



ONE STAIR, TWO PERSPECTIVES: SINGLE EXIT STAIR SYMPOSIUM

SYMPOSIUM HELD:

11-12 September 2024

NFPA Conference Center, Quincy, MA, USA

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EXECUTIVE SUMMARY

Evaluating changes such as increasing the allowable height of an apartment building served by a single exit stair belong in a time-tested, balanced, consensus-based standards development process. These processes ensure robust technical debate that considers the latest research, current practices, and the use of the latest technologies. When this process is substituted by uninformed legislative action, special interests, or misguided local policy decisions, there is a great risk to the protection and safety of people and property.

There have been recent legislative actions across the United States and Canada to allow new apartment buildings up to six stories in height to have only a single exit stair circumventing the open, transparent, balanced consensus codes and standards development processes that help ensure fire and life safety protection for residents, visitors, and first responders. When evaluating the proposed expanded allowance, it is imperative to understand and fully evaluate the fire protection and life safety concerns to ensure that changes to current single exit stair allowances do not jeopardize the minimum level of fire and life safety we have come to expect for residents, visitors, and first responders.

As the single exit stair issue continues to gain legislative traction, confusion among stakeholders continues to increase around what is currently allowed by various codes and jurisdictions for single exit stair apartment buildings. Two of the most widely used consensus codes in the United States, the *International Building Code*®, and NFPA 101®, *Life Safety Code*®, allow for new apartment buildings up to three and four stories respectively to have a single exit stair. In both cases, there are several other criteria that must be met including limitations on travel distance, limitation on the number of units per floor, and the installation of a sprinkler system.

The National Fire Protection Association® (NFPA®) hosted an international symposium focused on the single exit stair issue on 11-12 September 2024 at NFPA Headquarters in Quincy, Massachusetts. The symposium included representatives from the United States, Canada, the United Kingdom, and Australia. The goal of the symposium was to bring together proponents and opponents for a detailed discussion and to document the issue, identify concerns with the proposed changes, and to identify knowledge gaps.

The top concerns identified during the symposium with increasing the allowable height of single exit stair apartment buildings were:

1. The single exit stair results in the means of egress being susceptible to a single point of failure.
2. The types of allowable construction for single exit stair buildings.
3. Impact of a single exit stair on emergency responder operational capabilities.
4. Occupants egressing while first responders are ingressing.
5. Hazards arising post occupancy and human characteristics.

The knowledge gaps identified can be thought of in six broader categories:

1. Impact of a single exit stair on firefighter operations
2. Need for detailed comparisons/analysis

3. Need for more detailed and consistent data
4. Impact of human characteristics on fire risk
5. Impact of stair construction
6. Impact of emerging technologies

Two distinct perspectives quickly emerged during the symposium. First, those who saw single exit buildings as currently permissible with allowances limiting their height saw the proposal as simply expanding those limits to six stories with some additional proposed fire and life safety features. Second, the view that currently all six-story buildings require at least two exits saw the proposal as simply removing the second exit. These two perspectives appeared to drive the discussion and debate and illuminated the need for an in-depth code analysis and egress modeling of what is currently permitted.

The code analysis needs to compare the following three different types of apartment buildings:

1. Four-story apartment building with two exits
2. Four-story apartment building with one exit
3. Six-story apartment building with two exits

Once the code analysis and egress modeling are complete, these same analytics should be applied to the proposed six story single exit arrangement to document overall impact on egress.

NFPA will be sponsoring a research project to complete the code analysis and egress modeling through the [Fire Protection Research Foundation](#) (FPRF). As is typical with FPRF projects, a technical panel will be appointed to oversee and guide the project. The panel will be composed of a variety of stakeholders representing the different views. The goal of this project will be to determine if there is a technical basis for potential allowances for new six-story apartment buildings with a single exit stair. This potential arrangement will then be subject to the same full code analysis and egress modeling. Once complete, the FPRF report will be made publicly available for all interested stakeholders to be used in the consensus-based codes and standards processes to make informed decisions.

To download a copy of this report and explore additional resources from NFPA on the single exit stair issue, visit nfpa.org/singleexit.

INTRODUCTION

There has been a recent push across the United States and Canada to allow new apartment buildings of an increased height to have only a single exit stair. Many of these conversations have been happening in state legislatures with limited discussions occurring in the codes and standards process. Proposals such as these can be enticing where housing is in short supply, as it is in many areas of the United States and Canada. Housing availability is of extreme importance. There have been large loss-of-life fires that can, in part, be traced back to the lack of affordable housing available. One such recent example is the Ghost Ship Warehouse Fire in which 36 people died in a warehouse that was used for both assembly and residential purposes. It is also imperative that any changes to housing requirements do not reduce the level of fire and life safety the public has

come to expect for residents, visitors, and first responders. Therefore, evaluating changes such as increasing the allowable height of an apartment building served by a single exit stair in a consensus-based standards development process, such as the National Fire Protection Association® (NFPA®) process, is a vital step to help ensure that the life safety of both occupants and first responders is not being compromised.

NFPA Involvement in the Single Exit Stair Issue

NFPA strongly believes in its [standards development process](#) and the minimum level of fire and life safety the codes and standards developed through this process achieve. This is why NFPA has taken a firm stance that discussions related to increasing the allowable height of an apartment building with a single exit stair need to occur in a consensus-based standards development process and not state and local legislatures. More so than other processes, standards development organizations bring experts together from various backgrounds that can holistically evaluate the impacts of changes. As a standards development organization, NFPA will help facilitate these conversations in the appropriate arena; however, NFPA will remain neutral during the technical discussion. The consensus-based standards development process offers an open, transparent, and balanced evaluation of the technical merits of such proposals. However, in the case of the increased height for apartment buildings with a single exit, there were limited, if any, conversations happening in the various standards development processes. Additionally, there seemed to be confusion around what is currently allowed by codes for single exit stair apartment buildings. Therefore, NFPA decided to host an international event to bring both sides together to discuss the issue at hand. The goals of the event included:

- Detailing current code allowances for single exit apartment buildings and highlighting changes over the years to these allowances.
- Documenting international perspectives and experiences with single exit apartment buildings.
- Detailing proposed changes to the single exit stair allowances for apartment buildings that have been made to standards development organizations and local/state/provincial governments.
- Identifying aspects of the proposed changes that play a critical role in achieving the minimum level of life safety currently attained by codes and standards.
- Identifying concerns with proposed changes.
- Detailing open knowledge gaps to assist decision makers in making balanced decisions.

The output of the symposium is this report, which aims to help inform those faced with making decisions regarding the single exit stair issue and to serve as a starting point for future conversations within standards development processes.


Single Exit Stair Symposium Agenda

Based on the desired goals of the Single Exit Stair Symposium, it became clear there needed to be two distinct components of the symposium. The first was composed of various presentations related to the single stair issue. The presentations detailed current code allowances in the consensus-based codes, amendments local jurisdictions

enacted permitting taller apartment buildings with a single exit stair, as well as the current allowances and impending revisions in Canada. Often, the fact that single exit stair apartment buildings are common in most other countries is cited as a reason the rules are too strict in the United States and Canada. Two presentations were given to look at the landscape in two specific countries—the United Kingdom and Australia. Presentations also focused on the availability of data and the differences in how countries collect data, arguments for allowing an increased height for single exit stair apartment buildings, and opposition to the increase in height. This report contains summaries of the presentations.

The second portion of the symposium was a facilitated conversation among attendees. This provided an opportunity to discuss different concerns with the proposal as well as components of the proposal that are essential for its consideration. This portion began with an NFPA staff member facilitating conversations in smaller groups. The small groups discussed the question(s), then the larger group came together to see if and where there was some general agreement. The report contains detailed information on the discussion.

The agenda for the symposium is shown in Figure 1. The participants in the symposium included a diverse set of perspectives, including building and fire officials, fire service representatives, building code experts, housing advocates, international stakeholders, and researchers, among others.



SINGLE EXIT STAIR SYMPOSIUM AGENDA		
Wednesday, September 11, 2024		
12:00–1:00 p.m.	Lunch	
1:00–1:15 p.m.	Welcoming Remarks	Christian Dubay, Vice President and Chief Engineer, NFPA
1:15–1:40 p.m.	NFPA Requirements	Gregory Harrington, Principal Engineer, NFPA
1:40–2:10 p.m.	ICC Requirements	Beth Tubbs, Vice President of Codes, International Code Council
2:10–2:40 p.m.	Canada	Chief Keven Lefebvre, Chair of the Codes Committee for the Canadian Association of Fire Chiefs and Retired Fire Chief of Leduc, Alberta
2:40–3:00 p.m.	Break	
3:00–3:30 p.m.	Canada – Single Stair Report	Michael Lewis, Director, Office of the Fire Marshal, Justice and Public Safety, New Brunswick
3:30–4:00 p.m.	United Kingdom	Chief Gavin Tomlinson, Chief Fire Officer, UK
4:00–4:30 p.m.	Australia	Jeff Wood, Chief Technical Officer, FVS Fire Solutions
4:30–5:00 p.m.	Seattle, Washington	Karen Grove, Fire Prevention Director, Seattle Fire Department
Thursday, September 12, 2024		
9:00–9:30 a.m.	NFPA Research & Statistics	Birgitte Messerschmidt, Director of Research, NFPA
9:30–10:30 a.m.	Proponents	Stephen Smith, Executive Director, Center for Building in North America
10:30–10:45 a.m.	Break	
10:45–11:45 a.m.	Opponents	Nick Dawe (IFMA), Division Chief & Fire Marshal, Cobb County Fire and Emergency Services Deputy Chief Robert Marshall (IAFC), Vice Chair of the IAFC Fire and Life Safety Section Michael Desrochers (NASFM), President, NASFM and Executive Director, Department of Public Safety – Division of Fire Safety, State of Vermont Sean DeCrane (IAFF), Director of Health and Safety Operational Services, International Association of Fire Fighters
11:45 a.m.–1:00 p.m.	Lunch	
1:00–4:45 p.m.	Facilitated Discussion	
4:45–5:00 p.m.	Closing Remarks	Christian Dubay, Vice President and Chief Engineer, NFPA

Figure 1. Symposium Agenda.

Emerging Themes of the Single Exit Stair Symposium

Prior to the symposium, it had become rather apparent that the topic of a single exit stair in an apartment building was contentious. A major contributing factor to the contention is that each side firmly believes they are doing what is best for the greater good. Those who support increasing the height feel strongly that this is a way to make housing more affordable. Additionally, they argue that the types of units that will be available in these buildings will be more livable and will better accommodate families. On the other side, those who oppose the increased height feel strongly that allowing a single exit stair will decrease fire and life safety by putting occupants' lives at risk while also negatively impacting firefighting operations.

Throughout the one-and-a-half-day event, it became clear that there were two different perspectives on the issue, which would drive feelings on the topic. The first were those who saw single exit apartment buildings as permissible but current allowances limit their height. They viewed these proposals as simply increasing that allowable height to no more than six stories. Although the current allowances vary depending on what code you are using, both the *International Building Code*® (IBC®) and NFPA 101®, *Life Safety Code*®, permit certain apartment buildings to have a single exit stair. Others took the perspective that a six-story apartment building is always required to have two exits. They viewed the proposals as attempting to eliminate an exit rather than as an extension of what is already permitted. While both are valid ways of looking at the issue, it appeared there were not many attendees considering both perspectives. As the conversation continued, there did seem to be the potential for finding some middle ground. While the issue was not solved in the short amount of time available for discussion, proponents and opponents were talking and getting to the root issues. This was one of the main goals of the event given how few conversations were previously happening that involved both sides.

Another major theme that emerged during the discussion was the apprehension around a single point of failure within the means of egress. More specifically, it seemed that for many, regardless of what other fire or life safety features were added (restrictions on construction types, automatic sprinkler systems, increased fire resistance ratings, etc.) they struggled with the idea that if fire or smoke compromised the single exit stair, occupants would not have a way to egress. Those who supported the proposals seemed to believe the addition of the other fire and life safety features would greatly reduce the risk of a compromised single means of egress.

The speed at which the consensus codes and standards move compared to the speed at which legislatures need to make changes was another common topic throughout the discussion. Many legislatures are facing housing shortages in their communities. It will take years to see the benefits of changes that are being made right now. The consensus-based code process is much slower than enacting legislation. The more common codes in use tend to be on a three-year revision cycle and changes often must be introduced early in the process. The IBC and NFPA 101, which are arguably the two most relevant consensus-based codes on this topic, have editions scheduled for 2027. In both cases, proposed changes would have needed to be discussed earlier in 2024. If any changes are made for the 2027 edition, legislatures would then need to wait until late 2026 or early 2027 for the documents to be available. Once available, they would likely need to have legislation pass to make the documents enforceable. The consensus-based

code process is intentionally deliberate in the processing of changes. While some may argue that it is “too slow,” the processes used allow for multiple reviews and encourage the evaluation of the technical merit of changes. This is vital to ensure fire and life safety is not compromised. It became clear during the discussions that many legislatures feel they do not have the time to wait for the consensus-based process to make changes especially since they view the changes as being met with significant resistance.

NFPA Fire & Life Safety Ecosystem and the Single Exit Stair Issue

The facilitated discussion and the themes that emerged during it reiterated the importance of the NFPA Fire & Life Safety Ecosystem™. The Fire & Life Safety Ecosystem is a framework that identifies the components that must work together to minimize risk and help prevent loss, injuries, and death from fire, electrical, and other hazards. The framework, shown in Figure 2, consists of eight components:

- Government Responsibility
- Development and Use of Current Codes
- Referenced Standards
- Investment in Safety
- Skilled Workforce
- Code Compliance
- Preparedness and Emergency Response
- Informed Public

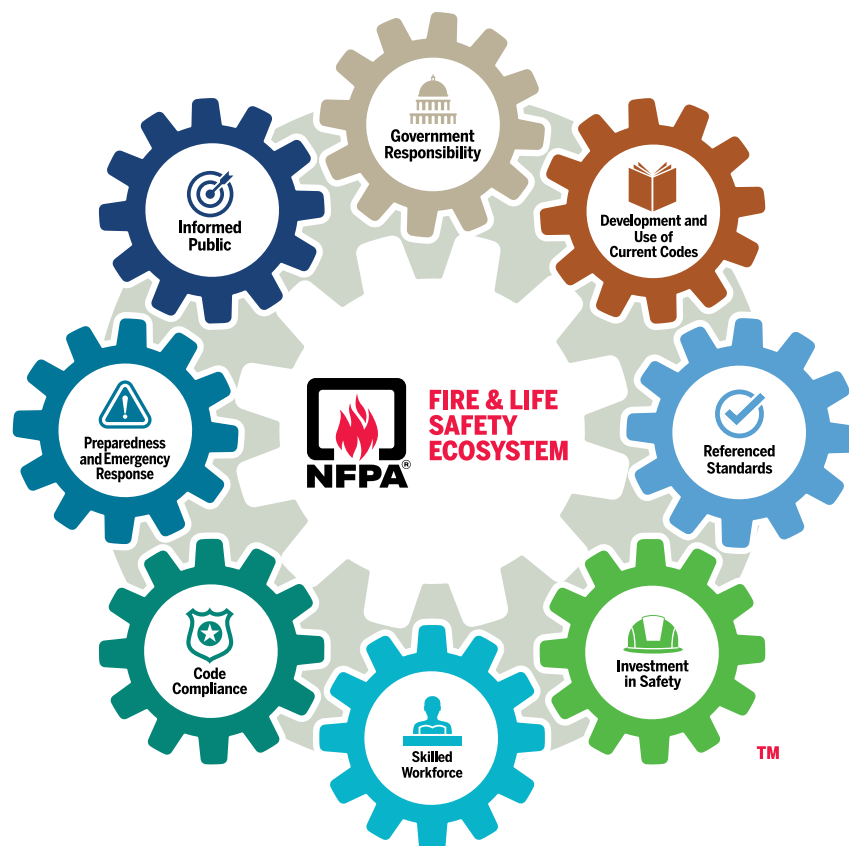


Figure 2. NFPA Fire & Life Safety Ecosystem.

The framework is also useful when looking at the ripple effects that changes to fire and life safety requirements could have on a community's fire and life safety ecosystem. The impact of changing the allowable height of an apartment building with a single exit stair could impact most, if not all of the components. However, four components in particular are worth exploring more deeply. The first is the **Development and Use of Current Codes** component. Circumventing the consensus-based codes and standards process, and legislating fire and life safety changes at the state or local level, could result in allowances that do not meet the anticipated minimum level of life safety of codes and standards the public has come to expect.



Another component that could be largely impacted is **Code Compliance**. Additional fire and life safety features will likely be required in apartment buildings with an increased allowable height for a single exit stair. This could then increase the demand for inspection services in that particular community to ensure the proper inspection, testing, and maintenance is occurring for the systems being relied upon to function in the event of an emergency. Many jurisdictions are already facing challenges due to the lack of resources so increasing the demand on the group responsible for inspections could have negative impacts.

The third component worth discussing more deeply is **Preparedness and Emergency Response**. It became clear that there was concern, particularly from the fire service, about the impact a single stair would have on firefighting operations and response. One of the main concerns was the counterflow that firefighters could face during the early stages of response. Counterflow would occur because only a single stair is available, and occupants may still be evacuating as firefighters begin their operations. Thus, creating a situation where firefighters are going in the opposite direction of building occupants trying to evacuate. In addition, there is a risk that the stair will become compromised as soon as the door to the stairwell on the fire floor is opened to allow firefighters to attack the fire. This puts occupants, particularly those above the fire floor, at risk of smoke inhalation from a compromised



stairwell, and/or becoming trapped where the stair is impassable. Another aspect to consider when it comes to emergency preparedness and response is the type of equipment available for fire response. If it has been decided that ladder trucks will be the rescue method for those trapped, does the responding fire department have ladders capable of reaching the necessary heights? And what does fire department access around the building look like? Can the ladder truck be positioned in such a way that rescue is possible?



While all the components play a role in the Fire & Life Safety Ecosystem, there is one more component worth highlighting: **Informed Public**. It is important to ensure that residents in apartment buildings with a single stair understand the fire safety measures they need to take. Additionally, if the evacuation strategy is different, such as a defend-in-place approach rather than full building evacuation, that needs to be properly communicated. Residents need to understand what is expected of them both in preventing a fire from occurring, and in response to a fire. The Fire & Life Safety Ecosystem can be a helpful tool in considering the impacts a change can have on the different components that need to work together to ensure a level of fire and life safety the public expects.

Welcoming Remarks

Valerie Ziavras, Senior Fire Protection Engineer at NFPA, began the symposium by welcoming everyone and providing a background of the symposium goals. She noted that so often fire protection and life safety considerations are reactionary and that it was exciting to have this opportunity to think critically and identify potential concerns and how best to address them prior to changes being implemented.

Ziavras encouraged everyone in attendance to keep an open mind on the topic and take advantage of the unique opportunity to hear from all sides of the single exit issue and to discuss fire and life safety concerns with increasing the allowable height of apartment buildings. She added that it is important for us as an industry to participate in these types of conversations to help find a balance between fire and life safety and other competing needs. We should be asking ourselves if we are doing things because that is the way they are always done, or if we are doing them because there is truly no safe alternative. The goal of this event was not to answer those questions, but to keep them in mind throughout the presentations and discussions. This was a start to the conversation on the topic with stakeholders sharing viewpoints and information from both sides.

Ziavras then took a moment to acknowledge that it was 11 September and invited Deputy Fire Chief Robert Marshall to lead the group in a moment of silence to honor those who lost their lives on 11 September 2001, and those who lost their lives as a result of their bravery on that day. Chief Marshall then led the attendees in a moment of silence.

Christian Dubay, Vice President and Chief Engineer at NFPA, provided his opening remarks. He thanked everyone in attendance at the symposium. He emphasized that NFPA is a neutral facilitator and takes pride in setting the table for issues such as this. He acknowledged that this is an emotional issue and that the discussion over the following days will be critically important to understand what factors need to be considered while making decisions. Dubay ended by thanking everyone for their time and passion.

CURRENT CODE LANDSCAPE IN THE UNITED STATES

This section summarizes the presentations that introduced the current code landscape in the United States related to the number of means of egress and building height as well as the history of these provisions.

National Fire Protection Association (NFPA)

Gregory Harrington, Principal Engineer with NFPA, presented the requirements for new apartment buildings from the 2024 edition of NFPA 101, and NFPA 5000®, *Building Construction and Safety Code*®. Both documents have the same requirements related to this issue. He noted that there have not been any public inputs on changes related to single exit allowances in the next edition (2027) that is currently under development. The presentation started with a brief history of NFPA 101, noting that the *Building Exits Code* was its predecessor from 1927 to 1966. The fundamental principle of exits has been that there must be multiple ways out of a building, including apartment buildings, but single exit exemptions have existed since the 1939 edition.

Harrington explained that it is important to note the NFPA definition of an apartment building is three or more dwelling units in a building, irrespective of ownership (i.e., a residential condominium building with three or more dwelling units meets the NFPA definition of apartment building). In addition, the concepts of means of escape vs means of egress were clarified. Means of escape requirements apply within dwelling units. Primary and secondary means of escape are required in all living and sleeping areas where a dwelling unit contains more than one room unless the building is sprinklered, in which case, secondary means of escape (e.g., rescue windows) are exempted. The means of egress starts once outside the dwelling unit and continues to include the exits and the exit discharges outside of the building. On upper floors of a multi-story apartment building, the two means of egress typically take the form of two exit stairs.

For apartment buildings, once an occupant leaves their dwelling unit and enters common areas, they must have access to two separate means of egress, unless either exemption below applies:

- Exemption 1: One of the following is met:
 - Dwelling unit has a door at ground level, or
 - Dwelling has direct access to an outside stair serving not more than two units on the same story, or
 - Dwelling has direct access to an interior stair serving only that unit and separated from the remainder of the building by 1-hour fire barriers with no openings.

- Exemption 2 (noted that this exemption is more closely related to the topic of this symposium): Where the building does not exceed four stories and meets the following criteria:
 - Not more than four dwelling units per story
 - Protected by automatic sprinklers (noted that it can be a system complying with NFPA 13R, *Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies*)
 - Stair does not serve more than ½ story below level of exit discharge (LED)
 - Travel distance from the dwelling unit entrance door to the exit is less than or equal to 35 ft (10.7 m)
 - Exit stair is separated by 1-hour fire barriers and 1-hour fire doors
 - Corridor access to exits is separated by 1-hr fire barriers (20-minute doors)
 - Minimum ½-hour fire barrier exists between apartments

A history of the single exit exemption in apartment buildings was also provided. Two exits were required in the code through 1938, and single exits were first permitted in 1939 through the following exemption, “having structural strength and fire resistance adequate to withstand a fire of slight severity” and limited to two stories. Subsequent editions of the code made the following changes:

- 1951 – Added garden apartment single exit exemption (dwelling door opens to grade level)
- 1956 – Revised exemptions to reflect what is now exemption 1 above and a modified exemption 2
- 1970 – Increased allowance to three stories
- 1981 – Added rated separation between units, travel distance
- 1988 – Limit of four units per floor
- 1991 – Sprinkler requirement added and increased allowance to four stories (to correspond with NFPA 13R)

International Code Council (ICC)

Beth Tubbs, Vice President of Codes, ICC, presented on apartment/flat requirements, single stairway allowances, and history within the International Codes (I-Codes) related to single exits. Provisions in the *International Building Code* (IBC) are regulated based on occupancy – apartments/flats are considered a Group R-2 Occupancy (along with congregate living facilities with more than 16 occupants, non-transient hotels with more than five guest rooms, live/work units, non-transient motels with more than five guest rooms, and vacation timeshares). Group R-1 occupancies include more transient populations.

General passive fire protection requirements are ½-hour rating for the corridor, ½-to 1-hour dwelling unit and sleeping unit separations, and Class C interior finishes. The passive fire protection requirements for stairway construction are based on height; for less than four stories, the requirement is one hour and for four or more stories, the requirement is two hours.

Generally, the active fire protection requirements are for sprinklers to be provided throughout with NFPA 13R systems allowed up to four stories and systems compliant with NFPA 13, *Standard for the Installation of Sprinkler Systems*, required for more than four stories. For buildings of four or more stories, standpipes are also required. Smoke

alarms and carbon monoxide detection are required throughout all R-2 buildings. Manual fire alarm systems are required if any one of the following applies:

- The building is three or more stories from the lowest level of exit discharge.
- The building has more than one story below the highest level of exit discharge.
- The building contains more than 16 dwelling units.

Emergency escape and rescue openings (EERO) are required for R-2 occupancies with access to only one exit. Elevators in buildings over four stories require standby power, for accessible egress (assisted), hoistway doors protected if connecting three or more stories, hoistway enclosure ratings required based on height, and elevators need to be large enough to accommodate a stretcher if four or more stories. The types of construction can be seen as a system with the lowest combustibility construction type being the highest fire resistance.

The single stair allowances for R-2 occupancies are:

- Currently limited to three stories (or two stories with occupiable roof)
- Maximum of four dwellings per story
- Maximum exit travel distance – 125 ft (38 m)
- Sprinkler system (either NFPA 13 or NFPA 13R)
- EEROs required

Single stair allowance for R-1 is as follows:

- One or less story above or below grade plane (with occupiable roof)
- Maximum 10 occupants/story
- Maximum exit access travel distance of 75 ft (23 m)

The history within the I-Codes related to single exits was also discussed:

- In 2003, the requirement went from two to three stories (automatic sprinklers required throughout, no exceptions).
- In 2012 (during the presentation it was mistakenly stated that it was 2015), data on sprinklers justified change in travel distance from 50 ft to 125 ft (15 m to 38 m). This travel distance could be applied to horizontal and vertical components (to a protected exitway).
- Legacy codes dealt with the issue in different ways. It was noted that previously, NFPA gave credit to NFPA 13R systems, but legacy codes did not.

Seattle, Washington

Dr. Karen Grove, Fire Prevention Director, Seattle Fire Department (SFD), provided an overview of current and past requirements related to single stair apartment buildings in Seattle, Washington. She began by providing information about Seattle's long history of code and program innovations centered on a pragmatic, risk-based approach. Historically, Seattle building officials and fire marshals were very participatory in the code process. To also provide historical perspective, she noted that Seattle's emergency medical technician (EMT) program was comprised of returning veterans and grounded in firefighter experience and focused on incremental improvements. As an example, she described Seattle's creation of one of earliest EMT programs in the

1960s, that made the then-unthinkable decision to allow non-physicians to provide care “in the field” and during transport to the hospital. Today, this “Seattle special” has become widely adopted; and Seattle continues to have among the best cardiac survival rate anywhere in the world. She described another “Seattle special”: early use of shaft pressurization in lieu of enclosed elevator lobbies in high-rises in the 1980s, to win back rentable square footage in high-rise buildings. This is retained in the current local code, which differs from the consensus-based codes. Seattle also adopted a very early sprinkler requirement in the 1960s for nursing homes and schools.

Dr. Grove then turned to the “Seattle special” for single stair provisions in apartment buildings up to 6 stories. The code option of allowing a single very well protected stair/egress path, in lieu of requiring two stairs, was first adopted for existing buildings in Seattle more than 50 years ago. It provided retroactive requirements for older hotels and apartments. After devastating fires occurred in the early 1970s in buildings that had open stairways, Seattle required existing hotels and apartments to have two fully enclosed stairs. The historical fires that led to these requirements were the Ozark Hotel fire and the Seventh Ave Apartment fire. The Ozark Hotel had two open stairs, no sprinklers, and was constructed of wood. The fire was caused by arson, which targeted the stairs. More than 100 firefighters responded and most occupants that were trapped were on upper floors. The fire killed 21 people and injured 13. This led to major changes in the Seattle Building Code. Within three months, the Ozark ordinance was passed (June 1970), which required all hotels and apartments with four stories or more to have solid core dwelling doors, two enclosed stairs with self-closing doors, 1-hour fire resistive construction for stairs. Alternatively, buildings that provided sprinkler protection for the corridor and stairwell were allowed a single stair.

In 1971, the Seventh Ave Apartment fire happened. This building included open stairwells, the fire started in the basement, and the building was three stories, so not subject to the Ozark ordinance. The fire moved quickly and killed 12 people. A new ordinance was passed that extended the Ozark provisions to all hotels and apartment buildings. In addition to the requirement for two enclosed stairs, and solid core doors, this new ordinance included an exemption to allow one stair, if the stair and corridors were protected by sprinklers and made of certain fire-resistant construction.

The Seattle experience in the 1970s gave SFD experience with the option of allowing a single very reliable stair in a sprinklered building, as an alternative to two enclosed stairs. In the late 1970s, Seattle’s Building Official and Fire Marshal for the first time introduced this exemption into the code for new construction: it allowed one stair in apartment buildings up to six stories, if the egress path, including the stair, is very reliable. The building needs to be a minimum of 1-hour construction, sprinklered, and there is a maximum of four dwelling units per floor. Other occupancies cannot “communicate with” the Group R portion of building or the stair being used by those in the Group R dwellings. The provision also introduced early use of stairwell and elevator shaft pressurization. See 2021 Seattle Building Code 1006.3.4 item 7.

Dr. Grove next provided summary data about Seattle Fire Department response times and capabilities, as part of the full context in which SFD evaluated and supported this code innovation. SFD is a well-funded career department with 33 stations throughout the city allowing very quick response times. In fact, the department has a Class 1 rating from the Washington State rating bureau and is the first and only department to

achieve this highest rating. The rating is based on fire department capabilities as well as good hydrant infrastructure helping SFD quickly get water on a fire for suppression, and good dispatch/emergency communications/fire prevention operations. She noted that this is important context for any department evaluating the single stair proposal because it is vital to understand what this change means for fire department operations. Seattle's code provisions may not be appropriate for all fire departments if they do not have the same resources and capabilities.

Dr. Grove then provided information about legislative efforts in the State of Washington to enact single stair provisions in Washington's fire code. In 2023, a bill passed that directed the State Building Code Council to form a working group to create code language to allow single stair apartment construction. In response, the Washington Association of Building Officials together with the Washington State Association of Fire Marshals reviewed single stair allowances in Seattle and New York, and proposed draft language based on the "Seattle special" with some additions and clarifications. The result is a provision that is in an appendix that can be adopted by any jurisdiction and allows for a single exit for multi-family buildings up to six stories. The appendix also provides guidance on how to decide whether or not a jurisdiction should adopt the provisions. This guidance includes how to review fire department capabilities, which references NFPA 1300, *Standard on Community Risk Assessment and Community Risk Reduction Plan Development*, and other relevant documents. The full draft appendix was shared and can be found [here](#).

Dr. Grove concluded by offering a perspective on the importance of working with legislators to maintain fire code safety while pursuing construction affordability. There is pressure in the Washington state legislature to remove elements of fire safety from the state code as part of a response to the housing crisis. Education and advocacy are needed around this issue. It is important that our work provides innovative and timely solutions to the problems and concerns expressed by legislators. Our code work and advocacy must also be guided by the importance and value of fire safety provisions for all populations, including those with lowest incomes. We need to help provide the path forward with elected officials to advance the mission to save lives and protect property.

During discussion with the stakeholders at the symposium, it was noted that this solution may not offer overall cost savings because of stair pressurization provisions, but this could help situations when land is constrained. It was also clarified that when the single exit stair allowance is used, a maximum of two of these buildings are permitted on a single property.

CURRENT CODE LANDSCAPE IN SELECT INTERNATIONAL COUNTRIES

This section summarizes the presentations that discussed allowances in other countries for single exit stair buildings.

Canada

Michael Lewis, Director, Office of the Fire Marshal, Justice and Public Safety, New Brunswick, Canada, provided an overview of the Canadian code system along with their ongoing effort of modernizing and harmonizing codes considering all priorities.

In 1941, the government of Canada published the first National Building Code (NBC). This is a model code and relies on municipal and provincial adoption. It is consensus-based and relies on an empirical science-based approach. There is an alternative approach to prescription included. It is administered and supported by the National Research Council (NRC). There has been a large effort in the past 10-15 years to modernize and harmonize the code. In some cases, cycles required acceleration, and some patchwork existed across construction practices. He noted that in Canada, there is limited material and labor force availability, so there is a need for less variation amongst provinces and more timely publication and adoption.

The system was significantly modernized in 2022 with some big changes: streamlined process, stakeholder strategic direction, transparency, expanded engagement opportunities with anyone allowed to submit. There is an overall direction toward harmonization nationally. This is relevant because it took 100 years of effort to get here. The code is based on experience and requires consensus on changes with scientific process. The interdependencies are resolved prior to modification with consideration of how a change impacts other requirements.

A request for a single exit stair code change was submitted in 2022 and is still in process. At this time, British Columbia (BC) has a provision related to single exit stairs already. Lewis noted that the current single exit stair pathway bypasses the formal process that has been developed over decades and that this could introduce considerable risk. Some important considerations are ingress by the fire department in the event manual suppression is needed, housekeeping, and maintenance. He noted that the current fire trends threaten some of the assumptions held about egress and appear to rely on human factors over engineered solutions.

Lewis noted that the fire officials are receptive to change but want it to go through the process. Some of the risks of this approach is that it bypasses the current systems and there is an opportunity for bias or influence. This is also a significant departure from harmonization by BC on this issue. The current approach puts the fire prevention community into response mode when they should be in science mode. There is a lot at stake, so it needs to be done correctly. This is a life-safety issue that will be embedded in model codes.

Currently there is an increase in fires and fatalities as well as in fires involving lithium-ion batteries and e-mobility devices. Other complicating factors include the challenge to recruit and retain volunteer firefighters along with staffing challenges in career departments. This could impact fire response. It is believed that changes with significant human implications should be offered the opportunity for independent review. Science and research stakeholders should be at the table. His position was that current single exit stair considerations for apartment buildings have not yet addressed stakeholder concerns.

As part of the discussions with the stakeholders at the symposium, it was clarified that code change requests get reviewed by elected officials and can generally address research needs in one code cycle, so urgent issues can be addressed through the current process. He noted that we owe it to constituents to study the issue with rigor and allow for technical commentary. When asked about fire data, he noted that Canada has the National Fire Incident Database, which is good at provincial and territorial levels and there are efforts starting now to compile this data nationally. When asked about

the scientific basis for the current requirement in the Canadian code limiting single exit building to two stories, it was noted that it is important to see the basis for the increase.

Chief Keven Lefebvre, Chair of the Codes Committee for the Canadian Association of Fire Chiefs and Retired Fire Chief of Leduc County, Alberta, Canada provided the perspective from the Canadian Association of Fire Chiefs (CAFC). He kicked off the presentation by noting that “One way out is also one way IN for first responders.” This topic has become a quick-moving topic in Canada.

As background, CAFC represents Canada’s 3200 fire departments through fire chiefs or a national advisory council. Resources are available on the topic from: <https://cafc.ca/page/single-egress>.

Chief Lefebvre noted that the single-egress issue in apartment buildings may be impacted in part by the federal budget in Canada for 2024 where funds have been committed to provinces for affordable housing innovation. The federal consultation on single stair egress is being led by the NRC and they are just now starting Phase 1. This phase includes information gathering across stakeholder groups as well as a review of currently available information to scope the research needed. He also noted that the media reports on this issue in Canada appear to be in support of single exits. A question was posed about whether there are any effective cost savings overall in consideration of the extra fire safety provisions that may be required.

Chief Lefebvre provided some context on the issue in Canada. More housing is needed nationally; Canada needs to build three million new homes by 2030. As there are housing strategy incentives for provinces and territories to find innovations in housing, he feels that single exit apartment buildings are being used as a “silver bullet” solution. He questioned why this is not being handled through the regular code process or through alternative solutions where equivalent safety needs to be demonstrated. CAFC has proposed to the federal government that they halt the innovation funding, which may now be related to single exit, to allow for the national harmonized process (discussed by the previous speaker) to bear fruit. Because this process has not been followed, neither the public nor those responsible for code development in Canada have heard from the fire sector yet.

Chief Lefebvre also noted that there are fewer firefighters available (more than 70 percent of these are volunteers) and they have aging equipment. Fires are becoming more complex, there is a tendency to prioritize fire research over fire experience, there is also a strong industry lobby around this issue, and the population in Canada is aging. Individually, these factors would increase risk. Combined, the increase in risk could be even more significant. Another complication is that there is no national fire administration in Canada like in the United States and other developed countries.

He explained that a [study](#) was undertaken by Jensen Hughes with the purpose to assess options for changes to the BC building code regulating the number of means of egress or exit stairs in multi-story residential buildings. This study reviewed 40 papers on fire history and analysis, relevant standards that allow single exit stair buildings, and international comparisons. The conclusion stated that single exits may be acceptable when additional requirements and features also apply. Examples of these include stairs constructed of noncombustible materials, the building is sprinklered, wider stairs are

provided, limited occupant loads, and smoke-management systems. Based on this study, BC instituted a [code change](#) that took effect 27 August 2024, that permit single exit stair apartment buildings up to six stories as long as the following are met: occupancy load per floor limited to 24, travel distance to exit is limited, smoke management is included, automatic sprinkler systems are installed, and coordination between the fire department and building operations exists to ensure there are ongoing fire system inspections.

Chief Lefebvre noted a few scenarios that are of grave concern for the fire service. In the first scenario, he stated evacuation times could increase if the number of exits decrease, the egress behavior of occupants is complex and may not fully be considered by the current proposed requirements, fires are faster and reach flashover sooner, and fires in exits do occur and designing for that scenario is challenging. In the second scenario, he noted there is a concern with over taxing the system where municipal resources are limited, there is a lack of firefighters, there is an additional training burden for scenarios with one exit, and there is an intersection of social risks (e.g., aging, decreased mobility) all using the same stairwell, and other risks like new lightweight, combustible construction, elevation concerns with this type of approach, and the presence of new hazards (e.g., lithium-ion batteries). Chief Lefebvre noted that this limitation also impacts other emergency services. The third scenario presented was based on interpretations of the requirements of 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*, that a single point of failure could indicate increased risk. It was stated that building construction materials used in Canada are often combustible, and deployment and response time requirements in the standard are difficult to meet with current resources.

Chief Lefebvre recommended that potential solutions do not bypass the codes system. It can create mistrust and can have unintended consequences. Fire experts need to be part of the discussion around any fire safety recommendations. The process puts the onus on the proponents to show the evidence and do the research, then a technical review process takes place. It was also noted that installing a National Fire Administration in Canada would be of great benefit in consideration and direction setting for this and many other fire-related issues in Canada.

United Kingdom

Gavin Tomlinson, Chief Fire Officer, Derbyshire Fire and Rescue, UK, and National Fire Chiefs Council (NFCC) Head of Protection and Business Safety, provided a perspective on fires in tall buildings. He noted that the UK relies on guidance and regulation and that a lot of changes are based on events and experience. Post World War II there were a series of building studies to help develop solutions to replace homes destroyed and deferred due to the war. They published 33 volumes between 1944 and 1946. Prior to the post-war studies, building work in England and Wales was regulated at a local level under a patchwork of local bylaws. The post-war studies standardized non-traditional methods of construction, including the use of prefabricated elements and poured concrete. This was the first iteration of modern methods of construction and had a significant impact on design and construction of buildings in the UK after the war.

One modern method of construction that was developed was pre-cast concrete (PRC) buildings. Problems with these buildings can include structural design flaws, which contribute to a cold and damp environment inside. The concrete gets polluted and changes color. One solution to this issue was to remediate existing buildings and, in some cases, use overcladding, which was done on the Grenfell building.

Post-war building study 20 covered the fire grading of buildings and it is still currently used, 80 years later. Key items covered include fire loading, fire severity, fire resistance, construction products, and use of combustible materials in construction. There is a provision for sprinklers, but that is not often used in the UK. Beginning in 2020 and moving forward, all new residential buildings over 11 m (36 ft) tall require sprinklers. However, this is not a retroactive requirement, even in the case of a significant refurbishment.

Post-war building study 29 also covered fire and included occupancy characteristics, combustible linings and finishings, travel distances, number of exits and escape widths, and roof coverings. Many features of this document read like current codes. It allowed for single exit buildings, under certain conditions related to building height, “where there is prompt attendance of the local fire brigade with suitable rescue appliances.” There was no set national maximum building height for single exit stair; however, there were recommendations that single exit buildings should not be taller than the normal working range for ladders carried by the local responding fire department. For many cities, this would have been 18 m (60 ft).

By the 1970s, the need for general fire precautions for the safe means of escape in case of fire was recognized. Emphasis was on fire safety features that protect occupants in place unless told to evacuate by the fire service. However, despite this recognition, the regulations were not retroactive, and it created varying levels of fire safety within the housing stock. In addition, they were designed for a general-needs population and did not account for age or disability. At the time, the Regulatory Reform (Fire Safety) Order 2005 (FSO) was implemented and created a requirement for a responsible person for each building to carry out a commission of a fire risk assessment from a competent person to ensure that the fire safety precautions within a particular building are fit for the purpose of the building. This is the current regulation in use today.

On 14 June 2017, a fire started behind a refrigerator-freezer in the Grenfell building. The fire became catastrophic and took the lives of 72 people, which shined a light on all aspects of building and fire safety in the UK. Grenfell was built prior to the 1974 requirements and during the refurbishment, they did not address fundamental flaws in the building itself and contributed to the risks by adding combustible cladding. The Grenfell fire was not the first incident of this type. In 2009, there was a fire in a building, Lakanal House, that resulted in the death of six people.

On the day following the Grenfell fire, Prime Minister Theresa May announced there would be a public inquiry into the fire. The terms of reference for the inquiry were “the circumstances surrounding the fire.” The inquiry was published in two reports with the first interim report published in 2019 and containing 46 recommendations and most, but not all, have been realized. The second report was released on 4 September 2024 with a further 58 formal recommendations. There was also a third report called the Hackitt Review that had additional recommendations, many along the same lines as the public inquiry. The overarching conclusion was that the building safety system is broken. It was found that understanding of Approved Document B, which is building

guidance written and maintained by government, and how to meet regulations is still poor across the industry. One of the key critiques of the inquiry was the advice of the occupants of Grenfell to stay put. It was noted that stay put is only an effective policy if there is adequate compartmentation and means of escape protected and maintained. However, this is just a strategy and does not overrule the right for all within a building to evacuate if they choose. Those with disabilities are required to have plans on how to evacuate the building in an emergency.

Following the Grenfell Inquiry, the government proposed a maximum height of 30 m (100 ft) for single exit stair buildings. Above this height, two means of egress would be required. In December 2022, the NFCC called for an even lower height limitation, 18 m (60 ft), on single exit stair buildings. This was published in an opinion paper. The reasoning behind the NFCC opinion paper was that there should be equality in egress. Everyone must be able to evacuate during a fire, despite their abilities or mobility. Some of the considerations of the NFCC's paper were that stairs be independent from each other, safety egress provided for all building users, and suitable resilience and flexibility provided for firefighting. Shortly after, in July 2023, the government announced the height would be set at 18 m (60 ft) as called for by the NFCC and others in the industry, including the Royal Institute of British Architects.

There have yet to be changes based on the Phase 2 Grenfell inquiry report. The Building Safety Regime is new and still working out issues. Residents now have a voice in the process.

As part of the discussion, Tomlinson noted that fire-resistance requirements for each apartment need to allow for a defend-in-place strategy, which requires separation between apartments have at least a 1-hour fire-resistance rating. It is important that the rated separation be maintained throughout the life of the building. The takeaway here might be that we should proceed with caution. It is important that even a building that is built to stringent requirements be managed and maintained. It was also highlighted that there are over 12,500 buildings that are over 18 m (60 ft), and many have deficiencies including the presence of combustible cladding and lack of fire protection systems.

Australia

Jeff Wood, Chief Technical Officer, FVS Fire Solutions provided the current requirements for single exit stair buildings in Australia. In Australia, a building is regulated under state regulation and city ordinances and there are historically inconsistencies between locations (e.g. 6 states and 7 different fire hose threads). There is a lack of retroactive requirements, so the historic requirements often need to be referenced.

Wood explained that in the city of Brisbane from 1924-1960 any building over two stories required two exits. The Queensland building act of 1975 allowed buildings up to six stories to have only one exit. In 1988, the Australian Uniform Building Regulations Co-ordinating Council (now the Australian Building Codes Board®, ABCB®), was introduced. They regulate the Building Code of Australia (BCA), which is not required, but called out by legislation in the states.

BCA Part 1 is a performance-based building code with deemed-to-satisfy solutions. The deemed-to-satisfy solutions are essentially prescriptive requirements. The build-

ing classifications from the BCA of interest are Class 2 – flats/apartments and Class 3 – hotels/boarding houses. Until 2019, at least one exit was required from each story. For Class 2-8 buildings, two exits were required if the building was over 25 m (80 ft) tall. For Class 2 or Class 3 buildings with a single exit stair, the maximum travel distance between a dwelling unit door and an exit was 6 m (20 ft). Additionally, the maximum travel distance from a dwelling unit door on the level of exit discharge served by a single exit is 20 m (65 ft) to a road or open space. In either case, no point outside of a dwelling unit on a floor is permitted to be more than 20 m (65 ft) from an exit. In Class 2 or Class 3 buildings with two exits, the distance between exits must not be less than nine meters apart with a maximum distance of 45 m (150 ft).

Therefore, the BCA allows for a single exit from mid-rise apartment buildings less than 25 m (80 ft) tall. There are creative layouts to achieve the 6 m (20 ft) travel distance to an exit choice. Sprinklers are not required. Fire-resistant construction is the same as for high-rise apartment buildings. Stairs must be separated from the remainder of the building by at least 1 ½-hour fire-resistant-rated construction and have protected penetrations. In addition, window openings in a path of exit travel need to be protected.

In June 2012, there was an eight-story Class 2 fire in a building called West Terrace. The fire started on a balcony and open doors allowed it to spread. The September 2015 inquest report had findings and recommendations for changes to the building code. A regulation impact statement (RIS) was required for any changes to a building, and this incorporated mandates for sprinklers in mid-rise apartment buildings.

The current code in Australia is the 2022 edition; however, the 2025 edition is under development. There is a recommendation to develop a fit-for-purpose sprinkler specification (i.e., cost-effective option). The FPAA101D (domestic) option is connected to domestic water through toilets, which is meant to monitor water supply. It is assumed that residents will notice if the toilet is not working. The other option is FPASS101H (hydrant). Neither provide an equivalent system to any international standards. It was clarified during the discussion that there are flow requirements for hydrant systems, but domestic systems are not easily tested.

The new concessional requirements for mid-rise apartment buildings (MRABs) include sprinkler systems (as noted by above options), 1-hour fire-resistance-rated construction separating the stair, and protected penetrations into the exit stair. For Class 2 or Class 3 buildings with a single exit stair, the maximum travel distance between a dwelling unit door and an exit is 12 m (40 ft) up from 6 m (20 ft) previously. The maximum travel distance from a dwelling unit door on the level of exit discharge served by a single exit is 30 m (100 ft), up from 20 m (65 ft) previously, and the maximum distance of travel between exits is 60 m (200 ft), up from 45 m (150 ft) previously.

In summary, prior to 1975 MRABs were required to have two or more exits. Between 1975 and 2019, there were allowances for a single exit in Class 2 or Class 3 buildings under 25 m (80 ft). Sprinkler protection for MRABs was one of the results of an inquest into a 2012 fire that was completed in 2015. Since 2020, exit requirements for MRABs have been relaxed due to the addition of sprinkler protection. The proposed changes for 2025 with fit-for-purpose sprinkler specifications are focused more on cost savings and introduced relaxations that would also apply to single exit stair buildings such as on travel distances.

AVAILABLE FIRE DATA AND THE SINGLE EXIT STAIR ISSUE

Birgitte Messerschmidt, Research Director for NFPA, presented on what insights fire data can provide. The NFPA Research Department identifies emerging issues, provides historical trends, and monitors existing issues affecting fire and life safety. They can provide national estimates based on data collected by the United State Fire Administration (USFA) from the fire service. The system currently used to collect that data is the National Fire Incident Reporting System (NFIRS), but there will be a transition to the National Emergency Response Information System (NERIS) in 2025. NFPA Research also conducts needs assessments of the fire service, the fire experience survey, and others. They analyze data from NFIRS and develop topic-related reports.

Fire deaths have generally decreased over the years according to NFPA Research findings. Homes are where the most fire deaths occur. Currently, fire deaths per 1,000 fires are 7.2 for all homes, which historically has not seen significant changes. For one-and-two family dwellings, the number of fire deaths per 1,000 fires is 7.5 as compared to 5.9 for apartments. The number of fire deaths in apartments has decreased over the years. For 2022, the national estimate for home structure fires by number of floors is shown in Table 1.

Table 1. 2022 National Estimate for Home Structure Fires by Number of Floors

Number of Floors	Number of Fires	Number of Deaths
One- and Two-Family Homes	280,000	2,240
Residential Buildings with Three Stories	33,870	145
Residential Buildings with Four to Six Stories	10,958	31
Residential Buildings with Seven or More Stories	8,414	25

The NFPA Research data also shows that there are significantly more fires in one- and two-family homes as compared to other types of residential buildings. Therefore, using the general residential number for fires and fire deaths in homes when talking about residential buildings that are three or more stories can be misleading.

Table 2 shows the number of fires per 1,000 housing units and the number of deaths per million housing units based on the annual housing survey in 2021.

Table 2. 2021 Annual Housing Survey Information Combined with 2022 National Estimate for Home Structure Fires by Number of Floors

Number of Floors	Number of Fires per 1,000 Housing Units	Number of Deaths per Million Housing Units
One- and Two-Family Homes	3.11	24.92
Residential Buildings with Three Stories	1.19	5.11
Residential Buildings with Four to Six Stories	1.5	4.25
Residential Buildings with Seven or More Stories	2.99	8.93

While there is an increase in number of fires and fire deaths in taller buildings compared to lower buildings, there is not a lot of data, so there is more uncertainty.

There was also a comparison of residential fires per 1,000 people in the United States to other countries. According to available data, the United States has the second most fires (1.15 fires). Of the countries discussed, Vietnam had the fewest fires (0.01 fires). In terms of residential fire deaths per million people, the United States is in the middle of the countries examined with 8.28 deaths. Russia has the highest number of deaths at 47.51, while Panama has the fewest at 0.91 deaths. Analyzing the data further and considering the number of deaths per 1,000 residential fires, Vietnam ranks the highest with 94.49 deaths while the United States has the third fewest with 7.22 deaths. One reasonable conclusion that could be drawn from this data is that countries collect and report data differently. Vietnam, for example, likely only collects data on fires with deaths or injuries, whereas the United States collects data on all fires.

Analysis of the data shows that it is not directly comparable between countries. Countries use their own definition of what a fire and fire death is and often only report fires without specifying the type of fire (structure, outdoors, vehicle, etc.). What is counted and reported as a fire death in one country may not be counted the same way in another. If comparisons are to be made between countries, there is a need to ensure data is being collected and reported the same way. This is challenging because although there is an international standard available from the International Standards Organization (ISO), it is not being used.

As part of the discussion, it was asked whether one-and-two family home fires are more common in the United States and Canada as compared to other countries. The data cannot be compared at that level yet. It is also not possible to assess if the buildings are owner occupied or rented. Maintenance status of the structure cannot be determined either. Data is also not available on how people escape from one- and two-family buildings. It was also noted that a wildland fire that moves to homes is considered a home fire.

One of the biggest pieces of data that is lacking are construction type details. An older version of NFIRS included this, but quality data was not being captured, so it was removed in a newer version of NFIRS. It also is not possible to filter data by the presence of a sprinkler system or the year of construction.

The fire environment is changing with new hazards such as battery fires, but NFPA Research does not do predictive modeling based on data. The NERIS system is going to be more agile and will have the ability to capture more emerging issues going forward.

STAKEHOLDER PERSPECTIVES ABOUT SINGLE EXIT STAIR BUILDINGS

At the symposium, there were several presentations both supporting and opposing changes to single exit stair building allowances. This section of the report summarizes the views of those presentations.

Support for Changes to Single Exit Stair Allowances

Stephen Smith, Executive Director, Center for Building in North America, provided that organization's perspective regarding single exit stair apartment buildings. The Center

for Building in North America is focused on research about construction policy and building codes, and they are interested in international comparisons. Their work is focused on mid-rise buildings. He made the comparison that based on the 2021 edition of the International Building Code (IBC), more occupants are allowed per stair in a two-exit stair building than are permitted in a single stair building allowed by the 2018 edition of the Seattle Building Code. This can be attributed to limits on travel distances, dwelling units per story, and total number of stories.

Smith provided some related history. A [journal article](#) by Frost and Jones shows data that, as cities increased in size, the number of fires grew with them and then it stopped. This happened in the United States in the mid-19th century. In the United States and other former British colonies, this was attributed to more space between buildings and more noncombustible construction.

In New York, a requirement for a second means of egress arrived after a Manhattan tenement fire in 1860, Smith explained. Later that year, the state legislature passed a law to require fire escapes on buildings. Before fire escapes were required, the standard apartment buildings in the United States were referred to as “point access blocks.” In these buildings, there is a single interior stair and a small number of units off a landing on each floor. These types of buildings are also commonly found in Europe and the rest of the world. Today, low-rise single stair “point access blocks” remain popular in the United States. These are sometimes referred to as “garden apartments.”

Smith said that during the middle of the 20th century, apartment construction went into semi-dormancy. There was a rise in single family house construction in the suburbs. At this time, apartments were still being built, but more commonly for dorms, public housing, and senior housing. In New York City, two interior stairs started to become required on a wider scale in 1968, with similar requirements in other jurisdictions.

At the turn of the millennium, cities increased in popularity as crime rates fell, Smith explained. There was an increase in multifamily construction, especially mid-rise double-loaded corridor buildings, sometimes called “5 over 1s” for five residential stories of wood construction over one multi-use story of noncombustible construction. These have two remote exits connected by a long corridor. He noted that based on research currently being conducted by the Center for Building North America with Pew Charitable Trusts, per-square-foot construction costs in the United States and Canada rise as buildings grow denser (moving from single-family to low-rise multifamily to mid-rise multifamily), whereas in other countries examined (Germany, Italy, and Mexico), construction costs remain stable across typologies. This can increase the cost of rent, making areas more expensive to live in.

Smith gave some examples of disadvantages of two exit stair buildings and provided some cost estimates for a four-story building. For a CMU-block stairway, hard costs can be in excess of \$200,000 in a typical U.S. market. This can be 10 percent or more of the total construction cost for a building with a small floor plate, which would be a single stair building in other countries. Smith also suggested that two remote exits can impact the quality of life because they reduce the number of windows due to double-loaded corridor floor plans. Windowless bedrooms are becoming more common in new apartment buildings. The access to only one wall of windows in IBC-compliant buildings can make family-sized units more inefficient as the bedrooms are often designed to take advantage of the windows. He noted that those pushing for changes

related to single exit stair buildings are architects, urbanists, and housing advocates, not really developers.

Safety is at the core of this argument. How dangerous are single exit apartment buildings compared to two exit apartment buildings? He noted that the United States fire safety outcomes are not particularly good compared to the rest of the world. He referenced data that shows the United States has a higher death rate than most other high-income countries. Many of those countries allow taller buildings with a single stair. During discussion it was noted that caution should be used when comparing the data when looking at all home data. The way one-and-two family homes are built in the United States has a significant impact on the fire data.

In New York City, R-2 buildings of Type 1 or 2 construction, six stories or less, and 2,000 square feet or less per floor, can have a single exit stair. There is good building data in New York City, which led to the identification of the construction of more than 4,000 of these buildings since 1968 in the city. Most of these were built after 1999 when sprinklers per NFPA 13R, *Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies*, began being required. (The New York City Building Code allows NFPA 13R sprinklers up to six stories for residential occupancies, rather than four stories for the IBC and NFPA codes.) There is also a crude smoke-control requirement in the form of a skylight that the New York City Fire Department (FDNY) can smash with an axe. Standpipes and elevator hoistway protection is not required. This single exit allowance was kept in the 2008 IBC harmonization.

Smith noted that historically, FDNY has struggled with reporting all fires and fire deaths to NFIRS, which has gotten worse after the pandemic. Therefore, the Center for Building North America with Pew Charitable Trusts is undertaking a review of fires in New York City based on media accounts, mostly collected by the U.S. Fire Administration. Comparing media reports back to 2012, the rate of fire fatalities in modern single exit buildings (not including those with fire escapes) is the same as the city as a whole. In their study, they found two fatal fires in single exit stair buildings that claimed three lives. There were multiple illegal apartments and no evidence that the fire deaths were impacted by the presence of a single exit. A report will be available soon with this analysis.

Smith also explained that in 2010, research was commissioned by the Dutch fire service on single exit in the Netherlands. In general, the country has a low fire death rate, and they found that single exit stair buildings had the same fire death rate as the country as a whole. It was noted that sprinklers are not required for these types of buildings. In contrast, the Dutch fire service also **commissioned a study** on smoke in double-loaded corridors. The study included field tests and modeling experiments, which showed that the smoke propagates horizontally more than vertically and that almost immediately after the door from the room of origin to the corridor is opened, the corridor becomes compromised by smoke. Dutch researchers concluded that this design with double-loaded corridors, without sprinklers, is not effective in providing life safety.

He also noted that there are growing travel distances in IBC-compliant buildings with two or more exits. The allowance for exit access travel distance in R-2 buildings is 200 ft (60 m) without sprinklers and 250 ft (75 m) with sprinklers. He clarified that travel distance limitations only apply to the closest stair, and there is no limit on the distance to the second stair. The trend is to maximize these distances with sprinkler allowances.

One common argument against single exit stair buildings is the increased difficulties when conducting firefighting operations. He noted that even in two exit stair buildings it is very difficult to separate egress stairs from attack stairs, meaning that there will always be evacuating occupants using the same stair as firefighters. Other issues noted are that plastics pose a risk of corridor and stair smoke spread even with sprinklers if there is nothing in place to help keep smoke out or ventilate it. He also noted that maintenance is an issue that impacts all types of buildings, single exit or multiple exit, so it should be applied equally.

Smith provided some recommendations on code solutions for small floorplate, single stair apartment buildings. He noted that one major difference between construction in the United States and Canada and other countries is the use of light wood frame for buildings. The building codes typically only require a fire resistance rating for mid-rise construction and do not require noncombustible construction throughout. In addition, it is more common to have active fire protection, like sprinklers, in the United States and Canada. For jurisdictions that allow single exit stair mid-rise buildings, there is typically some level of smoke control, which can range from a simple system, like in New York City, to an active mechanical system. He provided an overview of the proposal numbered [E24-24](#) to the IBC on single exit stair allowances. Some features of that include moving the allowance to an optional appendix (similar to what is done in Washington state), allowing a maximum of six stories, four units per story, and requiring safety features such as NFPA 13 sprinkler systems, two-hour fire resistance, EEROs, and a maximum travel distance of 25 ft (7.6 m) from unit door to the exit.

Opposition to Changes to Single Exit Stair Allowances

Nick Dawe, Division Chief & Fire Marshal, Cobb County Fire and Emergency Services, provided the opposing perspective on behalf of the International Fire Marshal's Association (IFMA) on single exit stair apartment building proposals. The top concerns from this group are that single exit stairs limit occupant egress and fire operations ingress. They limit the number of escape routes, can be a single point of failure, and present a challenge to firefighters entering buildings while people are evacuating.

Dawe noted that what is taking place now in some jurisdictions does not follow the NFPA code development process. He explained that the NFPA code process is a vetting process with input from various stakeholder groups and experts that help to ensure a balance between safety and design flexibility. There currently is an option, the performance-based option, for designs that do not meet the prescriptive requirements, which does allow for design flexibility.

There are also financial implications of the single exit stair proposals that could increase the cost of housing. Current proposals add smokeproof enclosures and two-hour fire resistance ratings for walls. He also explained that the fire environment is changing. It is becoming more hazardous due to materials present in homes such as batteries and plastics, and response times are not sufficient in many areas to manage these risks effectively.

In closing, Dawe said that IFMA takes the position that the consensus-based process needs to be followed and reducing exits could jeopardize occupant and firefighter safety.

Michael Desrochers, President, National Association of State Fire Marshals (NASFM) and Executive Director, Department of Public Safety – Division of Fire Safety, State of Vermont, provided the position of NASFM. NASFM is comprised of the most senior fire official from each state.

He asked why critical life safety and building code issues are being legislated rather than evaluated through the consensus-based code development processes. Trending shows a significant reduction in safety when life safety and buildings are legislated without consideration to the code development process and more importantly first responders and occupants are left out of the conversation. The code development process provides an opportunity for everyone to participate. The outcome of the code development process ensures minimum prescriptive codes and standards have been vetted through the consensus process based on research, science, data, investigation, public input, and facts.

Desrochers explained that NASFM thinks that proposing one-way out undermines the existence of codes and exposes first responders and occupants to risk. Codes and standards are based on sound research and science. The current exiting provisions date back to the early 1900s. The fundamental purpose of life safety codes and building codes is to prescribe minimum safety standards to provide a reasonable level of protection to first responders and building occupants. He asked, where is the reasonable level of protection with only one way out in a six-story apartment building? Proponents need to provide data showing that a single exit stair is safe. He noted that one change can impact other factors as well and that a law impacting safety is very difficult to change after it is incorporated. Other factors that need to be considered are the impact of changing demographics with more people aging in place and families relying on that to care for the elderly. NASFM is also concerned with the hazards placed in an exit stair including electric powered bikes and scooters. With only one way out of a building, the risk of compromising the stair is a concern.

Sean DeCrane, Director of Health and Safety Operational Services, International Association of Fire Fighters (IAFF), presented about the modern fire environment. He started by explaining that many of the IAFF members do not have the same response capabilities as FDNY.

He showed a [video](#) from the Fire Safety Research Institute (FSRI) comparing home furnishings and showing that flashover happens in less than five minutes. Modern furniture has significantly more plastic content. Coupled with that risk is the use of lightweight wood construction that can compromise structural integrity. Testing has shown engineered floor systems can collapse in three to eight minutes when exposed to fire conditions.

DeCrane also referenced a study with different types of floor support using lightweight wood. The supports did not provide much time for fire response before collapse. He noted that there is a significant difference between new growth and old growth wood and that Type V construction is very common in residential construction here in the United States.

Other factors to consider include types of fuels entering homes such as batteries. DeCrane said it is important to consider the need for a full building evacuation, and when

that is required, occupants need to be able to egress while firefighters ingress. He agreed that not maintaining systems is a problem across all buildings. Another complicating factor is that unwanted alarms have resulted in occupants not exiting when alarms sound. This can delay occupant egress and thus increase the likelihood that firefighters will face counterflow in the early stages of their response.

Deputy Chief Robert Marshall, Vice Chair of the International Association of Fire Chiefs (IAFC) Fire and Life Safety Section, provided the perspective on behalf of the IAFC. He discussed the code development process and noted that the fire code action committee of the ICC is very successful with a 90 percent acceptance rate of proposals. They achieve that because they get diverse stakeholder input and develop consensus with experts. The legislation path bypasses getting a consensus of industry experts.

He noted that having one way out of a building is just one issue. Attacks are already underway on fire department access, which can be seen as an improvement to pedestrian safety in urban areas but is a challenge for fire department apparatus access. He said there needs to be a balance. He provided an example of how the legislative route can introduce risks. In California, accessory dwelling units (ADUs) were passed legislatively for apartment buildings. The law allows planning departments to approve ADUs and restrict requiring sprinkler protection. Chief Marshall added, where are we going next? Are there going to be legislative proposals to remove stairs or other fire safety features from existing buildings?

Single exit stair apartment buildings have been painted as helping with the affordability issue. Multi-family buildings can be used by those of lower economic means. That same demographic group has a higher incidence of fires and fire-related deaths. There is a concern that we will fail this demographic even more with these proposals. Maintenance is a significant issue, especially when systems are being relied on to ensure safe egress. A new building becomes an old building and although it may have been constructed properly, maintenance of systems is required and necessary to ensure the building continues to function as expected.

In closing, Chief Marshall noted that to prevent fire deaths and injuries, we need to prevent the fire from starting or keep the fire small using fire safety systems and construction and maintain egress systems. He asked, if we fail the first two options, can all the occupants get out of the building safely and can the firefighters get into the building safely?

Code Change Proposals

There are active proposals to reduce the number of required exits in residential buildings up to six stories, driven by challenges in housing. The proposal for the next edition of the IBC is highlighted below. Please note the proponent was in attendance and had identified floor modifications he intended to make. The text below may vary from what can be viewed at this [link](#) because of these modifications.

The IBC E24-24 proposal includes the following details:

- The allowance appears as an optional appendix instead of in the body of the code
- Maximum of six stories and specifically not permitted to be a high-rise building
- Maximum of four units per story

- Limits on construction types and acceptable construction types include:
 - Type 1A and 1B
 - Type 2A
 - Type 3A
 - Type 4
 - Type 5A
- Maximum of 20 occupants per story
- Requires a full NFPA 13 sprinkler system
- Maximum of 125 ft (38 m) total travel distance and a maximum distance of 25 ft (7.6 m) from the unit door to the exit
- Stair must be separated by 2-hour fire resistance rated construction
- Stair must be a smokeproof enclosure
- Windows must be EERs (per IBC), but no reliance on window rescues
- Mixed use is permitted provided:
 - No occupancies other than residential are above the ground floor
 - Occupancies other than residential do not communicate with the stair

The group discussed that the U.S. Department of Housing and Urban Development (HUD) code allows up to four stories with an NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, system.

At this time, there are no proposals submitted into the current code change cycle for the next edition of NFPA 101 and NFPA 5000.

FACILITATED DISCUSSION

Valerie Ziavras, Senior Fire Protection Engineer at NFPA, provided context for the discussion. She began by thanking all those who presented and acknowledged that the information provided served as a great foundation for the conversation that was to come. Attendees were encouraged to approach the discussion with the goal of identifying the root of the fire and life safety concerns. Current codes allow for single exit stair buildings under certain conditions so simply saying “a single stair isn’t safe” does not provide enough information to those less familiar with fire and life safety. Identifying what changes when the height of a single exit stair building is increased and what proposed features play a vital role in safety for these single exit stair buildings will be important.

Ziavras explained that although there have been discussions on whether single exit stair proposals can help solve the housing issues, it is not the time for that debate. The focus of this discussion will be on fire and life safety issues, not economic debates. Similarly, there have been a number of conversations about where these types of provisions belong. Some have asked if the consensus codes are the right place for these allowances. NFPA firmly believes in its standards development process and that these types of conversations should occur within that arena. With that noted, again, this is not the time for that debate. The discussion will focus solely on identifying issues so the necessary conversations can occur in the appropriate place at a later date.

She added that many people have been surprised by how quickly these proposals are moving through state legislatures. Many jurisdictions are planning, or at least consid-

ering, to make changes that would allow these types of buildings. Simply saying, “it can’t be done,” is not enough. Instead, she said that we need to use this opportunity to clearly articulate what the issues are and identify what issues would need to be addressed to attain a similar level of life safety that we have come to expect in a building with two exits. By only saying “no” we risk having fire and life safety concerns being ignored during these important conversations.

Ziavras then explained how the facilitated discussion would work. Attendees would be divided into eight small groups. Each group would discuss the same questions and be led by an NFPA staff member. After each question, the small groups would come back together. The NFPA staff member would share the group’s findings, and a larger group discussion would follow to identify where there was agreement. Although there were significantly more participants in attendance opposed to the increase in single exit stair allowances than for it, a balance and a mix of stakeholders within the groups was attempted. Attendees in support of the proposals were separated into eight small groups. Then, attendees who were neutral were assigned a group, and finally those opposed were added to the groups. The following sections summarize the four questions asked and the discussion that followed.

Topics that Need to be Addressed Due to the Increased Allowable Height

Question 1: *How does the increased height from three or four stories to six stories change the safety concerns of single exit buildings? What new concerns arise? What concerns were alleviated based on the shorter height that now need to be reconsidered? What are the top five concerns?*

The breakout groups discussed and reported back to the group. Some of the topics highlighted in those discussions were:

- If the stair becomes compromised, fire departments will need aerial trucks, which are expensive.
- A single exit stair will increase the likelihood of firefighters facing counterflow when setting up internal firefighting response.
- Changes may be necessary to required egress widths to account for simultaneous ingress and egress, as well as for increased number of occupants since the number of floors and thus units are increasing.
- Proposals rely on additional systems to permit an increase in height. The maintenance of these systems becomes a bigger concern because the building houses more occupants.
- If the single exit stair is comprised, an occupant no longer has a choice to self-evacuate.
- Limiting the spread of fire becomes increasingly important, so noncombustible construction should be required.
- An increased height results in more units and more occupants. That coupled with ingress from first responders will likely lead to additional egress time for occupants, especially those on upper floors.

- Increased height of single exit stair buildings leads to longer required distances of travel to the outside of a building.
- The capability of local fire departments to adequately respond to a fire in a single exit stair building could be impacted. Examples could include:
 - Adequacy of available water (pressure and hydrant location)
 - Availability of rescue equipment
- Increased number of occupants results in a higher chance that there are various levels of mobility. Occupants incapable of self-preservation increase the demand on responding firefighters and shift the focus from early suppression to rescue.
- Increased number of occupants in a single exit stair building may result in more items (e.g., strollers, bikes, etc.) being stored in the exit. Since there is only a single exit, the reliability of the stairs become increasingly important.
- A compromised single exit stair in a taller building would lead to a greater number of occupants exposed to fire conditions.
- An increased number of stories, and thus additional units, increases the fuel load within the building, which can lead to larger fires.
- A single exit stair could impact the response to medical calls. One example would be if there was no elevator, responders would need to carry a stretcher down the stairs.
- A single exit stair could impact law enforcement by having only one way out of a building.
- A single exit stair could result in firefighter operation tactics needing to be altered.

The top five overall issues of single exit stair buildings as identified during full group discussion were:

- 1.** The single exit stair results in the means of egress being susceptible to a single point of failure.
- 2.** The types of allowable construction for single exit stair buildings.
- 3.** Impact of a single exit stair on emergency responder operational capabilities including:
 - Availability of aerial apparatus
 - Need for additional or different training
 - Consideration needed on the impact to non-fire related emergency responders such as emergency medical services (EMS) and law enforcement
- 4.** Occupants egressing while first responders are ingressing, including:
 - Impact of counterflow on firefighting operations and response time for first responders
 - Impact of additional occupants and likelihood of counterflow being encountered in the single stair on occupant evacuation time
 - Ability of occupants to egress due to occupant characteristics, such as limited mobility

5. Hazards arising post occupancy and human characteristics, including:

- Potential for lack of system maintenance in buildings that more heavily rely upon them for life safety
- Increased fuel loads
- Potential for lack of housekeeping, such as trash or “storage” in the stair (e.g., bikes, etc.)

During this discussion, there was a common concern that providing a limitation on the number of occupants per floor in a single exit stair building would give a false sense of protection.

A question was then posed to all participants regarding occupant load limits for single exit stair buildings: How is this different from other buildings where we design the means of egress to accommodate a specific occupant load?

The most concise answer was that historically there have not been limitations on the number of occupants in residential occupancies as this would be extremely challenging, if not impossible, to enforce. Typically, codes have only allowed for limiting the number of occupants in occupancies where it can be more easily controlled, such as an assembly occupancy where occupants often require a ticket to attend an event. It was acknowledged that limiting the size of the floor is an option, but that it should not necessarily be thought of as limiting the number of occupants. It was also noted that managing overcrowding in a residential building can also be a challenge in a multi-exit building. Additional responses included:

- Stairs are not sized for the accumulated occupant load. Instead, the stairs need to be sized appropriately for the occupant load of a floor it serves. When you add stories, more occupants will need to use that stair, without necessarily increasing the width of the stair. Therefore, as you add more stories, more occupants will be required to use that stair, which could lead to additional stress on the system.
- A wider single exit stair may be required to accommodate an increased number of occupants.

The following additional information was provided related to the concern about increased travel distance:

- Two travel distance measurements to consider (may need to address separately)
 - One related to dead ends
 - One from the furthest point
- Single exit stair has an increased risk of that stair being compromised. One of the major concerns is the difference in vertical travel distance required when the height of a single exit stair apartment building is increased to six stories.

During the full group discussion, additional context was provided related to the increased egress time in taller buildings with a single exit stair. It was noted that when the number of floors increases from three or four stories to six, there is an increase in vertical travel distance. Occupants on the upper floors will take longer to egress than those on the lower floors due to the increased vertical travel distance. The proposal does not compensate for the increased egress time by requiring a second stair.

Necessary Features of Single Exit Apartment Buildings

Question 2: *What aspects of the current proposal help mitigate those concerns identified in Question 1?*

The breakout groups considered this question and reported out to the full group. The discussion included:

- The six-story limitation
- Limitation on the size of the floor plate. It should be noted the original proposal attempts to do this by limiting the number of occupants per floor; however, the feedback during the discussion was that a limitation on the floor plate size would be more appropriate.
- Limitation on travel distances:
 - Shorter permissible travel distances indirectly limit the size of the floor plate, which ultimately leads to fewer occupants.
 - The maximum distance of 20 ft (6 m) to exit is an important component of the proposal.
- Increased protection to offset the single exit stair being a single point of failure. Examples of increased protection include:
 - Full NFPA 13 sprinkler system is required in lieu of NFPA 13R
 - Fire alarm requirements
 - Requirement for stairs to be smokeproof enclosures to help occupants that cannot evacuate themselves
 - Fire-resistance rating of stair enclosure
- Limitation on construction types: The proposal does have limitations; however, it was noted that the proposal should have even more stringent construction type requirements.
- Fire-resistance-rated construction: The proposal does have limitations; however, additional requirements could be included on fire-resistance particularly related to opening protectives.
- EEROs: The proposal does require EEROs; however, additional requirements specifically around how they are maintained for the life of a building would be beneficial.

Some other topics that were identified during Question 1 but were not sufficiently addressed by the proposal were discussed. The proposal does not adequately address fire department operations. However, it was noted that this would be outside the scope of the building code. Human factors and characteristics were not factored into the proposal. It was also noted that while some of the above-mentioned items help mitigate the risks associated with a single exit stair building, not all issues and concerns have been addressed. Specifically, the single exit stair for a taller building still introduces a vulnerability of a single point of failure within the means of egress of system. Lastly, while moving the allowance to an annex allows jurisdictions to decide if it is an appropriate allowance for their particular situation, additional guidance needs to be provided in the annex on how to assess if this is an appropriate option for a particular jurisdiction. Guidance should also be provided on how to assess the local fire department's capability.

After the breakout groups presented, the group continued the discussion together. A summary of the necessary features for single exit stair buildings from all participants were:

- 1.** Emergency responder operational capability needs to be considered, including:
 - a. Limit buildings to six stories.
 - b. Propose the material as an annex to give jurisdictions a choice based on their specific capabilities.
 - c. Limit the floor area and size as well as height.
- 2.** Egress/ingress considerations, including:
 - a. Travel distance to stair is less than or equal to 20 ft (6 m), with 125 ft (38 m) total.
 - b. Means of escape are protected.
 - c. Low occupancy loads are expected due to size limit
 - d. Presence of emergency escape rescue openings (EEROs)
- 3.** Address issues with single point of failure, including:
 - a. Require sprinklers and prefer compliance with NFPA 13 over a NFPA 13R system
 - b. Require fire alarm system
 - c. Require smokeproof enclosure
 - d. Require rated doors
 - e. Require 2-hour fire-resistance-rated construction
- 4.** Address the concerns with construction types, including:
 - a. Need to have minimum acceptable construction types
 - b. Require 2-hour fire-resistance-rated stair enclosure
- 5.** Address the issues related to human characteristics, including:
 - a. Construction types
 - b. Limited area/size

It was noted that a lot of those mitigations proposed are already required at six stories. The participants discussed what additional requirements should be considered that are not already part of the requirements for a six-story building. The two items discussed by the participants were having a limit on the floor plate size and requiring smoke protection. It was noted that the acceptable level of risk needs to be considered and then compared for each scenario.

The participants then undertook an issue-by-issue review of the IBC proposal and how the items proposed impact each of the major concern areas from the first breakout discussion. The results were as follows:

- Limit of six stories or less (occupiable roof permitted where area serves and access through individual dwelling units)
 - This helps with fire department operational capabilities.
 - It was noted that in Canada, the code only allows up to two stories for one exit, so this would be a significant increase.

- Maximum of four units per floor and a maximum of 20 occupants per floor. A maximum number of occupants would essentially limit the floor area to 4,000 ft² (370 m²) to help address all concerns except construction types.
- Requirements for sprinklers (NFPA 13 compliant system) and Class I standpipe
 - An NFPA 13 system is required at six stories already and in 2024 it would be required at five stories.
 - A standpipe is also already required in a six-story building.
- Fire alarm system and smoke alarms required, which is already a requirement for six story buildings.
- Maximum travel distance of 125 ft (38 m)
 - This would help address concerns around egress/ingress.
 - This is already required as part of the existing single exit stair allowance.
- Maximum travel distance from unit to exit door is 20 ft (6 m) or less to help address concerns around egress/ingress.
- Requirement for a two-hour fire resistance rating for exit enclosure:
 - This helps with concerns around fire department operations, single point of failure, and construction type.
 - Noted that IBC requires this in buildings more than four stories already; it would be an increase for four story buildings.
- Interior exit stairways must be smokeproof enclosures to help address concerns around fire department operational capability, ingress/egress, and single point of failure.
- Emergency escape and rescue openings must be provided in every sleeping room to help address concerns around fire department operational capabilities (depends on local capabilities and access) and ingress/egress.
- Construction type limited to Type 1A, 1B, 2A, 3A, 4, 5A:
 - This would address concerns related to the construction types used for single exit stair buildings.
 - It was noted that opening protectives be the same as currently required in these construction types.

Concerns with Proposed Allowances for Single Exit Apartment Buildings

Question 3: *What aspects of the concerns have not been addressed? This should include discussion of both building features and features outside the building.*

The attendees returned to breakout groups to discuss this question and reported out to the full group. The discussion included:

- Issues related to egress:
 - Exit discharge needs to be considered.
 - There should be apartment unit area uniformity (larger units = longer travel distance).
 - There may be a need to increase stair and door widths to accommodate travel in two directions.
 - Exit access corridor needs to be rated at least one hour with 45-minute openings.

- Noncombustible finishings should be required.
- Exterior access to EEROs needs consideration.
- There were concerns raised about evacuation in non-fire events and the need to consult with emergency medical services and law enforcement personnel. This includes questions around elevators and whether they should be required so that responders can use them during medical emergencies.
- Fire department operations need to be considered:
 - Fire department access to the building
 - Water supply for firefighting operations
 - Fire department capabilities as part of this proposal, may need to rely on ISO ratings of fire departments
- Additional information is needed for the required fire alarm system:
 - What type of system?
 - How does it differ from current requirements?
 - Do common areas require smoke detection?
- Assessments in accordance with NFPA 1300 needed (in addition to compliance with proposed standard NFPA 1750, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Providing Fire and Emergency Services to the Public*)
- Housekeeping and post-occupancy concerns:
 - Preventing storage in stairways
 - Keeping doors in usable condition and not blocked
 - Ensuring apartments are not overcrowded
- Safety during construction includes the need to verify NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations*, provides adequate safeguards for single exit stair buildings under construction
- Applicability of the remainder of the building code, if the allowance is included in an appendix
- Backup power for fire systems

After the report outs, the full group discussed and consolidated the items identified by the breakout groups. The additional considerations are summarized below:

- Systems or features contained within the building:
 - Increased stair widths (this was highlighted by more than one group)
 - Additional fire alarm details including smoke detection requirements (this was highlighted by more than one group)
 - Exit discharge considerations, including where exits discharge
 - Uniformity of apartment sizes (larger and smaller units can impact travel distances)
 - Items needed for non-fire events
 - Further limitations on construction types
 - Exit access corridor separation
 - Minimum requirements for interior finishes
 - Maintenance and housekeeping within the building

- Details on how the requirements in the body of the code apply to the allowance in the appendix
- More specific requirements for smokeproof enclosures
- Emergency power
- Enforcement of occupant load limitations
- Systems or features outside of the building:
 - Compliance needed with the proposed standard, NFPA 1750, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Providing Fire and Emergency Services to the Public* (this was highlighted by more than one group)
 - Considerations for fire department access roads (this was highlighted by more than one group)
 - Minimum water supply for fire flow (this was highlighted by more than one group)
 - Exterior access to EEROs (this was highlighted by more than one group)
 - Considerations related to community risk reduction (CRR)
 - Items needed to safeguard the building during construction if NFPA 241 does not already adequately cover single exit stair buildings

Knowledge Gaps

Question 4: *What knowledge gaps exist (such as how much longer does building evacuation take in a six-story apartment building compared to a three- or four-story apartment building) that, if solved, could help address outstanding concerns?*

The breakout groups considered the above question and reported out to the group. The report outs are summarized below.

- Impact of a single exit stair on firefighter operations:
 - Gain a better understanding of the fire department needs to respond to an event in a single exit stair building.
 - Review fire operations in various countries to better understand how and why single exit stair buildings are permitted.
- Need for detailed comparisons/analysis:
 - Compare what is currently allowed and required for an apartment building with one exit to what is allowed and required for an apartment building with two exits.
 - Perform a cost analysis to verify that allowing these types of buildings will help with housing issues.
 - Perform a risk analysis comparison of a six-story apartment building with two exits, to a six-story apartment building with one exit.
 - Review the impact on non-fire emergencies and other responders such as law enforcement and EMS. For example, what happens when the building needs to be evacuated for a non-fire event, but the only stair is compromised?
- Review the impact of the cascading effects of local changes. For example, when a sprinkler system is required by the code but has been amended by a jurisdiction, are further actions needed to be taken to adjust other “tradeoffs” in the code due to the assumption that a sprinkler system will be provided.

- Need for more detailed and consistent data:
 - Current fire data is not able to quantify the impact of having only a single exit.
 - Fire models may be needed to address evacuation concerns.
 - Data/justification behind original requirements is needed to give a baseline for new requirements.
 - Data and information are needed on the cost of smoke control systems and the reliability of these systems, and this should also include maintenance costs.
- Impact of human characteristics on fire risk: The impact of the following should be reviewed and better understood:
 - Level of education of occupants
 - Local input from potential occupants
 - Understanding who will be living in these buildings, including the social and economic differences
 - Best communication methods to reach residents
 - Vulnerable populations, including addressing what does a defend-in-place strategy require in a single exit stair building
- Impact of stair construction considerations:
 - Increased width
 - Examination of size of landings
- Impact of emerging technologies such as lithium-ion batteries
- Elevator considerations:
 - When are they required?
 - What can they be used for?

In summary, during the larger group discussion, the following areas were identified as knowledge gaps related to mid-rise single exit stair apartment buildings:

- Fire department considerations:
 - Fire department access needs
 - Impact on fire department response
 - Differences in jurisdictions
- Full understanding of current allowances (three, four, or five stories with one exit, six with two exits versus six with one exit)
- Cascading effects of code changes – in codes and at local level
- Risk analysis such as six stories with two exits versus six stories with one exit
- Modeling of various scenarios
- Human characteristics:
 - Level of public knowledge
 - Input from occupants
- Data behind original requirements
- Considerations for vulnerable populations
- Data collection for statistical analysis
- Stair width and landing size concerns
- Defend-in-place versus evacuate
- Impact on non fire events

- Non fire full evacuation events
- Law enforcement
- Emergency medical services
- Impact of emerging technologies
- Smoke control cost and reliability
- More information on countries that allow single exit stair buildings:
 - Social/economic differences
 - Fire operation differences
- Cost implications (including construction and maintenance)
- Impact of existing buildings and how single stair allowances for new buildings would apply for existing buildings
- Consideration of buildings in the wildland urban interface (WUI) and the differences of exterior fire
- Non-politicization

CLOSING REMARKS

Valerie Ziavras, Senior Fire Protection Engineer at NFPA, thanked attendees for participating. She acknowledged that it was challenging and difficult at times but emphasized the importance of participating in these types of conversations. Attendees were encouraged to continue the conversation and reflect on how they have been approaching the issue. It is important to keep fire and life safety in the conversation when changes to building and life safety codes are being proposed to address housing issues.

Christian Dubay, Vice President and Chief Engineer at NFPA, closed out the symposium by thanking everyone and reminding participants the report would be available in approximately one month.

CONCLUSIONS

The top five concerns identified during the facilitated discussion were:

1. The single exit stair results in the means of egress being susceptible to a single point of failure.
2. The types of allowable construction for single exit stair buildings.
3. Impact of a single exit stair on emergency responder operation capabilities.
4. Occupants egressing while first responders are ingressing.
5. Hazards arising post occupancy and human characteristics.

It is important to note that while these concerns were identified during the Symposium, the amount of time and goals of the symposium did not allow for a thorough review of or determination of the validity of these concerns. This section allows for additional commentary on the top five concerns identified to provide additional insight into some of the questions that need to be answered and the impacts that need to be considered prior to making changes.

Single Exit Stair Results in Potential of Single Point of Failure Within the Means of Egress

Introducing the potential for a single point of failure in the means of egress is understandably a concern. With that being said, it is vital that when evaluating this concern, the single exit stair is not addressed in a vacuum. The allowance requires a suite of protection features, and while the stair itself has the potential to be a single point of failure within the means of egress, many other systems are required. What needs to be addressed is the overall impact and likelihood of failure as whole. For example, the proposals discussed require a full NFPA 13 sprinkler system. Therefore, when considering the impact of a single exit stair the likelihood of the stair being compromised in a building with a full NFPA 13 sprinkler system would also need to be understood. This would include looking at the data available to understand how frequently a sprinkler system fails resulting in a fire expanding beyond the room of origin. Similarly, this will need to be done for fire-rated construction, fire doors, alarm response time, etc. Additionally, it is important to understand the evacuation time of a single exit stair building compared to how long it will take for the stair to be impassable.

Construction Type Allowances for Single Exit Stair Buildings

Typically, building codes and life safety codes limit the allowable construction type of buildings for one of two reasons: 1) limit the likelihood of collapse during building evacuation and emergency response; 2) limit the likelihood of the construction materials contributing to the fire spread within the building and to/from neighboring buildings. When considering the impact of building construction types as it relates to the single exit stair issue, it is imperative to understand how the single stair will impact evacuation time and amount of time responders will need to be in the building to perform firefighter operations.

Impact of Single Exit Stair on Emergency Responder Operation Capabilities

Closer examination of this concern will require understanding of what the current baseline is for emergency response in jurisdictions. This will include identifying response times, frequency of rescues, and level of internal firefighting operations in fully sprinklered buildings, size of initial response, availability and reliability of equipment such as ladder trucks, and availability of water (fire hydrant location and flow/pressure available). Another key aspect of this will be understanding modern fire development in single exit stair buildings. It will be important to look at fire development both with sprinkler activation and without. This will allow for further analysis of anticipated firefighter operations based on expected fire growth.

Occupants Egressing While First Responders Ingressing

The issues and challenges faced because of counterflow was a recurring theme. The single exit stair proposals limit the number of units per floor. Therefore, when evaluating the impact that the single exit stair has on the emergency responders facing counterflow, it is important to understand expected evacuation times of these buildings as well as response times of first responders. There is a possibility that the occupant load is low enough that the building could be fully evacuated prior to first responders arriving. As part of a closer examination of this issue, it would be beneficial to get a better understanding of how often counterflow is an issue in two exit buildings and the

role different stair construction considerations play in alleviating the hazards associated with counterflow. Occupant loads have the potential to be significantly higher in two exit stair buildings. This can lead to longer evacuation times, which may mean occupants are still egressing when first responders arrive in buildings with two or more exits. Additionally, a better understanding of how often first responders are communicating to egressing occupants that one stair is for firefighter operations and the other is for evacuation would help inform whether this issue truly is unique to single exit stair apartment buildings or if it is a challenge in all apartment buildings. One other key aspect of this issue is an analysis of stair construction considerations and the impact it has on firefighter operations and occupant evacuation. These considerations include details such as minimum stair width requirements as well as size of landings. While a single exit stair may introduce counterflow, a detailed analysis of stair considerations could help determine if increasing the required size of the single stair can offset the risk of counterflow.

Hazards Arising Post Occupancy

There are a number of hazards that can arise post occupancy of a building ranging from the inspection, testing, and maintenance of fire protection systems, to occupants storing goods in the corridor, to impacts of building rehabilitation. It is important to note that many of these issues are not specific to single exit stair buildings. When considering this concern, it is important to consider which issues are truly unique to single exit stair apartment buildings so that this proposed design allowance is not holding them to a different level of safety than other buildings. For example, challenges around lithium-ion battery fires, which was a common concern during the Symposium, are not unique to single exit stair buildings. However, what may be unique to these buildings is the impact a single exit stair has on the evacuation and response to a lithium-ion battery fire.

NEXT STEPS

There are a number of outstanding questions when it comes to fire and life safety concerns with increasing the allowable height of apartment buildings with a single exit stair. The first step in solving some of these questions is to have a clear understanding of what is currently allowed for apartment buildings. This can be accomplished by completing an in-depth code analysis of what is currently permitted.

The code analysis needs to compare three different types of apartment buildings:

1. Four-story apartment building with two exits
2. Four-story apartment building with one exit
3. Six-story apartment building with two exits

The code analysis should include a review of the following:

1. Requirements on allowable construction types, means of egress, protection, building services, and operating features.
2. Maximum size floor plate allowed (while still only requiring two exit stairs)
3. Maximum permissible distances wherever possible such as for travel distances, common path of travel, and dead-end corridor length

Egress modeling for these buildings also needs to be performed to get a better understanding of evacuation times. It can be used to better understand the minimum level of life safety that is currently required in these different types of apartment buildings. Additionally, it allows for a comparison of the difference in required safety features for a four-story apartment building with one exit and a four-story apartment building with two exits. This can then be taken a step further, and a comparison of the difference in required safety features for a six-story apartment building with two exits and a four-story apartment building with two exits can be completed. These comparisons can be used to help inform if and how the safety features need to change if the same level of life safety is to be provided in a six-story apartment building with a single exit. Once this is complete, these same analytics should be applied to the proposed six-story single exit arrangement to document the overall impact on egress.

As a direct outcome of this Symposium, NFPA will be sponsoring a research project to complete the code analysis and egress modeling outlined above through the **Fire Protection Research Foundation** (FPRF). As is typical with FPRF projects, a technical panel will be appointed to oversee and guide the project. The panel will be composed of a variety of stakeholders representing the different views. The goal of this project will be to determine if there is a technical basis for potential allowances for new six-story apartment buildings with a single exit stair. If there is, the arrangement will then be subject to the same full code analysis and egress modeling. Once complete the FPRF report will be made publicly available for all interested stakeholders. The completed research can be used in the consensus-based codes and standards processes to make informed decisions.

To download a copy of this report and explore additional resources from NFPA on the single exit stair issue, visit [nfpa.org/singleexit](https://www.nfpa.org/singleexit).

REFERENCES

- Neuman, S. (2021, March 9). Man Sentenced In 2016 Ghost Ship Warehouse Fire In Oakland, Calif., That Killed 36. Retrieved from NPR: <https://www.npr.org/2021/03/09/975206741/man-sentenced-in-2016-ghost-ship-warehouse-fire-in-oakland-calif-that-killed-36>
- Who We Are. (n.d.). Retrieved from International Code Council: <https://www.iccsafe.org/about/who-we-are/>