



SINGLE-STAIR BUILDINGS INCREASE RISK

TALKING POINTS ON THE SAFETY AND OPERATIONAL IMPACTS OF SINGLE-STAIR BUILDING DESIGN

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Across North America, there is a growing push to allow 4–6 story apartment buildings to be built with only one stairwell.

The International Association of Fire Fighters (IAFF) opposes these efforts because they remove a proven life safety feature from residential buildings and replace it with a single point of failure.

For decades, building codes have required at least two stairwells. That standard reflects a basic life safety design: If one path is compromised, there is always another. In a single-stair building, occupants above the fire may have no other way out, and fire fighters may have no other way in.

Research from the National Fire Protection Association (NFPA), CAL FIRE, the National Institute of Standards and Technology (NIST), and multiple state and provincial studies points to consistent concerns:

- Increased dependence on systems working perfectly, including sprinklers, alarms, and doors
- Added challenges for fire fighter operations, particularly when evacuation and fire attack must occur in the same space
- Greater risk for vulnerable populations, including the elderly, people with disabilities, and children.

Taken together, these conditions increase the overall risk in the building. Under NFPA 1750, higher-risk buildings require a larger, faster response – up to 43 fire fighters on scene within 10 minutes for high-hazard incidents.

The following points equip IAFF members to speak with authority to stakeholders about how single-stair buildings impact public safety.

FOUNDATIONAL RISK AND CODE CONTEXT

- Single point of failure. One stairwell forces evacuation and fire fighter access into the same place. If that stair is compromised by smoke or heat, upper floor occupants have lost their only exit and fire fighters lose their primary interior route (NFPA, 2024).
- Consensus codes cap single-stair apartments at 3–4 stories and only under strict conditions, including sprinkler protection, unit counts, and travel distances. Proposals to increase to 6 stories have often been enacted by legislation rather than through the NFPA/ICC consensus process (NFPA, 2024).
- NFPA 1750 ties deployment to risk categories set by the local jurisdiction. For high-hazard or high-rise incidents, that can mean up to 43 fire fighters on scene within 610 seconds (10:10 minutes) – capacity that must exist at the local level.



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EGRESS PERFORMANCE, COUNTERFLOW, AND HUMAN FACTORS

- Evacuation slows when everyone uses the same stairwell. CAL FIRE modeling ($\approx 4,500$ square feet per floor; ≈ 23 occupants per floor) shows total egress time rising from 2:23 to 6:35 (+4:12) when fire fighters enter using the only stair. A roof deck adds +4:46, a senior scenario adds +2:22, and a 6-story building adds +3:33 (2025).
- Research from the World Trade Center response found ascent rates of 1.4 minutes per floor without heavy gear, and 2 minutes per floor (± 0.5) when carrying equipment. These rates were significantly hindered by the physical interference of escaping occupants, illustrating how a lack of redundant stairwells delays life-saving operations (Spearpoint & Claridge, 2010).
- Measured stair speeds are modest and slower for vulnerable groups. NIST measured average stair movement at 0.44 m/s overall, dropping to 0.28 m/s for elderly or mobility-impaired occupants and 0.14 m/s when assisted by fire fighters. Pre-evacuation delays average ~ 230 seconds (≈ 160 seconds for able-bodied occupants), and range from 850–1708 seconds in assisted-living buildings. (Kuligowski et al., 2015).
- Stair width isn't a cure. Within code compliant ranges, NIST found flow is driven primarily by occupant load and travel distance, not modest increases in stair width. A single stair remains a bottleneck (Kuligowski et al., 2015).
- Egress path ignition is a real risk. About 8–10% of apartment fires start in corridors or stairwells – the exact areas single-stair design depends on to remain tenable (Jensen Hughes, 2024).

SYSTEMS DEPENDENCY (SPRINKLERS, DOORS, ALARMS) AND MAINTENANCE REALITY

- Single-stair buildings rely on systems working perfectly. When there is only one stair, conditions in that space must remain tenable for both evacuation and fire fighter access.
- Sprinkler reliability dominates risk. Minnesota's risk-informed analysis found that approximately 97% of modeled building risk in single-stair scenarios is tied to sprinkler failure to flow. If sprinklers fail and doors are open, corridors and stairs can quickly become untenable. Two stair buildings retain a fallback route (WJE & Crux, 2025).
- Mitigation measures help, but don't eliminate the risk. Corridor smoke detection, stronger code enforcement, and reliable door closers materially reduce modeled risk. However, the study notes data gaps for fire service operations above four stories and dependence on assumed reliability improvements (WJE & Crux, 2025).
- Protection degrades over time. Post-occupancy hazards – such as e-mobility batteries, storage in corridors or stairwells, and propped self closing doors – are ongoing threats to stair integrity (NFPA, 2024).
- Lower income renters/homeowners have less leverage to demand inspection, testing, and repairs (e.g., self closers, detection), making designs that depend on strict maintenance a disproportionate burden (NFPA, 2024).

FIRE FIGHTER OPERATIONS, AERIAL LIMITS, AND RESCUE

- In a single-stair building, hose lines, tools, and fire fighters move through the same space as evacuating occupants. CAL FIRE's survey found near-unanimous opposition from fire departments, citing reduced usable width, slower operations, and the inability to separate fire attack from evacuation (2025).



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- Aerial apparatus is not a reliable backup. A 107-foot ladder provides approximately 103.4 feet of vertical reach under ideal conditions. In practice, setbacks, overhead wires, trees, and limited placement room often restrict or eliminate this option (CAL FIRE, 2025).
- Fire fighter rescue is slow and workforce intensive. NIST data shows how mobility-impaired occupants move at 0.14–0.20 m/s when assisted by fire fighters or devices. Assisted descent dramatically slows evacuation and increases the time during which conditions can worsen (Kuligowski et al., 2015).

ADDITIONAL RISK FACTORS OFTEN OVERLOOKED

- When all occupants are forced into one stair, density increases and movement becomes uneven. NIST's Hawkes process analysis shows consistent clustering in stairs (periods of intense flow and stalls), raising the risk of falls and trampling, especially among children and panicked evacuees (Kuligowski et al., 2015).
- Evacuation does not begin immediately. Occupants delay to gather information, collect belongings, or assist others, commonly consuming ~170–230 s, and much longer in elderly housing. In a single-stair building, that means occupants enter the only stairwell after conditions worsen or as fire fighter operations are already underway (Kuligowski et al., 2015).
- Single stairs create predictable choke points. In non-fire emergencies, including active assailant or hostile events, a single interior stair concentrates movement into one path, impacting preparedness and emergency response demands (NFPA, 2024).
- Complex multi-threat incidents (fire + violence + medical) become harder to manage in single-stairwell buildings. Fire attack, evacuation, and casualty movement all compete for the same space.
- Risk-based deployment under NFPA 1750 requires a higher initial response force and coordination; these costs are borne by the AHJ (NFPA 1750 overview; NFPA 1750).
- Hazards extend beyond the interior. Exterior hazards – such as blocked exits, vehicles, snow or ice, or a threat outside – can further concentrate risk at that location (NFPA, 2024).

FISCAL/OPERATIONAL CONSEQUENCES FOR CITIES

- Construction “savings” shift costs to the public. CAL FIRE estimates adding a second stair accounts for approximately 7.5–12.5% of a mid-rise project. Eliminating that stair does not remove the cost – it shifts the burden to fire departments and the public through increased staffing to meet additional deployment demands, and increased inspection and enforcement for a more system dependent building stock (CAL FIRE, 2025).
- Under NFPA 1750, higher-risk buildings require a higher level of response, including assembling up to 43 fire fighters within 10 minutes for high-hazard incidents. That level of service must be considered before allowing higher risk designs (NFPA 1750 overview; NFPA 1750).
- Decades of safer outcomes validate current code requirements. Apartment fire deaths fell roughly 61% from 1980 to 2023, a trend widely attributed to stronger codes, including sprinkler requirements and improved life-safety design in multifamily buildings. Rolling back the dual-stair requirement reverses a proven approach without clear evidence demonstrating equivalent safety at 5–6 stories (Hall, S., NFPA Fire Loss in the United States, 2024; National Safety Council, Injury Facts, 2024).



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RURAL AND UNDERSTAFFED JURISDICTIONS FACE COMPOUNDED RISK

- Not every department has the same capacity. Rural and smaller departments often operate with fewer fire fighters, longer mutual-aid response times, and limited access to equipment like aerial apparatus.
- The risk is the same, but the resources are not. Single-stair mid-rise buildings in rural or smaller jurisdictions face the same hazards as urban buildings with fewer resources to mitigate them. Permitting single-stair designs without matching local capacity transfers risk onto the communities least equipped to handle it.
- Single-stair buildings are often marketed as affordable housing, but higher-density occupancy can increase call volume and service demand (Munjal et al., 2011). The resulting increase in deployment demand and response costs can decrease the fiscal benefit to the jurisdiction of denser, cheaper construction.

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