First Revision No. 57-NFPA 1700-2024 [Global Input]

[New Chapter on "Tactical Considerations for Search and Rescue"]

[insert Word file]

Supplemental Information

File Name	Description	Approved
NFPA_1700_New_Chapter_13_Search_and_Rescue.docx	New Search and Rescue Chapter	
1700_Global_FR-57_Chapter_13-new_for_ballot.pdf	For ballot	

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Wed Apr 24 11:06:18 EDT 2024

Committee Statement

Committee Statement: In the first edition of NFPA 1700, the importance of search and rescue tactics to meeting the incident priority of life safety to the public and the first responder was acknowledged, however there was no science-based research available to include. Since then, a study has been completed by UL FSRI where 21 experiments were conducted in two identical, purpose-built single-story, single-family residential structures to quantify the impact of how search and rescue tactics are coupled with ventilation and suppression actions and timing. Each fully furnished 1600 square foot structure included four bedrooms, two bathrooms and an open-floor kitchen and living room. The structures were instrumented to quantify post-ignition toxic gas and thermal conditions. Temperature, velocity, and pressure were measured to evaluate the fire dynamics. Gas concentrations and heat fluxes were measured to quantify toxic and thermal exposures. The results were published in three separate reports, Analysis of Search and Rescue Tactics in Single-Story Single-Family Homes Part I: Bedroom Fires , Part II: Kitchen and Living Room Fires, and Part III: Tactical Considerations.

The results of these experiments combined with the experience of our technical panel members formed the tactical considerations in the reports. These tactical considerations form the basis of this proposed chapter.

Response Message: FR-57-NFPA 1700-2024

Chapter 13 Tactical Considerations for Search and Rescue

13.1 Scope.

This chapter addresses the tactical considerations for search and rescue operations.

13.2 Purpose.

The purpose of this chapter is to provide guidance on search and rescue options for tactical consideration.

13.3 Application.

The intent of this chapter is for firefighting personnel to apply science-based tactical considerations for search and rescue operations.

13.4 General.

13.4.1

Life safety is and always will be of utmost importance to the fire service, and accomplishing search and rescue must be paramount on the fireground. All strategies and tactics should focus on ensuring the life safety threat to any occupants is handled quickly upon arrival.

13.4.2

Independent of fire department operations, research shows that four items impact the survivability of an occupant within a given space in a structure:

(1) Occupants’ proximity to the fire

(2) Occupants’ elevation in the space

(3) Occupants’ exposure duration (both toxic and thermal)

(4) Whether occupants are isolated from the fire through some form of compartmentation

13.4.2.1

Occupants closer to the fire area in a structure will have an increased risk of thermal injuries and thus a lower likelihood of survival. Similarly, occupants located higher in the space (e.g., on a bed as opposed to the floor, located above the level of the fire) will have an increased risk of exposure to toxic gases, decreasing their chance of survival. Isolation from the fire flow paths through a closed door will drastically increase the chances of survival for a trapped occupant.

13.4.2.2

The fire department can impact the survivability of trapped occupants through one of two ways: removing the occupant from the hazard or removing the hazard from the occupant.

13.4.2.2.1

Finding occupants is the first step to removing them, therefore searches need to begin as soon as feasible. Simultaneously, coordinating fire control and ventilation measures will reduce present hazards, aiding in the search and the overall mission of life safety.

13.4.2.2.2

Prior to fire control, the best protection for victims is isolation from the fire, smoke, and convective currents.

13.4.2.2.3

After fire control, ventilation of the structure, especially the victim removal pathways and compartments, should be considered.

13.4.2.3

Size-up is the assessment of the structure, occupancy type, fire or smoke conditions, and other critical factors that influence the risk management, strategy, and incident action plan on the fireground. When incident factors will allow for an offensive strategy, the incident commander (IC) is responsible for developing and communicating a plan to save lives and property to the best of their resources and capabilities.

13.4.2.3.1

Through the size-up process and when life hazard is determined to be a critical factor, the incident action plan should include a strategy and resource deployment for conducting search operations and rescue or removal if or when victims are found.

13.4.2.3.1.1

A size-up for life hazard should include the following:

(1) Volume and extent of the fire or smoke conditions

(2) Identification of the most threatened or exposed searchable spaces within the structure

(3) Most effective manner to access threatened or exposed searchable spaces within the structure

(4) Rescue or removal plan based on interior conditions, egress or access points, and the least possible amount of exposure to thermal or toxic insult

13.4.2.3.1.2

The fireground factors listed in 13.4.2.3.1.1 are measured in the initial size-up of all four sides of the fire structure. A specific plan for a 360-degree size-up should be executed either by the initial responding officer or IC or through tactical assignments of other personnel or companies to all sides of the structure yet to be viewed. The 360-degree size-up should challenge or verify the initial arriving size-up of the A side. This could include identification of areas of potential victims that could not be assessed from the original A-side position.

13.4.2.3.2

A 360-degree size-up assessing for life hazard should include the following:

(1) Number of stories from the A and C sides of the structure

(2) Presence and type of basement, as follows:

(a) Basement types, as follows:

(i) No-access basement

(ii) Limited-access basement

(iii) Full-access basement

(b) Finished or unfinished, as follows:

(i) Finished: provides protection to structural floor components with a potential for livable space

(ii) Unfinished: provides no protection to structural floor components or livable space, but does not eliminate potential for victims

(3) Fire or smoke location, volume, and extent from all sides

(4) Use of thermal imaging camera to assist with locating the fire and identifying the most threatened, as well as the most protected, interior spaces

(5) Ventilation profile and recognition of the flow path, identifying air inlets and outlets

(6) Identifying unidirectional and bidirectional air flow at the openings

(7) Presence of occupant escape systems

13.4.2.3.3

Size-up should consider the current and future state of the fire or smoke conditions and structural integrity. Search should be coordinated with fire control efforts from the most advantageous position(s). If search actions are taking place prior to or without a fire attack, it should be expected that the fire or smoke conditions may worsen. This becomes a safety concern for firefighters and decreases the firefighters' capability to save victims.

13.4.2.3.4

Assessing opportunities to create compartmentalization around potential victims is critical. Size-up from the interior becomes the next critical step in challenging or validating the exterior size-up and the initial plan for action and should consider the following:

(1) Location of the fire

(2) Ability and position to extinguish fire

(3) Ability and position to create or maintain searchable space

(4) Ability and position to prioritize the most endangered spaces or compartments to search or isolate

(5) Ability and position to determine the best removal routes or paths for any victims located

13.4.2.3.4.1

This action steps listed in 13.4.2.3.4 are best accomplished with reasonable expectations for the resources and staffing on scene. Resources and staffing should be the greatest determining factor on the ability to prioritize and execute a fire attack and search plan based on the interior and exterior size-up. The complexity and access points of search and rescue operations should be determined based on the conditions, standards, training, and competence of the search crews. Independent search and fire attack operations should not be executed when resources and staffing will not support it.

13.4.2.3.4.2

When incident factors require a defensive strategy, the IC is responsible for developing and communicating a plan to save lives and property in the exposures that have conditions suitable for search operations. In an incident action plan for a defensive strategy, the IC should define the priority exposures and ensure searches are conducted when the fire conditions and building integrity allow.

13.5 Search.

13.5.1 General.

On the fireground, coordination of suppression and search operations are paramount to ensuring that trapped occupants have the highest likelihood of survival. These tactics cannot be performed independently without consideration for how one may affect the other. Suppression stops the hazard from getting worse and ventilation is needed to remove the hazard and improve conditions. Searching firefighters need to control (i.e., both open and close) doors and windows during operations, depending on the timing of suppression. Tactical considerations regarding the timing of search relative to suppression are outlined in this section for the two types of searches conducted routinely at a structure fire: primary search and secondary search.

13.5.1.1 Primary Search.

13.5.1.1.1

A primary search is intended to be a rapid but thorough search of locations where it is believed savable victims may be present. Factors like structure type, fire conditions, and time of day will help firefighting personnel determine these priority locations at a given incident. Primary search locations can include the following:

(1) Common paths of travel

(2) Main entry and egress points of the structure

(3) Bedrooms

(4) Closets

(5) Bathrooms

13.5.1.1.2

The goal of a primary search is to locate occupants who are in immediate danger. Occupants can only survive in a hostile smoke-filled environment for a limited amount of time, which emphasizes the need to complete primary search rapidly. Since primary search typically occurs earlier in the incident, firefighters moving about the structure should stay as low as functionally possible to minimize their exposure to thermal hazards and maximize their visibility.

13.5.1.2 Secondary Search.

13.5.1.2.1

A secondary search is slower and more in depth than a primary search to ensure all spaces within the structure have been covered. Having a crew separate from that of the primary search conduct the secondary search to avoid bias should be considered. During the secondary search, it is important to check every possible location an occupant could be hiding, including the following:

(1) Closets

(2) Cabinets

(3) Under beds

13.5.1.2.2

During a secondary search, the emphasis should be on ensuring that all spaces were checked thoroughly to confirm that no occupants were missed during the primary search. A secondary search should not be considered complete until the search crew can say with confidence there are no occupants left inside the structure.

13.5.1.3 Search Methods.

13.5.1.3.1 General.

To avoid implying a sequence or specific order of events within a given search tactic, research refers to the firefighter's location for where a search begins, either via a door or a window. The fireground is complex, and ventilation openings (both exterior and interior) may be in various states upon entry. As such, tactical considerations for search are described based on their relative timing to suppression operations (i.e., pre-fire, during fire, and post-fire), which includes firefighter control of windows and doors. Once inside the structure, a search can take many forms including standard, large-area, oriented, or split, among others. The specifics of how a search is conducted after entry are driven by the agency's response model, standard operating procedures or guidelines, and training.

13.5.1.3.2 Door-Initiated Search.

A door-initiated search is a search that commences through a door to the structure in question. While firefighters typically associate this with the front door, it could also mean entry through a door closer to the seat of the fire or reported or suspected locations of trapped occupants.

13.5.1.3.3 Window-Initiated Search.

A window-initiated search is a search that commences through a window to the structure in question. Traditionally, entry through a window for search operations has been referred to as a vent, enter, search (VES) or vent, enter, isolate, search (VEIS) tactic. Sometimes, however, the window is already ventilated and the doorway to the entry room is already isolated. Whether or not the window and doorway to the remainder of the structure are desired open depends on the timing of suppression operations.

13.5.2 Pre-Fire-Control Search.

13.5.2.1

If an isolated space is identified as part of a thorough size-up, making entry into that space as part of a window-initiated search ahead of suppression should be considered. Isolation inhibits the establishment of a flow path between the fire compartment(s) and the newly created vent until the firefighters are prepared to make the opening. If conditions permit searching beyond the compartment of entry, reisolation upon exiting the space could maintain a place of refuge if needed.

13.5.2.2

For window-initiated search into nonisolated spaces prior to suppression, isolation of the entry space should be considered. Upon isolation, increasing the amount of exterior ventilation within that space should also be considered.

13.5.2.3

For door-initiated search conducted prior to suppression, isolating the room being searched from flow paths connected to the fire compartment should be considered. Upon isolation, further consideration should be given to opening exterior vents within that space.

13.5.2.4

Isolation of the fire compartment from adjoining spaces or isolation of the fire compartment from sources of oxygen supply (e.g., close the bedroom door for a bedroom fire, close the front door for a kitchen or living room fire) should be considered. Employing further isolation and subsequent exterior ventilation of non-fire compartments during pre-suppression search operations should also be considered.

13.5.2.5

In situations where isolation is not possible during a window-initiated search ahead of suppression, maximizing the on-plane distance between the entry location and the fire compartment should be considered (i.e., if possible, enter the structure furthest from the fire).

13.5.3 Search During Fire Control.

13.5.3.1

Research and fireground experience has shown that effective interior or exterior fire control can successfully enable the simultaneous execution of search and rescue operations. Effective fire control measures support the search, and commencing these efforts should not be delayed.

13.5.3.2

Suppression crews may deem that the initial water application to the fire occurs from outside the structure. With proper coordination and communication, this should not delay a search crew from entering the structure. Effective water on the fire improves conditions throughout the structure, even if that application occurs from the exterior. With ongoing suppression operations, both toxic and thermal hazards are reduced and allow for searching firefighters to quickly locate and remove any trapped occupants.

13.5.4 Post-Fire-Control Search.

13.5.4.1

Following suppression, opening previously isolated spaces and creating local ventilation openings that establish flow paths to the exterior to facilitate the removal of accumulated combustion gases should be considered.

13.5.4.2

Once the fire is considered under control and extinguished, all doors and windows should be opened to allow for the movement of air throughout the structure. This will ensure all spaces have access to fresh air, improving both visibility and survivability.

13.6 Rescue.

13.6.1 General.

13.6.1.1

Rescue of an occupant should occur as fast as practical with minimal additional exposures to the fire environment. Exposure can be minimized by the following means:

(1) Isolating the occupant from the fire environment during removal

(2) Selecting a path of egress remote from the fire compartment

(3) Selecting a path of egress in the intake portion of the flow path and moving with the occupant's head at the lowest functional elevation

13.6.1.2

Depending on the location of the occupant relative to the fire, the timing of suppression operations, and the conditions present in the structure, firefighters should consider whether removal from a door or window is best suited to minimize further exposure. Tactical considerations in this section describe recommendations for when a removal is conducted prior to, during, or after fire control.

13.6.2 Pre-Fire-Control Rescue.

13.6.2.1

For fires where occupant removal may precede fire control, an egress route that does not pass the fire compartment along the path of travel should be considered. This route may differ from that taken by the search firefighters.

13.6.2.2

In situations such as the pre-suppression removal of a trapped occupant past a nonisolated fire compartment or an inability for expedient occupant removal (e.g., hoarder conditions), delaying removal until toxic and thermal hazards along the egress path are reduced should be considered if the occupant is in a space isolated from fire-induced flows.

13.6.3 Rescue During Fire Control.

13.6.3.1

Research and fireground experience has shown that effective interior or exterior fire control can successfully enable the simultaneous execution of rescue operations. Effective fire control measures support rescue, and commencing these efforts should not be delayed.

13.6.3.2

If occupant removal occurs during suppression operations, coordination should be explicit with those applying water. Research into suppression shows that a “flow and move” approach (i.e., bale open and flowing water in a pattern while advancing towards the seat of the fire) provides isolation by separating the fire area from the remainder of the structure. If the occupant is able to be removed behind the advancing suppression team, they will be in the intake portion of the flow path which will likely have better visibility and lower toxic and thermal hazards due to the entrainment of fresh air from the actively flowing hose stream.

13.6.4 Post-Fire-Control Rescue.

13.6.4.1

Following fire control, opening previously isolated spaces to facilitate the removal of the occupant should be considered. This also depends on the elevation and accessibility of the opening. Even if the victim will not be removed via the opening, there is an additional benefit because the ventilation openings will establish flow paths to the exterior to facilitate the removal of accumulated combustion gases during the removal of the occupant.

13.6.4.2

Coordination should be made with the suppression team to ensure hydraulic ventilation is performed throughout the duration in which occupant removal is being conducted. Hydraulic ventilation ensures the removal of accumulated combustion gases and entrainment of fresh air through any available opening to the exterior of the structure. This will not only minimize the toxic exposure but will trend towards improved conditions throughout including an increase in visibility, a reduction of toxic gas concentrations, and an increase in available oxygen.

13.6.4.3

Prioritization of life safety does not stop with the removal of a trapped occupant from the fire building. The continuation of treatment of fire victims is important in the survivability after removal from the fire building. Dedicated crews for medical care should be available at the incident scene and in communications with the IC. These crews should be in a position of quick access once a victim is removed, have adequate equipment to assess and treat fire victims, and be able to coordinate rapid transportation as needed.

First Revision No. 90-NFPA 1700-2024 [Global Input]

Change document title to: Guide for Structural Firefighting

Submitter Information Verification

Committee: FCO-AAA
Submittal Date: Tue Jun 04 13:40:23 EDT 2024

Committee Statement

Committee Statement: Per NFPA style, updating document title to show 'firefighting' as one word.
Response Message: FR-90-NFPA 1700-2024

First Revision No. 91-NFPA 1700-2024 [Detail]

[Revise definition to match the 2022 edition of NFPA 24]

3.3.68 Fire Department Connection (FDC).

A connection through which the fire department can pump supplemental water into the sprinkler system, standpipe, or other water-based fire protection systems, ~~furnishing water for fire extinguishment to supplement~~ thereby supplementing existing water supplies. [24, ~~2019~~ 2022]

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Mon Jul 01 20:03:32 EDT 2024

Committee Statement

Committee Statement: Definition was revised in the 2022 edition of NFPA 24.

Response Message: FR-91-NFPA 1700-2024

First Revision No. 92-NFPA 1700-2024 [Detail]

[Revise definition to match the 2020 edition of NFPA 1410]

3.3.241 Ventilation-Limited Fire.

A fire in which the heat release rate ~~or~~ and fire growth ~~is controlled~~ are regulated by the ~~amount of air (oxygen)~~ available oxygen within the space ~~to the fire~~. [1410, 2020]

Submitter Information Verification

Committee: FCO-AAA
Submittal Date: Mon Jul 01 20:12:57 EDT 2024

Committee Statement

Committee Statement: Definition is updated to match the 2020 edition of NFPA 1410
Response Message: FR-92-NFPA 1700-2024

First Revision No. 56-NFPA 1700-2024 [Section No. 1.3]

1.3 Application.

~~The intent of this guide is to provide guidance on the application of science-based fire dynamics research supporting firefighting practices recognizing that life safety of the public and the first responder is the highest incident priority, followed by incident stabilization and property conservation.~~

1.3.1

~~The intent of this~~ This guide ~~is to~~ provides guidance on the application of science-based fire dynamics research supporting firefighting practices, recognizing that life safety of the public and ~~the~~ of first responders is the highest incident priority, followed by incident stabilization and property conservation.

1.3.2

This guide provides information to be used by the authority having jurisdiction (AHJ) in developing and maintaining a written mission statement or policy that establishes the following as the flow of decision-making on the fireground:

(1) Incident priorities

(2) Risk management

(3) Strategical considerations *(see Chapter 9)* , appropriate for the incident

(4) Tactical considerations *(see Chapters 10 and 12)* appropriate for the incident, such as the following:

   (a) Fire control

   (b) Search

   (c) Ventilation or nonventilation

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 22:09:56 EDT 2024

Committee Statement

Committee Statement: The technical committee identified a need to incorporate priorities, strategies and tactics into the application section.

Response Message: FR-56-NFPA 1700-2024

First Revision No. 88-NFPA 1700-2024 [Section No. 1.4]

1.4 Units of Measure.

Metric units of measurement in this guide are in accordance with the modernized metric system known as the International System of Units (SI). The unit of liter is outside of but recognized by SI and is commonly used in international fire protection. These units are listed in Table 1.4.

Table 1.4 SI Units and Equivalent US Customary Units

SI	US
Distance	
1 cm	0.394 in.
2.54 cm	1 in.
1 m	3.28 ft
0.305 m	1 ft
Area	
1 cm^2	0.155 in.^{2}
6.45 cm^2	1 in.^{2}
1 m^2	10.8 ft^2
0.093 m^2	1 ft^2
Volume	
1 cm^3	0.34 fluid oz
29.6 cm^3	1 US fluid oz
1 L	1.06 US qt
0.95 L	1 US qt
1 m^3	35.3 ft^3
0.028 m^3	1 ft^3
Mass	
1 g	~~0.353 oz~~ 0.0353 oz
28.25 g	1 oz
1 kg	2.20 lb
0.454 kg	1 lb
Density	
1 g/cm^3	8.35 lb/US gal
0.12 cm^3	1 lb/US gal
1 kg/m^3	0.063 lb/ft^3
Flow	
1 L/sec	15.9 US gal/min
0.063 L/sec	1 US gal/min
Pressure	
1 bar (750 mmHg)	14.5 lb/in.^{2}
0.069 bar	1 lb/in.2 (27.7 in. water column)
1 kPa	0.145 lb/in.^{2}
Energy	
1 J	9.48×10^{-4} Btu
1055 J	1 Btu

SI	US
1 kJ	0.948 Btu
Power	
1 kW	0.952 Btu/sec
1.06 kW	1 Btu/sec

Note: Converting from one system of measurement to another usually introduces additional significant figures to a value. The converted values should be rounded off, so that they include no more significant figures than the original measured or reported values.

Submitter Information Verification

Committee: FCO-AAA
Submittal Date: Fri May 31 14:45:36 EDT 2024

Committee Statement

Committee Statement: correction in SI conversion, 1 g = 0.0353 oz
Response Message: FR-88-NFPA 1700-2024

First Revision No. 21-NFPA 1700-2024 [Section No. 2.2]

2.2 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems,* ~~2018~~ 2022 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* ~~2019~~ 2022 edition.

NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes,* ~~2019~~ 2022 edition.

NFPA 13R, *Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies,* ~~2019~~ 2022 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems,* ~~2019~~ 2024 edition.

NFPA 30, *Flammable and Combustible Liquids Code,* ~~2018~~ 2024 edition.

NFPA 72®, *National Fire Alarm and Signaling Code®,* ~~2019~~ 2022 edition.

NFPA 1407, *Standard for Training Fire Service Rapid Intervention Crews,* 2020 edition.

~~NFPA 1500™, *Standard on Fire Department Occupational Safety, Health, and Wellness Program,* 2018 edition.~~

NFPA 1550, *Standard for Emergency Responder Health and Safety,* 2024 edition.

NFPA 1584, *Standard on the Rehabilitation Process for Members During Emergency Operations and Training Exercises,* ~~2015~~ 2022 edition.

NFPA 1585, *Standard for Exposure and Contamination Control,* 2025 edition.

~~NFPA 1620, *Standard for Pre-Incident Planning,* 2020 edition.~~

NFPA 1660, *Standard for Emergency, Continuity, and Crisis Management: Preparedness, Response, and Recovery,* 2024 edition.

NFPA 1801, *Standard on Thermal Imagers for the Fire Service,* ~~2018~~ 2021 edition.

NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting,* 2020 edition.

NFPA 1931, *Standard for Manufacturer's Design of Fire Department Ground Ladders,* 2020 edition.

NFPA 1960, *Standard for Fire Hose Connections, Spray Nozzles, Manufacturer's Design of Fire Department Ground Ladders, Fire Hose, and Powered Rescue Tools,* 2024 edition.

~~NFPA 1961 *Standard on Fire Hose,* 2020 edition.~~

~~NFPA 1964, *Standard for Spray Nozzles and Appliances,* 2018 edition.~~

NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting,* 2018 edition.

NFPA 1975, *Standard on Emergency Services Work Apparel,* 2019 edition.

NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services,* 2019 edition.

NFPA 1982, *Standard on Personal Alert Safety Systems (PASS),* 2018 edition.

NFPA 1983, *Standard on Life Safety Rope and Equipment for Emergency Services,* 2017 edition.

Supplemental Information

File Name	Description	Approved
1700_FR-21_2.2.docx		

Submitter Information Verification

Committee: FCO-AAA
Submittal Date: Fri Apr 19 10:09:31 EDT 2024

Committee Statement

Committee Statement: The technical committee updated NFPA Standards referenced in the guide.
Response Message: FR-21-NFPA 1700-2024

First Revision No. 60-NFPA 1700-2024 [New Section after 2.3.2]

2.3.3 SFPE Publications.

Society of Fire Protection Engineers, 9711 Washingtonian Boulevard, Suite 380, Gaithersburg, MD 20878.

Babrauskas, V., "Heat Release Rates," *SFPE Handbook of Fire Protection Engineering* , 2016.

Beyler, C., "Flammability Limits of Premixed and Diffusion Flames," *SFPE Handbook of Fire Protection Engineering* , 2002.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Wed Apr 24 12:42:56 EDT 2024

Committee Statement

Committee Statement: SFPE publications place into its own section.

Response Message: FR-60-NFPA 1700-2024

First Revision No. 22-NFPA 1700-2024 [Section No. 2.3.3]

2.3.4 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 19, *Standard for Lined Fire Hose and Hose Assemblies*, ~~2013~~ 2024 .

Submitter Information Verification

Committee: FCO-AAA
Submittal Date: Fri Apr 19 10:41:19 EDT 2024

Committee Statement

Committee Statement: The technical committee identified the UL standard is updated.
Response Message: FR-22-NFPA 1700-2024

First Revision No. 59-NFPA 1700-2024 [Section No. 2.3.4]

2.3.5 Other Publications.

ANSI/APA PRG 320, *Standard for Performance-Rasted Cross-Laminated Timber* , APA — The Engineered Wood Association, Tacoma, WA, 2018.

Babrauskas, V., and J. Krasny, J., *Fire Behavior of Upholstered Furniture,* NBS Monograph 173, Fire Behavior of Upholstered Furniture US Department of Commerce, 1985 .

Babrauskas, V., "Heat Release Rates," in *SFPE Handbook of Fire Protection Engineering* , 3rd edition, National Fire Protection Association.

Beyler, C. "Flammability Limits of Premixed and Diffusion Flames." In *SFPE Handbook of Fire Protection Engineering* , ed. P. DiNenno. Quincy, MA: National Fire Protection Association, 2002.

Fleischmann, C. harles M. , and Z. hiJian Chen, "Defining the Difference Between Backdraft and Smoke Explosions. , " The 9th Asia-Oceania Symposium on Fire Science and Technology, *Procedia Engineering*, Vol. 62, pp . 324–330. , 2013.

Horn, G. P., et al., "Hierarchy of contamination control in the fire service: Review of exposure control options to reduce cancer risk," *Journal of Occupational and Environmental Hygiene* , Vol. 19 (9), 538–557.

Kesler R., "Thermal degradation of self-contained breathing apparatus facepiece lenses under radiant thermal loads," *Journal of Fire Sciences* , Vol. 42 (3), 236–247, 2024. journals.sagepub.com/doi/10.1177/07349041241227921

"Occupational exposure as a firefighter," Volume 132, International Agency for Research on Cancer (IARC) Monographs on the Identification of Carcinogenic Hazards to Humans, July 2022.

Lee, B. T., *Heat Release Rate Characteristics of Some Combustible Fuel Sources in Nuclear Power Plants*, NBSIR 85-3195, US Department of Commerce, 1985 .

"UL FSRI Home Furnishings Comparison (Natural vs. Synthetic)," YouTube video, Fire Safety Research Institute, October 2020. youtube.com/watch?v=87hAnxuh1g8

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003 2020 .

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Wed Apr 24 12:20:07 EDT 2024

Committee Statement

Committee Statement: References updated as used in main body of the guide

Response Message: FR-59-NFPA 1700-2024

First Revision No. 58-NFPA 1700-2024 [Section No. 2.3.5]

2.3.6 References from Chapter 4.

1. Madrzykowski, D., *Fire Fighter Equipment Operational Environment (FFEOE): Evaluation of Thermal Conditions. ,* UL Firefighter Safety Research Institute, Columbia, MD, August 2017.

2. *America Burning, the Report of The National Commission on Fire Prevention and Control. ,* Washington, DC, May 1973.

3. Gross, D., "Fire Research at NBS: The First 75 Years. ," In *Fire Safety Science — Proceedings of the Third International Symposium*, pages pp. 119–133. , International Association for Fire Safety Science, 1991.

4. Hurley, M. J., ed., *SFPE Handbook of Fire Protection Engineering. ,* Springer, NY New York , NY, 5th edition, 2016.

5. *Fire Protection Handbook. ,* National Fire Protection Association, Quincy, MA, 20th ed. edition , 2008.

6. Drysdale, D., *An Introduction to Fire Dynamics.* John Wiley and Sons , New York, NY, 2nd edition, 2002.

7. Madrzykowski, D., "Fire Dynamics: The Science of Fire Fighting. ," *International Fire Service Journal of Leadership and Management. ,* Vol. 7, FPP/IFSTA, Stillwater, OK, vol 7, 2013.

8. Kerber, S., "Analysis of Changing Residential Fire Dynamics and Its Implications on Firefighter Operational Timeframes. ," *Fire Technology*, Vol. 48: , pp. 865–891, October 2012.

9. Stroup, D. W., Madrzykowski, D., Walton, W.D. and Twilley, W. et al., *Structural Collapse Fire Tests: Single Story, Ordinary Construction Warehouse. ,* NISTIR 6959, National Institute of Standards and Technology, Gaithersburg, MD, NISTIR 6959, May 2003.

10. Stroup, D. W., Bryner, N.P., Lee, J., McElroy, J., Roadarmel, G., and Twilley, W.H. et al., *Structural Collapse Fire Tests: Single Story, Wood Frame Structures. ,* NISTIR 7094, National Institute of Standards and Technology, Gaithersburg, MD, NISTIR 7094, March 2004.

11. Izydorek, M. S., Zeeveld, P.A., Samuels, M. D., Smyser, J. P. et al., *Report on Structural Stability of Engineered Lumber in Fire Conditions. ,* Underwriters Laboratories, Northbrook, IL, September 2008.

12. Kerber, S., Madrzykowski, D., Dalton, J., and Backstrom, R. et al., *Improving Fire Safety by Understanding the Fire Performance of Engineered Floor Systems and Providing the Fire Service with Information for Tactical Decision Making. ,* Underwriters Laboratories, Northbrook, IL, March 2012.

13. Madrzykowski, D. and J. Kent, J. *Examination of the Thermal Conditions of a Wood Floor Assembly above a Compartment Fire. ,* NISTTN 1709, National Institute of Standards and Technology, Gaithersburg, MD, NISTTN 1709, July 2011.

14. Madrzykowski, D., and S. Kerber, S. *Fire Fighting Tactics Under Wind Driven Conditions: Laboratory Experiments. ,* NISTTN 1618, National Institute of Standards and Technology, Gaithersburg, MD, NISTTN 1618, January 2009.

15. Kerber, S., and D. Madrzykowski, D. *Fire Fighting Tactics Under Wind Driven Conditions: 7 Story Building Experiments. ,* NISTTN 1629, National Institute of Standards and Technology, Gaithersburg, MD, NISTTN 1629, April 2009.

16. Kerber, S., *Impact of Ventilation on Fire Behavior in Legacy and Contemporary Residential Construction. ,* Underwriters Laboratories, Northbrook, IL, December 2010.

17. Kerber, S., *Study of the Effectiveness of Fire Service Vertical Ventilation and Suppression Tactics in Single Family Homes. ,* Underwriters Laboratories, Northbrook, IL, June 2013.

18. Kerber, S., and W. D. Walton, W. D. *Effect of Positive Pressure Ventilation on a Room Fire. ,* NISTIR 7213, National Institute of Standards and Technology, Gaithersburg, MD, NISTIR 7213, March 2005.

19. Kerber, S., and W. D. Walton, W. D. *Full-Scale Evaluation of Positive Pressure Ventilation In a Fire Fighter Training Building. ,* NISTIR 7342, National Institute of Standards and Technology, Gaithersburg, MD, NISTIR 7342, July 2006.

20. Kerber, S., D. Madrzykowski, D. and D. W. Stroup, D. W. *Evaluating Positive Pressure Ventilation In Large Structures: High-Rise Pressure Experiments*, – NISTIR 7412, National

Institute of Standards and Technology, Gaithersburg, MD, NISTIR 7412, March 2007.

21. Kerber, S., and D. Madrzykowski, D. *Evaluating Positive Pressure Ventilation In Large Structures: High-Rise Fire Experiments.* , NISTIR 7468, National Institute of Standards and Technology, Gaithersburg, MD, NISTIR 7468, November 2007.

22. Kerber, S., and D. Madrzykowski, D. *Evaluating Positive Pressure Ventilation In Large Structures: School Pressure and Fire Experiments.* , NISTTN 1498, National Institute of Standards and Technology, Gaithersburg, MD, NISTTN 1498, July 2008.

23. Zevotek, R., and S. Kerber, S. *Study of the Effectiveness of Fire Service Positive Pressure Ventilation During Fire Attack in Single Family Homes Incorporating Modern Construction Practices.* , UL Firefighter Safety Research Institute, Columbia, MD, May 2016.

24. Weinschenk, C., and R. Zevotek, *Exploratory Analysis of the Impact of Ventilation on Strip Mall Fires* , UL Fire Safety Research Institute Columbia, MD, April 2020.

24 25 . Madrzykowski, D., S. Kerber, S., and J. Zipperer, J. *Scientific Research for the Development of More Effective Tactics — Governors Island Experiments Training: Governors Island Experiments*, July 2012. Accessed January 3 2018, from http://ulfirefightersafety.org/resources.

25 26 . ISFSI. The Principles of Modern Fire Attack Course. Accessed January 3 2018, from http://www.isfsi.org/p/cl/et/cid=1000 , International Society of Fire Service Instructors .

26 27 . Weinschenk, C., K. Stakes, K., and R. Zevotek, R. *Impact of Fire Attack Utilizing Interior and Exterior Streams on Firefighter Safety and Occupant Survival: Air Entrainment*, Columbia, MD, December 2017.

27 28 . Knapp, J., T. Pillsworth, T., and S. White, S. "Nozzle Tests Prove Fireground Realities, Part 1. ," *Fire Engineering*, February 2003.

28 29 . Knapp, J., T. Pillsworth, T., and S. White, S. "Nozzle Tests Prove Fireground Realities, Part 2. ," *Fire Engineering*, September 2003.

29 30 . Knapp, J., T. Pillsworth, T., and S. White, S. "Nozzle Tests Prove Fireground Realities, Part 3. ," *Fire Engineering*, September 2003.

30 31 . Willi, J., C. Weinschenk, C., and D. Madrzykowski, D. *Impact of Hose Streams on Air Flows Inside a Structure.* , NISTTN 1938, National Institutes of Standards and Technology, Gaithersburg, MD, 2016.

31 32 . Weinschenk, C., K. Stakes, K., and R. Zevotek, R. *Impact of Fire Attack Utilizing Interior and Exterior Streams on Firefighter Safety and Occupant Survival: Water Mapping.* , UL Firefighter Safety Research Institute, Columbia, MD, December 2017.

32 33 . Zevotek, R., K. Stakes, K., and J. Willi, J. *Impact of Fire Attack Utilizing Interior and Exterior Streams on Firefighter Safety and Occupant Survival: Full Scale Experiments.* , UL Firefighter Safety Research Institute, Columbia, MD, December 2017.

33 34 . Horn, G. P., Kerber, S., Fent, K. W., Fernhall, B., and Smith, D.L. et al., *Cardiovascular and Chemical Exposure Risks in Modern Firefighting.* , Interim Technical report Report , Illinois Fire Service Institute, University of Illinois-Urbana/Champaign, Urbana, IL, 2016.

34 35 . Horn, G. P., Kesler, R. M., Kerber, S., Fent, K. W., Schroeder, T. J., Scott, W. S., Fehling, P.C., Fernhall, B., and Smith, D. L. et al., "Thermal Response to Firefighting Activities in Residential Structure Fires: Impact of Job Assignment and Suppression Tactic." *Ergonomics*, 0(0):1–16, 0. PMID:28737481 Vol. 61(3), 404–419, 2018 .

36. Regan, J., J. Bryant, and C. Weinschenk, *Analysis of the Coordination of Suppression and Ventilation in Single-Family Homes* , UL Fire Safety Research Institute Columbia, MD, March 2020. fsri.org/research-update/technical-report-released-single-family-homes-experiments

37. Stakes, K., et al., *Analysis of the Coordination of Suppression and Ventilation in Multi-Family Dwellings* , UL Fire Safety Research Institute Columbia, MD, June 2020. fsri.org/research-update/technical-report-released-multi-family-dwellings-experiments

38. Madrzykowski, D., and C. Weinschenk, *Understanding and Fighting Basement Fires* , UL Fire Safety Research Institute, Columbia, MD, August 2018. fsri.org/research-update/fsri-and-isfsi-release-report-understanding-and-fighting-basement-fires

39. Weinschenk, C., *Analysis of Search and Rescue Tactics in Single-Story Single-Family Homes Part I: Bedroom Fires* , UL Fire Safety Research Institute, Columbia, MD, May 2022. fsri.org/research-update/report-release-analysis-search-and-rescue-tactics-single-story-single-family-homes

40. Weinschenk, C., and J. Regan, *Analysis of Search and Rescue Tactics in Single-Story Single-Family Homes Part II: Kitchen and Living Room Fires* , UL Fire Safety Research Institute, Columbia, MD, May 2022. fsri.org/research-update/report-release-analysis-search-and-rescue-tactics-single-story-single-family-0

41. Weinschenk, C., and K. Stakes, *Analysis of Search and Rescue Tactics in Single-Story Single-Family Homes Part III: Tactical Considerations* , UL Fire Safety Research Institute, Columbia, MD, May 2022. fsri.org/research-update/report-release-analysis-search-and-rescue-tactics-single-story-single-family-1

42. McKinnon, M.B., S. DeCrane, and S. Kerber, *Four Firefighters Injured In Lithium-Ion Battery Energy Storage System Explosion — Arizona* , UL Fire Safety Research Institute, Columbia, MD, July 2020. fsri.org/research-update/report-four-firefighters-injured-lithium-ion-battery-energy-storage-system

43. Barowy, A., et al., “UL 9540A Installation Level Tests with Outdoor Lithium-ion Energy Storage System Mockups,” UL Research and Development Report, Northbrook, IL, April 2021. fsri.org/research-update/energy-storage-system-installation-test-report-now-available

44. Schraiber, A., et al., *Considerations for Fire Service Response to Residential Battery Energy Storage System Incidents* , UL Fire Safety Research Institute, Columbia, MD, December 2023.

45. Madrzykowski, D., and C. Weinschenk, “Fire Safety of Batteries and Micro-mobility Devices,” *Fire Protection Engineering Magazine* , Q4, 2023. fireprotectionengineering-digital.com/fireprotectionengineering/library/item/q4_2023/4155029/?utm_source=newsletter&utm_medium=email&utm_campaign=TXFIR4231206002&utm_content=gtx

~~35~~ 46 . ~~CDC, NIOSH.~~ Fire Fighter Fatality Investigation and Prevention~~.~~ , ~~Accessed January 4, 2018, from https://www.~~ National Institute for Occupational Safety and Health, US Centers for Disease Control and Prevention. cdc.gov/niosh/fire/default.html

47. “NIOSH Alert: Preventing Injuries and Deaths of Fire Fighters due to Structural Collapse,” National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Publication No. 99–146, August 1999. cdc.gov/niosh/docs/99-146/pdfs/99-146.pdf?id=10.26616/NIOSHPUB99146

48. Webb, S., et al., “Challenges and Tactics for Fighting Row House Fires,” National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Publication No. 2023-101. cdc.gov/niosh/docs/video/2023-101/default.html

49. Loflin, M.E., “Preventing Deaths and Injuries to Firefighters Working at Strip Mall Fires,” National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Publication No. 2023-126, 2023. cdc.gov/niosh/docs/wp-solutions/2023-126

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Wed Apr 24 11:49:38 EDT 2024

Committee Statement

Committee Statement: Reference list updated to match recommendations made for Chapter 4.

Response Message: FR-58-NFPA 1700-2024

First Revision No. 62-NFPA 1700-2024 [Section No. 2.4]

2.4 References for Extracts in Advisory Sections.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* ~~2019~~ 2022 edition.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances,* ~~2019~~ 2022 edition.

NFPA 30, *Flammable and Combustible Liquids Code,* ~~2018~~ 2024 edition.

NFPA 53, *Recommended Practice on Materials, Equipment, and Systems Used in Oxygen-Enriched Atmospheres,* ~~2016~~ 2021 edition.

NFPA 54, *National Fuel Gas Code,* ~~2018~~ 2024 edition.

NFPA 55, *Compressed Gases and Cryogenic Fluids Code,* ~~2020~~ 2023 edition.

NFPA 68, *Standard on Explosion Protection by Deflagration Venting,* ~~2018~~ 2023 edition.

NFPA 70®, *National Electrical Code®,* ~~2020~~ 2023 edition.

NFPA 72®, *National Fire Alarm and Signaling Code®,* ~~2019~~ 2022 edition.

NFPA 92, *Standard for Smoke Control Systems,* ~~2018~~ 2024 edition.

NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations,* ~~2017~~ 2024 edition.

NFPA 101®, *Life Safety Code®,* ~~2018~~ 2024 edition.

NFPA 115, *Standard for Laser Fire Protection,* 2020 edition.

NFPA 400, *Hazardous Materials Code,* ~~2019~~ 2022 edition.

~~NFPA 402, *Guide for Aircraft Rescue and Fire-Fighting Operations,* 2019 edition.~~

NFPA 440, *Guide for Aircraft Rescue and Firefighting Operations and Airport/Community Emergency Planning,* 2024 edition.

NFPA 470, *Hazardous Materials/Weapons of Mass Destruction (WMD) Standard for Responders,* 2022 edition.

~~NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents,* 2018 edition.~~

NFPA 475, *Recommended Practice for Organizing, Managing, and Sustaining a Hazardous Materials/Weapons of Mass Destruction Response Program,* ~~2017~~ 2022 edition.

NFPA 610, *Guide for ~~the~~ Emergency and Safety Operations at Motorsports Venues,* ~~2019~~ 2024 edition.

NFPA 654, *Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids,* 2020 edition.

NFPA 901, *Standard Classifications for Fire and Emergency Services Incident Reporting ~~and Fire Protection Data~~* , ~~2016~~ 2021 edition.

NFPA 921, *Guide for Fire and Explosion Investigations,* ~~2017~~ 2024 edition.

NFPA 1006, *Standard for Technical Rescue Personnel Professional Qualifications,* ~~2017~~ 2021 edition.

NFPA 1026, *Standard for Incident Management Personnel Professional Qualifications,* ~~2018~~ 2024 edition.

NFPA 1405, *Guide for Land-Based Fire Departments That Respond to Marine Vessel Fires,* 2020 edition.

NFPA 1410, *Standard on Training for Emergency Scene Operations,* ~~2015~~ 2020 edition.

~~NFPA 1620, *Standard for Pre-Incident Planning,* 2020 edition.~~

~~NFPA 1670, *Standard on Operations and Training for Technical Search and Rescue Incidents,* 2017 edition.~~

NFPA 1660, *Standard for Emergency, Continuity, and Crisis Management: Preparedness, Response, and Recovery,* 2024 edition.

NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments,* 2020 edition.

NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting,* 2020 edition.

NFPA 1900, *Standard for Aircraft Rescue and Firefighting Vehicles, Automotive Fire Apparatus, Wildland Fire Apparatus, and Automotive Ambulances,* 2024 edition.

NFPA 1960, *Standard for Fire Hose Connections, Spray Nozzles, Manufacturer's Design of Fire Department Ground Ladders, Fire Hose, and Powered Rescue Tools,* 2024 edition.

~~NFPA 1901, *Standard for Automotive Fire Apparatus,* 2016 edition.~~

~~NFPA 1963, *Standard for Fire Hose Connections,* 2019 edition.~~

~~NFPA 1964, *Standard for Spray Nozzles and Appliances,* 2018 edition.~~

NFPA 1977, *Standard on Protective Clothing and Equipment for Wildland Fire Fighting and Urban Interface Fire Fighting*, ~~2016~~ 2022 edition.

NFPA 2500, *Standard for Operations and Training for Technical Search and Rescue Incidents and Life Safety Rope and Equipment for Emergency Services,* 2022 edition.

NFPA 5000®, *Building Construction and Safety Code®*, ~~2018~~ 2024 edition.

Supplemental Information

File Name	Description	Approved
1700_FR-62_2.4.docx		

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Wed Apr 24 14:09:01 EDT 2024

Committee Statement

Committee Statement: NFPA publications updated to currently issued documents.

Response Message: FR-62-NFPA 1700-2024

First Revision No. 72-NFPA 1700-2024 [Section No. 3.3.9]

3.3.9 BLEVE.

~~Boiling~~ An acronym for boiling liquid expanding vapor explosion. [**921,**~~2017~~ 2024]

Submitter Information Verification

Committee: FCO-AAA
Submittal Date: Thu May 30 09:46:55 EDT 2024

Committee Statement

Committee Statement: Definition changed to match the 2024 edition of NFPA 921.
Response Message: FR-72-NFPA 1700-2024

First Revision No. 73-NFPA 1700-2024 [Section No. 3.3.18]

3.3.18 Ceiling Layer.

A buoyant layer of hot gases and smoke produced by a fire in a compartment. ~~[**921,** 2017]~~

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Thu May 30 16:43:38 EDT 2024

Committee Statement

Committee Statement: Extract to NFPA 921 dropped. Title in NFPA 921 is "Upper Layer." "Ceiling Layer" is a preferred title for the term, even though it mirrors the definition of Upper Layer in NFPA 921.

Response Message: FR-73-NFPA 1700-2024

First Revision No. 74-NFPA 1700-2024 [Section No. 3.3.51]

3.3.51* Energy Storage System (ESS).

One or more ~~components assembled together~~ devices installed as a system capable of storing energy and providing electrical energy into the premises wiring system or an electric power production and distribution network. [**70**~~:~~ , ~~706.2~~ 2023]

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Thu May 30 16:52:17 EDT 2024

Committee Statement

Committee Statement: Definition for Energy Storage System (ESS) updated to 2023 edition of NFPA 70.

Response Message: FR-74-NFPA 1700-2024

First Revision No. 75-NFPA 1700-2024 [Section No. 3.3.63]

3.3.63 Fire.

A rapid oxidation process, which is ~~a gas phase~~ an exothermic chemical reaction, resulting in the evolution of light and heat in varying intensities. [**921,**~~2017~~ 2024]

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Thu May 30 16:55:46 EDT 2024

Committee Statement

Committee Statement: definition updated to referenced edition of NFPA 921

Response Message: FR-75-NFPA 1700-2024

First Revision No. 76-NFPA 1700-2024 [Section No. 3.3.76]

3.3.76 Flameover.

The condition where unburned fuel (pyrolysate) from ~~a~~ the originating fire has accumulated in the ~~ceiling~~ upper layer to a sufficient concentration (i.e., at or above the lower flammable limit) that it ignites and burns~~; can~~ . This can occur without ignition of, or prior to~~,~~ the ignition of, other fuels separate from the origin. [**921,**~~2017~~ 2024]

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Thu May 30 17:03:06 EDT 2024

Committee Statement

Committee Statement: Definition updated to match referenced NFPA 921 2024 edition.

Response Message: FR-76-NFPA 1700-2024

First Revision No. 77-NFPA 1700-2024 [Section No. 3.3.78]

3.3.78 Flammable Gas.

A material that is a gas at 68°F (20°C) or less at an absolute pressure of 14.7 psi (101.3 kPa), that is ~~ignitable~~ ignitible at an absolute pressure of 14.7 psi (101.3 kPa) when in a mixture of 13 percent or less by volume with air, or that has a flammable range at an absolute pressure of 14.7 psi (101.3 kPa) with air of at least 12 percent, regardless of the lower limit. [**55,**~~2020~~ 2023]

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Thu May 30 17:17:05 EDT 2024

Committee Statement

Committee Statement: Definition updated to match the 2023 edition of NFPA 55

Response Message: FR-77-NFPA 1700-2024

First Revision No. 78-NFPA 1700-2024 [Section No. 3.3.84]

3.3.84 Flashover.

A transition phase in the development of a compartment fire in which surfaces exposed to thermal radiation reach ignition temperature more or less simultaneously and, given sufficient availability of oxygen, fire spreads rapidly throughout the space, resulting in full room involvement or total involvement of the compartment or enclosed space. [**921,**~~2017~~ 2024]

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Thu May 30 17:37:20 EDT 2024

Committee Statement

Committee Statement: definition updated to the 2024 edition of NFPA 921.

Response Message: FR-78-NFPA 1700-2024

First Revision No. 79-NFPA 1700-2024 [Section No. 3.3.88]

3.3.88 Fuel.

~~A~~ Any material that will maintain combustion under specified environmental conditions. [**53,**~~2016~~ 2021]

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Thu May 30 17:54:58 EDT 2024

Committee Statement

Committee Statement: definition updated to the 2021 edition of NFPA 53.

Response Message: FR-79-NFPA 1700-2024

First Revision No. 80-NFPA 1700-2024 [Section No. 3.3.98]

3.3.98 Hazard.

~~Any arrangement of materials~~ A condition that presents the potential for harm or damage to people, property, or the environment . [**921**, ~~2017~~ 2024]

Submitter Information Verification

Committee: FCO-AAA
Submittal Date: Thu May 30 18:28:35 EDT 2024

Committee Statement

Committee Statement: Definition updated to the 2024 edition of NFPA 921.
Response Message: FR-80-NFPA 1700-2024

First Revision No. 81-NFPA 1700-2024 [Section No. 3.3.114]

3.3.114 Ignitible Liquid.

Any ~~liquid or the liquid phase of any material that is capable of fueling a fire, including a flammable liquid, combustible liquid, or any other material that can be liquefied and burned~~ combustible or flammable liquid . [**921,**~~2017~~ 2024]

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Thu May 30 18:47:55 EDT 2024

Committee Statement

Committee Statement: definition updated to the 2024 edition of NFPA 921.

Response Message: FR-81-NFPA 1700-2024

First Revision No. 71-NFPA 1700-2024 [Section No. 3.3.132]

~~**3.3.132** Layering.~~

~~The systematic process of removing debris from the top down and observing the relative location of artifacts at the fire scene. [**921,** 2017]~~

Submitter Information Verification

Committee: FCO-AAA
Submittal Date: Thu May 30 09:24:30 EDT 2024

Committee Statement

Committee Statement: Term is not used in the main body of the guide.
Response Message: FR-71-NFPA 1700-2024

First Revision No. 82-NFPA 1700-2024 [Section No. 3.3.135]

3.3.134 Liquid.

Any material that (1) has a fluidity greater than that of 300 penetration asphalt when tested in accordance with ASTM D5/D5M , *Standard Test Method for Penetration of Bituminous Materials*, or (2) is a viscous substance for which a specific melting point cannot be determined but that is determined to be a liquid in accordance with ASTM D4359, *Standard Test for Determining Whether a Material is a Liquid or a Solid*. [**30**,~~2018~~ 2024]

3.3.134.1 Combustible Liquid.

~~Any~~ An ignitible liquid that ~~has a closed-cup flash point at or above 100°F (37.8°C), as determined by the test procedures and apparatus set forth in Section 4.4 of NFPA 30 . Combustible liquids are classified according to Section 4.3 of NFPA 30~~ is classified as a Class II or Class III liquid. *(See 4.2.2 and 4.2.3 of NFPA 30 .)* [**30**,~~2018~~ 2024]

3.3.134.2 Flammable Liquid.

~~Any liquid that has a closed-cup flash point below 100°F (37.8°C), as determined by the test procedures and apparatus set forth in Section 4.4 of NFPA 30 and a Reid vapor pressure that does not exceed an absolute pressure of 40 psi (276 kPa) at 100°F (37.8°C), as determined by ASTM D323, *Standard Test Method for Vapor Pressure of Petroleum Products (Reid Method)* . Flammable liquids are classified according to Section 4.3 of NFPA 30 .~~ An ignitible liquid that is classified as a Class I liquid. *(See 4.2.1 of NFPA 30 .)* [**30**,~~2018~~ 2024]

Submitter Information Verification

Committee: FCO-AAA
Submittal Date: Thu May 30 18:50:53 EDT 2024

Committee Statement

Committee Statement: Definitions updated to the 2024 edition of NFPA 30.
Response Message: FR-82-NFPA 1700-2024

First Revision No. 83-NFPA 1700-2024 [Section No. 3.3.168]

3.3.167 Radiation.

Heat transfer by way of electromagnetic ~~energy~~ waves that are longer than visible light waves and shorter than radio waves . [**921**,~~2017~~ 2024]

Submitter Information Verification

Committee: FCO-AAA
Submittal Date: Thu May 30 19:06:54 EDT 2024

Committee Statement

Committee Statement: definition updated as it appears in the 2024 edition of NFPA 921
Response Message: FR-83-NFPA 1700-2024

First Revision No. 66-NFPA 1700-2024 [Section No. 3.3.189]

3.3.188 Smoldering.

~~Combustion~~ Self-sustained glowing combustion without flame, usually with incandescence and smoke. [**921,**~~2017~~ 2024]

Submitter Information Verification

Committee: FCO-AAA
Submittal Date: Thu Apr 25 12:56:03 EDT 2024

Committee Statement

Committee Statement: Definition for smoldering updated to 2024 edition of NFPA 921
Response Message: FR-66-NFPA 1700-2024

First Revision No. 68-NFPA 1700-2024 [Section No. 3.3.192]

3.3.191 Special Amusement Building.

A building or portion thereof that is temporary, permanent, or mobile and contains a ~~device~~ ride or ~~system that conveys passengers or~~ device that conveys patrons where the patrons can be contained or restrained, or provides a walkway along, around, or over a course in any direction as a form of amusement or entertainment, and arranged so that the egress path is not readily apparent due to visual or audio distractions ~~or~~ , contains an intentionally confounded egress path, or is not readily available due to the mode of conveyance through the building or structure. [**101,**~~2018~~ 2021]

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Thu Apr 25 13:07:43 EDT 2024

Committee Statement

Committee Statement: definition updated to match changes of the updated standard from which it is extracted from.

Response Message: FR-68-NFPA 1700-2024

First Revision No. 84-NFPA 1700-2024 [Section No. 3.3.193]

3.3.192 Specific Gravity (~~air) (vapor density~~ of a gas or vapor).

The ratio of the average molecular weight of a gas or vapor to the average molecular weight of air, or the ratio of the density of a gas to the density of dry air at standard temperature and pressure . [**921,**~~2017~~ 2024]

Submitter Information Verification

Committee: FCO-AAA
Submittal Date: Thu May 30 19:11:41 EDT 2024

Committee Statement

Committee Statement: definition updated to the 2024 edition of NFPA 921.
Response Message: FR-84-NFPA 1700-2024

First Revision No. 85-NFPA 1700-2024 [Section No. 3.3.197]

3.3.196 Sprinkler System.

A system, commonly activated by heat from a fire and discharges water over the fire area, that consists of an integrated network of piping designed in accordance with fire protection engineering standards that includes a water supply source, a ~~water~~ control valve, a waterflow alarm, and a drain. The portion of the sprinkler system above ground is a network of ~~specially~~ specifically sized or hydraulically designed piping installed in a building, structure, or area, generally overhead, and to which sprinklers are attached in a ~~system~~ systematic pattern. [**13,**~~2019~~ 2022]

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Thu May 30 20:47:01 EDT 2024

Committee Statement

Committee Statement: Definition changed to match the extracted 2022 edition of NFPA 13

Response Message: FR-85-NFPA 1700-2024

First Revision No. 86-NFPA 1700-2024 [Section No. 3.3.200]

3.3.199 Standard Operating Procedure (SOP).

A written directive that ~~established specific operation~~ establishes specific operational or administrative methods to be followed routinely for the performance of a task or for the use of equipment. [**475,** 2017]

Submitter Information Verification

Committee: FCO-AAA
Submittal Date: Thu May 30 21:10:26 EDT 2024

Committee Statement

Committee Statement: definition corrected to match referenced 2017 edition of NFPA 475
Response Message: FR-86-NFPA 1700-2024

First Revision No. 67-NFPA 1700-2024 [Section No. 3.3.228]

3.3.227 Vacant.

~~No~~ A space having no persons, furnishings, or equipment present. [**901,**~~2016~~ 2021]

Submitter Information Verification

Committee: FCO-AAA
Submittal Date: Thu Apr 25 13:01:49 EDT 2024

Committee Statement

Committee Statement: Definition updated to match current edition of NFPA 901
Response Message: FR-67-NFPA 1700-2024

First Revision No. 87-NFPA 1700-2024 [Section No. 3.3.234]

3.3.233 Ventilation.

~~Circulation of air in any space by natural wind or convection or by fans blowing air into or exhausting air out of a building; a fire-fighting~~ The movement of gases within, into, or from any compartment or space or the firefighting operation of removing smoke and heat from the structure by opening windows and doors or making holes in the roof. [**921,**~~2017~~ 2024]

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Thu May 30 21:29:15 EDT 2024

Committee Statement

Committee Statement: Definition updated to match the extract version of the 2024 edition of NFPA 921.

Response Message: FR-87-NFPA 1700-2024

First Revision No. 2-NFPA 1700-2024 [Chapter 4 [Title Only]]

~~General~~ Background

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Wed Apr 03 21:32:47 EDT 2024

Committee Statement

Committee Statement: The technical committee recognized that this chapter should be labeled "Background" based on the content contained in it.

Response Message: FR-2-NFPA 1700-2024

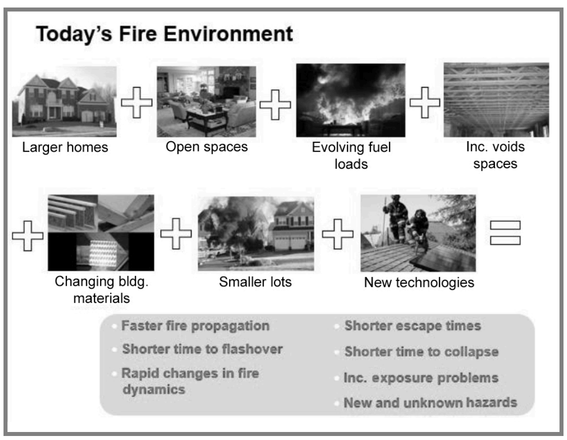
Public Input No. 3-NFPA 1700-2023 [Chapter 4 [Title Only]]

First Revision No. 3-NFPA 1700-2024 [Section No. 4.3.2]

4.3.2 Changes in ~~the Fire Fighters~~ Firefighters ' Work Environment.

~~Over the past 50 years~~ Since the 1970s , changes in construction materials, construction methods, insulation, and furnishings have changed the means and the speed of fire growth within a structure. Both research experiments and line-of-duty death (LODD) and line-of-duty injury (LODI) investigations have demonstrated the importance of understanding how ventilation affects fire behavior. Fires in today's fire environment, fueled predominantly by synthetic materials, commonly become ventilation-limited. How, where, and when a fire receives oxygen greatly impacts the fire dynamics and the resulting thermal environment inside the structure. As outlined in Figure 4.3.2, many factors in ~~the~~ construction methods, building materials, fuel loads, and power technologies have transformed ~~the~~ firefighters' working environment. The construction techniques and materials used to build a house have changed over the past 50 years ~~have changed~~ . Engineered wood products have enabled long spans and open areas for improved use of living space in houses. Gypsum board interior linings have been reduced en masse by 30 percent in recent years. In order to increase the energy efficiency of houses, insulation has improved, walls are wrapped in plastic to limit incursion of air and water, and multipane, low-emissivity windows are now the norm. The objects and materials inside ~~our~~ homes have changed as well. Some areas have seen more of these changes than others. It is important to note that even though a jurisdiction may have very few newly built homes, many structures are being renovated using new building materials, construction methods, and design features.

Figure 4.3.2 Today's Fire Environment. ***(Source: UL FSRI.)***



Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Wed Apr 03 21:37:47 EDT 2024

Committee Statement

Committee Statement: The technical committee determined that 50 year benchmark would constantly change with each edition and wanted it to be date certain.

Response Message: FR-3-NFPA 1700-2024

First Revision No. 4-NFPA 1700-2024 [Section No. 4.3.3]

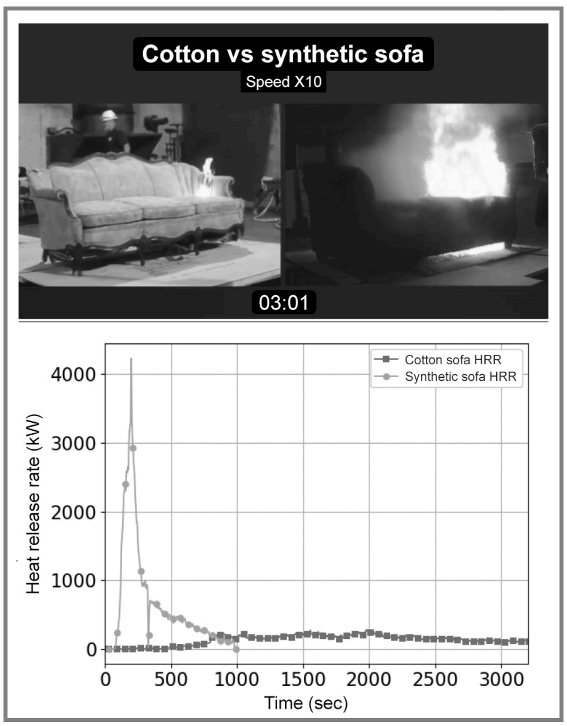
4.3.3 ~~Furnishings~~ Changes in Fuel Loads .

~~In the 1950s a wide range of synthetic materials called polymers became available for use in clothing, furniture, interior finish, and insulation. Today, the use of polyester, polystyrene, polyethylene, nylon, and polyurethane foam has become commonplace in homes, vehicles, and industry. Durability, comfort, and economics all play a role in the design and manufacturer of furnishings that people choose to buy. Flexible polyurethane foam is one of the most common materials used in upholstered furniture. Figure 4.3.3 illustrates the speed of fire development, fire size, and heat release rate between a sofa with cotton cushions and a sofa with polyurethane foam cushions.~~

4.3.3.1 Synthetic Materials.

In the 1950s, a wide range of synthetic materials called polymers became available for use in clothing, furniture, interior finish, and insulation. Today, the use of polyester, polystyrene, polyethylene, nylon, and polyurethane foam has become commonplace in homes, vehicles, and industry. Durability, comfort, and economics all play a role in the design and ~~manufacturer~~ manufacturing of furnishings that people choose to buy. Flexible polyurethane foam is one of the most common materials used in upholstered furniture. Figure 4.3.3.1 illustrates the speed of fire development, fire size, and heat release rate between a sofa with cotton cushions and a sofa with polyurethane foam cushions.

Figure 4.3.3.1 Cotton Versus Synthetic Furnishings. ***(Source: UL FSRI.)***



4.3.3.2 Lithium-Ion Batteries.

Commercial development of rechargeable lithium ion (li-ion) batteries began in the 1990s. As a result, devices that use li-ion battery power now fill homes and businesses. Synthetic materials have a higher energy density than natural materials, which can result in faster fire growth and higher heat release rates. Li-ion batteries also have a higher energy density than the lead-acid and nickel-cadmium batteries they are replacing. The widespread use of li-ion batteries has resulted in deadly residential and commercial fires. Firefighters have been injured in fires involving li-ion-battery-powered electric vehicles and energy storage systems. Hazards resulting from these battery fires may range from stranded energy, toxic smoke, and rapid fire development to explosions. Best practices for fighting these types of fires are actively being researched.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Wed Apr 03 21:58:08 EDT 2024

Committee Statement

Committee Statement: Technical committee determine the section pertain to changes in fuel load, of which furnishings is only a part of. Li-ion batteries are recognized as an emerging fuel load.

Response Message: FR-4-NFPA 1700-2024

First Revision No. 5-NFPA 1700-2024 [Section No. 4.3.4.1]

4.3.4.1

~~During the same 50-year period~~ The advent of personal protective equipment, including protective clothing, boots, gloves, helmets, and self-contained breathing apparatus (SCBA) ~~,~~ has changed the tactics firefighters use on the fireground ~~have also changed~~ . ~~The~~ Former reliance on indirect, or exterior, attack prior to entry has changed to a focus on interior, direct fire control.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Wed Apr 03 22:09:25 EDT 2024

Committee Statement

Committee Statement: The technical committee identified some changes in PPE that impacted tactics since the 1970s.

Response Message: FR-5-NFPA 1700-2024

First Revision No. 6-NFPA 1700-2024 [Section No. 4.3.4.3]

4.3.4.3

~~The~~ SCBA use ~~of self-contained breathing apparatus (SCBA)~~ has improved conditions for firefighters. The continued development of SCBAs with lighter materials, increased air supply, electronic monitoring, and warning devices also have made working in a smoke-filled building safer. Early versions of respiratory protective equipment have been around for more than 100 years, as shown in Figure 4.3.4.3, ~~however~~ though routine use of SCBA did not begin for many fire departments until the 1980s. Continued developments in the fields of electronics and sensing have produced improvements in situational awareness for firefighters in the form of thermal imaging and firefighter tracking and accountability systems.

Figure 4.3.4.3 ~~Fire Fighter~~ Significant Changes to Firefighter Protective Equipment ~~Changed Significantly~~ . *(Source: UL FSRI.)*

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Wed Apr 03 22:14:15 EDT 2024

Committee Statement

Committee Statement: Style change in using acronym for SCBA only.

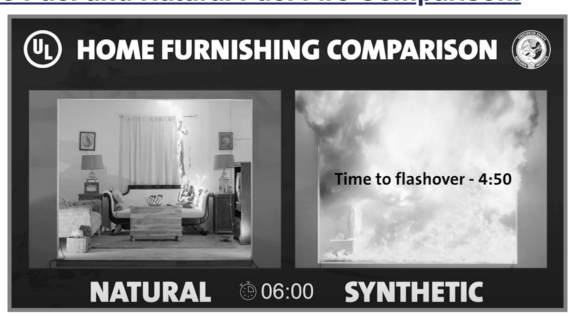
Response Message: FR-6-NFPA 1700-2024

First Revision No. 7-NFPA 1700-2024 [Section No. 4.6.1]

4.6.1 Time to Flashover.

~~The paper,~~ Many of the changes that have occurred on the fireground, including home size, geometry, contents, construction materials, and construction methods, are discussed in Kerber's "Analysis of Changing Residential Fire Dynamics and Its Implications on Firefighter Operational Timeframes~~,~~ " ~~by Kerber discusses many of the changes that have occurred on the fireground~~ [8]. ~~These changes include home size, geometry, contents, construction materials, and construction methods.~~ As a result of these changes , ~~the~~ fire development in structures and ~~the~~ fire's response to traditional firefighting tactics has also changed. Kerber conducted a series of compartment fire experiments to examine the difference in time to flashover between a room furnished with legacy (natural) fuels and a room furnished with modern (synthetic) fuels. ~~Legacy~~ Natural fuels ~~meant~~ are ~~furnishings made from~~ wood, steel, and cotton. ~~Modern~~ Synthetic fuels are ~~characterized by~~ polyurethane foam, polyester fiber and fabric, engineered wood, and plastics in ~~many~~ different forms. Each room was ignited by a small open flame from a candle on ~~the~~ a sofa. The flashover times for the modern room averaged 235 seconds after ignition. Only two of the three legacy room fires resulted in flashover~~. The~~ , the average ~~flashover~~ time~~s~~ for ~~the two legacy rooms~~ which was 1912 seconds after ignition. It took eight times longer for the cotton sofa of the legacy room , compared to the synthetic material sofa ~~comprised of synthetic materials~~ of the modern room , to generate enough heat release rate to spread fire throughout the room [8]. The driving difference in these experiments was the sofa with cushions made from polyurethane foam and polyester batting. ~~These~~ Such synthetic fuels can significantly change the thermal environment to which firefighters respond ~~to~~ . Figure 4.6.1 contains comparison images from a UL Fire Safety Research Institute video demonstrating how synthetic fuels enable rapid fire growth, fuel-rich fire conditions, and faster transitions to flashover than natural fuels.

Figure 4.6.1 Synthetic Fuel and Natural Fuel Fire Comparison.



Supplemental Information

File Name	Description	Approved
Figure_4.6.1_FR-7.jpg		

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Wed Apr 03 22:17:21 EDT 2024

Committee Statement

Committee Statement:	The technical committee wanted to include the distinction between natural and synthetic fuels.
Response Message:	FR-7-NFPA 1700-2024

First Revision No. 61-NFPA 1700-2024 [Section No. 5.5.3.1]

5.5.3.1 Heat Release Rate.

Heat release rate (HRR) is the rate at which fire releases energy. It is , or the power output of the fire. HRR is measured in units of watts (W), kilowatts (kW), or megawatts (MW). The heat release rate HRR of a fire is variable over time and is dependent on the fuel load characteristics, available oxygen available (ventilation), and enclosure characteristics. The HRR of a fire inside a compartment or structure can influence interior temperatures, compartment pressure, the amount of smoke produced by the fire, structural stability, and the amount of water needed to control the fire. *(See Table 5.5.3.1.)*

Table 5.5.3.1 Representative Peak Release Rates HRRs (Unconfined Burning) [921:5.6.3.1]

-	**Mass**		**Peak HRR (kW)**
Fuel	**kg**	**lb**	
Wastebasket, small	0.7–1.4	1.5–3	4–50
Trash bags, 42 L (11 gal) with mixed plastic and paper trash	2.5	7.5	140–350
Cotton mattress	12–13	26–29	40–970
TV sets	31–33	69–72	120 to over 1500
Plastic trash bags/paper trash	1.2–14	2.6–31	120–350
PVC waiting room chair, metal frame	15	34	270
Cotton easy chair	18–32	39–70	290–370
Gasoline or kerosene in 0.2 m^2 (2 ft^2) pool	19	42	400
Christmas trees, dry	6–20	13–44	3000–5000
Polyurethane mattress	3–14	7–31	810–2630
Polyurethane easy chair	12–28	27–61	1350–1990
Polyurethane sofa	51	113	3120
Wardrobe, wood construction	70–121	154–267	1900–6400

Sources: Values are from the following publications:

Babrauskas, V. and Krasny, J., *Fire Behavior of Upholstered Furniture*, NBS Monograph 173 Fire Behavior of Upholstered Furniture.

Babrauskas, V., "Heat Release Rates," in *SFPE Handbook of Fire Protection Engineering*, 3rd 5th ed., National Fire Protection Association.

Lee, B.T., *Heat Release Rate Characteristics of Some Combustible Fuel Sources in Nuclear Power Plants*, NBSIR 85-3195.

NFPA 72.

[**921:** Table 5.6.3.1]

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Wed Apr 24 14:05:25 EDT 2024

Committee Statement

Committee Statement: extracted table updated to the 2024 edition of NFPA 921

Response Message: FR-61-NFPA 1700-2024

First Revision No. 10-NFPA 1700-2024 [Section No. 7.5.3.2.2]

7.5.3.2.2

Common life safety features may include the following:

(1) Travel distances

(2) Signage

(3) Emergency lighting

(4) Elevators

(5) Fire escapes

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Thu Apr 18 22:47:51 EDT 2024

Committee Statement

Committee Statement: Fire Escapes are an important life safety feature of Class III multiple dwellings

Response Message: FR-10-NFPA 1700-2024

Public Input No. 4-NFPA 1700-2023 [Section No. 7.5.3.2.2]

First Revision No. 11-NFPA 1700-2024 [Section No. 7.5.3.4]

7.5.3.4 Vulnerabilities of Type III Buildings.

Type III buildings may be protected with active sprinkler protection but, in many occupancies ~~there is no~~ , a lack of sprinkler protection~~, leading~~ leads to catastrophic collapse very early in the event. Firefighters must use extreme caution in these structures because of the likelihood of early structural collapse due to the effect of heat on unprotected structural components. Common vulnerabilities to Type III construction include the following:

(1) Open floor plans, achieved by ~~utilizing~~ using lightweight truss construction

(2) Limited, unknown, or inconsistent building fire protection and life safety features

(3) Ventilation issues (e.g., heat, smoke control)

(4) Collapse zone consideration

(5) Fire spread to adjacent separated spaces within the building envelop through penetrations, unprotected openings, interstitial spaces, and so forth

(6) When present, fire sprinkler systems for residential occupancies ~~might~~ not ~~provide~~ providing coverage in concealed combustible spaces, such as attics

(7) Difficulty completing 360-degree survey due to construction features, size of building footprint, or absence of alleys to rear

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Thu Apr 18 22:48:18 EDT 2024

Committee Statement

Committee Statement: A key weakness of these buildings in terms off Firefighting is the difficulty of completing a 360 degree survey early on in the operation. Obstacles to this include the size of the building, adjoining buildings directly adjacent with no alley ways to the rear. It can be difficult to determine what floor a fire in the rear apartments is on without this early survey. This is especially dangerous when dealing with basement fires where the only access is via the interior or a walk out basement exit in the rear.

Thank you for you consideration.

Response Message: FR-11-NFPA 1700-2024

Public Input No. 5-NFPA 1700-2023 [Section No. 7.5.3.4]

First Revision No. 9-NFPA 1700-2024 [New Section after 7.5.4.1]

7.5.4.1.1 Type IV Construction: Mass Timber Buildings.

7.5.4.1.1.1 Type IVA.

Type IVA construction permits greater heights and areas based on full interior protection of gypsum board. Characteristics include the following:

(1) Height up to 18 stories in Occupancy M, Occupancy B, and Occupancy R

(2) Unlimited area [ft ^{2} (m ^{2})]

7.5.4.1.1.2 Type IVB.

Type IVB construction permits greater heights and areas based on full interior protection of gypsum board. Characteristics include the following:

(1) Height up to 12 stories in Occupancy M, Occupancy B, and Occupancy R

(2) Limited area [ft ^{2} (m ^{2})]

7.5.4.1.1.3 Type IVC.

Type IVC construction permits greater heights and areas based on greater degrees of fire protection. Characteristics include the following:

(1) Height up to 9 stories

(2) Limited height of 85 ft (25.91 m)

7.5.4.1.1.4 Additional Protection Features.

Additional protection features of mass timber buildings include the following:

(1) Special inspections during construction

(2) Annual inspections of active and passive fire protection

(3) Redundant water supplies in structures over 180 ft (54.86 m)

(4) Passive protection in place during construction two floors below the active floor

(5) Compliance with ANSI/APA PRG 320, *Standard for Performance-Rated Cross-Laminated Timber*

Supplemental Information

File Name	Description	Approved
1700-2021_Chapter_7_FR-9.docx		
1700-2021_Chapter_7_FR-9.docx	For prod use	

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Thu Apr 18 22:38:09 EDT 2024

Committee Statement

Committee Statement:	The TC identified new building materials and classifications related to Mass Timber construction to be addressed.
Response Message:	FR-9-NFPA 1700-2024

First Revision No. 8-NFPA 1700-2024 [New Section after 7.7.2]

7.7.2.1 Battery Energy Storage Systems (BESSs).

Battery energy storage systems (BESSs) with li-ion batteries present a range of potential safety hazards to firefighters, including high voltages and thermal runaway. Thermal runaway can result in the release of hydrogen and other flammable gases, which can contribute to rapid fire development, cell or material ejection, flame jetting, or explosion. Potential post-event hazards include stranded energy, further thermal runaways, and materials contaminated with battery residue. Tactical considerations for the fire service include the following:

(1) Ventilation of an ESS installation may result in a deflagration or rapid transition to flashover.

(2) Thermal imaging cameras do not enable evaluation of the number or location of ESS units in thermal runaway.

(3) Thermal imaging cameras enable a limited ability to determine whether a suppression system has operated or is operating.

(4) Thermal imaging cameras are not a viable tool for determining the nature of visible vapors [e.g., battery gas, steam, perfluoro(2-methyl-3-pentanone)].

(5) First responders should consider the practicality of continuous monitoring of the interior and exterior gas environment.

(6) Gas meters and visual observations should be used for defining the hot zone or exclusion zone at BESS incidents.

(7) Full structural PPE (i.e., Level D ensemble) with full SCBA should be donned before performing size-ups or operating within the hot zone.

(8) Portable gas meters have limited effectiveness in evaluating the potential for explosive atmospheres within the ESS container.

(9) Fire service portable gas meters have limitations in battery gas environments.

7.7.2.2 Failure Responses.

Types of li-ion battery failure responses for energy storage systems include the following:

(1) Commercial BESS: above 20 kWh

(2) Residential BESS: 20 kWh and less

(3) Electrical vehicle in a residential garage

(4) Micromobility device in a residential occupancy

7.7.2.3 Tactical Considerations.

Tactical considerations for energy storage systems include the following:

(1) When li-ion batteries undergo thermal runaway without burning, an explosion hazard begins to develop.

(2) The timing of a battery gas explosion is unpredictable, and the severity of a battery gas explosion is dependent on gas quantity.

(3) Unburned battery gas ignites readily and can increase the flammability of the smoke in a ventilation-limited fire.

(4) Without active fire, li-ion battery pack thermal runaways may be recognizable by white/gray battery gas leaking from the structure and forming low-hanging clouds.

(5) Stratification of smoke at the ceiling and the floor, with or without active fire, indicates the thermal runaway of lithium-ion batteries.

(6) There are no reliable visual or thermal imaging indicators to confirm battery involvement from the exterior of the structure during an active fire.

(7) Portable gas meters are not effective for determining whether a garage fire involves li-ion batteries.

(8) During size-up of residential energy storage system installation fires, the following additional indicators should be considered beyond smoke appearance:

    (a) Response area (know your running district and frequency of installations or electric vehicles)

    (b) Presence of photovoltaic systems

    (c) Meter altering (additional connections)

    (d) Labeling

    (e) Presence of electric vehicles

    (f) Sounds and smells

    (g) Dispatch information (eyewitness accounts)

(9) Because firefighters are at greatest risks for explosion hazards in the driveway and at doors, windows, and other vent points, apparatus or stage crews should not be parked in line of the front of the garage door.

(10) If there is a suspected case of batteries in thermal runaway and no indicators of an active fire, approach or entrance to take portable gas meter measurements should not be attempted.

(11) Because conditions can change rapidly, full structural PPE with SCBA should be donned before performing size-up and be worn in the vicinity of heat-impacted batteries until removed from the scene.

(12) Because conditions can change rapidly, hose lines should be pre-deployed, charged, and ready for operations before ventilation or entry when li-ion thermal runaways are suspected.

(13) Hose lines should remain available to manage reignition or thermal runaway of heat-impacted batteries until removed from the scene.

Supplemental Information

File Name	Description	Approved
1700-2021_Chapter_7_FR-8.docx		
1700-2021_Chapter_7_FR-8.docx	For prod use	

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Thu Apr 18 22:16:32 EDT 2024

Committee Statement

Committee Statement: The new section lists the potential hazards to FFs operating on a Li-Ion powered Battery Energy Storage System and provides a list of tactical considerations taken from current research findings. This is ongoing research so additional information may be available to include in the second revision.

Response Message: FR-8-NFPA 1700-2024

First Revision No. 70-NFPA 1700-2024 [Section No. 8.7]

8.7 SCBA and SCBA Face Pieces (NFPA 1981).

Equipment produced to 2013 and previous editions of the standard (before 2013) NFPA 1981 were tested to a lower thermal exposure. As determined in “Thermal degradation of self-contained breathing apparatus facepiece lenses under radiant thermal loads,” comparison of SCBA facepiece lenses compliant with the 2007 edition of NFPA 1981 to lenses compliant with the 2013 edition of NFPA 1981 resulted in differences thermal damage timing. Specifically, the facepiece lens model meeting the 2013 edition had statistically significantly longer times to crazing, bubbling, and hole formation. Hole formation occurred only at the highest tested heat flux (20 kW/m^2) for the 2013 edition model, while lenses meeting older editions developed holes at heat flux exposures of 10 kW/m^2 and 15 kW/m^2.

8.7.1 Heat and Flame Resistance Test.

~~The SCBA facepiece is mounted on a headform and placed in a convection oven at 203°F (95°C) for 15 minutes, while breathing is simulated at a ventilation rate of 10.6 g/min (40 L/min). After the headform is removed from the oven, the breathing rate is increased to 27.2 g/min (103 L/min) and the mask is exposed to direct flame contact at a temperature of 1500°F to 2102°F (815°C to 1150°C) for 10 seconds. Immediately following the direct flame exposure, the SCBA and mannequin are dropped 5.9 in. (150 mm). During the test, no components of the SCBA may fail or separate from the assembly, no afterflame can be sustained longer than 2.2 seconds, and positive pressure must be maintained within the facepiece throughout the test. In addition, the lens cannot incur damage that obscures visual acuity below 20/100.~~

8.7.1.1

Heat and resistance flame tests include the following steps:

(1) The SCBA facepiece is mounted on a headform and placed in a convection oven at 203°F (95°C) for 15 minutes, while breathing is simulated at a ventilation rate of 10.6 g/min (40 L/min).

(2) After the headform is removed from the oven, the breathing rate is increased to 27.2 g/min (103 L/min) and the mask is exposed to direct flame contact at a temperature of 1500°F to 2102°F (815°C to 1150°C) for 10 seconds.

(3) Immediately following ~~the~~ direct flame exposure, the SCBA and mannequin are dropped 5.9 in. (150 mm).

8.7.1.2

During the test, no components of the SCBA may fail or separate from the assembly, no afterflame can be sustained longer than 2.2 seconds, and positive pressure must be maintained within the facepiece throughout the test. In addition, the lens cannot incur damage that obscures visual acuity below 20/100.

8.7.2 Elevated Heat and Flame Resistance Test.

~~This~~ The elevated heat and flame resistance test ~~introduces~~ places the SCBA facepiece and breathing mannequin ensemble into a convection oven at 500°F (260°C) for 5 minutes prior to direct flame contact for 10 seconds and a vertical drop test. Any loss of positive pressure during the test results in a failure.

8.7.3 Lens Radiant Heat Test.

The lens radiant heat test exposes SCBA facepieces, mounted on a headform, ~~are exposed~~ to a constant heat flux of 1.32 Btu/ft^2 (15 kW/m^2) for 5 minutes, ~~. After 5 minutes of exposure,~~ after which the radiant source is removed and the headform is dropped 5.9 in. (150 mm). The facepiece is required to maintain a positive pressure air supply within certain limits for a total of 24 minutes~~. Any~~ , and any loss of positive pressure during the test results in a failure.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Mon Apr 29 13:45:31 EDT 2024

Committee Statement

Committee Statement: Additional text demonstrating the improvements in the thermal resistance of SCBA facepiece lenses

with implementation of the 2013 edition of NFPA 1981.

Response Message: FR-70-NFPA 1700-2024

First Revision No. 19-NFPA 1700-2024 [Section No. 9.1]

9.1 Scope.

This chapter addresses the sources of information that can be ~~utilized~~ used to initiate strategic decisions. The purpose of initial strategic decisions should be to eliminate situations in which firefighters are working in offensive firefighting positions during defensive fire conditions. Incident strategy is defined as the position from which fire control as well as search and rescue work will take place based on the defined incident hazard zone.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Fri Apr 19 10:04:05 EDT 2024

Committee Statement

Committee Statement: The technical committee added an explanation as to why strategic decisions are critical on the fire ground.

Response Message: FR-19-NFPA 1700-2024

First Revision No. 20-NFPA 1700-2024 [Section No. 9.4.1]

9.4.1 Existing Reference Materials.

Materials such as pre-incident plans and maps should be developed ~~per~~ in accordance with NFPA ~~1620~~ 1660 ~~, providing~~ and should provide information regarding the structure, its contents, and occupancy.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Fri Apr 19 10:07:15 EDT 2024

Committee Statement

Committee Statement: The technical committee identified that NFPA 1620 is consolidated into NFPA 1660, Standard for Emergency, Continuity, and Crisis Management: Preparedness, Response, and Recovery.

Response Message: FR-20-NFPA 1700-2024

First Revision No. 18-NFPA 1700-2024 [Section No. 9.5]

9.5 Initial Arrival Factors.

9.5.1

The initial fire control strategy should be assessed through ~~evaluation~~ size-up of the overall conditions upon arrival. The incident strategy should be continuously evaluated throughout the incident until the hazard has been mitigated, the victims have been located and removed, and property loss has been stopped.

9.5.2

Initial arrival factors should include considerations of the following:

~~Bystander/witness statements~~

~~Access concerns on the property~~

~~Building height, size, and stability~~

~~Occupancy type~~

~~Construction type~~

~~Wind direction relative to the building location and configuration~~

~~Fire location, size, extent~~

~~Civilian and fire fighter life safety~~

~~Suspected direction of fire and smoke travel within the structure (flow path)~~

~~Smoke and fire exposures exterior to the structure~~

~~Presence and status of fixed fire protection systems~~

~~Fire fighter safety building marking systems~~

~~Resources available~~

(1) Fire and smoke conditions

(2) Building construction type

(3) Occupancy classification

(4) Hazard to life

(5) Arrangement of the structure(s)

(6) Resources available

(7) Action to be taken

(8) Special circumstances

9.5.3

Upon arrival at an incident, firefighters and officers will need to ~~take into account~~ consider all the pre-arrival factors and then combine those with the on-scene factors. ~~These on~~ On -scene factors are the observations and knowledge of the incident scene that ~~help~~ assist in determining the incident strategy. Arriving firefighters and officers should identify the most significant incident factors and communicate them as directed within a department's incident command system .

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Fri Apr 19 09:51:14 EDT 2024

Committee Statement

Committee Statement: The technical committee determined to more clearly define the value of size up and that it must be ongoing until the incident objectives have been met. Additionally, the TC changed text to match the broad critical fire ground factor categories found in multiple standards, documents, and reports across the fire service. The TC added to text regarding standard communication for critical factors to ensure that all personnel on the fire ground are informed and that it a standard practice to improve common operating picture.

Response Message: FR-18-NFPA 1700-2024

First Revision No. 17-NFPA 1700-2024 [Section No. 9.6]

9.6 360-Degree Survey.

9.6.1

A visual assessment of all four sides of the structure looking at smoke conditions, fire conditions, openings, life safety and victim potential, and personnel hazards is essential to assessing the fire dynamics occurring within the building to the extent practicable.

9.6.2

Information obtained during the 360-degree survey should challenge and verify the initial arriving A-side size-up and critical factors . This may involve a change in strategy from offensive to defensive or from defensive to offensive. Changing conditions or building layout and integrity should initiate a reassessment of strategy decision.

9.6.3

~~The use of a~~ A 360-degree survey of a structure fire is extremely important concerning the possible location of occupants, fire dynamics, and crew safety information. The exterior survey should provide essential data ~~to~~ for ~~develop~~ developing an incident action plan.

9.6.4

A 360-degree survey should be focused on the protection of all occupants in conjunction with controlling the fire and maintaining the tenability of the likely avenues of exit by occupants from the building ~~by occupants~~ .

9.6.5

Considerations should include the following:

(1) Number of stories, A and C sides

(2) Verify basement type (finished or unfinished) and consider the following factors:

- (a) Type of windows
- (b) Likelihood of occupancy

(3) Presence of occupant escape systems

(4) Utilities, including the following:

- (a) Electrical drops
- (b) Fuel gas tanks
- (c) Natural gas service (location of shutoff)
- (d) Propane tanks (above or below ground)

(5) Pre-existing structural hazards

(6) Hazardous grade changes

(7) Roof type and construction

(8) Presence of fire protection features (e.g., hydrants, FDC, fire pump~~, etc.~~)

9.6.6

If available and appropriate, a thermal imager (TI) is a valuable tool ~~and~~ that should be used during the initial 360-degree size-up to assist in determining fire location and extension.

Supplemental Information

File Name	Description	Approved
1700_FR-17_9.6.docx		

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Fri Apr 19 09:06:16 EDT 2024

Committee Statement

Committee Statement: The technical committee added life safety potential to the items required in 360-degree size up. Also adding text to assist with the standard of analyzing 360-degree size up to compare critical factor information compared to initial A side size up to confirm or change initial actions. Additionally adding text to ensure building integrity is also considered not just fire/smoke conditions. Added text for propane tanks as this has proven to be an explosive hazard that has gone unrecognized and created severe threats/injury to firefighters based on it's specific gravity.

Response Message: FR-17-NFPA 1700-2024

First Revision No. 16-NFPA 1700-2024 [Section No. 9.7]

9.7 Assessment of Fire Dynamics to Determine Strategy.

Factors observed from the exterior of the structure should be used ~~for the determination of~~ to determine interior conditions. Case studies of LODD and near-miss incidents and corresponding firefighting research studies have shown that addressing the observed conditions or known information prior to interior operations improved conditions, both for firefighting and occupant survival. This approach reduced the risks of unknown conditions (e.g., unexpected floor plan, high energy fuel load, lack of visibility, high heat, exhaust portion of flow path, loss of structural integrity) that may be encountered as fire operations move to the interior.

9.7.1 Smoke and Fire Conditions.

Specific evaluation of smoke, air, flame, and heat conditions issuing from an opening can be made by observing volume, speed/velocity, optical density, and color. Fires that have become ventilation-limited may present with little to no smoke showing from the exterior when initial companies arrive on scene. Members on scene should continually evaluate smoke production and characteristics throughout the course of the incident and make tactical adjustments as needed based on changing or deteriorating conditions. Smoke and fire conditions can assist in locating the source of the fire.

9.7.2 Fuel Load.

An increased fuel load in a structure may cause higher heat release rates and longer burn times. Fuel packages may be arranged closer to structural elements, resulting in a larger threat of structural involvement in the fire. Comparison ~~should be made of~~ between the fuel load ~~vs.~~ and the available water application should be made .

9.7.3 Openings.

Openings can include windows, doors, garage~~/~~ or roll-up doors, skylights, gable~~/~~ or ridge vents, and any other similar openings designed into the building. Fire conditions can further create additional openings as a result of burned-through sections of the roof or walls or the breaching of windows and doors by a developing fire. Openings may be exhausting smoke ~~and/~~ or fire conditions to the exterior, ~~may be~~ serving as air inlets for exhaust openings in other portions of the building, or ~~may be doing~~ both as the pressure inside the building naturally seeks equilibrium ~~due to the developing fire~~ .

9.7.4 Assessing Flow Path.

The flow path is the route by which the flow of gases, including air and fire gases, move from high pressure to low pressure. Initial arriving companies need to evaluate all existing openings in the building to develop an accurate ventilation profile for the early stages of the incident prior to determination of strategy. Flow path assessment should include an evaluation of the neutral plane, relative to the size and physical position of the opening ~~in relation~~ , relative to the fire location. ~~Another consideration should include the~~ The direction of flow within each opening should also be considered . Opening of doors and windows for the purposes of firefighter entry can affect the flow path and should be considered. ~~Some~~ Additional things to consider when assessing the flow path are the type of flow (i.e., unidirectional, bidirectional, or dynamic) and the characteristics of the flow (i.e., height within the boundaries of a compartment or at an opening, the degree of turbulence and its direction, velocity, and shape).

9.7.5 Weather Conditions.

The impact of wind on a fire should be considered. Wind speeds of 10 mph (16.1 km/h) or greater may cause a high pressure in one area of the building and lower pressures in others. This pressure difference can affect the ventilation profile. ~~Consideration should be given to temperature~~ Temperature and its influence on stack effect should be considered .

9.7.6 Accessibility of the Structure.

Initial arriving units should determine accessibility to the structure and its surroundings. ~~Consideration should be given to the~~ The ability to position apparatus to allow for the use of tools and equipment effectively~~. Consideration should be given to~~ and the ability of crews to access the structure ~~via~~ on foot and by ground ladders should be considered .

9.7.7 Fire Progression.

~~Based upon the 360-degree survey, identify the~~ The fire's suspected direction of travel or potential directions of travel~~. Consider dynamic~~ should be identified based on the 360-degree survey. Dynamic events such as changes in ventilation and application of cooling, which may affect the path of travel, should be considered . What is the current perimeter of the fire, and where is it spreading?

9.7.8 Fire Control Positioning.

Determining the size and location of the fire assists in determining the safest and most effective fire control positions for fire suppression personnel. Fire control should be done from the most advantageous position(s) (interior and/or exterior). Fire control positions should be established to prevent crews from operating above the main body of fire~~,~~ or on the existing (or potential) exhaust side of the flow path. The following questions should be considered:

(1) What floor is the fire located on?

(2) Where might potentially viable occupants be located?

(3) What area of the floor plan is the fire located on?

(4) Is there direct and timely access to the fire given its location?

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Fri Apr 19 09:02:29 EDT 2024

Committee Statement

Committee Statement: The technical committee added text to 9.7 Assessment of Fire Dynamics to Determine Strategy to point out the value of using the information gained through observation in determining the strategy and the incident action plan. Text is also added that any fire attack should be considered from the most advantageous position (interior and/or exterior).

Response Message: FR-16-NFPA 1700-2024

First Revision No. 15-NFPA 1700-2024 [Section No. 9.8]

9.8 Risk Management Plan.

Every department should have a risk management plan in writing. ~~The combined processes of understanding of risk~~ Risk management~~, pre-arrival factors, and on-scene factors will drive the decision of the initial declaration of strategy by the first arriving unit~~ for any incident is determined based on the size-up and critical fireground factors as assessed by the initial arriving incident commander. Critical factors and risk management drive the incident strategy decision of an offensive or defensive strategy . ~~The constant~~ Constant evaluation of the incident and all factors could possible change the strategy of the incident, depending on the changes. *(See NFPA ~~1500~~ 1550 .)*

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Fri Apr 19 07:49:26 EDT 2024

Committee Statement

Committee Statement: The technical committee added text to ensure this language aligned with multiple standards, documents, and reports from across the fire service.

Response Message: FR-15-NFPA 1700-2024

First Revision No. 14-NFPA 1700-2024 [Section No. 9.9.2]

9.9.2

~~Crew accessibility to the fire~~ A fire company's positioning and ability to get water on the fire or into involved compartments is a key component in determination of strategy. Selection of the appropriate operational strategy for the incident is based on the efficiency with which crews can perform their tactical responsibilities from safe and protected fire control positions.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Fri Apr 19 07:38:18 EDT 2024

Committee Statement

Committee Statement: The technical committee added text to improve understanding that water on the fire or into burning compartments, from the most advantageous position, is most critical in managing fire attack positions.

Response Message: FR-14-NFPA 1700-2024

First Revision No. 13-NFPA 1700-2024 [Section No. 9.10.2]

9.10.2

~~Life safety~~ The ability to control fire conditions in conjunction with locating victims is the greatest consideration when determining the overall incident strategy.

Supplemental Information

File Name	Description	Approved
1700_FR-13_9.10.2.docx		

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Thu Apr 18 22:58:16 EDT 2024

Committee Statement

Committee Statement: Th technical committee determine that adding text to state that fire control and access to victims combined is the greatest impact incident strategy.

Response Message: FR-13-NFPA 1700-2024

First Revision No. 27-NFPA 1700-2024 [Section No. 10.4.3]

10.4.3*

~~Conditions, staffing, and resources should drive fireground tactics and tasks. While the majority of this chapter focuses on fire control and ventilation (water and air), that is not because search and rescue is being minimized, it is only because this document is driven by empirical data, and the fire service has yet to truly dissect the tactic and tasks of search and rescue. Search and rescue is, and always will be, of utmost importance to the fire service and to unprotected occupants. Although we do not yet have empirical data on search, the fire service does have data points on occupant survivability. We now know that, apart from fire department operations, three things impact the survivability of a given space in the structure: the proximity to the fire, the elevation in the space, and whether or not the room/volume is isolated from the fire.~~ Fireground tactics and tasks should be driven by critical fireground factors, risk management, strategy, and resource capacity *(see Chapter 13 for size-up and search and rescue tactics)* .

A.10.4.3

As more research is conducted, and more data made available to the fire service, Chapter 10 will evolve to improve efficiency and effectiveness on the fireground.

10.4.3.1

Assessing fire and smoke conditions to determine effective application and coordination of water and ventilation or nonventilation are critical elements to locating and removing potential victims in the most effective manner. Fire attack and search and rescue operations should be coordinated with the understanding that if search is done without the ability to control the fire and ventilation, smoke and fire conditions will continue creating a more life-threatening environment for the victims.

10.4.3.2

Prior to fire control, the best protection for victims is isolation from the fire, smoke, and convective currents. After fire control, ventilation of the structure, especially the victim removal pathways or compartments, should be considered. While this chapter does not focus on search, it is still essential to operations. At residential fires, fire control and ventilation are there to support the primary search. A primary search needs to be conducted in all involved and exposed buildings that can be entered.

Supplemental Information

File Name	Description	Approved
1700_FR-27_10.4.3.docx		

Submitter Information Verification

Committee: FCO-AAA
Submittal Date: Mon Apr 22 14:35:40 EDT 2024

Committee Statement

Committee Statement:	This section was rewritten to recognize the new chapter on Search and Rescue being proposed.
Response Message:	FR-27-NFPA 1700-2024

First Revision No. 64-NFPA 1700-2024 [Section No. 10.4.6]

~~**10.4.6**~~

~~While this chapter does not focus on search, it is still essential to our operations and therefore is defined and mentioned here. Primary search is the fast, yet thorough, search for life and fire. At residential fires, fire control and ventilation are there to support the primary search. A primary search needs to be conducted in all involved and exposed buildings that can be entered. As more research is conducted, and more data made available to the fire service, this chapter will continue to evolve to help improve efficiency and effectiveness on the fireground.~~

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Thu Apr 25 11:37:42 EDT 2024

Committee Statement

Committee Statement: New chapter on Search and Rescue replaces the need for this section.

Response Message: FR-64-NFPA 1700-2024

First Revision No. 26-NFPA 1700-2024 [Section No. 10.4.13]

10.4.12

More people are saved by a A well-placed and advanced hose line than by any other tactic. Controlling hose stream controls the fire, reduces the exposure hazards to the victim and victims, facilitates a more effective primary search, and enhances firefighter safety . In the absence of confirmed viable occupants, it is vital to find, control, and extinguish the fire as quickly as possible.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Mon Apr 22 14:29:59 EDT 2024

Committee Statement

Committee Statement: The technical committee determined to emphasize the need for immediate fire control to influence the survivability of occupants and the safety of firefighters.

Response Message: FR-26-NFPA 1700-2024

First Revision No. 25-NFPA 1700-2024 [Section No. 10.5]

10.5 Water.

10.5.1 General.

Water is the most widely used fire extinguishing agent due to it being effective (absorbs heat energy), environmentally friendly, nontoxic, inexpensive, and, in many cases, readily available. Therefore, it is important to understand ~~the most effective ways to use~~ how to optimize the effectiveness of hose streams ~~in order to optimize the effectiveness~~ .

10.5.2 Exposure Control.

10.5.2.1 Tactical Objective.

The ~~main~~ objective is to control fire extension and limit fire growth to the building of origin.

10.5.2.2 How It Works.

Water reduces the impact of radiant heat or direct flame contact on exposed surfaces.

10.5.2.3 Tactical Considerations.

10.5.2.3.1

Surface wetting ~~utilizes~~ uses water streams to limit exposure of radiant heat transfer to the following:

(1) Building of origin

(2) Other building(s) or adjacent combustible(s)

10.5.2.3.2

A water curtain is not as effective on radiant heat transfer as direct application.

10.5.2.4 Preferred Technique.

Direct water application to exposed surfaces using a straight or solid stream or large droplet fog is the preferred technique.

10.5.2.5 Alternative Techniques .

The following are alternative techniques for exposure control:

(1) Foam application to exposure

(2) Direct~~/~~ or indirect application to source fire

10.5.2.6 Safety Considerations .

The following are safety considerations for exposure control:

(1) Collapse zones

(2) Radiant heat

10.5.3 Exterior Control — Transitional Attack.

10.5.3.1 Tactical Objective.

The objective is to improve ~~occupant tenability and~~ interior conditions for both occupant survivability and fire control. Exterior fire control can be used as part of either an offensive or defensive strategy.

10.5.3.2 How It Works.

The following are examples of successful outcomes of transitional exterior ~~control-transitional~~ fire control:

(1) Compartment linings and burning fuel surfaces are cooled, interfering with pyrolysis~~, which~~ and cooling fire gases, which halts flaming combustion and ~~in turn~~ reduces the heat release rate.

(2) Reducing surface temperature of unignited fuels stops pyrolysis.

(3) The flame is displaced from the surface of burning fuels.

(4) Steam production absorbs energy from the environment to cool smoke.

10.5.3.3 Tactical Considerations.

~~The following are tactical considerations:~~

~~Coordinated to support other fire operations (e.g., fire control/rescue).~~

~~Performed from an exterior position.~~

~~Optimal through a ventilation opening to the fire room.~~

~~Flow path not disrupted.~~

~~Flow rate appropriate with heat release rate and area of involvement; balanced to avoid excessive water damage.~~

~~Rapid interior control following/concurrent with exterior control crucial to limit regrowth and maintain tenability.~~

~~Limited on-scene resources, large fire volume, delayed entry time/access for direct fire control may require multiple or longer applications; more time equals more water.~~

10.5.3.3.1

The following are tactical considerations of transitional exterior fire control :

(1) Coordinated to support other fire operations (e.g., fire control,~~/~~ rescue) *(see 10.5.3.3.2)*

(2) Performed from an exterior position

(3) Optimal through a ventilation opening to the fire room

(4) Flow path not disrupted

(5) Flow rate appropriate with heat release rate and area of involvement~~; balanced to avoid excessive water damage~~

(6) Rapid interior control following~~/~~ or concurrent with exterior control crucial to limit regrowth and maintain ~~tenability~~ survivability

(7) Limited on-scene resources, large fire volume, delayed entry time~~/~~ or access for direct fire control may require multiple or longer applications~~;~~ (more time equals more water)

10.5.3.3.2

Exterior fire control does not preclude simultaneous operations such as search, rescue, or interior suppression. As with all fire operations, communication, coordination, and control are essential.

10.5.3.4 Preferred Technique.

The preferred technique for transitional exterior fire control is a stationary straight or solid stream handline aimed through the bottom third of an opening, at a steep angle, deflected off the ceiling in the fire room to create a broken stream , ~~with care taken to not~~ without disrupting the flow path. If this application has a limited impact, the stream can be pulled back to the top edge of the window frame, to disperse the broken stream into the fire compartment. Proper stream application for exterior fire control will maximize water flow into the fire compartment, minimize the air entrainment into the fire compartment, and will not occlude the opening.

10.5.3.5 Alternative Techniques .

The following are alternative techniques for transitional exterior fire control :

(1) Master stream devices~~/~~ or appliances

(2) Water application to eaves for attic fire control

(3) Floor below nozzle or rotary nozzle from above for high-rise structures

10.5.3.6 Safety Considerations.

The following are safety considerations for transitional exterior fire control :

(1) Improper ~~nozzle~~ stream application may disrupt flow path and can injure or kill occupants ~~and/~~ or interior firefighters.

(2) Change of flow path may also result in rapid fire growth to other uninvolved areas.

10.5.4 Straight Stream or Solid Bore Interior Advancement.

10.5.4.1 Tactical Objective.

The ~~primary tactical~~ objective is to cool and control smoke temperature, flammability, and radiation to increase safety during interior progression to the seat of the fire and until effective water is applied to the source fire.

10.5.4.2 How It Works.

The following are examples of successful outcomes using straight stream~~/~~ or solid bore ~~application~~ interior advancement :

(1) Water is used to cool hot compartment surfaces, which allow those surfaces ~~then~~ to ~~have the ability~~ be able to absorb more thermal energy from the hot smoke layer.

(2) Water deflection off the ceiling cools the hot gases as droplets travel through the hot layer.

(3) Steam created from cooling both the ceiling area and hot gases will further absorb thermal energy as the steam is heated to equalize with the hot layer.

~~**10.5.4.2.1** Straight Stream/Solid Bore Application.~~

~~The following are examples of successful outcomes using straight stream/solid bore application:~~

~~Water is used to cool hot compartment surfaces, which allow those surfaces then to have the ability to absorb more thermal energy from the hot smoke layer.~~

~~Water deflection off the ceiling cools the hot gases as droplets travel through the hot layer.~~

~~Steam created from cooling both the ceiling area and hot gases will further absorb thermal energy as the steam is heated to equalize with the hot layer.~~

~~**10.5.4.2.2** Fog Stream Application.~~

~~The following are examples of successful outcomes using fog stream application:~~

~~Water droplets applied to the smoke volume convert to steam cooling the smoke.~~

~~Steam conversion reduces temperature causing contraction and dilution of smoke, resulting in reduced flammability and radiation.~~

10.5.4.3 Tactical Considerations.

~~The following are tactical considerations:~~

- ~~These are not extinguishment techniques but a means of safer interior progression to the seat of the fire.~~
- ~~Factors that affect these techniques include fire intensity, room size and configuration, location, ventilation profile, and distance to the source fire.~~
- ~~Effectiveness of the water application technique and reapplication should be continuously assessed while advancing.~~
- ~~Water must be applied to the source fire as soon as possible with consideration given to safe positioning.~~
- ~~Optimal position, nozzle pattern, and technique should be evaluated to maximize or minimize air entrainment/movement based on ventilation conditions and flow path.~~
- ~~Ventilation should be coordinated until water is applied to the main body of fire.~~
- ~~Limiting ventilation with door control will increase the effectiveness of smoke cooling techniques and should be considered.~~
- ~~If the intent is to move smoke ahead of the advancing crew, a large and sufficient vent opposite the advancing crew is required.~~
    - ~~The hose stream can then be moved rapidly and consistently in an O, T, Z, or ∩ pattern to maximize air movement.~~
    - ~~Utilize a reach and penetration of the stream to wet all surfaces forward of the operating position.~~
    - ~~A “flow and move” technique is most effective in dwellings with a known fire location, or if a “shut down and move” technique is utilized, reapplication of water as needed to control heat rebound of fire is necessary.~~

10.5.4.3.1

The following are tactical considerations of straight stream or solid bore interior advancement :

~~These are not extinguishment techniques but a means of safer interior progression to the seat of the fire.~~

~~Factors that affect these techniques include fire intensity, room size and configuration, location, ventilation profile,and distance to the source fire.~~

(1) Effectiveness of the water application technique and reapplication should be continuously assessed while advancing.

(2) Water must be applied to the source fire as soon as possible with consideration given to safe positioning.

(3) Optimal position, nozzle pattern, and technique should be evaluated to maximize or minimize air entrainment~~/~~ or movement based on ventilation conditions and flow path.

(4) Ventilation should be coordinated until water is applied to the main body of fire.

(5) Limiting ventilation with door control will increase the effectiveness of smoke cooling techniques ~~and should be considered~~ .

(6) If the intent is to move smoke ahead of the advancing crew, ~~a large and sufficient vent opposite the advancing crew is required.~~ the following steps apply:

- (a) ~~a~~ A large and sufficient vent opposite the advancing crew is required.
- (b) The hose stream can ~~then~~ be moved ~~rapidly~~ methodically and consistently in an O, T, Z, or ∩ pattern to maximize air movement.
- (c) ~~Utilize~~ Use of a reach and penetration of the straight or solid bore stream ~~to~~ can wet all surfaces forward of the operating position.
- (d) A “flow and move” technique is most effective in dwellings with a known fire location~~, or if~~ .
- (e) If a “shut down and move” technique is ~~utilized~~ used , reapplication of water as needed to control heat rebound of fire is necessary.
- (f) Use of a fog stream can increase air entrainment but decrease the reach of the stream, which will reduce cooling ahead of the suppression crew.

10.5.4.3.2

The tactical considerations of 10.5.4.3.1 are not extinguishment techniques but a means of safer interior progression to the seat of the fire. Factors that affect these techniques include fire intensity, room size and configuration, location, ventilation profile, available fuel, and distance to the source fire.

10.5.4.4 Preferred Techniques .

~~A straight stream/smooth bore application is preferred with the following techniques to consider:~~

~~Utilize a reach of the stream to wet ceiling surfaces forward of the crew position.~~

~~A straight stream pattern should be flowed and swept across the ceiling area.~~

~~New ceiling areas should be swept and cooled while advancing towards the fire area.~~

~~The frequency and extent of the water application is influenced by fire intensity, smoke temperatures, room size and configuration, location, and distance to the source fire.~~

10.5.4.4.1

~~A~~ Continual flowing of a straight stream or ~~/smooth~~ solid bore ~~application~~ interior advancement is preferred with the following techniques to consider:

(1) ~~Utilize a~~ The reach of the stream can be used to wet ~~ceiling~~ surfaces (ceiling, walls, and floor) forward of the crew position.

~~A straight stream pattern should be flowed and swept across the ceiling area.~~

~~New ceiling areas should be swept and cooled while advancing towards the fire area.~~

(2) A pattern can be employed during the advance (O, T, Z, or ∩) for maximal cooling, isolation of the fire area from the remainder of the structure, and entrainment of fresh air behind the operating hose line.

(3) The fire control team can advance through the structure while flowing water, known as a “flow and move” approach.

10.5.4.4.2

The frequency and extent of the water application is influenced by fire intensity, smoke temperatures, room size and configuration, location, and distance to the source fire.

10.5.4.5 Alternative Techniques .

~~A fog stream application is an alternative with the following techniques to consider:~~

~~Water mist or fog stream is directed into the smoke layer in short or long pulses (with a sweeping motion).~~

~~Nozzle, cone angle, pulse duration, and flow rate are important in achieving an optimal droplet size of 0.12 in. (0.3 mm); this ensures effective cooling and contraction of the smoke and lessens the disruption of the thermal balance.~~

~~Avoid contact with hot surfaces to prevent excess wet steam and disruption of thermal balance.~~

~~Reapplication is necessary during advance.~~

~~Water application should quickly transition to extinguishment on the source fire.~~

10.5.4.5.1

~~A fog~~ An alternative technique for straight stream or solid bore interior advancement involves intermittent flowing straight stream or solid bore application ~~is an alternative~~ with the following techniques to consider:

(1) With entry to each compartment in the structure, the reach of the stream can be used to wet surfaces (ceiling, walls, and floor) forward of the crew position.

(2) A pattern can be employed during the advance (O, T, Z, or ∩) for maximal cooling, isolation of the fire area from the remainder of the structure, and entrainment of fresh air behind the operating hose line.

10.5.4.5.2

The frequency and extent of the water application is influenced by fire intensity, smoke temperatures, room size and configuration, location, and distance to the source fire. Deterioration of conditions along the flow path until direct fire control is achieved should be considered every time the bale is closed for forward advancement of the fire control team.

10.5.4.6 Safety Considerations.

The following are safety considerations for straight stream or solid bore interior advancement :

(1) Firefighters should avoid advancing under a superheated thermal layer without cooling as they advance.

(2) Hose stream air entrainment should be limited when no vent is available opposite the fire.

(3) Continuous monitoring of cooling effectiveness against fire conditions with a thermal imager should be maintained while advancing to the source fire.

(4) PPE can be quickly compromised during interior advancement within a high-temperature convective flow in the absence of effective water application .

(5) Wind speed and direction in relation to intended flow path should be checked prior to and during cooling operations.

(6) Overhead should be inspected or tested for suspended loads or ceilings and void spaces.

(7) Pulling or inspecting for fire in overhead void should occur from the side of the entry door or frame prior to entry into the room or compartment.

(8) Exposing accumulated fuels (e.g., smoke, dust, fibres) in voids can result in rapid fire development.

10.5.5 Interior Direct Fire Control.

10.5.5.1 Tactical Objective.

The ~~primary tactical~~ objective is fire control and extinguishment.

10.5.5.2 How It Works.

The following are examples of successful outcomes of interior direct fire control:

(1) Water cools burning fuel surfaces, interfering with pyrolysis~~, which~~ and cooling fire gases, which halts flaming combustion and ~~in turn~~ reduces the heat release rate.

(2) The flame is displaced from the surface of burning fuels.

(3) Reducing surface temperature of unignited fuels stops pyrolysis.

(4) Secondary steam production absorbs energy from the environment to cool smoke.

10.5.5.3 Tactical Considerations.

The following are tactical considerations of interior direct fire control :

(1) Direct fire control should be conducted as soon as the fire seat is located and can be reached with a water stream.

(2) Direct water application should be performed from an interior or exterior position to the fire room.

(3) The flow rate should be appropriate with the heat release rate and area of involvement and be balanced to avoid excessive steam generation and water damage.

(4) The ideal position is the air intake side of the flow path with flow path control.

(5) Optimal position, nozzle pattern, and technique should be evaluated to maximize or minimize air entrainment~~/~~ or movement based on ventilation conditions and flow path.

(6) Advance should be matched to interior conditions.

(7) Smoke or surface cooling prior to direct attack may be appropriate.

10.5.5.4 Preferred Techniques .

The following are preferred techniques for interior direct fire control :

(1) Straight or solid stream, applied in an unbroken pattern directly to burning fuels, where compartment/ or room is unvented opposite the attack line

(2) O, T, Z, or ∩ pattern applied from furthest distance if compartment/ or room has vent opposite attack line

10.5.5.5 Alternative Techniques . (Reserved)

The following are techniques for direct fire control:

An indirect attack.

Switching to a fog pattern may improve coverage and reduce water damage.

10.5.5.6 Safety Considerations.

The following are safety considerations for interior direct fire control :

(1) Avoid position between the seat of the fire and the exhaust outlet.

(2) Apply reach and penetration of the stream to provide standoff distance from the effects of fire.

(3) Wind speed and direction are in relation to the intended flow path.

10.5.6 Interior Indirect Attack.

10.5.6.1 Tactical Objective.

The primary tactical objective is fire suppression to improve tenability survivability for follow-up fire control and overhaul when there is limited access to the confined or isolated fire compartment and when presented as an action of opportunity .

10.5.6.2 How It Works.

Water is applied to into a compartment contacting linings, burning fuel, and the smoke layer to produce the maximum volume of steam. Steam production reduces temperature, dilutes smoke, and displaces oxygen.

10.5.6.3 Tactical Considerations.

The following are tactical considerations:

Application is made from outside the fire compartment/room that remains under-ventilated.

Smoke or surface cooling may be appropriate to gain access to the fire room prior to indirect attack.

Indirect water application can be utilized for shielded fires.

The flow rate should be appropriate with heat release rate and area of involvement and balanced to avoid excessive water damage.

Advance should be matched to interior conditions.

This technique is not intended for use in occupied spaces.

10.5.6.3.1

The following are tactical considerations for indirect attack fire control :

(1) Application is made from outside the fire compartment/ or room that remains under-ventilated.

(2) ~~Smoke~~ The fire compartment must have controlled ventilation or ~~surface cooling may be appropriate~~ the ability to ~~gain access to the fire room prior to~~ be isolated for indirect attack to be effective .

(3) Indirect water application can be ~~utilized~~ used for shielded fires.

(4) The flow rate should be appropriate with heat release rate and area of involvement and be balanced to avoid excessive water damage.

(5) Advance should be matched to interior conditions.

10.5.6.3.2

~~This technique~~ Indirect attack fire control is not intended for use in occupied spaces.

10.5.6.4 Preferred Techniques .

The following are preferred techniques for ~~interior~~ indirect attack fire control:

(1) Water is applied from the exterior of the compartment/ or room ~~utilizing~~ using a fog stream.

(2) A narrow fog is applied to compartment linings, burning fuel, and the smoke layer to quickly produce the maximum volume of steam.

(3) The compartment/ or room is isolated to ensure maximum effectiveness of steam production.

10.5.6.5 Alternative Techniques .

The following are alternative techniques for ~~interior~~ indirect attack fire control:

(1) Broken straight or solid stream

(2) Rotary nozzle

(3) Fog- or mist-producing piercing nozzle

(4) Fire extinguisher

10.5.6.6 Safety Considerations.

The following are safety considerations for indirect attack fire control :

(1) Fog application from a position exposed to resultant outflow of heated smoke and steam can be dangerous.

(2) Steam production may reduce tenability in adjoining spaces.

Supplemental Information

File Name	Description	Approved
1700_FR-25_10.5.docx		

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Mon Apr 22 12:48:20 EDT 2024

Committee Statement

Committee Statement: The technical committee identified a number of changes related to the application of water in fire control. A key aspect is occupant survivability in the accomplishment of fire control. Additional “safety considerations’ are added. The technical committee recognizes that a flow and move with a wall, ceiling, wall (arc) hose stream application was more effective and easier to teach and implement than pulsing.

Response Message: FR-25-NFPA 1700-2024

Public Input No. 1-NFPA 1700-2023 [Section No. 10.5.5.5]

First Revision No. 24-NFPA 1700-2024 [Section No. 10.6]

10.6 Air.

10.6.1 General.

Decisions about when and where ventilation is needed and the method(s) to be employed is to should be guided by an the understanding that, in the absence of effective water being applied on the fire, air increases will increase the HRR and potential for rapid fire development. in the absence of effective water being applied on a fire. With this understanding of the impact of air on fire growth and the requirement for coordinated water Given such factors , the tactical options are for either nonventilation or ventilation.

10.6.2 Nonventilation.

10.6.2.1 Tactical Objective.

The primary tactical objective is limiting combustion air to the fire to hold fire growth in preparation for interior operations.

10.6.2.2 How It Works.

Fire growth is dependent on oxygen. By limiting the oxygen supplied to the fire, growth and heat release rate are reduced.

10.6.2.3 Tactical Considerations.

The following are tactical considerations for nonventilation fire control :

(1) Life-fire-layout sweep to assess survivability profile in the fire compartment/ or room.

(2) Assess ability to close or restrict openings.

(3) Utilize Use to create survivable areas in other parts of the structure.

(4) Height of interface layer lowers and reduces tenability.

(5) Thermal imaging to source fire and monitor changing conditions.

(6) Plan for exposure control.

10.6.2.4 Preferred Techniques .

The following are preferred techniques for nonventilation fire control:

(1) Close or restrict building Building ventilation openings closed or restricted .

(2) Manage the flow Flow path managed by control of the air inlet(s) and/ or the smoke outlet(s).

10.6.2.5 Alternative Techniques .

An alternative Alternative techniques is to employing for nonventilation fire control including ventilation control devices or a portable door or smoke curtain.

10.6.2.6 Safety Considerations.

The following are safety considerations for nonventilation fire control :

(1) Interior fire control crew must be consulted prior to any tactical ventilation.

(2) Anticipate rapid fire development if If ventilation is increased absent the application of water, rapid fire development should be anticipated (for both planned and unplanned ventilation) .

(3) Wind speed and direction is in relation relates to position and potential flow path.

10.6.3 Horizontal Ventilation.

10.6.3.1 Tactical Objective.

The ~~primary tactical~~ objective is to improve interior tenability by releasing smoke and heat during ~~the~~ fire control and to support search, extinguishment, overhaul, and post-fire ventilation.

10.6.3.2 How It Works.

Buoyant smoke is replaced by denser fresh air due to the gravity current ~~and/~~ or air pressure differentials.

10.6.3.3 Tactical Considerations.

The following are tactical considerations for horizontal ventilation fire control :

(1) Coordinated inlet and outlet openings concurrent with effective application of water

(2) Survivability profile in the fire room

(3) ~~Smoke~~ Whether smoke or surface cooling prior to fire control ~~may be~~ is appropriate

(4) Purposeful management of the flow path considering wind direction

(5) Thermal imaging to source fire and monitor changing conditions~~.~~

(6) Plan for exposure control

10.6.3.4 Preferred Technique.

The following are preferred techniques for horizontal ventilation fire control :

(1) Door control and limited ventilation ~~may be~~ used until effective water is on the fire~~.~~

(2) Ventilation outlet ~~is~~ established in the fire compartment~~.~~

(3) ~~Opening the entry~~ Entry door opened as an additional inlet~~,~~ while considering flow path impacts~~.~~

(4) Inlet and outlet on opposite sides of the structure or compartment~~.~~

(5) Vent openings chosen ~~to take into account~~ considering wind speed and direction and potential flow path~~.~~

10.6.3.5 Alternative Techniques .

~~Vertical~~ Depending on the fire conditions, life safety hazard, time, objectives, and building layout, the following means of ventilation ~~is an~~ may be alternative ~~technique for horizontal ventilation.~~ techniques for horizontal ventilation fire control:

(1) Vertical ventilation

(2) Positive-pressure attack

(3) Hydraulic ventilation

(4) Positive-pressure ventilation

(5) Negative-pressure ventilation

10.6.3.6 Safety Considerations.

The following are safety considerations for horizontal ventilation fire control :

(1) Failure to coordinate ventilation with effective water application will increase ~~heat release rate~~ HRR .

(2) ~~Rapid fire development should be anticipated if~~ If ventilation is increased absent the application of water, rapid fire development should be anticipated (for both planned and unplanned ventilation) .

(3) ~~Consider opposing~~ Opposing wind, wind speed, and impact on the direction of the flow path should be considered .

10.6.4 Vertical Ventilation.

10.6.4.1 Tactical Objectives.

~~To~~ The objective is to improve interior ~~tenability~~ survivability by releasing smoke and heat during interior fire ~~attack~~ control and to support search, extinguishment, overhaul, defensive trenching operations, and post-fire ventilation.

10.6.4.2 How It Works.

The following are examples of successful outcomes of vertical ventilation fire control :

(1) Buoyant smoke is replaced by denser fresh air due to the gravity current ~~and/~~ or air pressure differentials.

(2) Buoyant smoke is exhausted from an opening located above the level of fire ~~utilizing~~ using the stack effect, and denser fresh air is entrained via a horizontal inlet(s) due to the gravity current ~~and/~~ or air pressure differentials.

10.6.4.3 Tactical Considerations.

The following are tactical considerations for vertical ventilation fire control :

(1) Coordinated inlet and outlet openings concurrent with effective application of water~~.~~

(2) Survivability profile in the fire room~~/~~ or compartment~~.~~

(3) Inability to horizontally ventilate~~.~~

(4) ~~Smoke~~ Whether smoke cooling prior to fire control or indirect attack ~~may be~~ is appropriate~~.~~

(5) Purposeful management of the flow path considering wind, wind speed, and direction~~.~~

(6) Raising of interface layer height and visibility ~~will be~~ is temporary if fire is not controlled~~.~~

(7) Thermal imaging to source fire and monitor changing conditions~~.~~

(8) Plan for exposure control~~.~~

(9) Delays due to staffing, assembly time, or equipment~~.~~

(10) ~~A 4 ft × 4 ft (1.22 m × 1.22 m) hole is rarely sufficient for~~ Insufficient effective ventilation~~.~~ [e.g., 4 ft × 4 ft (1.22 m × 1.22 m) hole]

10.6.4.4 Preferred Techniques .

The following are preferred techniques for vertical ventilation fire control :

(1) Door control and limited inlet ventilation until vertical outlet is established~~.~~

(2) Inlet opening ~~is~~ on the windward side and outlet ~~is~~ opening above or close to the source fire~~.~~

(3) ~~Establish outlet~~ Outlet openings established, followed by inlet openings, coordinated with fire control~~.~~

10.6.4.5 Alternative Techniques .

~~Alternative techniques for vertical ventilation should be considered to minimize risk.~~ Depending on the fire conditions, life safety hazard, time, objectives, and building layout, the following means of ventilation may be alternative techniques for vertical ventilation fire control:

(1) Horizontal ventilation

(2) Positive-pressure attack

(3) Hydraulic ventilation

(4) Positive-pressure ventilation

(5) Negative-pressure ventilation

10.6.4.6 Safety Considerations.

The following are safety considerations for vertical ventilation fire control :

(1) Failure to coordinate ventilation with effective water application will increase heat release rate HRR .

(2) Rapid fire growth should be anticipated if If ventilation is increased absent the application of water, rapid fire development should be anticipated (for both planned and unplanned ventilation) .

(3) Consider wind Wind speed and direction should be considered .

(4) Working at heights increases risks for the risk of falls from or through a roof.

(5) Working position, means of egress, and structural performance must be continually assessed.

10.6.5 Positive-Pressure Attack (PPA).

10.6.5.1 Tactical Objectives .

The primary objective is to improve interior tenability conditions for advancing crews and trapped occupants. Additional objectives include and establish purposeful direction of the flow path, extinguishment, and property conservation.

10.6.5.2 How It Works.

Fans A fan(s) are is used to create a pressure differential influencing the flow of smoke, air, heat, and flame from the inlet to the exhaust prior to or during fire control .

10.6.5.3 Tactical Considerations.

The following are tactical considerations for ~~positive pressure attack~~ PPA :

(1) Staff controlling operation of the fan should have a radio to coordinate operations (e.g., change speed, angle) if adverse conditions develop.

(2) Staff controlling exhaust should have a radio to coordinate operations if adverse conditions develop.

(3) Bringing a line to the exhaust(s) for exposure protection should be considered.

(4) Fan activation should be communicated and the structure should be continuously monitored for negative effects ~~should be continuously monitored~~ .

(5) ~~Transitional attack~~ Exterior fire control may be ~~utilized~~ used , if possible, prior to fan activation.

(6) Fire growth due to ventilation must be reduced by applying water on the fire during fan operation.

(7) PPA in domestic floor plans with many rooms and closed doors (compartmented) is more effective.

(8) PPA will not be effective on a fire located in an open floor concept plan or any floor plan with high ceilings.

(9) ~~Source~~ The source fire must be near or adjacent to an exterior outlet.

(10) ~~It should be understood that the~~ The inlet is the opening to the fire compartment, and not necessarily the exterior door.

(11) ~~During PPA, creating~~ Creating additional openings not in the fire room will create additional flow paths, making PPA ineffective with the potential to draw the fire into all flow paths.

(12) An exhaust larger than the inlet must be provided in the fire room to allow for effective PPA.

(13) PPA should be coordinated with exhaust.

(14) ~~During PPA, an~~ An ongoing assessment of inlet and exhaust flow is imperative to understanding whether ~~or not~~ a fan flow path has been established and if conditions are improving~~/~~ or effective.

(15) The setback of the fan or development of a cone of air is not as important as the exhaust size.

(16) The quick application of water, ~~as quickly as possible,~~ whether from the interior or exterior, prior to initiating PPA will increase the likelihood of a successful outcome.

(17) PPA is not a replacement for using the reach of ~~your~~ a hose stream.

(18) ~~During PPA, extension~~ Extension into void spaces when using PPA is directly related to the exhaust capabilities of the void space.

(19) PPA does not negatively affect the survivability of occupants behind a closed door.

10.6.5.4 Preferred Technique.

Exhaust ventilation should be established prior to mechanical ventilation at the inlet~~. The~~ , and the exhaust should be larger than the inlet. Interior advancement techniques can be used as appropriate, followed up by timely fire control.

10.6.5.5 Alternative Techniques .

Positive-pressure ventilation or positive-pressure isolation might be used as ~~an~~ alternative techniques to PPA.

10.6.5.6 Safety Considerations.

The attack team should coordinate and communicate with the IC and fan and exhaust control personnel. The assessment of inlet and exhaust must be continuous for adverse conditions. Rapid fire growth should be anticipated if ventilation is increased absent the application of water for both planned and unplanned ventilation. Consideration should be given to wind speed and direction. Depending on the fire conditions, life safety hazard, time objectives, building layout, and wind speed and direction, the following are safety considerations for PPA:

(1) The attack team should coordinate and communicate with the IC and fan and exhaust control personnel.

(2) The assessment of inlet and exhaust must be continuous for adverse conditions. , including induced convective flow and the impacts on life safety.

(3) Rapid fire growth should be anticipated if If ventilation is increased absent the application of water, rapid fire development should be anticipated (for both planned and unplanned ventilation) .

(4) PPA will not overcome wind-driven conditions.

10.6.6 Positive-Pressure Ventilation (PPV).

10.6.6.1 Tactical Objective.

Tactical The objectives are as follows:

(1) Remove smoke from the non-fire area to improve tenability

(2) Secure egress path to assist search and rescue or the approach to fire area

(3) Remove smoke from fire room post-fire

(4) Purposeful management of the flow path

10.6.6.2 How It Works.

The fan(s) is used to create a pressure differential influencing the flow of smoke, air, and smoke heat from the inlet to the exhaust after fire control .

10.6.6.3 Tactical Considerations.

The following are tactical considerations for positive pressure ventilation PPV :

(1) Communicate fan Fan activation should be communicated and continuously monitor the structure should continuously monitor for negative effects.

(2) Hose A hose line(s) should be in place for potential growth or extension of the fire.

(3) When PPV is used post fire control, in single-story residential structures, the The more openings made in the single-story residential structures during PPV, the more efficient it is at ventilating the structure ventilation .

(4) When PPV is used post fire control, it It is important to assess for extension.

(5) When PPV is used post fire control, starting Starting or turning in the fan immediately after fire control will provide the most benefit.

(6) Interior CO concentration levels should be monitored for gas-powered fans when clearing smoke post-fire.

10.6.6.4 Preferred Technique.

Outlet ventilation should be established prior to mechanical ventilation at the inlet. Multiple , and multiple exhaust openings should be created wherever possible to increase efficiency.

10.6.6.5 Alternative Technique.

Hydraulic ventilation should be considered an alternate alternative technique for positive pressure ventilation PPV .

10.6.6.6 Safety Considerations.

~~The attack team coordinates and communicates with the IC and fan and exhaust control personnel. Rapid fire development should be anticipated if ventilation is increased absent the application of water for both planned and unplanned ventilation. Consideration should be given to wind speed and direction.~~ The following are safety considerations for PPV:

(1) The attack team should coordinate~~s~~ and communicate~~s~~ with the IC and fan and exhaust control personnel.

(2) ~~Rapid fire development should be anticipated if~~ If ventilation is increased absent the application of water, rapid fire development should be anticipated (for both planned and unplanned ventilation) .

(3) ~~Consideration should be given to wind~~ Wind speed and direction should be considered .

10.6.7 Positive-Pressure Isolation (PPI).

10.6.7.1 Tactical Objective.

The ~~primary~~ objective is to create a positive pressure in the non-fire area greater than the pressure in the fire area to limit ~~fire and~~ smoke ~~propagation~~ and fire spread .

10.6.7.2 How It Works.

Mechanical fans or systems are used to increase the pressure in an adjoining room or compartment to contain smoke to the fire room or compartment. Protected areas have a mechanical fan at the inlet with limited or no exhaust openings.

10.6.7.3 Tactical Considerations.

~~PPI is contra-indicated in compartments impacted by fire extension from the compartment of origin. Fan activation should be communicated and the structure should be continuously monitored for fire/smoke propagation. As long as a flow path through the seat of fire is not created there is no fire growth. Pressurize areas of the structure that are isolated from the fire compartment. Anticipate rapid fire growth if ventilation is increased absent the application of water for both planned and unplanned ventilation.~~ The following are tactical considerations for PPI:

(1) PPI is contraindicated in compartments impacted by fire extension from the compartment of origin.

(2) Fan activation should be communicated and the structure should be continuously monitored for fire or ~~/~~ smoke propagation.

(3) ~~As long as~~ If a flow path through the seat of fire is not created, there is no fire growth.

(4) ~~Pressurize areas~~ Areas of the structure that are isolated from the fire compartment should be pressurized .

(5) ~~Anticipate rapid fire growth if~~ If ventilation is increased absent the application of water, rapid fire development should be anticipated (for both planned and unplanned ventilation) .

10.6.7.4 Preferred Technique.

All inlet and exhaust openings should be controlled to maintain desired pressure differential and isolate the fire.

10.6.7.5 Alternative Technique.

Nonventilation might be a viable alternative technique to PPI .

10.6.7.6 Safety Considerations.

~~Progress reports should be given to the IC and should be coordinated with fan control personnel. Consideration should be given to wind speed and direction. Rapid fire development is possible if the fire has extended to concealed spaces.~~ The following are safety considerations for PPI:

(1) Progress reports should be given to the IC and ~~should be~~ coordinated with fan control personnel.

(2) ~~Consideration should be given to wind~~ Wind speed and direction should be considered .

(3) Rapid fire development is possible if the fire has extended to concealed spaces.

10.6.8 Hydraulic Ventilation.

10.6.8.1 Tactical Objective.

The ~~primary tactical~~ objective is to improve interior tenability conditions during primary~~/~~ search, secondary search, or overhaul~~,~~ and to conserve property ~~conservation~~ through purposeful direction of the flow path.

10.6.8.2 How It Works.

The following are examples of successful outcomes of hydraulic ventilation:

(1) A hose stream is employed at an opening, creating a pressure differential, entraining smoke, and discharging it from the compartment~~/~~ or room.

(2) This action results in a net negative pressure in the compartment~~/~~ or room, drawing in replacement air from other openings.

10.6.8.3 Tactical Considerations.

The following are tactical considerations for hydraulic ventilation:

(1) Check if ventilation can be done safely post-fire ~~utilizing~~ using the fire control hose line.

(2) Evaluate optimal position, nozzle pattern, and technique to maximize air entrainment~~/~~ or movement.

(3) Observe the movement of smoke and adjust position for best ventilation effect.

(4) Check surroundings for rekindling or adverse effects.

(5) Check for exterior consequences of stream application.

10.6.8.4 Preferred Technique.

The hose line should be open on a straight stream and move to fog selection within the opening to prevent turbulence. The opening should be approached from a low position~~.~~ ~~Nozzle~~ , and nozzle placement should create a water pattern that fills the window opening.

10.6.8.5 Alternative Technique.

An alternative technique to hydraulic ventilation is a straight stream or straight bore nozzle pattern ~~with positioning furthest~~ positioned as far from the opening as possible with a rapid consistent O, T, Z, or ∩ pattern to maximize air movement.

10.6.8.6 Safety Considerations.

Personnel should stay low on approach to the intended vent location and ensure hose stream operation does not create other hazards downstream (~~e.g.,~~ i.e., energized electrical, structural damage, or compromise other control operations). The operation should be monitored for fire ~~rekindle~~ rekindling ~~. Consideration should be given to~~ and wind speed and direction should be considered .

10.6.9 Negative-Pressure Ventilation.

10.6.9.1 Tactical Objective.

The ~~tactical~~ objective is to create a negative pressure at an established ventilation opening post-fire to exhaust smoke.

10.6.9.2 How It Works.

A mechanical fan (i.e., ejector) is used to create a negative pressure at an outlet to pull smoke from a structure.

10.6.9.3 Tactical Considerations.

The following are tactical considerations for negative-pressure ventilation:

(1) Smoke ejectors are most effective when working with natural air flow and not against a prevailing wind.

(2) Ventilation efficiency is greatly reduced if air is allowed to recirculate around the ejector or by opening windows or doors near the ejector.

(3) Manhole or spiral duct adapters can enable more effective and efficient smoke extraction delivery to hard-to-reach spaces, both above and below grade.

(4) Power supply and electrical cords are required.

(5) Ventilation is ineffective in high ceiling areas.

10.6.9.4 Preferred Technique.

The ejector is placed on the leeward side of the structure with the perimeter of the fan sealed to the ventilation opening with a tarp or commercial adapter while ensuring the ejector inlet and outlet are not obstructed.

10.6.9.5 Alternative Technique.

~~Positive pressure ventilation~~ PPV might be considered as an alternative technique to negative-pressure ventilation .

10.6.9.6 Safety Considerations.

The following are safety considerations for negative-pressure ventilation :

(1) ~~Ensure ejector~~ The ejector fan ~~is~~ needs to be intrinsically safe.

(2) ~~Ensure electrical~~ Electrical cords ~~are~~ need to be protected from environmental conditions.

(3) ~~Do not move operating fans~~ Operating fans should not be moved .

Supplemental Information

File Name	Description	Approved
1700_FR-24_10.6.docx		

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Mon Apr 22 10:33:50 EDT 2024

Committee Statement

Committee Statement: The technical committee added text to put into context to why you might choose this tactic. Due to limited water or potentially limited access. The TC also added text to clarify the role of the fire compartment confinement for indirect attack to be successful and provided an example. The TC modified tactical considerations to emphasize the need for fire compartment confinement and deleted the concern over water damage. The TC modified “how it works” sections of PPA and PPV to differentiate the two tactics and to align with the definitions of both tactics. The TC replaced ‘transitional attack’ with ‘exterior fire control” for consistency.

Response FR-24-NFPA 1700-2024

Message:

Public Input No. 2-NFPA 1700-2023 [Section No. 10.6.5]

First Revision No. 23-NFPA 1700-2024 [New Section after 10.6.9.6]

10.7 Alternatives.

10.7.1 Exterior Control — Basement Fires.

10.7.1.1 Tactical Objective.

The objectives of exterior control of basement fires are as follows:

(1) Improve occupant tenability and interior conditions for fire attack.

(2) Avoid placing firefighters over a compromised floor assembly prior to fire control.

10.7.1.2 How It Works.

The following are examples of successful outcomes of exterior control of basement fires:

(1) The surface temperature of unignited fuels is reduced and pyrolysis is stopped.

(2) Flame is displaced from surface of burning fuels.

(3) Steam production absorbs energy from the environment.

10.7.1.3 Tactical Considerations.

The following are tactical considerations for exterior basement fire control:

(1) Location of a fire in the basement should trigger a high degree of caution.

(2) Potential flow paths (e.g., interior stair, side windows, ground level door) should be identified.

(3) Coordinate ventilation with suppression tactics.

(4) Use piercing nozzles, cellar nozzles, hose streams through holes and windows, at grade attack (i.e., fastest, most effective water) to initiate cooling.

(5) After extinguishment, assessment and entry should occur, if appropriate.

(6) Gather information from occupants, develop survival profiles, determine compartment isolation (closed or open doors), and initiate vent, enter, isolate, search (VEIS).

(7) Evaluate the ventilation profile, flow path(s), and flow (i.e., unidirectional, bidirectional, or dynamic) using a 360-degree evaluation, if possible.

(8) Fight a basement fire from the basement level by introducing water from the exterior where possible.

(9) Conditions at the front door could be misleading regarding the hazard in the basement or the basement stairway.

(10) Belowgrade fires are likely to be ventilation-limited.

(11) Coordinating ventilation with water application is required to limit the growth of a ventilation-limited fire.

(12) Water application into the belowgrade space is key to cooling the gas and reducing the chances of flashover or smoke ignition (i.e., flash fire, backdraft, or smoke explosion).

(13) Determine access type (i.e., no exterior access, limited-exterior access, or interior-only access).

(14) If no exterior access is possible, assess and control the collapse potential and protect firefighters from the flow path (e.g., reach of stream to top of stairs, patio door, piercing nozzle, or rotary distributor nozzle from place of safety).

(15) Sounding the floor may not be a good indicator of its structural integrity.

(16) Thermal imagers may not provide sufficient information on the basement fire condition or on the floor's structural integrity.

10.7.1.4 Preferred Technique.

Stationary straight stream or solid stream through the basement opening directed at flaming combustion or bouncing off basement surfaces is the preferred technique for exterior basement fire control.

10.7.1.5 Alternative Techniques.

The following are alternative techniques for exterior basement fire control:

(1) Narrow fog (<30 degrees from outside of the flow path)

(2) Piercing applicator nozzles

(3) Rotary distributor nozzles

(4) Portable monitors

10.7.1.6 Safety Considerations.

The following are safety considerations for exterior basement fire control:

(1) Fire conditions and building stability support interior operations

(2) Controlling the flow path

(3) Avoiding convective flow

(4) Awareness of flow path reversal or outflow from stream application

(5) Assessing the floor's structural integrity prior to committing firefighters to the structure

(6) Conforming to risk management principles

10.7.2 Exterior Control — Bent Tip Nozzle.

10.7.2.1 Tactical Objective.

The objective is to achieve fire control or improved occupant tenability from an alternative position, creating conditions for an interior fire attack hose crew to approach for extinguishment.

10.7.2.2 How It Works.

The following are examples of successful outcomes of exterior fire control using a bent tip nozzle:

(1) Compartment linings and contents are cooled to lower production of pyrolytic gases.

(2) The droplets produced cool and control smoke temperature, flammability, and radiation to increase safety during interior progression to the seat of the fire and until effective water is applied to the source of the fire.

10.7.2.3 Tactical Considerations.

The following are tactical considerations for exterior fire control using a bent tip nozzle:

(1) Consider use for high-rise firefighting with high HRRs, such as wind-impacted fires or difficult to access areas.

(2) Size up the suitability of the tactic by assessing the ventilation profile.

(3) When a nozzle crew cannot use interior advancement on a fire, this tactic can improve tenability for a hose crew to approach.

(4) Size-up may reveal opportunities where the nozzle can be used on a fulcrum like a window or balcony. In some cases, a table, a couch, or other furniture may be used as a fulcrum. Note that deep balconies and recessed areas may obstruct the stream from entering the fire compartment and prevent this tactic from being effective.

(5) Crews may need to be tied off to achieve safety working at heights.

(6) It may take the staffing of four trained firefighters for safe and effective operation of the nozzle.

(7) An exterior spotter should be designated that can determine the nozzle stream's effectiveness.

(8) A water supply and a hose crew for the nozzle should be established. The building fire protection system (standpipe) should be augmented to ensure required flow at optimum pressure.

(9) The standpipe hook up should be optimized with a minimized length of stretch.

(10) Consider the use of a second riser. Ensure that stairwell tenability is maintained, and make sure the use of a second riser will not compromise life safety of the building by moving smoke or creating a flow path.

(11) Coordinate between the exterior spotter, the nozzle crew, and the fire attack crew to advise when the nozzle can be shut down, allowing for the fire attack crew to advance on the fire from the interior.

(12) Stream effectiveness should be assessed by a significant decrease in fire conditions (i.e., HRR).

10.7.2.4 Preferred Techniques.

The following are preferred techniques for exterior fire control using a bent tip nozzle:

(1) Staffing is comprised of four firefighters: one to operate the standpipe, ensuring the gate and gauge; one on the hose line, directing the jet reaction of the hose line into ground; and two firefighters controlling the nozzle. Webbing can assist in controlling nozzle reaction.

(2) Nozzle is positioned appropriately to apply a stream to a desired opening.

(3) A suitable support and fulcrum for the nozzle is identified and established that allows for adjustment of extension and angle of water application.

(4) The water stream is directed by sliding the nozzle's body on the fulcrum in and out, pitching up and down, and yawing left and right. Rolling the nozzle should be avoided because the nozzle reaction is extreme.

(5) External spotters need to ensure that the stream is optimized for maximum flow directed at the ceiling of the fire compartment.

10.7.2.5 Alternative Techniques.

The following are alternative techniques for exterior fire control using a bent tip nozzle:

(1) Stream deflection off window frames and lintels into the fire

(2) Other applications include hidden voids and exterior cladding (see safety considerations; webbing is needed to control excessive nozzle reaction)

(3) Ground or appliance monitors

(4) Rotary nozzles

(5) Aerial appliances

10.7.2.6 Safety Considerations.

The following are safety considerations for exterior fire control using a bent tip nozzle:

(1) Uncontrolled nozzle reaction force can cause injury or death.

(2) Nozzle reaction needs to be grounded. This can be achieved with webbing or a strap to secure to a suitable anchor.

(3) Safe practices must be observed for working from heights.

(4) Staffing is needed to assist with nozzle control and crew rotation.

(5) Limit the roll of the nozzle to assist with nozzle control; only adjust the yaw and pitch of the nozzle to adjust the stream.

10.7.3 Exterior Control — Opposing Tip Nozzle.

The objective is to achieve fire control or improved occupant tenability from an alternate position, creating conditions for an interior fire attack hose crew to approach for extinguishment.

10.7.3.1 Tactical Objective.

The objectives include the following:

(1) Achieve fire control or improve occupant tenability and interior conditions for fire attack from an alternative position.

(2) Control attic, cockloft, or roof void fires prior to extinguishment.

(3) Access shielded fire, buy time, and protect exposures.

(4) Control auto-exposure, other exposures, and progression to cladding.

10.7.3.2 How It Works.

The following are examples of successful outcomes of exterior fire control using an opposing tip nozzle:

(1) Surface temperature of unignited fuels is reduced and pyrolysis is stopped.

(2) Flame is extinguished from surface of burning fuels.

(3) Steam production absorbs energy from the environment.

10.7.3.3 Tactical Considerations.

The following are tactical considerations for exterior fire control using an opposing tip nozzle:

(1) Identify the ventilation profile and determine the suitability of exterior control.

(2) Forecast fire progression to reflex time for fire control.

(3) Fire is accessible for the reach of stream of the opposing tip nozzle, and the structure is not compromised.

(4) The fire control team should coordinate and communicate with the IC.

(5) Be aware of the increased live load of water on the structural stability of the building.

(6) Once knockdown is achieved, shut down the opposing tip nozzle.

10.7.3.4 Preferred Techniques.

The following are preferred techniques for exterior fire control using an opposing tip nozzle:

(1) Gain access for the nozzle to the target.

(2) Place nozzle in target position, using reach of stream to achieve fire knockdown.

(3) Flow water until fire knockdown is achieved.

(4) Use multiple access and observation points when required.

(5) Adjust depth as required, twisting the nozzle to achieve maximum water distribution to the target.

10.7.3.5 Alternative Techniques.

The following are alternative techniques for exterior fire control using an opposing tip nozzle:

(1) Rotary distributor nozzles

(2) Piercing nozzles

(3) Bent tip nozzles

10.7.3.6 Safety Considerations.

The following are safety considerations for exterior fire control using an opposing tip nozzle:

(1) Communications and coordination are required between the fire control team and the IC.

(2) Be aware of adverse effects and other hazards due to flow path disruption and structural stability, including weight of water.

(3) Practice correct firefighting techniques when gaining access to the target.

(4) Work the opposing tip nozzle from a safe space, using reach of stream to achieve fire knockdown.

10.7.4 Exterior Control — Rotary Distributor Elevating Apparatus.

10.7.4.1 Tactical Objective.

The objectives include the following:

(1) Achieve fire control or improve occupant tenability and interior conditions for fire attack from an alternative position, creating conditions for an interior fire attack hose crew to approach for extinguishment.

(2) Control attic, cockloft, or roof void fires prior to extinguishment.

(3) Control auto-exposure, other exposures, and progression to cladding.

10.7.4.2 How It Works.

The following are examples of successful outcomes of exterior fire control using a rotary distributor elevating apparatus:

(1) Surface temperature of unignited fuels is reduced and pyrolysis is stopped.

(2) Flame is displaced from surface of burning fuels.

(3) Steam production absorbs energy from the environment.

10.7.4.3 Tactical Considerations.

The following are tactical considerations for exterior fire control using a rotary distributor elevating apparatus:

(1) Identify the ventilation profile and determine the suitability of exterior control.

(2) Forecast fire progression to reflex time for fire control.

(3) Fire is accessible for the rotary distributor off an elevating apparatus, and the roof structure is compromised.

(4) Position elevating apparatus to reach the opening while remaining outside of potential collapse zones, obstructions, and hazards.

(5) Establish a water supply for the elevated apparatus.

(6) Use an exterior spotter to assist with stream placement and incident safety.

(7) The fire control team should coordinate and communicate with the IC and the spotter personnel.

(8) Ensure sufficient hose to reach the target operating position, allowing for safe working distance while not diminishing the elevating apparatus effective operating height.

(9) Elevated apparatus operators should ensure that the hose stays plumb. A bend in the hose will indicate that the rotary distributor has bottomed out and needs to be raised.

(10) Be aware of the increased live load of water on the structural stability of the building.

(11) Once knockdown is achieved, shut down the rotary distributor.

10.7.4.4 Preferred Technique.

The preferred technique for exterior fire control using rotary distributor elevating apparatus is to position the distributor over the objective, start the water, and lower the rotary distributor to the target.

10.7.4.5 Alternative Techniques.

The following are alternative techniques for exterior fire control using rotary distributor elevating apparatus:

(1) Rotary distributor roof application

(2) Piercing nozzles

(3) Cockloft nozzles

10.7.4.6 Safety Considerations.

The following are safety considerations for exterior fire control using rotary distributor elevating apparatus:

(1) Communications and coordination are required between the fire control team, the spotter, and the IC.

(2) Be aware of adverse effects and other hazards due to flow path disruption or structural stability, including weight of water.

(3) Safe practices must be observed for working from heights.

(4) Collapse zones should be identified.

10.7.5 Exterior Control — Rotary Distributor Internal High-Rise Application.

10.7.5.1 Tactical Objectives.

Tactical objectives of exterior control using rotary distributor internal high-rise application include the following:

(1) Achieve fire control or improve occupant tenability and interior conditions for fire attack from an alternative position.

(2) Control auto-exposure or progression to cladding and voids.

10.7.5.2 How It Works.

The following are examples of successful outcomes of exterior fire control using a rotary distributor internal high-rise application:

(1) Surface temperature of unignited fuels is reduced and pyrolysis is stopped.

(2) Flame is displaced from surface of burning fuels.

(3) Steam production absorbs energy from the environment.

10.7.5.3 Tactical Considerations.

Tactical considerations of exterior control using rotary distributor internal high-rise application include the following:

(1) Identify the ventilation profile and determine the suitability of exterior control.

(2) Forecast fire progression to reflex time for fire control.

(3) Determine an operating position for deployment and associated logistics (e.g., water supply, hose and layout, tie-offs, shutoff, gauge, standpipe equipment, staffing).

(4) Ensure the building fire protection system (standpipe) has been supplied when required.

(5) Select a rotary distributor (orifice size) to allow for passing of standpipe debris.

(6) Set the gate and gauge to optimize distribution of stream.

(7) Consider the use of a second riser.

(8) Maintain flow path control.

(9) Use an exterior spotter to assist with stream placement and incident safety.

(10) Safe practices must be observed for working at heights.

10.7.5.4 Preferred Techniques.

The following are preferred techniques for exterior fire control using a rotary distributor internal high-rise application:

(1) Staff a rotary distributor crew to establish an operating position by creating a visual two floors above the smoke or fire conditions. If there is flame or volatile smoke rising to the proposed operating position, personnel should continue up the building until they are two floors above any volatile smoke or flame. One 50 ft (15 m) hose length will extend five floors.

(2) Remove any combustibles (e.g., curtains, furniture) from the operating position.

(3) Lay out hose and ensure a shutoff valve is used before the final operating length.

(4) Connect a gate and pressure gauge on the standpipe side of the shutoff valve.

(5) Lower the operating length 5 ft (1.5 m) from the operating position. Staff the line with a firefighter that will anchor the dry line at the edge of the opening to prevent "kickback" while charging.

(6) Lower the rotary distributor onto target in communication with external spotter and any crews within the vicinity.

(7) External spotters are required to ensure that the stream is optimized for maximum flow directed into the fire compartment.

10.7.5.5 Alternative Techniques.

The following are alternative techniques for exterior fire control using a rotary distributor internal high-rise application:

(1) Rotary distributor roof application

(2) Bent tip nozzles

10.7.5.6 Safety Considerations.

The following are safety considerations for exterior fire control using a rotary distributor internal high-rise application:

(1) The rotary distributor team ensures communication with the IC and the external spotter.

(2) The spotter should look for the positioning of rotary nozzle.

(3) The spotter should look for negative effects of air entrainment.

(4) This tactic can entrain air into the fire compartment which will displace fire, smoke, and gases. Clear communication with interior crews should be ensured during rotary nozzle operations.

(5) When going beyond five stories of the fire compartment, the coupling should be anchored to a suitable anchor point.

(6) Safe practices must be observed for working at heights.

Supplemental Information

File Name	Description	Approved
1700_Chapter_10_FR-23.docx		
1700_10.7_FR-23-new.docx	For prod use	

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Fri Apr 19 11:43:30 EDT 2024

Committee Statement

Committee Statement:	The technical committee identified some alternative approaches to controlling a fire outside of the fire compartment.
Response Message:	FR-23-NFPA 1700-2024

First Revision No. 29-NFPA 1700-2024 [Section No. 11.3]

11.3 Application.

The intent of this chapter is to apply the principles of science-based research to minimize firefighters' risk on the fireground and reduce secondary impacts before and after the incident. Principles of the hierarchy of contamination control for firefighters are provided throughout this chapter *(see* *Table 11.3* *)* . *(See "Hierarchy of contamination control in the fire: Review of exposure control options to reduce cancer risk.")*

Table 11.3 Overview of the Hierarchy of Controls Approach

Potential Effectiveness	**Type of Controls**	**Options Being Researched**
Least	PPE — Inhalation	Consistent use of respiratory protection during all phases of a response
	PPE — Dermal	Tightening the interfaces of turnout gear, use of particulate-blocking hoods
	Administrative controls	Use of specific fire attack tactics, crew rotation, PPE donning and duffing practices, PPE decontamination, PPE retirement or removal from service, skin cleaning, fire apparatus cleaning, fire station cleaning
	Engineering controls	Fire station design, diesel exhaust capture, training prop design
	Substitution	Training fuel selection, use of simulated smoke and flame, replacing hazardous chemicals in products with less hazardous chemicals (e.g., fluorine-free foam), replacing diesel apparatus with electric or hybrid-electric apparatus
Most	Elimination	Public education programs, increased installation of smoke alarms and sprinklers, fuel reduction efforts to prevent exterior fires transitioning to structure fires

Supplemental Information

File Name	Description	Approved
1700_Chapter_11_FR-29.docx		
1700_11.3_FR-29.docx	For prod use	

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Mon Apr 22 22:47:53 EDT 2024

Committee Statement

Committee Statement:	Technical committee added text and a reference to the Application section to introduce the hierarchy of contamination control which is followed in principle throughout the chapter.
Response Message:	FR-29-NFPA 1700-2024

First Revision No. 28-NFPA 1700-2024 [Section No. 11.4]

11.4 General.

~~Cancer~~ According to the World Health Organization's International Agency for Research on Cancer (IARC) 2022 report, "Occupational exposure as a firefighter," cancer is one of the leading causes of ~~line-of-duty deaths~~ LODD among firefighters today. ~~Fire-fighting~~ The IARC evaluated the carcinogenicity of occupational exposure as a firefighter and determined that firefighting duties significantly increase an individual's risks for contracting several types of cancers. Cancer rates for firefighters have risen dramatically in correlation with the increase in toxicity of smoke. Smoke from a fire always contains contaminants~~, which~~ that are harmful to health when ~~these toxins~~ they enter the body via the mouth, respiratory tract, mucous tissue, or skin. During working fire responses ("hot smoke"), these contaminants occur in high concentrations as gases, which are easily absorbed. During overhaul operations or other lower heat conditions ("cold smoke"), contaminants may be bonded to soot, runoff water, or ash. Additional hazards at the fireground may be caused by hazardous materials, such as asbestos or flame-retardant materials found in the products of combustion. *(See NFPA 1585 .)*

11.4.1

Prior to complete fire suppression, combustion products are released as smoke. Initially many of these substances are mobile. The toxic ~~and/~~ or caustic gases and vapors that occur in high concentrations during this phase, such as carbon monoxide (CO), carbon dioxide (CO_2), hydrogen chloride (HCl, hydrochloric acid when condensed), acrolein, and hydrogen cyanide (HCN, prussic acid when condensed), constitute a potential hazard for operating members and civilians. The smoke plume must be considered when the ~~incident commander~~ IC designates the hot zone at an operation.

11.4.2

Once the fire has been extinguished and the burnt materials have cooled down to ambient temperature, hazardous organic substances~~, in particular soot particles,~~ are still present in particular soot particles . Operating personnel continue to ~~have the~~ face a potential for contamination~~,~~ and ~~members continue to utilize~~ should use the appropriate level of ~~personal protective equipment (~~ PPE~~)~~ , including respiratory protection. Care must be taken not to transport contaminants outside the hot zone.

11.4.3

~~There are three primary ways in which airborne harmful substances produced by fires can make their way into the body: via inhalation, via skin absorption, and via the mouth (orally).~~ Firefighters should be aware of good hygiene practices to minimize their exposure to harmful substances both on scene and post-incident. Ensuring that firefighters have the proper tools, processes, and knowledge is essential in minimizing exposure to harmful substances involved with structural firefighting.

11.4.4

Firefighters can protect themselves ~~to a great extent~~ by limiting exposure and conducting fireground decontamination. During and after ~~extinguishing~~ extinguishment of the fire, respiratory protection should be worn when contaminants are present. To further limit exposures, the ~~incident commander (~~ IC~~)~~ should establish zones on the fireground similar to those commonly accepted at the scene of a hazmat release (i.e., hot, warm, and cold). Operating apparatus should, if possible, be positioned outside the hot zone, and an effort should be made to limit entry of smoke into the crew compartment by closing cab windows and additional openings. Structural firefighting gear will continue to off-gas after the firefighter leaves the hot zone. PPE should be removed prior to removing the facepiece (as dictated by best practices).

11.4.5

A critical on-scene tactical consideration is setting up decontamination and rehabilitation areas. Gross on-scene decontamination of PPE and firefighting equipment should be undertaken in the warm zone prior to PPE or equipment being removed to the cold zone and placed back on the fire apparatus. If necessary, contaminated PPE and equipment should be bagged and transported back to the station outside the crew compartment. In the cold zone adjacent to the rehabilitation areas, rehabilitation should be set up where drinking and eating is permissible.

11.4.6

Upon return to the fire station, personnel who were exposed to smoke and contaminants in the hot zone should shower immediately. Clothing should be laundered at the station and not transported in a private vehicle to ~~a member's~~ personnel's homes . Contaminated equipment should be thoroughly cleaned before being placed back into service.

Supplemental Information

File Name	Description	Approved
1700_FR-28_11.4.docx		

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Mon Apr 22 22:36:35 EDT 2024

Committee Statement

Committee Statement: Technical committee added IARC reference from 2022 which stated that occupational exposure as a firefighter as carcinogenic to humans (Group 1) on the basis of sufficient evidence for cancer in humans.

Occupational exposure as a firefighter is complex and includes a variety of hazards resulting from fires and non-fire events. Firefighters can have diverse roles, responsibilities, and employment (e.g. full-time, part-time, volunteer) that vary widely across countries and changeover their careers. Firefighters respond to various types of fire (e.g. structure, wildland, and vehicle fires) and other events (e.g. vehicle accidents, medical incidents, hazardous material releases, and building collapses). Wildland fires are increasingly encroaching on urban areas. Changes in types of fire, building materials, and personal protective equipment have resulted in significant changes in firefighter exposures over time.

Firefighters may be exposed to combustion products from fires (e.g. polycyclic aromatic hydrocarbons, particulate matter), building materials (e.g. asbestos), chemicals in firefighting foams (e.g. per- and polyfluorinated substances), flame retardants, diesel exhaust, as well as other hazards (e.g. night shift work and ultraviolet or other radiation).

An IARC Monographs Working Group reviewed evidence from cancer studies and mechanistic studies in humans to assess the carcinogenic hazard to humans of occupational exposure as a firefighter and concluded that:

Occupational exposure as a firefighter is carcinogenic to humans (Group 1).

Response Message: FR-28-NFPA 1700-2024

First Revision No. 55-NFPA 1700-2024 [Section No. 12.5.2]

12.5.2

Using the reach of the stream, the initial water application should be made ~~as close to the fire as possible, including~~ at the level and side of the building where fire is encountered.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 22:03:49 EDT 2024

Committee Statement

Committee Statement: Technical committee removed some unnecessary text.

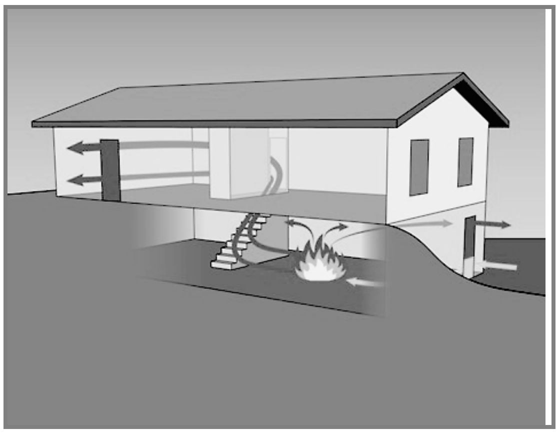
Response Message: FR-55-NFPA 1700-2024

First Revision No. 35-NFPA 1700-2024 [New Section after 12.5.4]

12.5.5

It is critical that the size-up identify a structure with an additional level in the rear (potential for low intake and high exhaust) — such as three levels in the rear and two levels in the front — and the location of the fire. If the fire is on a lower level, it could set up a flow path with an intake on the level of the seat of the fire and an exhaust at the street level for the structure. Figure 12.5.5 illustrates a structure fire with a low intake on grade with the seat of the fire and a high exhaust (vertical vent). As a result, the typical interior access to the seat of the fire has become the exhaust portion of the flow path. Door control is one means of controlling the flow to prevent the exhaust portion of the flow path from extending to the floors above the fire. If door control is not an option, getting effective water on the seat of fire prior to interior operations should be considered to reduce the risk of operating in the exhaust portion of the flow path and reduce the risk of floor collapse. *(See also Section 12.16 .)*

Figure 12.5.5 Structure Fire with Low Intake on Grade with Seat of Fire and High Exhaust (Vertical Vent).



Supplemental Information

File Name	Description	Approved
Figure_12_5_5.jpg		

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 07:39:32 EDT 2024

Committee Statement

Committee Statement: The technical committee added this section to call out the hazards of a low intake and a high exhaust flow path scenario. LODDs, similar to the Pang Fire or the Cherry Road fires have continued to occur in this scenario.

Response Message: FR-35-NFPA 1700-2024

First Revision No. 54-NFPA 1700-2024 [Section No. 12.5.5]

12.5.6

Exterior fire ~~communication~~ spread can occur through interior ceiling openings, and auto-exposure through eaves and soffit vents can result in fire spread to the attic.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 21:29:35 EDT 2024

Committee Statement

Committee Statement: technical committee changed communication to spread.

Response Message: FR-54-NFPA 1700-2024

First Revision No. 34-NFPA 1700-2024 [New Section after 12.5.6]

12.5.8

An exterior fire, such as a fire involving a deck or enclosed porch, that may have extended into the structure needs exterior fire control to occur prior to, or simultaneously with, interior operations to be effective. Interior operations prior to effective suppression on an exterior could result in firefighters being overtaken by a fire that they cannot control from their position.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 07:31:23 EDT 2024

Committee Statement

Committee Statement: The technical committee added this section to call out the importance of effective water on an exterior fire to prevent fire from overtaking crews in the interior. This was the situation at the Meadowood Court fire in 2008, Marshover Look Fire in 2007 (Kyle Wilson), and several near misses (multiple FFs burned in each) in NYC and Georgia in the past few years.

Response Message: FR-34-NFPA 1700-2024

First Revision No. 53-NFPA 1700-2024 [Section No. 12.7]

12.7 Garages .

Most garages contain a significant fuel load and fire control hazards due to internal combustion engine and electric vehicles, powered equipment, ~~ignitable~~ ignitible liquids, battery energy storage systems, and various fuels. Detached garage roofs may be ~~of~~ inferior construction, including the lightweight truss. Storage in and suspended from the overhead supports is common and will add to a collapse hazard.

12.7.1

Due to the storage of flammable compressed gases, the potential for a flash fire and boiling liquid expanding vapor explosion (BLEVE) in these spaces is relatively high.

12.7.2

The height of a garage may accommodate a hydraulic lift that may have a vehicle in a raised position. Failure of a hydraulic line could cause the lift to fail.

12.7.3

Overhead garage doors can open or close during a fire and ~~have the potential to~~ could collapse or trap firefighters.

12.7.4

~~It may be preferable to have a handline that flows more than~~ Handlines should flow at least 150 gpm (568 L/m) to knock down and extinguish fires in ~~these spaces~~ garages from a relative area of safety. The ~~utilization~~ use of exterior streams through as small an opening as possible, having a charged line flowing into an open vent as soon as possible, or the use of a piercing nozzle, in the case of a closed garage, should be considered.

12.7.5

~~Consideration should be given to applying~~ Applying exterior water streams to attached garages should be considered , particularly in ~~particular in~~ avoiding fire propagation into the main structure. Firefighter safety and fire control, in most cases, is enhanced by an exterior stream application. Using exterior streams and maintaining closed doors between the attached garage and the main structure may limit the extent of fire spread into the main structure.

12.7.6

Attached garage fires where venting has occurred or where the garage door to the exterior is open should be considered exterior fires. An exterior fire that may have spread into the structure needs exterior fire control to occur prior to interior operations to be effective. Interior operations prior to effective suppression on an exterior could result in firefighters being overtaken by a fire that they cannot control from their position.

12.7.7

Crews should consider alternative access modes before opening, cutting, or removing overhead doors. If an overhead door is the best access, small openings can be cut in the door and fire streams ~~can be~~ applied through these openings to manage the ventilation of the compartment while extinguishing the fire. Thermal imagers and penetrating (i.e., piercing) nozzles can be effective in suppression operations.

12.7.8

Adjacent or attached structures should be assessed to identify any fire extension. Interior doors should be closed to confine the fire and slow extension into the living space when possible.

12.7.9

An interior charged hose line should also be placed at potential fire spread openings in order to confine the fire.

12.7.10

Vertical ventilation should not be ~~utilized~~ used due to the potential for early collapse. Incident commanders should thoroughly consider the risks and benefits before assigning crews to perform such roof operations ~~such as vertical ventilation~~ .

12.7.11

Positive pressure ventilation should be considered in the living space to create a pressure differential, thereby inhibiting fire spread.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 17:07:05 EDT 2024

Committee Statement

Committee Statement: The technical committee updated some recommendations for garages due to emerging technologies. Also added a section to illustrate an attached garage fire that has vented to the exterior should be controlled from the exterior.

Response Message: FR-53-NFPA 1700-2024

First Revision No. 69-NFPA 1700-2024 [New Section after 12.8.4]

12.8.5

A portion of the skirting below a manufactured home should be pulled back to check for horizontal fire spread below the floor prior to making entry.

Submitter Information Verification

Committee:	FCO-AAA
Submittal Date:	Fri Apr 26 14:34:19 EDT 2024

Committee Statement

Committee Statement:	Technical committee recognizes the need to check for fire spread beneath a manufactured home by removing skirting.
Response Message:	FR-69-NFPA 1700-2024

First Revision No. 52-NFPA 1700-2024 [Section No. 12.9]

12.9* Large Estate Dwellings.

Building construction trends continue to evolve, producing larger and more open floor plans in residential structures that commonly include lightweight construction and engineered elements. It is not uncommon to encounter residential structures with ~~square footage~~ areas similar to commercial buildings. These dwellings may contain features that affect fuel load and access such as indoor pools, movie theaters, or bowling alleys. Large estate dwellings are structures that exceed 3000 ft^2 (279 m^2) , have open floor plan designs, and use lightweight construction and engineered structural elements. Such features increase ~~which creates~~ the potential for large area fires and early collapse, necessitating ~~adjustments to~~ increased firefighting resources and adjustments to fire tactics as recommended by Section 12.9.

12.9.1

As with any fire, strategy and tactical decisions should be based on available resources and tactical priorities. Given the size and configuration of large estate dwellings, communication of complex geometries may be a challenge and should be prepared for in advance. Operating units should make every effort in their initial 360-degree assessment and ongoing size-up to identify the fire area and building construction features. Searching for the fire should incorporate a charged line, thermal imaging camera, door control, crew integrity, and communication with the IC to maintain situational awareness and crew accountability.

12.9.2

Due to the large open floor plan and fuel load, it is recommended to control ~~these~~ fires in large estate dwellings with high-volume fire flows~~, utilizing~~ using the reach of the stream and the cooling ability of the increased flows.

12.9.3

~~Doorway curtains~~ Door control and other means to isolate spaces can be ~~utilized~~ used to slow fire extension in ~~these open spaces~~ large estate dwellings .

12.9.4

~~Incident commanders~~ ICs should consider the need for additional resources to complete primary and secondary searches of ~~these structures~~ large estate dwellings in a reasonable amount of time. Searches must be conducted in coordination with suppression activities.

12.9.5

Large windows in large estate dwellings present a significant inadvertent ventilation risk. The failure of such windows can result in rapid ventilation of the fire, which can cause rapidly deteriorating conditions and extreme fire conditions.

12.9.6

Large objects, such as light fixtures, artwork, and other decorations suspended in open areas, can pose an additional hazard to firefighters.

12.9.7

Large open areas include long spans typically using lightweight truss construction. These structural characteristics can lead to early structural failure, primarily roof and floor collapse. ~~Incident commanders~~ ICs should thoroughly consider the risks and benefits before assigning crews to perform interior and roof operations such as vertical ventilation.

12.9.8

Multiple large open stairwells, the presence of elevators shafts, and large open floor plans can facilitate rapid spread of fire.

12.9.9

~~These structures~~ Large estate dwellings often present numerous obstacles regarding access to the structure. Lengthy setbacks from public access, gates, and other impediments can complicate apparatus placement and result in long hose lays for supply and fire control lines.

Supplemental Information

File Name	Description	Approved
1700_FR-52_12.9.docx		

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 16:51:56 EDT 2024

Committee Statement

Committee Statement: Technical committee refined guidance on large estate dwellings

Response Message: FR-52-NFPA 1700-2024

First Revision No. 51-NFPA 1700-2024 [Section No. 12.10.2]

12.10.2

Living units may be found at all levels including the basement and the attic, resulting in extremely limited access for fire operations. This increases the hazard to life and complicates search operations.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 16:49:31 EDT 2024

Committee Statement

Committee Statement: Technical committee recognizes the life hazard that converted dwellings present to responders.

Response Message: FR-51-NFPA 1700-2024

First Revision No. 50-NFPA 1700-2024 [Section No. 12.11.1.1]

12.11.1.1 Size-Up .

Size-up ensures that the best initial action is taken to extinguish the fire and protect any potential victims. The initial strategic decision should be to ensure firefighters are working in the correct strategy for the given incident conditions. An initial size-up and 360-degree follow up assessment are critical. A 360-degree assessment by the initial IC may not be possible due to size, obstacles, and complexity; however, it must be completed through tactical assignments or positions, especially at the rear or C side. Size-up must include the suspected location, level, and extent of the fire, potential searchable spaces, and best access to the fire area for hose line advancement. Size-up should direct a fire attack from the most advantageous position with the most effective water volume, regardless of the strategy.

12.11.1.2 ~~Size-up~~ Fire Control.

The first arriving ~~water source~~ units should prioritize ~~master~~ hose streams to ~~reset~~ control the fire ~~with a deck gun or a monitor if possible~~ . If a confirmed fire is reported from the first arriving resources, additional resources should be requested immediately. Placement of apparatus becomes paramount in many cases due to setbacks, parking lots, and a multitude of access issues.

Supplemental Information

File Name	Description	Approved
1700_FR-50_12.11.1.1.docx		

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 16:42:53 EDT 2024

Committee Statement

Committee Statement: The technical committee revised the sections related to size up and initial actions to be taken with consideration with challenges the IC may have.

Response Message: FR-50-NFPA 1700-2024

First Revision No. 49-NFPA 1700-2024 [Section No. 12.11.1.2]

12.11.1.3 Rescue.

The residents in greatest danger should be an immediate priority. ~~It must be understood if~~ If large numbers of residents require immediate rescue, resources become critical~~. Delayed~~ and delayed extinguishment of the fire is often the result. Even in the face of rescues or removals, emphasis must be placed on extinguishment. Effective suppression creates and maintains survivable spaces; delayed extinguishment creates greater danger to victims and firefighters.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 16:24:24 EDT 2024

Committee Statement

Committee Statement:	Technical committee affirms the importance of extinguishment as other actions are taken place.
Response Message:	FR-49-NFPA 1700-2024

First Revision No. 30-NFPA 1700-2024 [New Section after 12.11.1.4]

12.11.1.5.1 Tank Water.

Research studies and fireground experience have shown that an apartment fire with flames extending out of the windows and to balconies and eaves two to three stories above it can be controlled with less than 300 gal (1135.6 L) of water from an effective exterior stream. Given the potential for rapid fire growth, incident commanders should consider the use of tank water for a rapid exterior attack. An example of a fire that was quickly extinguished with a single hand line with exterior fire control followed by interior fire control is shown in Figure 12.11.1.5.1 with a total water usage of 185 gal (700 L).

Figure 12.11.1.5.1 Tank Water Use for Initial Fire Attack. ***(Courtesy of UL Fire Safety Research Institute.)***

Supplemental Information

File Name	Description	Approved
Figure_12_11_1_4_1_Tank_Water.jpg		

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 06:49:47 EDT 2024

Committee Statement

Committee Statement: The technical committee added a section on the use of tank water to the multifamily dwelling section. With many people potentially at risk in this type of structure it can be most effective to quickly reduce the fire hazard in order to enable time for search and rescue.

Research studies and fire ground experience have shown that an apartment fire with flames extending out of the windows and extending to balconies and eaves two to three stories above it can be controlled with less than 300 gallons of water from an effective exterior stream. In other words tank water is a sufficient source for that initial fire control. A photo was added to help visualize the scenario.

Response Message: FR-30-NFPA 1700-2024

First Revision No. 45-NFPA 1700-2024 [Section No. 12.11.1.5]

12.11.1.6 Laddering.

Active fires in these structures will often increase the demand of ground ladders to effect rescue and provide access and egress for firefighters . Incident commanders should proactively consider early placement of ground ladders.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 16:11:45 EDT 2024

Committee Statement

Committee Statement: Th technical committee added the reason for the increased demand for ground ladders.

Response Message: FR-45-NFPA 1700-2024

First Revision No. 46-NFPA 1700-2024 [Section No. 12.11.2]

12.11.2

Using the reach of the stream, the initial water application should be made as close to the fire as possible, including at the level and side of the building where fire is encountered. The proper placement of the initial hose line is of vital importance. Effective suppression creates and maintains survivable spaces.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 16:14:00 EDT 2024

Committee Statement

Committee Statement: The technical committee determined effective water fire suppression will provide survivability.

Response Message: FR-46-NFPA 1700-2024

First Revision No. 32-NFPA 1700-2024 [Section No. 12.11.3]

12.11.3

The incident commander should consider the extent and location of fire involvement prior to the commencement of interior fire control and primary search. Flow path control tactics, which can limit the introduction of heat and smoke into the common stairway or hallways, should be considered. For ground level garden apartments, the use of exterior patio doors for entry to the fire apartment as opposed to entry from the hallway should be considered.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 07:21:28 EDT 2024

Committee Statement

Committee Statement: The technical committee added text to 12.11.3 to highlight the importance of flow path control tactics and alternate point of entry considerations to limit the amount of heat and smoke that would be introduced to the common stairway or hallways during fire operations. Keeping the stair and hallways clear can facilitate rapid search and rescue operations.

Response Message: FR-32-NFPA 1700-2024

First Revision No. 47-NFPA 1700-2024 [Section No. 12.11.4]

12.11.4

Generally, vertical travel of heat and smoke occurs in interior stairwells in multistory residences. This can create rescue and egress challenges, especially when upper-floor windows are opened or compromised. Fire extension through confined spaces, such as in balloon-framed row houses, may have smoke showing from an upper floor opening when in fact the fire is in the basement or cellar. The bravo and delta exposures should be assessed for fire extension and fire wall integrity.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 16:16:27 EDT 2024

Committee Statement

Committee Statement: The technical committee outlined the challenges related to balloon-type construction.

Response Message: FR-47-NFPA 1700-2024

First Revision No. 48-NFPA 1700-2024 [Section No. 12.11.5]

12.11.5

Exterior ~~fire communication can occur through interior ceiling openings, and auto exposure~~ fires can move through eaves and soffit vents ~~can result~~ , resulting in fire spread to the attic.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 16:20:39 EDT 2024

Committee Statement

Committee Statement: The technical committee address the exterior to interior fire extension.

Response Message: FR-48-NFPA 1700-2024

First Revision No. 44-NFPA 1700-2024 [Section No. 12.13]

12.13 Abandoned and Vacant Structures.

Abandoned ~~or~~ and vacant structures are buildings that are no longer in use~~,~~ and are, in many cases, ~~are~~ in an unknown state of condition or compromise, which could result in weakened or deficient structural components, such as holes in floors~~, and structural deficiencies~~ . In some instances, fires may have already occurred in these structures, creating more dangerous situations. The following should be considered when controlling fires in these structures:

(1) Exterior fire control should be considered prior to entry.

(2) Early collapse should be anticipated.

(3) Gutted, deteriorated, and modified interiors can result in unpredictable and increased fire activity~~. These conditions~~ and may impede normal firefighting operations.

(4) Occupancy by squatters and transients should be considered~~. As~~ ; as such, an evaluation of occupant survivability and rescue potential should be made.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 16:07:44 EDT 2024

Committee Statement

Committee Statement: The technical committee recognizes the reoccurrence fire challenge in vacant and abandoned structures and the safety challenges they present.

Response Message: FR-44-NFPA 1700-2024

First Revision No. 43-NFPA 1700-2024 [Section No. 12.14]

12.14 Large-Space Buildings.

Large-space buildings are structures with large, noncompartmentalized spaces that typically have atypical construction features , such as churches, skating rinks, bowling alleys, gymnasiums, and concert halls~~, and so forth. They generally have atypical construction features~~ .

12.14.1

A fire of any significance in a ~~large structure of this type~~ large-space building will challenge the resources of many departments. It is not possible to convert deadly defensive conditions into survivable offensive conditions in these structures. Deep-seated fires with large fuel loads or structural involvement are rarely (if ever) extinguished from interior, offensive positions.

12.14.2

Large~~,~~ ~~noncompartmented~~ noncompartmentalized areas with their fuel load and available air can lead to ~~a~~ well-developed fires .

12.14.3

Large open areas require long spans typically using truss construction. These structural characteristics can lead to early structural failure and roof and floor collapse.

12.14.4

Fire control for large-space buildings may require multiple large flow streams from the most advantageous position, with consideration of collapse zones .

12.14.5

~~These~~ Large structures may have unique roof characteristics that can be hazardous for vertical ventilation operations. If the fire in the structure is ventilation-limited, ventilation must be coordinated with effective water on the fire. Given the limited effectiveness of vertical ventilation based on the volume of the fire area against the potential vent openings early in the fire event, resources may be better served to provide information to the IC from a position where the roof can be observed.

12.14.6

Controlling the advancement of firefighters into ~~this~~ large structures is vital ~~as~~ because there is an increased potential of firefighters becoming disoriented ~~and so that command can determine their location~~ or lost inside the structure . ~~Special~~ The best possible tactics from offensive positions are focused on fire control with appropriate water volumes from positions of advantage to provide an effective fire attack and manage firefighter safety. If interior operations are needed, special tactics and equipment~~,~~ such as search ropes~~,~~ should be considered.

12.14.7

Air management and accountability ~~should be a critical consideration~~ are foundational elements embedded into the tactics and safety system that is managed by the IC and the ICS .

Supplemental Information

File Name	Description	Approved
1700_FR-43_12.14.docx		

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 15:55:40 EDT 2024

Committee Statement

Committee Statement: Technical committee added recommendations related to large space structures related to ventilation and search.

Response Message: FR-43-NFPA 1700-2024

First Revision No. 42-NFPA 1700-2024 [Section No. 12.15]

12.15 Warehouses.

Warehouse and storage fires are complex incidents involving many factors that expose firefighters to ~~many~~ challenges and hazards~~. The complexity of these incidents is a function of a number of factors~~ and can require significant resources to mitigate. ~~Fires in these occupancies can involve large open areas and high fuel loads.~~ Due to the size of the interior spaces, potential fuel loads, and challenges in getting enough water into these occupancies, any advanced fire will be incredibly difficult to extinguish from interior offensive conditions.

12.15.1

Key risk factors for warehouse fires include the following:

(1) Construction features including construction type, total building size, details of fire-rated enclosures, and ~~the~~ presence of large open fire areas

(2) ~~The types~~ Types and hazard levels of material stored

(3) Details on ~~the~~ storage configurations such as height and type (e.g., rack storage, floor storage)

(4) Presence, type, and suitability of fire protection and detection systems

(5) Any available methods to facilitate ventilation such as roof vents, smoke control, and exhaust systems

(6) Available water supply sources and adequacy

(7) Equipment and machines related to material handling

(8) Automatic-closing fire doors

12.15.2

Preplanning of warehouse and storage occupancies is a critical aspect of enabling an effective fire response.

12.15.3

High fuel loads, large open areas, and complex floor layouts can make size-up and determining the exact location of the fire difficult. These factors ~~can~~ may require ~~additional~~ more staffing to properly execute ~~engine company, ladder company, and rapid-intervention team activities~~ effective fire control and support work .

12.15.4

Large open areas with complex and confusing floor plans can ~~facilitate~~ cause firefighter disorientation and hamper search operations and hose movement. ~~If automatic-closing fire doors are present, they should be monitored so that they do not impact the emergency egress of fire crews. Good communication, controlled movements, and fire fighter accountability should be a focus of incident command~~ Air management and accountability have to be embedded into the tactics and safety system managed by the incident commander (IC) and the incident command system (ICS) .

12.15.5

High fuel loads and long structural spans can ~~facilitate~~ cause structural collapse. Structural conditions should be continually evaluated.

12.15.6

Localized collapse of storage racks and storage piles are a safety hazard to firefighting personnel.

12.15.7

Fire sprinkler systems may control, confine, or suppress fires, ~~greatly reducing~~ which can reduce damage, ~~helping to~~ maintain structural stability, and ~~providing~~ provide time for the establishment of manual firefighting operations. ~~Sprinkler control valves and associated water supplies should be verified to be in service, and systems should not be shut down until incident command determines it is appropriate to do so. Manual fire-fighting efforts should be supplemental to the efforts of the fire sprinkler system and typically are used for final extinguishment and overhaul.~~

12.15.7.1

When a building has an operating fire sprinkler system, “first water” is on the fire. Fire sprinkler systems are designed to confine the fire in the sprinkler area and pre-wet the fuel in the exposed areas around the fire for up to 2 hours without fire department intervention.

12.15.7.2

Location and access to the fire department connection (FDC) should be a component of the initial incident actions. The FDC should be pumped at a minimum of 150 psi (1034 kPa) or the marked system pressure on the outside of the building.

12.15.7.3

Assessment of the sprinkler riser pressures can provide valuable information regarding the sprinkler system’s ability to control the fire growth or whether the fire is expanding. Sprinkler control valves and associated water supplies should be verified to be in service, and systems should not be shut down until ~~incident command~~ the IC determines ~~it is appropriate to do so~~ adequate hose lines and units are in place to complete final extinguishment.

12.15.7.4

Personnel must remain in position at the sprinkler control valve and be prepared to open it on the orders of the IC if the fire redevelops. Manual firefighting efforts should be supplemental to the efforts of the fire sprinkler system and typically are used for final extinguishment and overhaul. Fire sprinklers are designed to work most effectively with no or minimal ventilation. Smoke removal and HVAC systems should be shut off until the sprinkler system is ultimately shut down.

12.15.8

Warehouse and storage occupancies can result in high fire flow demands. Potential sources of water include public hydrants, water supply shuttles (tanker~~/~~ or tender), and large diameter hose lays. If available, private water supplies are also an option~~; however,~~ , though these systems are typically sized to supply fire sprinkler system demands; ~~so caution should be used when~~ accessing ~~these supplies so~~ them should be done carefully, such that the effectiveness of the sprinkler systems is not impacted. Likewise, interior standpipe systems typically draw water from the sprinkler system. ~~Utilization~~ Use of ~~these standpipe~~ such systems could also hamper the effectiveness of the sprinkler system.

12.15.9

When the warehouse or storage facility is equipped with a fire sprinkler system, the first or second arriving engine should feed the ~~fire department connection (~~ FDC~~)~~ .

12.15.10

If the warehouse or storage building has multiple fire divisions, fire doors can be closed around the fire area to reduce ~~the potential for~~ the spread of fire and related fire gases and smoke.

12.15.11

Uninvolved fire-rated areas adjacent to the fire can be used as forward staging areas for staffing and equipment.

12.15.12

Consideration for ~~use of~~ handline~~s~~ use (in non-sprinkler-controlled fires) should include the following:

(1) Due to the high fuel loads and large areas involved, larger volume hand lines [≥2½ in. (≥63.5 mm)] that can reach the base of the fire should be considered.

(2) ~~The large~~ Large areas and complicated storage layouts can make the use of traditional pre-connected lines ineffective; ~~. In these cases consideration should be given to the use of portable monitors or gated wyes and hose/high-rise packs~~ interior hose stretches and fire attack positions should always match the smoke conditions and the air management plan and capabilities inside of a structure .

12.15.13

For large fires where the fire has vented through the roof, defensive operations are recommended. If defensive operations are initiated, personnel should be evacuated from ~~within~~ the interior and ~~the~~ roof areas and appropriate collapse zones should be established and enforced. Aerial water streams and ground-level monitors can be used to ~~help~~ control the spread of fire and ~~for protection of~~ protect exposures.

12.15.14

Rooftop ventilation operations, especially involving fires with high fuel load materials and when roof supports include lightweight construction ~~and/~~ or unprotected steel members, can be hazardous with due to potential for structural collapse ~~a significant concern~~ . This is especially true for buildings not equipped with fire sprinkler systems. Use of existing ventilation facilities including skylights, melt out vents, and smoke control systems can be effective. Positive pressure ventilation may not be practical due to the large volume areas involved with warehouse and storage occupancies. Sprinkler controlled fires should be kept as ventilation-limited as possible until the sprinkler system is shut down as directed by the IC.

12.15.15

Products of combustion from ~~the~~ stored materials ~~stored~~ can contain hazardous or toxic components. Appropriate PPE and SCBA should be ~~utilized~~ used at all times, and environmental monitoring of air and effluent water should be considered.

12.15.16

Controlling the advancement of firefighters into ~~this structure~~ warehouses or storage facilities is ~~vital as~~ important because there is an increased potential of ~~fire fighters becoming disoriented~~ firefighter disorientation and ~~for~~ of command ~~to determine~~ losing their location.

12.15.17

Air management and accountability should be a critical consideration.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 15:07:55 EDT 2024

Committee Statement

Committee Statement: The technical committee added content to the warehouse section based on emerging challenges and complexities of warehouse structures.

Response Message: FR-42-NFPA 1700-2024

First Revision No. 41-NFPA 1700-2024 [Section No. 12.16.2]

12.16.2

Entering the structure above the fire creates the potential of being within the exhaust portion of the flow path.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 15:00:46 EDT 2024

Committee Statement

Committee Statement: The technical committee refined the flow path as to the portion of.

Response Message: FR-41-NFPA 1700-2024

First Revision No. 40-NFPA 1700-2024 [Section No. 12.18.1]

12.18.1

Access to floor levels that are beyond the reach of aerial apparatus ~~are~~ is generally limited to ~~the~~ interior stairways. The use of tactical tools such as high-rise nozzles, wind control devices, smoke curtains, and door control may be needed to enable suppression and search crews to access the fire floor. The use of elevators during fire operations should be designed for fire service operations and closely monitored with safety precautions.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 14:58:32 EDT 2024

Committee Statement

Committee Statement: The technical committee added tactical tools to the section.

Response Message: FR-40-NFPA 1700-2024

First Revision No. 39-NFPA 1700-2024 [Section No. 12.19]

12.19 Basement.

Basement or belowgrade fires can be extremely difficult to control and extinguish once they are past the incipient stage. Access and ventilation opportunities are limited, floor plans are not standard, and fuel loads can be extraordinary and unpredictable. Firefighters are injured and killed at these fires when the floor beneath them collapses or they are caught in the exhaust portion of the flow path of the fire.

12.19.1

The following factors should be determined:

(1) Basement type, as follows *(see Figure 12.19.1)* :

(a) No-access basement (i.e., no external basement access, internal access only)

(b) Limited-access basement (i.e., external window access to basement only, walk up or lookout basement)

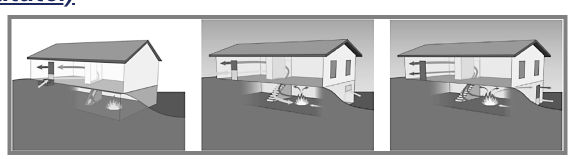
(c) Full-access basement (i.e., external door or large escape window access, walkout or daylight basement)

(2) Finished or unfinished, as follows:

(a) Finished: provides protection to structural floor components with a potential for livable space

(b) Unfinished: provides no protection to structural floor components or livable space, but does not eliminate potential for victims

Figure 12.19.1 Diagrams Representing Exterior No-Access Basement (left), Limited-Access Basement (middle), and Full-Access Basement (right). ***(Courtesy of UL Fire Safety Research Institute.)***



12.19.2

A thermal imager can be ~~utilized~~ used on the exterior to assess the thermal conditions at windows, vents, and doorways to assess the potential for a fire within the basement. ~~It should be noted that~~ Note: thermal imagers cannot see through walls or barriers, only the thermal conditions at the material's surface.

12.19.3

Smoke showing from chimney or vent pipes may indicate a basement fire.

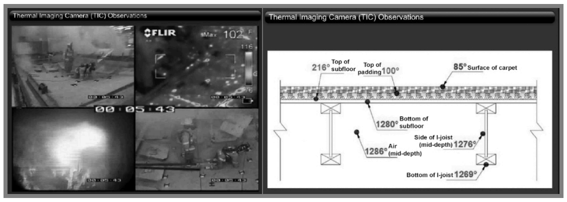
12.19.4

Observing the position of the neutral plane at the first-floor entryway door of a building might indicate a basement fire. An example of an observable indication of a basement fire ~~can be~~ is smoke filling an entire first floor door opening of a structure without the presence of a neutral plane. Such an observation~~s~~ may also indicate a fire located on the first floor, which is ventilated elsewhere and is providing fresh air to the fire. Additional openings on the first floor might also affect the level of the neutral plane at the front door. Basement fires are more likely to be ventilation-limited upon fire department arrival, and control of the flow path on the first floor ~~through~~ by managing openings is critical.

12.19.5

A thermal imager may be used to assess the temperature of the interior basement door and to look for heat sources around ground-floor penetrations, such as ~~near~~ heating registers and pipe penetrations. A thermal imager should not be used to assess the structural stability of the floor from above. Additionally, the use of a thermal imager on the ground floor surface is not a conclusive way to assess elevated temperatures in the basement area. The images in Figure 12.19.5 illustrate the thermal imaging view and temperatures just prior to collapse of the first floor in a basement fire research experiment.

Figure 12.19.5 Exterior Thermal Imaging. ***(Courtesy of UL Firefighter Safety Research Institute.)***



12.19.6

During a suspected basement fire, ~~the~~ risk analysis should consider ~~the~~ firefighter safety issues prior to placing personnel above the basement level because sounding the floor and thermal imagers are not reliable means of determining the structural integrity of the floor system, especially in buildings using lightweight construction materials .

12.19.7

When initiating ~~the~~ fire control, when possible, firefighters should control the basement fire from an exterior opening on the same level as the fire. If ~~this is~~ not possible, use of special nozzles or appliances may be used to flow water into the basement from the safest positions ~~as~~ possible, including through exterior basement window openings, door openings, vent holes, or holes cut above the fire. The application of a water spray pattern that cools the hot gases is the most effective way to control a basement fire. There are many nozzles or application devices that provide an effective spray pattern such as spray nozzles, penetrating nozzles, and distributor nozzles.

12.19.8

Any potential ventilation operations including opening of doors to the basement or breakage of windows should be performed in a controlled manner once an incident action plan is established and at the direction of the ~~incident commander~~ IC . Controlling flow path through ventilation management is essential in conducting rescue operations and limiting fire spread. Positive pressure ventilation should be used with caution due to its effect on flow path and fire spread ~~due to the~~ because of limited exhaust vent sizes.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 14:21:33 EDT 2024

Committee Statement

Committee Statement: Technical committee added limitations of using thermal imagers.

Response Message: FR-39-NFPA 1700-2024

First Revision No. 31-NFPA 1700-2024 [New Section after 12.20.5]

12.20.6

According to a NIOSH report, “Preventing deaths and injuries to firefighters working at strip mall fires,” additional potential hazards for strip mall occupancies include entanglement in and being struck from drop ceiling assemblies, wiring, and HVAC ducting; high heat release rate fuel loading; disorientation due to maze-like conditions; and facade collapse.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 07:08:10 EDT 2024

Committee Statement

Committee Statement: Added text to include additional hazards for strip mall occupancies that have been identified as a result of LODDs and Near Miss reports. These hazards have been reported in NIOSH [2023]. Preventing deaths and injuries to firefighters working at strip mall fires. By Loflin ME. Cincinnati OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2023-126, https://doi.org/10.26616/NIOSHPUB2023126

Response Message: FR-31-NFPA 1700-2024

First Revision No. 38-NFPA 1700-2024 [Section No. 12.23.7]

12.23.7

Attic fires are typically ventilation-limited due to limited natural ventilation openings. Controlled openings created below the neutral plane (~~such as~~ e.g., through the ceiling below the attic space) will not cause immediate growth and can provide access for suppression operations.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 12:57:27 EDT 2024

Committee Statement

Committee Statement: Grammar correction only.

Response Message: FR-38-NFPA 1700-2024

First Revision No. 37-NFPA 1700-2024 [Section No. 12.23.10]

12.23.10

~~Vertical ventilation should be closely timed or limited until fire suppression water is available.~~ In the absence of effective fire suppression ~~water~~ , vertical ventilation can result in uncontrollable fire growth, fire blowback into the occupied space, and ~~potentially~~ smoke explosions. Vertical ventilation should be limited until fire suppression water is controlling or supporting the suppression of the attic fire.

Supplemental Information

File Name	Description	Approved
1700_FR-37_12.23.10.docx		

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 12:46:49 EDT 2024

Committee Statement

Committee Statement: The technical committee identified that vertical ventilation should be use judiciously until water is available for suppression.

Response Message: FR-37-NFPA 1700-2024

First Revision No. 36-NFPA 1700-2024 [Section No. A.4.8]

~~A.4.8~~

~~Many governmental fire fighter training organizations and fire departments have incorporated fire dynamics and evidence-based practices into their training documents and/or their standard operational procedures or guidelines. The following is a list of those organizations and fire departments, but it is not all-inclusive:~~

~~In the United States, examples of fire departments that have incorporated fire dynamics and evidence-based practices include the following:~~

~~Boston (MA) Fire Department~~

~~Chicago (IL) Fire Department~~

~~Cleveland (OH) Division of Fire~~

~~Columbus (OH) Division of Fire~~

~~Eau Claire (WI) Fire Department~~

~~Fairfax County (VA) Fire and Rescue Department~~

~~Fire Department City of New York (FDNY)~~

~~Fort Worth (TX) Fire Department~~

~~Hanover (VA) Fire EMS Department~~

~~Houston (TX) Fire Department~~

~~Laramie (WY) County Fire District #2~~

~~Las Cruces (NM) Fire Department~~

~~Los Angeles (CA) County Fire Department (LACoFD)~~

~~Mesa (AZ) Fire and Medical Department~~

~~Oklahoma City (OK) Fire Department~~

~~Prince George's County (VA) Fire/Emergency Medical Services Department~~

~~St. Petersburg (FL) Fire and Rescue~~

~~San Jose (CA) Fire Department~~

~~Tucson (AZ) Fire Department~~

~~In Canada, many of the provincial organizations responsible for fire fighter training that have incorporated fire-dynamics-based fire tactics into their curriculums include the following:~~

~~Justice Institute of British Columbia Fire and Safety~~

~~Newfoundland Fire School~~

~~Nova Scotia Fire School~~

~~Ontario Fire College~~

~~Ontario Association of Fire Training Officers~~

~~IPIQ – Institut de protection contre les incendies du Québec~~

~~Manitoba Emergency Services College~~

~~Examples of Canadian fire departments that have incorporated fire dynamics and evidence-based practices include the following:~~

~~District of North Vancouver Fire and Rescue Services~~

~~Ottawa Fire Services~~

~~Oakville Fire Department~~

~~Hamilton Fire Department~~

~~Calgary Fire Department~~

~~Winnipeg Fire Paramedic Service~~

~~Service d'Incendie de Montréal~~

~~Halifax Regional Fire and Emergency~~

~~Saint John Fire Department~~

~~European fire departments that have implemented a fire dynamics training program include the following:~~

~~Belgium: Brussels, Antwerp~~

~~Croatia: Federal fire academy~~

~~Finland: Federal fire academy~~

~~France: Paris~~

~~Germany: All 102 career departments especially the "big five": Berlin, Hamburg, Munich, Cologne, Frankfurt; all 20 state fire academies (main target group: volunteer fire departments all over the country)~~

~~Greece: Thessaloniki~~

~~Great Britain: Federal fire academy, some regional fire academies, London, Liverpool (Merseyside), and Birmingham~~

~~Netherlands: Amsterdam, the Hague, and the national and regional fire academies~~

~~Poland: Federal fire academy~~

~~Sweden: The two federal academies: Stockholm and Gothenburg~~

~~Spain: Madrid~~

~~Switzerland: Both federal fire academies~~

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Tue Apr 23 09:20:36 EDT 2024

Committee Statement

Committee Statement: The technical committee determined the list of agencies has and should be outdated with adoption of the recommendations from the 1st edition of NFPA 1700. The list would be too long to publish and may omit some organizations inadvertently.

Response Message: FR-36-NFPA 1700-2024

First Revision No. 1-NFPA 1700-2024 [Section No. C.1]

C.1 "16 Firefighter Life Safety Initiatives."

In 2004, the NFFF held an unprecedented gathering of the fire service leadership when more than 200 individuals assembled in Tampa, Florida, to focus on the troubling question of how to prevent line-of-duty deaths and injuries. Every year approximately 100 fire fighters lose their lives in the line of duty in the United States — about one every 80 hours. Every identifiable segment of the fire service was represented and participated in the summit.

Every year, approximately 100 firefighters lose their lives in the line of duty in the United States — about one every 80 hours. — and are honored at the annual National Memorial Service in Emmitsburg, Maryland. In 2022, statistics provided by NFPA indicated a firefighter is injured every 7.5 hours, an 8 percent increase over 2021.

The first Firefighter Life Safety Summit marked a two significant milestone, because it not only gathered milestones: first, for gathering all segments of the fire service behind toward a common goal, ; but it also developed second, for developing the " 16 Firefighter Life Safety Initiatives." The summit (16 FLSIs)." Summit attendees agreed that the " 16 Firefighter Life Safety Initiatives" FLSIs could serve as a blueprint to reduce line-of-duty reducing preventable deaths and injuries. In Subsequent gatherings in Novato, California, in 2007; Tampa, Florida, in 2014; 2014, a second Life Safety Summit was held and more than 300 and San Antonio, Texas, in 2021 revisited the initiatives to determine their continued relevance and evaluate progress. Attendees agreed to a five-year cycle of revisiting the 16 FLSIs versus the original ten-year cycle due to advances in fire service leaders gathered. At the second Firefighter Life Safety Summit, the "16 Firefighter Life Safety Initiatives" were reaffirmed as being relevant to reduce line-of-duty deaths and injuries. training, technology, and evolution. Future gatherings are expected to assess and revise the initiatives, reflecting progress and positive changes in the LODD and injury landscape.

Supplemental Information

File Name	Description	Approved
1700_FR-1_C.1.docx		

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Wed Apr 03 21:18:20 EDT 2024

Committee Statement

Committee Statement: Representatives of the NFFF recommended some changes to the annex to recognize recent meetings and updated statistics.

Response Message: FR-1-NFPA 1700-2024

First Revision No. 89-NFPA 1700-2024 [Section No. D.1.2.2]

D.1.2.2 NFFF Publications.

National Fallen Firefighters Foundation, P.O. Drawer 498, Emmitsburg, MD 21727.

"16 Firefighter Life Safety Initiatives," ~~2004~~ 2024 .

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Mon Jun 03 08:09:04 EDT 2024

Committee Statement

Committee Statement: NFFF reference updated by the organization in 2024 and to be used going forward in any document utilizing it.

Response Message: FR-89-NFPA 1700-2024

First Revision No. 65-NFPA 1700-2024 [Section No. D.2.6]

D.2.6 Other Publications.

Colburn, D, et al., “A Comparison of Cooling Techniques in Firefighters After a Live Burn Evolution,” ~~*Prehosp Emerg*~~ *Prehospital Emergency Care,* Vol. 15(2), 2011.

Dickinson, E. T., and M. A. Wieder, *Emergency Incident Rehabilitation*, 2nd edition~~.~~ , Upper Saddle River, NJ, ~~Pearson Education,~~ 2004.

Espinoza, M., and M. Contreras, ~~M.~~ “Safety and Performance Implications of Hydration, Core Body Temperature and Post Incident Rehabilitation~~.~~ ,” Orange County Fire Authority (CA), December 2007.

Horn, G.P., ~~Blevins, S., Fernhall, B., and Smith, D.L. (2013)~~ et al., “Core temperature and heart rate response to repeated bouts of firefighting activities,” *Ergonomics*, Vol . 56(9):1465~~-~~ – 73, 2013 . ~~doi: 10.1080/00140139.2013.818719. Epub 2013 Jul 22~~ pubmed.ncbi.nlm.nih.gov/23869685/ .

Horn, G.P., ~~DeBlois, J., Shalmyeva, I., Smith, D.L., (2012)~~ et al., “Quantifying dehydration in the Fire Service using field methods and novel devices,” ~~;~~ *Prehospital Emergency Care*, Vol. 16(3), 347~~-~~ – 355~~.~~ , 2012 ~~DOI: 10.3109/10903127.2012.664243~~ .

Horn, G.P., ~~Gutzmer, S., Fahs, C.A., Petruzzello, S.J., Goldstein, E., Fahey, G.C., Fernhall, B., Smith, D.L., (2011)~~ et al., “Physiological recovery from firefighting activities in rehabilitation and beyond,” ~~;~~ *Prehospital Emergency Care* 15(2), 214~~-~~ – 225, 2011 .

Hostler, D., et al., “Comparison of Active Cooling Devices with Passive Cooling for Rehabilitation of Firefighters Performing Exercise in Thermal Protective Clothing: A Report from the Fireground Rehab Evaluation (FIRE) Trial,” ~~*Prehosp Emerg*~~ *Prehospital Emergency Care,* Vol. 14(3), 2010.

Madrzykowski, D., and C. Weinschenk, *Understanding and Fighting Basement Fires*, UL Firefighter Safety Research Institute, Columbia, MD, March 27, 2018.

McLellan, T. M., and G. A. Selkirk, “The Management of Heat Stress for the Firefighter,” Defence Research and Development Canada, 2005.

National Oceanic and Atmospheric Administration, National Weather Service Wind Chill–Temperature (WCT) Index.

Sawka, M. N., and K. B. Pandolf, “Effects of Body Water Loss on Physiological Function and Exercise Performance~~.~~ ,” ~~C. V. Gisolfi and D. R. Lamb (eds.),~~ *Fluid Homeostasis During Exercise*~~.~~ , ~~Benchmark Press,~~ Indianapolis, IN, 1~~-~~ – 38, ~~(~~ 1990~~)~~ .

Sawka, M. N., and K. B. Pandolf, “Physical Exercise in Hot Climates: Physiology, Performance, and Biomedical Issues,” *Medical Aspects of Harsh Environments*, Vol. 1, C. B. ~~Wenger and R. S. Pozos.~~ Washington, DC~~: Borden Institute~~ , 2002.

Smith, D. L., and S. J. Petruzzello, “Selected Physiological and Psychological Responses to Live-Fire Drills in Different Configurations of Firefighting Gear,” *Ergonomics*, Vol. 41(8), 1141~~-~~ – 1154, ~~(~~ 1998~~)~~ .

Smith, D. L., ~~S. J. Petruzzello, M. A. Chludzinski, J. J. Reed, and J. A. Woods,~~ et al., “Effects of Strenuous Live-Fire Firefighting Drills on Hematological, Blood Chemistry, and Psychological Measures,” *Journal of Thermal Biology*, Vol. 26(4-5)~~:~~ , 375-380, ~~(~~ 2001~~)~~ .

Smith, D. L., S. J. Petruzzello, and T. S. Manning, “The Effect of Strenuous Live-Fire Drills on Cardiovascular and Psychological Responses of Recruit Firefighters,” *Ergonomics*, Vol. 44(3)~~:~~ , 244~~-~~ – 254, ~~(~~ 2001~~)~~ .

~~U.S. Fire Administration (USFA).~~ FA-114, *Emergency Incident Rehabilitation*~~.~~ , Federal Emergency Management Agency, US Fire Administration, Emmitsburg, MD, ~~: USFA~~ July 1992. ~~vfdb (German Fire Protection Association);~~ “ Recommendations for operational hygiene in the course of fire fighting,” Vereinigung zur Förderung des Deutschen Brandschutzes (German Fire Protection Association), Germany, March 2014.

Submitter Information Verification

Committee: FCO-AAA

Submittal Date: Thu Apr 25 11:42:38 EDT 2024

Committee Statement

Committee Statement: Technical committee recognizes some additional references used in A.12.5.5 & A.12.20.6

Response Message: FR-65-NFPA 1700-2024

First Revision No. 63-NFPA 1700-2024 [Section No. D.2.7]

D.2.7 Internet ~~References~~ Resources .

~~https://www.~~ Illinois Fire Service Institute (IFSI) Research, fsi.illinois.edu/~~content~~ research ~~/research~~

~~https://ulfirefightersafety~~ Fire Safety Research Institute (FSRI), fsri .org

~~https://www.~~ National Institute of Science and Technology (NIST), Engineering Laboratory, Fire Service Division, nist.gov/el/fire-research-division-73300/firegov-fire-service

~~https://www.~~ National Institute for Occupational Safety and Health (NIOSH), Fire Fighter Fatality Investigation and Prevention Program (FFFIPP), cdc.gov/niosh/fire/default.html

~~http://www.~~ International Society of Fire Service Instructors (ISFSI), Online Courses and Resources, isfsi.org/~~p/cl/et/cid=1000~~ continuing-education/online-courses-resources

Submitter Information Verification

Committee: FCO-AAA
Submittal Date: Wed Apr 24 14:32:22 EDT 2024

Committee Statement

Committee Statement: Internet URLs updated
Response Message: FR-63-NFPA 1700-2024