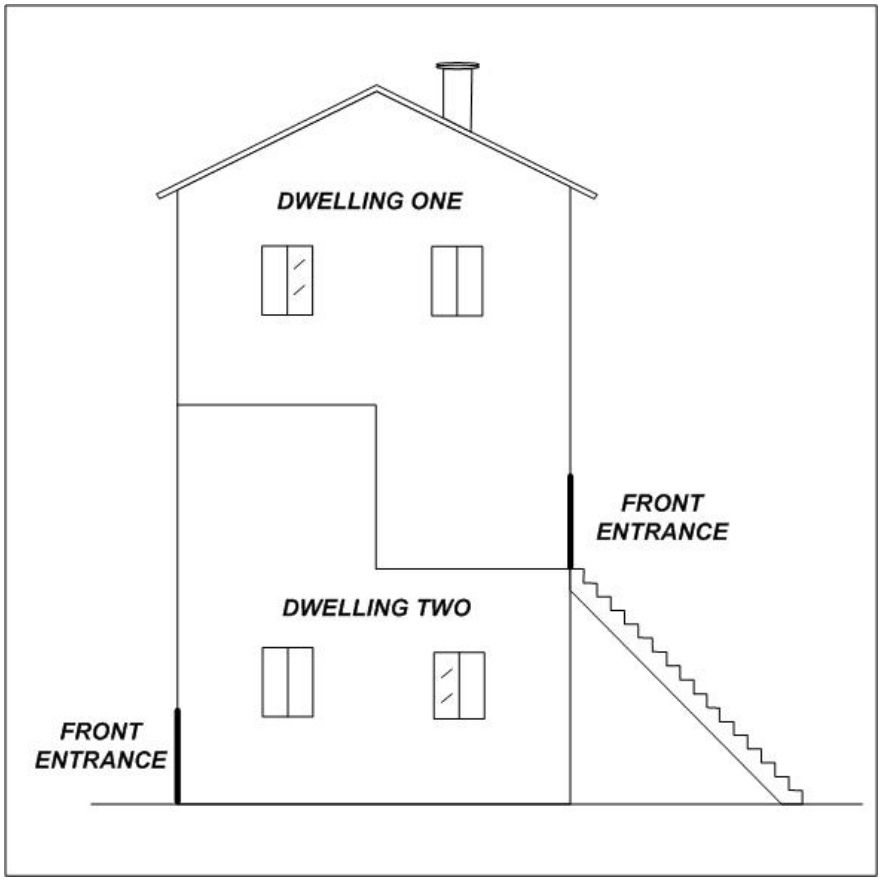

Figure 8. Cross-section of a piggyback townhouse.

An over–under townhouse consists of two stacked dwellings (i.e., one over the other). These are usually 2-level occupancies over 1-level occupancies with entrances on opposite sides, but other floor plan variations may exist. **Figure 9** shows an over–under townhouse from side Alpha and side Charlie. Figure 10 shows a cross-section of this type of structure.

Figure 9. Over–under townhouse from side Alpha (left) and side Charlie (right).

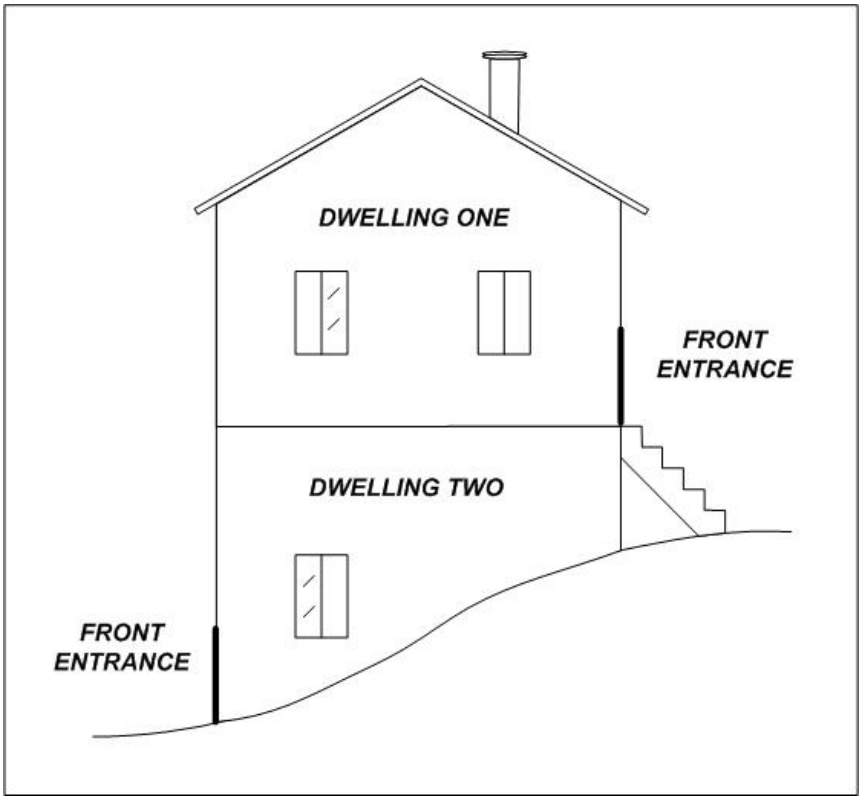

Figure 10. Cross-section of an over–under townhouse.

A back-to-back style townhouse consists of two or more occupancies under one roof that are connected by a common wall (see Figure 11). Figure 12 shows a cross-section of this type of structure.

Figure 11. Back-to-back townhouse.

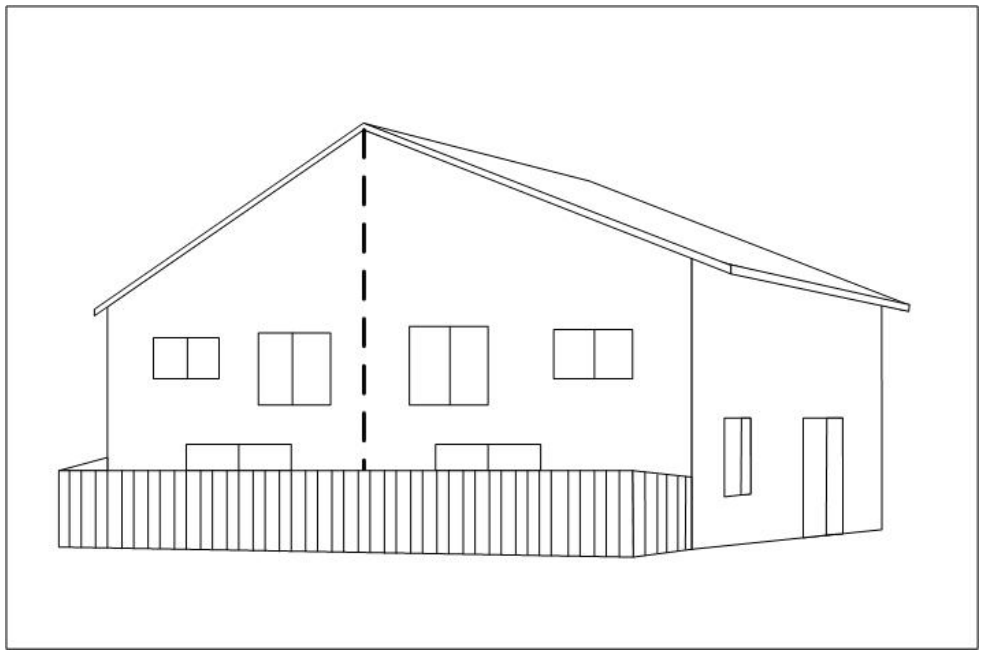

Figure 12. Cross-section of a back-to-back townhouse.

A two-over-two (i.e., stacked) townhouse is a 4-story townhouse divided into two 2-story dwellings (see Figure 13). Both units typically have doors opening to the street, usually within a small alcove, making the building appear to be one large house. Less commonly, two-over-two townhouses can be found sharing one street-level entrance that leads to a shared interior stairwell with separate entrances to both units. Builders often incorporate garages on side Charlie and make them accessible from an alley.

Figure 13. Example of two-over-two townhouses.

Hybrid townhouses incorporate characteristics of various townhouse styles under one roof. Figure 14 shows a duplex from side Charlie. The diagram in Figure 15 shows the five different occupancies for the building pictured in Figure 14. Identifying a fire's location and determining how to access it within a hybrid townhouse can be challenging. Personnel with preincident knowledge of the interior layout and means of building access can significantly improve operational efficiency when responding to fires in hybrid townhouses.

Figure 14. Hybrid townhouse from side Charlie.

Figure 15. Five different occupancies of a hybrid townhouse.

Construction

Townhouse design typically utilizes wood-framed materials and platform-frame construction method (see Figure 16). The presence of the platform frame and fire stopping limit vertical fire extension in the walls.

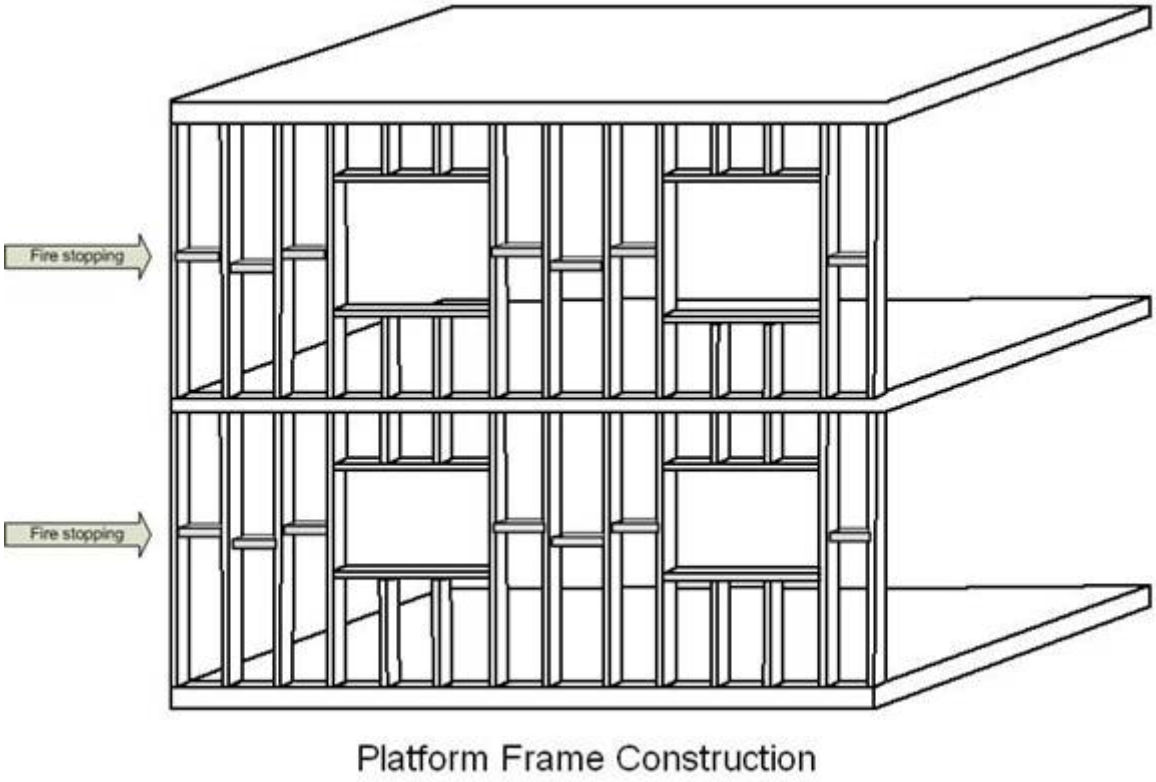

Figure 16. Example of platform-frame construction.

Wood-framed townhouses built prior to the 1930s may have utilized balloon-framed construction methods. Ordinary construction methods can be found in older duplexes and townhouses throughout Northern Virginia.

Roofs

Townhouse roofs are typically constructed utilizing one of two basic methods:

- Lightweight. These roofs utilize triangular trusses that rest on load-bearing and non-load-bearing walls on the top floor. Alternatively, parallel chord trusses or plywood I-beams form the roof peak that spans from the front and rear load-bearing walls to a ridge pole.

- Wood frame. These roofs rely on sawn wood rafters that form the roof peak from the front and rear load-bearing walls to a ridgepole.

Townhouse roof decking is typically constructed with 4' by 8' plywood sheathing or particleboard. Flat townhouse roofs may utilize gypsum board integrated with fiberglass for decking. Personnel often refer to this type of gypsum board using the widely recognized industry product names Securock or DensDeck.

Roof decking applied over sawn wood rafters is typically plywood sheathing, although occasionally, 1" by 4" or 1" by 6" boards are found nailed perpendicular to the rafters.

Roof coverings typically involve asphalt shingles; however, slate and wood shingles are not uncommon.

Many townhouses constructed during the 1980s have fire retardant (FR) plywood sheathing roof deck. Over time, early decomposition showed much of this FR plywood to be defective. Some were replaced, but firefighters should suspect the presence of FR plywood and use caution during fireground operations. Personnel should question the integrity of an FR plywood roof, even before a fire occurs.

Townhouses can have numerous styles of roof construction. These roofs are typically pitched from a center peak to the front and rear. Occasionally, personnel may find a perpendicular gable or dormer. The presence of a dormer does not always indicate a finished attic. The dormer may be false and only be attached to the exterior roof surface and not connected to the attic. Regardless, personnel must check the dormer area to determine if it contains living space that should be searched.

Although not common, personnel may encounter flat and mansard-style roofs (see Figure 17). Firefighters should remain cognizant of the knee walls created by mansard-style roof construction and the inherent potential for fire spread in these void spaces.

Figure 17. Example of a mansard roof.

Attics

Attics, if present, are usually unfinished, and occupants may use them for storage. Personnel may access this space through a scuttle or pull-down stairs located somewhere in the top-floor ceiling.

Such access points may be located inside a bathroom or closet. This space can also house water heaters and heating, ventilation, and air conditioning 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 loft. The attic may include flooring that makes it difficult to apply fire streams from the floor below.

Walls

Walls are constructed of 2" by 4" lumber and may be load-bearing or non-load-bearing. Occasionally, lightweight aluminum studs appear in non-load-bearing walls.

Interior walls are typically covered with gypsum; however, older buildings may have plaster and lath wall coverings.

Knee walls can occur in townhouses with lofts and dormers. Building occupants sometimes use these void spaces for storage. During fire operations, knee walls should be checked early to identify fire extension (see Figure 18).

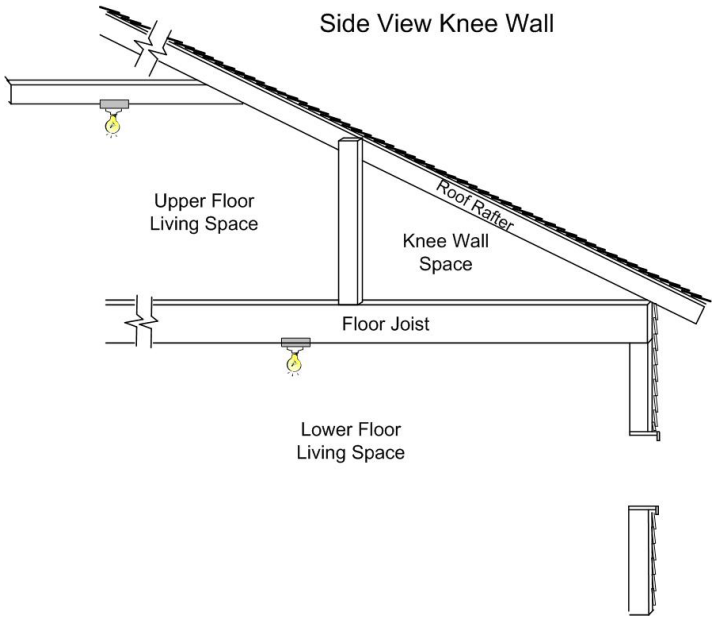

Figure 18. Cross-section showing a knee wall.

Exterior walls may be covered with brick veneer, wood, aluminum, or vinyl siding over a thin layer of insulating sheathing. If operationally necessary, aluminum and vinyl siding can be easily breached.

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

Insulation

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

Firewalls

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

- nonexistent,
- located between each address,
- located between every other address, or
- located between occupied livings spaces without extending into the attics or basements.

Firewalls are constructed from masonry materials or gypsum board. Firewalls might be penetrated to allow the running of utilities.

If parapets extend through the roof, masonry firewalls are visible from the exterior. Otherwise, firewalls typically stop at the underside of the roof deck. Rooflines may be offset at each address to separate the attic spaces.

Efforts to gain familiarity with the buildings in each response district, especially during construction, will generate knowledge of firewall type and location.

Floors

Floor decking is usually comprised of ½ or 5/8 in. thick wood boards or wood composite sheets (i.e., plywood or oriented strand board). The decking may be covered with carpet and pad, masonry or vinyl tile, or wood.

The decking material is laid on sawn wood joists, parallel chord trusses, or plywood I-beams. These joists, trusses, or beams are spaced from 16 to 24 in. apart on center and run side-to-side or front-to-rear.

Basement load-bearing walls typically support side-to-side floor joists. Front-to-rear floor joists may be supported by a basement-level steel girder and Lally column. If these construction features exist in an unfinished townhouse basement, they present a collapse hazard when exposed to fire.

Windows

The double-hung, sliding sash window represents the most common style of window used in present-day townhouses. The glazing may be of single, double, or triple thickness. Personnel may encounter other styles of windows and should note them during preplanning and size-up opportunities.

Casement windows create a special hazard. The windows have steel frames set in concrete or masonry. Although breaking all the glass in the windows will ventilate the affected area, The remaining window frame physically blocks passage through this window. To open the window, personnel must lift a latch and rotate a crank. Removing the frame with force presents great difficulty under adverse conditions and requires the use of heavy forcible entry tools. Firefighters should note these windows in their initial size-up. Casement windows should be treated as if they are barred. If incident dynamics indicate the need (or potential need) for access to or egress from the area associated with a casement window, it must be completely removed.

Doors

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

Exterior doors on residential townhouses may be solid wood, composite, insulated metal, or wood panel. In addition, sliding glass or French doors may exist in the rear. Commercial townhouses may also have a tempered glass front door. Residential exterior doors swing inward, and commercial doors swing outward.

Two standard locks occur 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 that can hinder hoseline advancement and rescue operations. Stairs require hoseline protection to maintain access and egress routes. Firefighters should remember that stairways are stacked in most cases.

Basement stairs can be unfinished on the underside, and storage under them is common. A fire originating in this storage area can quickly cause the stairs to collapse.

In commercial townhouses, the basement stairwell is enclosed. However, building occupants may remove the door at the top of the basement stairs. If present, a door slows the spread of fire and its products to the upper floors.

Fire Protection Features

Townhouses can be found with fire protection features such as sprinkler systems, fire department connections (see Figure 19), and alarm systems.

Figure 19. Typical fire department connection on a townhouse

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 prefabricated chimney, involves a galvanized metal pipe in a wood-framed chimney with siding on the exterior. The wood-framed chimney can lack fire-stopping and can interconnect to adjoining floor or ceiling voids. Fire spread to attached occupancies is likely where occupancies use a common chimney (e.g., duplexes, quadplexes, piggybacks).

Garages

Municipal fire codes require garages attached to living spaces to have fire-rated interior walls, doors, doorframes, and hardware. Although surrounded by fire-rated materials, a vehicle, or other contents, fire in a garage can rapidly extend to other areas of a townhouse.

The area positioned directly above a townhouse garage often contains finished living space. These areas present a serious life hazard when a fire originating in a garage extends to other parts of the dwelling.

The overhead entrance door to the garage and its associated mounting hardware must be fire-rated. When exposed to heat, the overhead garage door, door springs, or chain motor may fail, causing the door to close. Personnel should secure the opened garage door with pike poles, a ladder, or vice grips, or by bending or pinching the track housing the rollers.

HAZARDS

This section describes hazards that may occur in townhouses.

Life Hazards

A building's structure and content influence the life hazards associated with emergency operations. To determine the hazards associated with a building's construction, design, and layout, personnel should conduct preincident planning during a building's construction phase. To determine the hazards posed by the building's contents, personnel should conduct annual postconstruction walk-throughs.

Occupants can be found on any level of a townhouse. The positive pressure generated from a fire can cause smoke to migrate into adjacent units through common voids. It is not uncommon for a large number of occupants to reside in one dwelling. Subleasing may create an additional life hazard as both basement and subbasement areas may serve as sleeping areas, many of which may have separate locked entrances.

In commercial townhouse occupancies, transient occupants unfamiliar with the means of egress may create a life safety hazard. Security measures that block exits or impede fire company entrance also threaten life safety.

Fire Hazards

The use of combustible interior finishes and the type of furnishings found within these structures contribute to fire loading. A typical residential townhouse has a low fire load, requiring 10 gpm per 100 sqft, and a commercial townhouse may have a medium fire load, requiring 20 gpm per 100 sqft.

Fire spread to attached exposures presents a major concern. Fire can spread horizontally to adjoining townhouses by passing through penetrations made in the firewall or by spreading over the firewall.

The presence of interior void spaces may also add to fire spread. Vertical and horizontal openings allow smoke and fire to enter and attack the structure itself. When fire enters these voids, personnel must open floors, ceilings, and walls. This is especially crucial in balloon-frame construction.

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

Collapse

In general, most modern townhouses are constructed of lightweight materials that do not withstand degradation from long-term fire exposure.

With the exception of 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.

Collapse of the roof members (i.e., trusses) onto the top floor can occur in an attic fire or top-floor fire that has extended to the attic. Interior compartmentalization can provide firefighters operating on the top floor with areas of haven to position and continue firefighting operations. Operating from a hallway or bathroom provides greater safety than working from large open areas prior to and during roof structure collapse.

Roof features such as perpendicular gables and dormers often fall away from the building, creating an exterior collapse hazard.

Many commercial occupancies have suspended ceilings that create a void or plenum space. Fires in the plenum space above the suspended ceiling may burn undetected and weaken structural components. This can lead to collapse and trap personnel below.

The mass of grid members comprising a roof or ceiling assembly is almost impossible to escape once it falls onto a person. Although illegal, some merchants place combustibles above the drop-ceiling for storage. This adds weight to the ceiling system and may cause an early collapse under fire conditions.

Basements

Operations in townhouse basements can pose hazards due to stairwell design, limited ventilation, and limited means of ingress and egress. These factors hinder hose advancement and search operations in basements.

Fires in unfinished basements rapidly attack and weaken the exposed structural members supporting the floor above. Predominantly finished basements may have unfinished utility rooms. These unfinished areas can be located under a townhome’s main entrance. Firefighters directly above floor components weakened by fire operate from a significantly precarious position. The fire service has experienced numerous line-of-duty deaths resulting from firefighters falling through compromised floor systems. The importance of identifying the lowest level of fire involvement, refraining from operating directly above the fire, and testing the stability of the floor prior to advancing cannot be overstated.

FIRE OPERATIONS

Command Considerations

The first command officer to arrive on-scene should establish Command. Fires in townhouses can require more resources than similar fires in a single-family dwelling. After confirming a townhouse fire, incident commanders (ICs) should evaluate the need for additional resources and make requests for additional alarms and rapid intervention team (RIT) resources commensurate with the situation's severity.

Additional command officers may be used in tactical positions. ICs should assign these positions early in an incident to establish and build an effective and efficient command structure. Strategic positions for additional command officers include the following:

- division supervisor,
- group supervisor,
- branch director, and
- section chiefs.

Life Safety

Life safety takes the highest priority at all structure fires, so all operational tactics should be assigned to support this strategic goal.

To achieve life safety of townhouse occupants, personnel should conduct a thorough primary search and contain and extinguish interior fire. Primary search operations should focus on the area near the fire, as well as bedrooms and means of egress.

Once personnel have accounted for the building occupants, they should focus on the strategic goals of firefighter safety and fire extinguishment.

Horizontal Fire Spread

Horizontal fire extension represents a significant concern in townhouses. Fire can rapidly spread horizontally to attached exposures via combustible exterior siding. Exterior siding fires can be drawn into the attic vents of the involved occupancy as well as those of the adjacent exposures.

ICs should consider the time and resources needed to access adjacent exposures and check for extension. ICs and unit officers should anticipate where the fire may have traveled during efforts to gain access. Personnel should tactically position hoselines to prevent the fire from extending to exposures, causing suppression operations to chase a rapidly spreading fire.

Exposure Designation

Exposure designation starts with Delta or Bravo 1 and continues as shown in Figure 20.

Figure 20. Exposure numbering with one unit involved.

Typically, personnel can easily differentiate the exposures. However, when fire conditions exist in more than one unit, ICs must decide which unit to designate as the fire unit and then begin exposure identification. They must communicate this to all units working the incident. Once the IC makes the exposure designation, the numbering does not change, even if the fire later extends to other exposures. Figure 21 shows three units involved with fire and the exposure numbering beginning on either side of the fire unit.

Figure 21. Exposure numbering with three units involved.

Additional Resources

The following townhouse fire situations should cue the IC to request a second alarm:

- known rescues,
- fire in two separate occupancies,
- fire on more than one level of the townhouse, and
- fire in attic space.

Operational Communications

Personnel should reference the NOVA *Field Communications* manual for information about operational communications. Related information specific to fires in townhouses is provided in the following sections.

Water Supply Report

The unit officer of the first-arriving engine company should communicate a water supply report to the second due engine company. The report should identify the location and method of the hose lay.

Personnel should utilize a forward (i.e., straight) hose lay, when possible, with care given to maintaining unimpeded access for subsequently arriving truck companies.

In most cases, this means the first-arriving engine company should position at least two addresses past the involved unit. If the truck enters the block from the opposite direction as the engine company, it must stop at least two addresses short of the involved unit.

A common problem in townhouse complexes involves the water supply engine blocking access to the street when spotting the hydrant. This can prevent other units from reaching the scene.

Water supply reports should resemble the following:

“Engine 444 from Engine 401. We are forward laying from the hydrant at the corner of Kirby Rd."

On-Scene Report

The first-arriving unit officer, typically that of the first due engine company, should provide the first due command-level officer the following information in the on-scene report:

- unit identification and side of structure where the apparatus is positioned;
- building height (i.e., number of stories above ground);
- occupancy type; and
- a detailed report of evident conditions, to include side of structure where conditions are evident, quadrant location, and conditions description.

Officers at townhouse fires should include the involved unit's position in relation to exposures (i.e., end unit, middle unit) in their on-scene report occupancy description.

On-scene reports should resemble the following:

"Battalion 402 from Engine 401. Engine 401, on-scene, side Alpha of a 3-story, residential, end-unit townhouse. Fire showing from a second-floor window on side Delta, quadrant Charlie."

Size-Up and Situation Report

The type of occupancy (i.e., commercial or residential) within a townhouse determines the potential fire load and affects the fire growth rate. The strategy and tactics employed by first-arriving unit officers should change according to occupancy type and conditions. Residential fire tactics are not appropriate in commercial townhouses.

During the size-up, unit officers should complete a 360-degree lap of the structure. The use of a thermal imaging camera during this lap can help determine the location and intensity of the fire. The officer should also use the lap to determine:

- number of above-grade floors in front;
- number of above-grade floors in rear;
- specific location of fire, if visible;
- presence of a basement, conditions present in the basement, and location of basement access;
- floor labeling;
- hazards observed;
- presence of exposures;
- occupant status (if able to obtain); and
- the need for additional resources.

It may be impractical to complete a 360-degree lap if an incident requires immediate lifesaving actions from the first-arriving officer and crew or if the incident involves a middle-unit townhouse with multiple exposures to either side. In these instances, unit officers can attempt to enter the side Bravo or side Delta exposure to achieve a visual assessment of side Charlie.

If unable to complete a 360-degree lap, first-arriving unit officers must communicate with other responding units to assign this task. A complete size-up and determination of the mode of operation and associated tactics cannot be made until a 360-degree assessment of the structure has been completed. Personnel should not typically commence interior operations until after receiving a report from side Charlie.

Officers should use the information gathered during their size-up to determine their initial strategies and tactics. This information, as well as actions needed from other units and the need for additional resources, should be communicated to the first due command-level officer in a situation report. Situation reports should resemble the following:

"Battalion 402 from Engine 401. Lap completed. Three in the front, four to the rear. Floors will be labeled basement, 1, 2, and 3. Basement is clear of smoke and fire with access on side Charlie. The fire is located on side Delta, Floor 2, quadrant Charlie. Unable to confirm occupant status. Engine 401 is stretching a 1 ¾" line through the front door with a crew of three. Truck 401 is conducting a primary search on Floor 2 with a crew of two, two remaining outside to throw ground ladders. Dispatch RIT taskforce. Requesting to transfer Command."

CAN Reports

Unit officers should provide ongoing situation reports to ICs as their unit completes their tasks or when they require assistance to achieve their unit's objectives. Ongoing situation reports should take the form of a conditions, actions, needs (CAN) report and should resemble the following:

"Battalion 402 from Engine 401. [Conditions] Floor 2, we have considerable heat and smoke conditions with a fire in the kitchen area. [Actions] Engine 401 has a line on the fire. [Needs] requesting horizontal ventilation on Floor 2 and a check for extension on Floor 3."

Hoseline Selection and Advancement

Initial Hoseline

Officers and crews should consider a fire's intensity, size, and location, together with available staffing, when determining the initial hoseline. A typical residential townhouse has a low fire load, requiring 10 gpm per 100 sqft. A commercial townhouse may have a medium fire load, requiring 20 gpm per 100 sqft. These gpm requirements can be produced by a variety of nozzles and hoseline combinations.

The initial hoseline for most townhouse fires should be the 1 ¾" hoseline, allowing for the needed speed, mobility, and fire flow. The first arriving engine crew usually takes responsibility for deploying this line. They should position it to protect occupants and the interior stairway and, if possible, to advance it to the seat of the fire for confinement and extinguishment. The crew may also deploy this hoseline to perform a quick exterior knock on the fire before transitioning to the interior.

The most advantageous location for confinement and extinguishment may not always be through the front door (e.g., deck fires, vinyl siding fires). Company officers should make tactical decisions based on the information provided during on-scene and situation reports, as well as from their own ongoing size-up.

When members confront well-advanced fires in townhouse structures, they should consider using large-caliber handlines and smooth-bore nozzles. Extinguishing these fires requires delivering enough water to the seat of the fire to cool and stop pyrolysis. Large, well-advanced townhouse fires may preclude the use of fog streams for this task because a large fire's thermal energy can evaporate the fog stream before its water reaches the burning material.

Conversely, personnel should consider the manpower required to efficiently maneuver 2 ½" hoselines. These large caliber hoselines require two companies to advance efficiently inside a structure.

When fires have reached advanced stages and no life hazard exists, personnel should strongly consider using master streams. Personnel should reference the NOVA *Engine Company Operations* manual for more information about fire behavior and fire-stream application.

Second Line

The second line for most fires in townhouses should be the 1 ¾" 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 should generally be stretched from the first due engine company apparatus. In most cases, the second due engine company accomplishes this task.

This line should be capable of delivering adequate fire flow for the fire encountered and the task assigned. In the case of a 1 ¾" line, personnel must make adjustments to produce the higher flow. The need for advancement depends on the initial attack line's progress. If personnel on the attack line do not need support from the second line, then the second line 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 search crew's safety is to place this line at the base of the stairs on the fire floor. From there, the hose crew can observe fire conditions and prevent fire from spreading up those stairs.

Hoseline Advancement

It can be difficult to advance hoselines to upper floors and basements due to narrow staircases that incorporate one or two 90-degree turns. In some instances, these staircases incorporate 180-degree turns. Personnel must be able to deploy hose quickly and efficiently. More information about hoseline advancement appears in the NOVA *Engine Company Operations* manual.

Aerial Master Streams

Aerial master streams provide significantly greater extinguishment potential than smaller caliber hoselines. When members encounter large-volume fires extending beyond the originating townhouse unit, they should consider utilizing aerial master streams.

Building characteristics, incident scene geography (e.g., parking lot layout, building set-back), and the IC's operational strategy all influence aerial master-stream placement and positioning. Aerial master-stream nozzle positioning and hose-stream direction may differ with offensive or defensive strategies.

When fires in townhouses require the deployment of aerial master streams, the first-arriving truck's turntable should be positioned in front of the most threatened exposure. The second-arriving truck should position its turntable 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 extinguishing the main body of fire.

If elevated streams become necessary, the IC should request a tower ladder, which is the most effective unit for the task. For this reason, all officers and apparatus operators arriving on-scene should remember to maintain scene access for later arriving trucks.

When ICs utilize aerial master streams, the most advantageous nozzle positioning is often found at the soffit level, with the hose stream directed parallel to and along the underside of the pitched roof. The advantages of this positioning may not change, even when fire has self-vented and burned through the roof.

During aerial master-stream operations, personnel should note the amount of runoff flowing out of the building. As personnel direct large volumes of water into the structure, the weight of the water held in the structure may add stress to fire-compromised components, increasing the potential for collapse.

During offensive operations, personnel assigned to operate aerial master streams should pay close attention to hose stream direction and prioritize delivering water to the structure's interior. The impact of these large-caliber hose streams directed against building components (e.g., walls, roofs, facades) can cause structural damage.

The use of aerial master streams for fire attack does not preclude the later interior deployment of smaller caliber handlines to complete extinguishment operations. However, given the potential structural damage caused by large-volume fires and the impact of the water delivered by aerial master streams, personnel should assess structural stability before initiating interior operations.

Attic Fires

Townhouse fires involving attics or cocklofts (see Figure 22) can occur as a result of several scenarios:

- Fires in the living area or basement that extended into the structural components and entered the attic via void spaces.
- Interior fire that vented through a window to expose the vented soffit area.
- Fire that originated on the dwelling's exterior involving the siding and exposing the soffit area.
- Electrical fires that originated from ceiling or exhaust fans or recessed lighting.
- Fire that originated in the attic itself by natural occurrences, such as a lightning strike.
- Fire resulting from the current or prior work of roofers, plumbers, or painters.

Figure 22. Example of an attic fire (left) and a cockloft fire (right) with smoke issuing from cockloft vents.

The tactics employed to extinguish attic and cockloft fires vary according to construction type and degree of fire involvement. Attic fires can be very fast-moving, so personnel should direct water into the attic space as quickly as possible. Several of the tactics described in this section have been informed by research performed by the Underwriters Laboratories (UL) Fire Safety Research Institute. The institute conducts rigorous research and produces education tools and resources to inform fire ground tactical decision making. Personnel should review UL's attic fire mitigation tactics material for more information.

Sweeping the Eaves and Soffit Attacks

Eaves are a common structural feature of townhouses. They extend the ends of rafters or trusses of a pitched roof over exterior walls. They are often enclosed by nailing a fascia (i.e., board) to the ends of rafters or trusses and a soffit to the underside. Enclosed eaves typically extend the attic and incorporate ventilation openings, making them vulnerable to fire extension.

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 the eaves are enclosed with lightweight vinyl or sheet-metal soffits.

Exterior fire-stream application can prevent an exterior fire from extending into an attic. Personnel can also use it to begin to confine and extinguish an attic fire.

As indicated by UL's research, rapid water application to knock down the exterior fire is a critical part of any attempt to control not only the fire's spread to adjacent structures but also the fire's migration into an exposed building's interior. Firefighters can prevent fire from extending into the attic by sweeping the eaves with hose streams directed at the underside of the soffit and parallel to the wall. Additionally, water striking the underside of the overhang will cascade down the wall to extinguish burning exterior siding.

Upon arrival, firefighters can rapidly knock down attic fires from the exterior by directing water into the attic through the soffit. This soffit—or eave—attack is illustrated in the UL video, Eave Attack—Get Water in the Eaves for Attic Fires. It may be necessary to remove sections of the soffit to provide an unimpeded path for hose streams. To complete a soffit attack, firefighters should match their hose stream with the roof's pitch and direct water flow under the gutter and through the soffit. A 2 ½" smooth-bore nozzle provides an effective reach and penetration from the structure's exterior.

Interior Attic Fire Operations

If offensive interior operations are appropriate, firefighters should attempt to stop horizontal fire spread by deploying hoselines to the top floor and accessing the attic as quickly as possible.

The most operationally efficient position for extinguishing attic fires involves opening the top-floor ceiling and attacking the fire horizontally. However, applying hose stream into the attic from below can also successfully confine and begin to extinguish an attic fire.

The interior crew should use hooks to open the ceiling as needed by the attack crew. Personnel should bring salvage covers in to cover contents during this operation. The top floor should be searched prior to pulling down the ceiling.

Officers should make an early request for attic ladders to the top floor when they suspect a fire has entered the attic space. If not available, firefighters can utilize furniture to achieve attic access and horizontal positioning (see Figure 23). Personnel deciding where to locate the attic access point should consider the fire location in the attic and the roof's structural integrity.

Figure 23. Gaining access to an attic fire.

Figure 24 shows the intentional exposure of several truss bays to allow firefighters to project the hose stream into the attic. Directing hose steams straight up into the space is ineffective. The hose stream should be placed ahead of the fire to cut off its advance. Typically, personnel should keep this line static, directing the stream toward the fire without advancing the line. The 24 in. space between roof joists often hampers the stream angle.

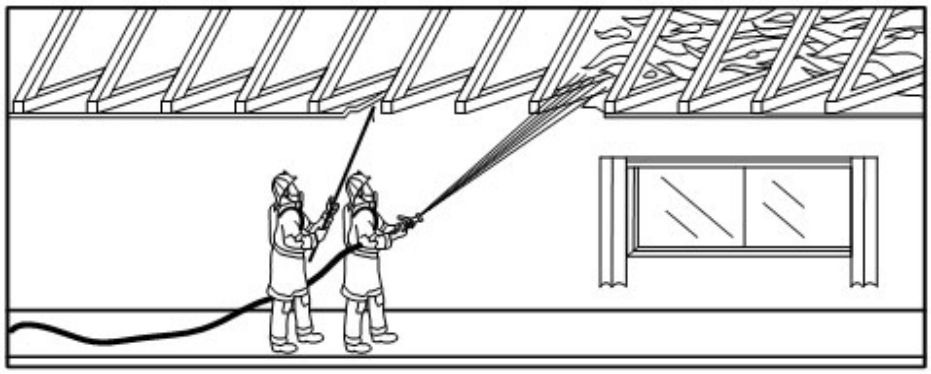

Figure 24. Projecting a hose stream into an attic.

The standard gable roof has been the stage for many spectacular fires (see Figure 25). If not quickly extinguished, this roof design tends to "burn away." However, it represents a relatively low catastrophic collapse hazard. Companies should consider operating in areas of the structure without large overhead dead loads (e.g., hallways, bathrooms, and bedrooms) because the interior walls give some protection from falling ceiling materials. Units should avoid working under open areas such as foyers due to the long, unsupported span of the truss. Personnel should keep in mind that with platform construction, the roof itself adds support for the top-floor walls. If the roof has burned away, the walls will be inherently weakened.

Figure 25. Gable roof attic fire.

Company officers must communicate the conditions in the attic to Command, and Command must advise companies on the top floor of changing exterior conditions. The intensity of an attic fire and progress of fire attack has a tendency to appear differently to interior and exterior observers.

The IC must understand the big picture so the correct tactics can be employed or maintained. If the fire overwhelms companies' operating lines on the top floor or structural stability becomes questionable, crews should transition to an exterior attack. Officers should consider using heavy

streams, preferably from a tower. They must also consider the construction type and method of roof assembly when weighing options for combating an attic fire.

Another hazard associated with a well-involved attic fire is the collapse of the soffit (see Figure 26). The exterior wall acts as a fulcrum in this situation. As the majority of the roof burns away, the remaining overhang may collapse onto the balconies or ground below. Firefighters must remain aware of the risk when operating on balconies, towers, ladders, or the ground below this collapse hazard.

Figure 26. Attic overhang (i.e., soffit) collapse.

In more modern occupancies, the presence of water heaters and heating, ventilation, and air conditioning units in the attic space, as well as cosmetic dormers (see Figure 27), create significant potential for collapse when fire enters the attic space. Companies should not operate directly under the involved area in these instances.

Figure 27. Dormer collapse.

Cockloft Fires

Flat roofs do not typically create an interior enclosed space equal to that of pitched roofs—nor do they have as much fire loading. These roofs are typically constructed using 2" by 8" or 2" by 10" wood joists. When fire enters the space above the top-floor ceiling, it usually runs in one or more bays (i.e., the area between joists). This inherently confines the fire and provides time for crews to access and extinguish it.

Some flat roofs may have several feet of space between the flat roof and the top-floor ceiling; this space is commonly referred to as the cockloft (see Figure 28).

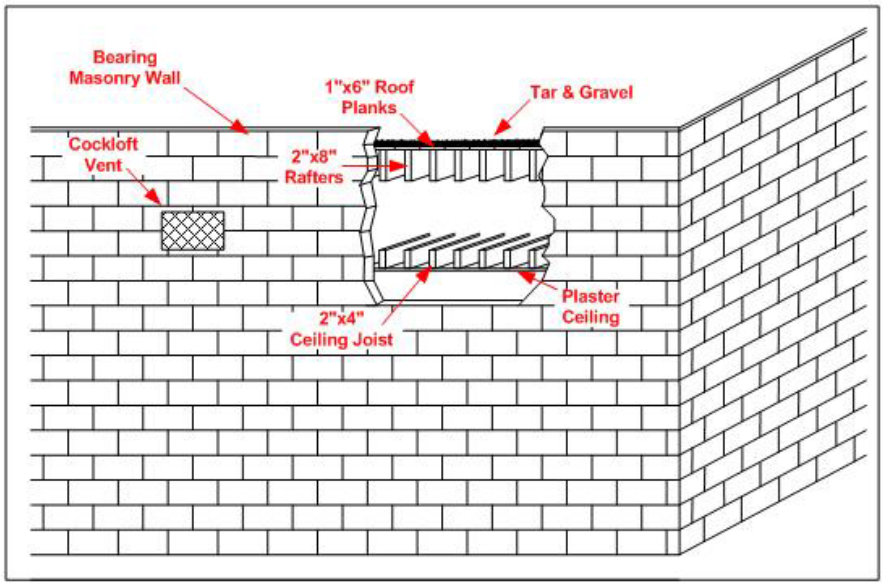

Figure 28. Example of a cockloft.

One attack line on the top floor is usually sufficient to handle a cockloft fire. However, in the presence of a significant void of several feet, personnel should apply tactics for pitched roofs.

Personnel can also direct streams into the cockloft through the exterior cockloft vents or openings created by hand tools. This has proven effective with both handlines and master-stream devices. Firefighters should be sure interior personnel have vacated the affected areas before applying streams from the exterior.

If a new gable-style roof has been placed over a flat roof, firefighters may encounter a multilayered cockloft and attic fire within the same building. These fires are very difficult to extinguish, but the application of streams through the gable ends and the cockloft vents or firefighter-created openings has proven effective (see Figure 29).

Figure 29. Opening into an attic for a hose stream.

Basement Fires

Basement or below-grade fires pose unique hazards and challenges due to limited access points and the potential for unimpeded fire impingement on the above floor's structural support.

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 basement access. If an officer locates the fire in the basement, they must quickly determine if an exterior basement access exists. Exterior doors are most often found in the rear.

If possible, personnel must determine early if the basement is unfinished. Fires in unfinished basements have unimpeded access to the structural supports of the floor above.

Firefighters typically need two hoselines to contain and extinguish a basement fire. The officer must coordinate the deployment, positioning, and operation of these hoselines for a successful operation. Similarly, they must coordinate ventilation of the basement and the floors above to effectively support the fire attack.

It is incumbent on the first-arriving engine company officer to identify the fire's location and where to deploy the handline to best address the incident's immediate needs. The initial handline may be deployed to

- an exterior basement entrance, if present, for fire attack or
- the front door, utilizing the fire stream reach to protect the interior stairs and upper floors.

The officer must communicate the decision of where to deploy this line on the tactical channel.

For townhouses of balloon-frame construction, personnel should check early for vertical extension through the stud bays in the exterior walls. They should expect fire to extend to all floors and the attic. Other early considerations include siding removal and the deployment of additional handlines to upper floors to check for vertical extension.

Basement Fire With an Exterior Entrance to the Basement

For a basement fire, the preferred point of attack for the initial handline is an exterior entrance leading directly into the basement, allowing personnel to attack the fire at the same level. Personnel should use straight or solid fire streams to avoid unnecessary steam conversion that could force steam and products of combustion up the stairs to the above floor.

Personnel must position a second hoseline to contain fire extending up the interior basement stairs and to protect occupants and firefighters on upper floors. Positioning the second hoseline at the main entrance threshold to the floor above the basement often achieves this objective given the reach and penetration of a 1 ¾" hoseline. This hoseline should not advance to an interior position on the first floor until the structural stability of the first floor is confirmed (see Figure 30).

If crews operating in the basement confirm the stability of the first floor, the second line can be advanced to the interior. Personnel should communicate this advancement to Command.

Figure 30. Hoseline positioning for a basement fire with an exterior entrance to the basement.

The first-floor door to the basement stairs should be closed, if possible. If the basement door cannot be closed, is nonexistent, or has burned through, firefighters should aim a hose stream with a narrow fog pattern at the ceiling over the stairway to contain fire extending up the stairs. Firefighters must take care not to direct the narrow fog stream downward into the stairwell. The main objective of this line is to stop vertical fire extension.

Basement Fire With No Exterior Entrance to the Basement

When firefighters encounter a basement fire in a townhouse without an exterior basement entrance, personnel should consider these methods of applying water to the basement from the exterior to knock down the fire:

- Direct a fire stream through an available basement window (see Figure 31).
- Remove a section of band board to enable the direction of fire streams into the basement. Band board is the material covering the area where the first-floor floor joists meet the exterior wall. Removing a section of this material with hand tools or a chainsaw creates a space through which firefighters can direct water into the basement. Personnel may see smoke pushing from behind the band board during some well-involved basement fires.
- Perform a window cut-down or extend an existing cut-down by 1 or 2 ft to access the band board and floor joist area on the first floor.
- If equipped with a Bresnan distributor nozzle (i.e., cellar nozzle), personnel can insert this device from the exterior into the structure through a hole over the immediate fire area. Personnel assigned to this task must be proficient in deploying and operating this nozzle.

These methods may not extinguish the fire, but they may cool the basement and contain the fire enough to deploy a crew into the basement.

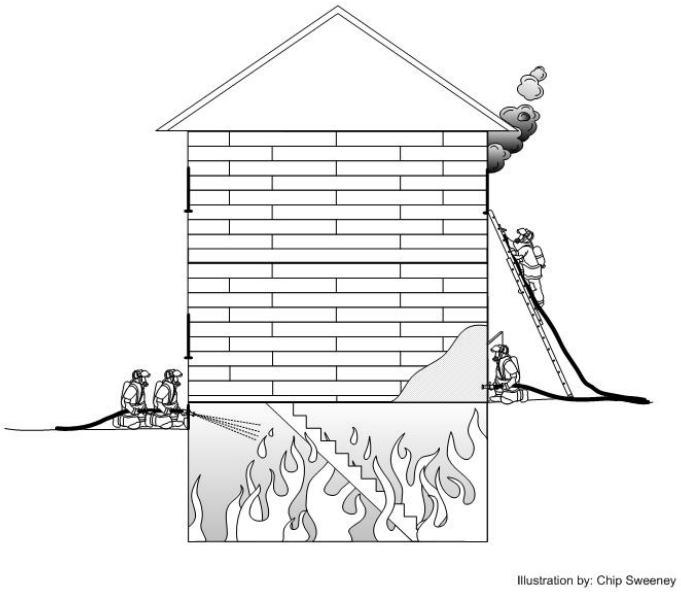

Figure 31. Hoseline placement for advanced basement fire with no exterior basement entrance.

Basement Fire With No Exterior Entrance or Access

When members encounter a basement fire in a townhouse without an exterior entrance and no other access into the basement can be achieved, the officer may determine an attack via the interior basement stairs presents the only option. Personnel should make every effort to knock down a basement fire prior to attacking via the interior basement stairs.

The officer must determine if it is prudent to descend the basement stairs for a direct fire attack. The officer must consider structural stability, life hazard, as well as fire and heat conditions at the top of the basement stairs. A second hoseline team should position at the main entrance threshold to the floor above the basement and be prepared to advance prior to commencing the basement fire attack.

Basement Doors

The proximity of the basement door to the rear door can prove a hindrance in some townhouses. When these doors are opened, they each swing toward the other and can block access to either door (see Figure 32). In this case, personnel should remove one of the doors to aid in hoseline movement.

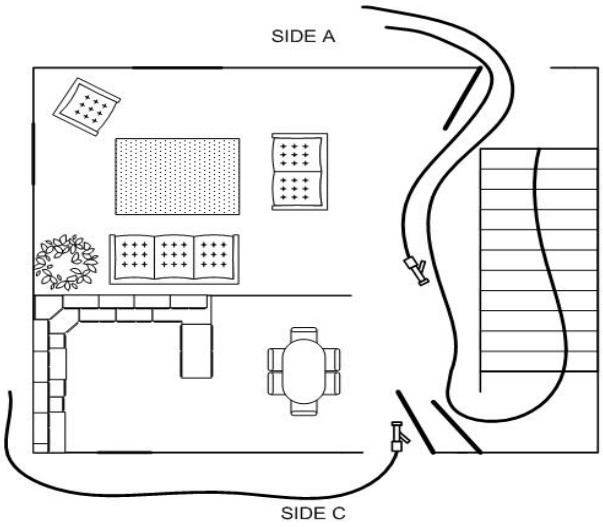

Figure 32. Opened basement door blocking access to rear door. One of these two doors must be completely removed to allow crews unimpeded access to the basement when entering from side Charlie.

Deck Fires

In the event of a townhouse deck fire, firefighters should prioritize positioning a hoseline on the structure's deck side to extinguish fire on the deck, soffit, and eaves. If personnel determine the deck is still structurally sound, the first engine may access the fire building through that affected side with the handline to perform a fire extension and extinguishment investigation. It is permissible to move from the burned portion of the structure to the unburned portion in this situation.

Exterior Fires Extending Into the Dwelling

Townhouse builders throughout the NOVA region have utilized vinyl siding as an exterior covering over lightweight wood construction due to its low installation and maintenance costs

and longevity of use. This combination of materials and construction type has significantly impacted fire dynamics, especially when fires originate on the structure's exterior. Exterior fires can quickly ignite vinyl siding and exterior sheathing and run up the exterior, through the soffit, and into the attic space. This fire can also enter the structure through a window or void space in a truss construction floor.

Line-of-duty deaths and close calls have occurred during fires that originated on a structure's exterior and extended via vinyl siding or combustible sheathing. Personnel conducting incident size-ups and developing strategies and tactics for exterior fires must always consider the potential for rapid fire progression to multiple townhouse floors.

First-arriving officers must communicate incident dynamics, the mode of operation, initial tactics, and personnel assignments to subsequently arriving units and command officers to safely extinguish this type of fire. Officers from the first engine and the first-arriving special service unit should coordinate tactics and operations before the special service unit enters the building.

Officers should utilize the following tactics when responding to exterior townhouse fires extending into the dwelling:

1. Deploy the first hoseline to the fire location on the structure's exterior to quickly knock down the fire.

2. Deploy the second line to the dwelling's interior. 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 (see Figure 33).

3. After knocking down the exterior fire, redeploy the first hoseline to the interior to assist the interior line or progress to upper floors to attack any fire.

Figure 33. Thermal imaging camera used to check the ceiling area.

Garage Fires

When members encounter a townhouse garage fire, they should consider fire conditions, garage location, the presence of windows, and the status of the overhead garage door to determine appropriate fire attack tactics. Members may also communicate the status of the overhead garage door in the on-scene or situation report.

If the overhead garage door is open and fire exists in the garage area, personnel should attack the fire from the exterior by quickly applying water through the open garage door to the seat of the fire. Personnel should deploy a second line through the building's main entrance to check for and extinguish fire that extended beyond the garage. If windows provide access to the garage, personnel should consider directing hose streams through the windows to knock down the garage fire.

If the overhead garage door is closed and the garage does not have windows, crews should access the garage through the building's main entrance and the interior garage door. Personnel should reference the NOVA *Truck Company Book 2 – Forcible Entry* manual for information about breaching overhead garage doors.

When advancing the first hoseline through the main entrance to the interior garage door, crews must be ready to operate the line as they enter the townhouse front door. If the interior garage door was left open at the time of the fire, the advancing crew could encounter fire in the living area. Personnel should advance a second line to back up the first or to proceed to the upper floors.

Garage fires often originate inside parked vehicles. Standard precautions associated with all vehicle fires, such as exploding bumper cylinders or ruptured fuel tanks, should be observed.

Attached garage fires sometimes extend to upper floors and attics. Crews must perform a quick assessment of extension into these areas.

A townhouse garage may be located under, in front of, or behind a living area. Adjacent living areas must be checked early for smoke and fire spread. Companies operating directly above a garage fire should exercise caution because the fire below them may directly access the floor members supporting them.

Wind-Driven Fires

A wind-driven fire is a rapidly developing fire that results from prevailing winds entering a fire-vented location in a structure. The wind pressurizes the interior, so the creation of a second opening in this environment produces a deadly flow path for blowtorch-effect flames and untenable temperatures. Wind-driven townhouse fires can create backdrafts, flashovers, or extensive fire extension through failed windows. These fires can burn with enough heat and intensity to destroy fire barriers. Numerous firefighter and civilian deaths have resulted from wind-driven fires.

Generally, the higher a structure is built, the more susceptible its upper stories are to wind-driven fires. However, 2- and 3-story townhouses are also susceptible to wind-driven fires. The conditions required to create a wind-drive fire can exist with exterior winds as low as 10–20 mph.

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

- fire in the structure,
- a failed or opened window or exterior door in the fire area,

- wind on the structure's exterior,
- a secondary failed or opened window or door remote from the fire area, and
- an unobstructed flow path from the fire area to the secondary failed or open window or door.

Street-level recognition of a wind-driven fire along with proper tactical resource deployment are critical for member safety. To aid in sizing up a wind-driven fire, personnel should consider the following:

- the presence and direction of the wind from street level,
- failure of windows to the fire area,
- lack of smoke and flames or intermittent smoke or flames resulting from wind gusts pushing from the failed window, and
- a large volume of fire present within the fire area.

The first-arriving officer should communicate dynamics associated with wind-driven fires to the first-arriving command officer in their on-scene and situation reports.

Special service units advancing ahead of hoseline crews should strategically close interior doors as they advance to interrupt the fire's flow path. Interrupting the flow path of a wind-driven fire may allow companies to advance a hoseline to the fire area.

In the National Institute of Standards and Technology report, Fire Fighting Tactics Under Wind Driven Fire Conditions: 7-Story Building Experiments, authors Daniel M. Madrzykowski and Stephen Kerber demonstrated several successful alternative tactics for use when personnel cannot make entry during a wind-driven fire. These tactics involve the following variations of exterior attack:

- elevated master streams through the fire room window,
- handlines to upper floor windows via portable ladders, and
- large-caliber handlines positioned with the wind to the back of the hose crew.

If officers employ any of these tactics, they must coordinate 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.

Given the intensity and behavior of wind-driven fires, coordinated ventilation is also critical to effective suppression. If wind-driven fire conditions exist, personnel should not perform horizontal ventilation until directed by Command.

Large-Volume Fires

A large-volume townhouse fire can quickly spread to adjoining exposures (see Figure 34).

Figure 34. Large-volume townhouse fire.

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 2 ½" hoseline. Water supply is paramount in the quick control of a large-volume fire and must be prioritized by arriving engine companies.

Firefighters should stretch the next line into the most severely threatened exposure, which will most likely be downwind. Based on fire conditions, officers should consider placing a line in the opposite exposure.

In the situation where personnel encounter heavy fire volume in the originating townhouse, it may be appropriate for the first-arriving officer to address the attached exposures first. In large-volume fires, the aim is to defend the firewalls of the involved unit with the elevated stream. Defending a firewall involves applying heavy-caliber streams to the fire side of the firewall to prevent horizontal spread of fire to the attached exposure.

RESOURCES FOR FIRES IN TOWNHOUSES

The minimum initial alarm assignment for a townhouse fire consists of the following:

- four engines,
- two trucks,
- one rescue,
- one emergency medical services (EMS) unit,
- two battalion chiefs, and
- one EMS supervisor.

The unit assignments outlined in this document are based on common tasks performed in a logical order. Officers may need to adjust assignments according to an incident's specific challenges.

Unless otherwise directed by the IC, companies should position and report according to the following sections.

First Due Engine

The first due engine company's responsibilities are as follows:

- View as much of the structure as possible during approach.
- Communicate primary water supply report to the second due engine.
- Position to allow for rapid hoseline advancement while maintaining priority positioning for truck companies. In most cases, this means the first engine pulls at least two addresses past the involved unit.
- Communicate an on-scene report to the first due command-level officer.
- Complete a 360-degree lap of the structure and communicate a situation report to the first due command-level officer.
- Deploy initial hoseline and begin fire suppression operations in coordination with Command.

The first due engine officer must identify and verify the fire unit. If smoke conditions exist in multiple units, the officer must determine if fire exists in those units. Taking time to quickly gather this pertinent information saves time in the long run.

The first engine and all other engine companies should bring forcible entry tools if they arrive significantly before the first-arriving truck or rescue companies.

Second Due Engine

The second due engine company's responsibilities are as follows:

- Establish primary water supply to the first due engine.
- Identify and supply the building's fire department connection (FDC), if present.
- Assist the first engine with initial hoseline, if needed.

- Prepare to deploy a second hoseline. Depending on fire conditions, this hoseline can be advanced into the fire unit as a second hoseline or directed to an exposure unit.

Upon arrival, the second due engine driver should establish the water supply to the first due engine and stretch the supply hoseline to the FDC, if present. The driver should charge the FDC when a company reports fire or visible smoke or if directed to do so by the IC.

Third Due Engine

The third due engine company's responsibilities are as follows:

- Establish a secondary water supply and coordinate with the fourth due engine, if needed.
- Position at the rear of the structure, if possible.
- Report to Command via radio:
  - evident conditions on side Charlie;
  - number of stories present in the rear;
  - changes in the location, volume, and characteristics of any fire or smoke; and
  - the presence of any persons in distress.
- Deploy a side-Charlie hoseline.
- Coordinate suppression operations and hoseline advancement through rear entrances to the involved unit or into exposures with units operating on side Alpha.

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 Due Engine

The fourth due engine company's responsibilities are as follows:

- Help the third due engine establish a side-Charlie water supply, if needed.
- Establish the initial RIT.

Long townhouse rows may limit quick access to side Charlie. In this event, after a RIT group has been established, RIT-group supervisors should consider positioning RIT resources on side Alpha and side Charlie.

First Due Truck

The first due truck company's responsibilities are as follows:

- Position at the most strategic location for rapid ladder placement and entry into the structure. Crews should anticipate using the aerial and should position the turntable either directly in front of the involved unit or upwind from it.
- Deploy the ground ladder on side Alpha.
- Gain access or force entry to the involved unit and exposure units on side Alpha.
- Assist with advancing 2 ½" hoseline, if needed.

- Search for victims prioritized by incident dynamics on side Alpha.
- Locate the fire, if needed.
- Control utilities.
- Perform ventilation operations.
- Establish scene lighting.

If necessary, truck company officers may request to split crews and create an interior and exterior (i.e., X-ray) crew to complete multiple tasks at once. Command must be notified and must approve requests to splits crews into two teams working in two distinctly separate areas or functions in the immediately dangerous to life or health (IDLH) environment.

The first due truck officer should complete a lap of the structure and help the first due engine officer develop the initial size-up and determine the operation mode and appropriate tactics. Truck company personnel should facilitate access to the involved occupancies for engine company hoseline advancement, utilizing forcible entry techniques, if necessary.

If the fire location is not readily apparent, the truck company should search for it while the engine crew stands by, ready to advance. At this point, the engine crew operates as the rescue team for the truck, if needed. Once the truck crew has located the fire and the engine company has advanced the hoseline, the truck crew should begin searching the rest of the area for victims.

Second Due Truck

The second due truck company's responsibilities are as follows:

- 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.
- Deploy ground ladders on side Charlie with the primary goal of providing access and egress for personnel operating on upper floors.
- Light the roof and rear area early.

Rescue

The rescue company's responsibilities are as follows:

- Position to afford rapid access to the structure without blocking other companies.
- Search for victims prioritized by incident dynamics.
- Gain access or force entry to the involved unit and exposure units.
- Assist with advancing 2 ½" hoseline, if needed.
- Locate the fire, if needed.
- Control utilities.
- Perform ventilation operations.

If necessary, rescue company officers may request to split crews and create an interior and exterior (i.e., X-ray) crew to complete multiple tasks at once. Command must be notified and

approve requests to splits crews into two teams to work in two distinctly separate areas or functions in the IDLH.

Depending on the number and type of handlines deployed, rescue personnel may assist in hoseline movement and operation. Specifically, the 2 ½" hoseline requires additional personnel to successfully deploy.

EMS Units

Transport personnel should not routinely be assigned suppression duties or non-EMS functions such as RIT. Transport units should park as close as possible to the incident, allowing for rapid care of any injured persons, emergency departures, and equipment access while providing a sheltered environment, if needed.

Transport personnel should not routinely don personal protective equipment and self-contained breathing apparatus unless the IC deems them necessary for a suppression task. When a Mayday has occurred or people have been reported trapped or injured, EMS personnel should leave their personal protective equipment and self-contained breathing apparatus on the unit and rapidly report to the incident scene with their EMS equipment.

When reports of trapped occupants or multiple victims are received, Command should consider assigning additional advanced life support units.

Battalion Chiefs

The first chief officer should position the vehicle to facilitate effective incident command without blocking firefighting units.

The second chief officer should avoid blocking firefighting units while positioning the vehicle to support command, enabling members to most easily report to the IC with their full personal protective equipment, including self-contained breathing apparatus.

OTHER CONSIDERATIONS

Forcible Entry

Personnel should reference the NOVA *Truck Company Book 2 – Forcible Entry* manual for information about various forcible entry techniques appropriate for townhouses. Related information specific to fires in townhouses appears in this section.

Crews can easily gain entry into townhouses using conventional methods. Personnel should remain cognizant that forcible entry is ventilation and can adversely impact the fire's path and intensity. The engine company's access point is almost always the front door. Depending on the fire's location, this access point may change to attempt 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. Personnel also must access attached exposures. These may require forcible entry as well.

Ladder Deployment

Personnel should reference the NOVA *Truck Company Book 3 – Ladders* manual for information about various techniques appropriate for townhouses. Related information specific to fires in townhouses appears in this section.

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

Aerial ladder deployment should typically follow ground ladder deployment. When aerial ladders are deployed, personnel should position supply hoseline to facilitate the use of aerial master streams to address rapid changes in conditions or tactics.

Search and Rescue

Personnel should reference the NOVA *Truck Company Book 4 – Search and Rescue* manual for information about various techniques appropriate for townhouses. Related information specific to fires in townhouses appears in this section.

The area closest to the fire on the fire floor and the area directly above the fire are the two most dangerous areas. Means of egress and sleeping areas are generally considered to be the most critical areas to search. Personnel conducting a primary search should check these areas first.

Due to the relatively small areas within most townhouses, execution of the primary search occurs quickly. 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 first arriving at the area over the fire then searching outward from that point.

If personnel use the vent-enter-isolate-search tactic, they must notify the IC to avoid duplicating efforts. Crews must report the outcome of the primary search to the IC because this is the primary strategic focus of the operation

Ventilation

Fire department personnel should manage the openings (i.e., doors, windows) to the structure to limit fire growth and spread and to control the flow path of inlet air and fire gases during tactical operations.

Members must coordinate all ventilation with suppression activities because uncontrolled ventilation allows additional oxygen into the structure. This can rapidly elevate heat release rates, expand the fire, and increase the hazards associated with it. A variety of actions (e.g., forcible entry) can facilitate ventilation, even when not intended. Personnel must force entry to access the seat of the fire, but without the proper water application, this form of ventilation can negatively affect life safety, incident stability, and property conservation.

Members must use door control and coordinated ventilation to control flow paths during the search. Crews must remember to close any open doors along their path to the fire location. Closing doors serves a multitude of purposes, including limiting airflow that feeds the fire and reducing the ability of unchecked fires to spread rapidly. Also, the closed door can provide refuge for trapped occupants by reducing temperatures and fire spread in their area.

Ventilation on the fireground can be one of the most dangerous and most important tasks performed by firefighters. The technique of horizontal ventilation involves opening or removing windows. This accomplishes several objectives that aid in fire extinguishment. By allowing heat and smoke to escape through the newly created openings, horizontal ventilation reduces the danger of heat or fire passing over or around the nozzle team, permitting the crew to rapidly advance the attack hoseline to the fire area.

Officers must coordinate all horizontal ventilation measures taken by the inside or outside ventilation team and the advancing hose team. Uncoordinated, poorly located, or ill-timed horizontal ventilation can cause the fire to spread rapidly, subjecting personnel inside to extreme heat and flashover conditions. The introduction of *any* additional ventilation into the structure increases fire intensity and spread. Firefighters must remain vigilant regarding the fire's ventilation status. Failure to recognize changes in the ventilation status can result in personnel being caught in a rapid fire or flashover event.

Before any ventilation takes place, the ventilation team must answer the following questions:

- What is the location of the fire?
- What is the current ventilation status?
- Will adding ventilation openings affect fire conditions?
- Where is the hoseline?

Vertical Ventilation

When ordered by Command, personnel should accomplish vertical, rooftop ventilation using common methods. The discovery of a lightweight trussed roof should be made known and reacted to appropriately. Members *must* be independently supported when operating on lightweight construction. A viable and safer option involves venting the ends of a gable roof.

The majority of NOVA townhouse roofs are of truss construction, so members should 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

Hoarding Conditions

Compulsive hoarding disorder refers to the accumulation of a large number of belongings that have little-to-no apparent value.

Clues of hoarding conditions may be noticeable to members arriving on-scene or while completing the 360-degree size-up. Examples could include cluttered front yards, cars filled with belongings, excessive accumulation of personal items or trash, and backyard privacy fences that hide large numbers of items. Members may notice excessive belongings through windows, or they may notice window coverings designed to hide clutter from public view.

Notable challenges to mitigating incidents involving hoarding conditions may include, but are not limited to:

- access and egress issues,
- increased fire load,
- collapse concerns due to weight and load shifting,
- delays in extinguishment and rescue operations, or
- long burn times and vent-limited fires.

Tactical considerations may include:

- alternate means of access to perform operations (e.g., line-over-ladder and vent-enter-search-isolate),
- exterior water application and use of extinguishing foam to minimize added weight, and
- the summons of additional units due to the amount of work necessary to complete tasks.