NFSA NATIONAL FIRE SPRINKLER ASSOCIATION
The Voice of the Fire Sprinkler Industry

TechNotes

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This edition of TechNotes was written by Jeffrey M. Hugo, CBO, NFSA's Vice President of Codes & Standards and Training & Education.

Looking Over the Past 50-Years

Fire sprinkler systems have been around for 130+ years, but the greatest era of fire sprinklers started in the 1970s and continues today. Yes, everyone in the fire sprinkler industry today plays a part as the greatest generation of fire protection. Since the 1970s, we have seen many changes in fire sprinklers, systems, codes, standards, regulations, and licensing. Some significant moves in the 1970s are:

- Mandatory text versus permissive text in codes and standards. Many codes and standards up to this period were unenforceable because they contained words that suggested compliance.
- Sprinkler technology and design. The 1972 edition of NFPA 13 introduced hydraulic calculations and the area/density curves. The 1973 edition of NFPA 13 required high-rise buildings to use hydraulic calculations. The booming retail market, such as shopping malls and Wal-Mart, increased storage sprinkler research and development.
- Licensing. Many states adopted professional licensing and certification programs for contractor and professional designers. See NFSA's website for **State-By-State Contractor Licensing and Application Forms**.
- Fire sprinkler tradeoffs. The early 70s model codes, through encouragement from the *America Burning* document, started applying tradeoffs for active fire sprinkler systems. Today, the IBC has over 125 tradeoffs published **in NFSA's Fire Sprinkler Guide**.
- 65% increase in code mandated fire sprinklers in buildings. Annual fire fatalities of an estimated 12,000 fire fatalities in the early 70s, to less than 3,000 fatalities annually today.
- The establishment of state fire marshals and code commissions in all 50 states.

Contrary Effects of a Great Last 50 Years

Model codes in the 1970s started with optional fire sprinkler systems but allowed the majority of buildings to remain unsprinklered. Some buildings, such as low-rise business and mercantile buildings, are still sprinkler optional. Some design professionals and communities still avoid sprinkler requirements in new codes and standards and write regulations that go around sprinklers, which ultimately contributes more to the fire problem down the road by reducing life safety and increasing community risk. The 70s added more partial sprinklered building and portions thereof acceptable.

Another change in the 70s is the Insurance Service Office (ISO) ceased reviewing fire sprinkler shop drawings. This action shifted plan examination to the state and local authorities having jurisdiction (AHJ). Speaking of risk, this era left us today with grandfathered unsprinklered and sprinklered buildings. Grandfathering is a term used to allow existing buildings to remain, unaffected by newer codes, standards, technologies such as fire protection.

Grandfathering: Unsprinklered Buildings

An existing building is typically unaffected by new codes and standards, unless construction or change of use occurs. This practice protects building owners from retrofitting requirements. Often when existing building stock remains unsprinklered the property value and life cycle are shorter and lower than sprinklered. Older buildings without fire sprinklers, fire alarms, and other life safety measures have a higher risk. The NFPA 101 *Life Safety Code* is the longest serving code dealing with existing buildings and is often the leader in history to require existing buildings to upgrade fire and life safety systems. Today, codes such as NFPA 1 and NFPA 101 have criteria for existing buildings to be upgraded, as well as the IFC's Chapter 11.

Grandfathering: Existing Fire Sprinkler Systems

With a 65% increase in sprinklered buildings since the 1970s, the service market has increased incrementally. In 1992, a new standard, NFPA 25, replaced the decades old NFPA 13A recommended practice that dealt with maintaining water-based fire protection systems. Today, the two national model fire codes (NFPA 1 *Fire Code, International Fire Code* (IFC)) reference a current edition of NFPA 25 across the US. While the service work has increased, the ability to update or recommend changes from the inspector to the owner is extremely limited in NFPA 25. Materials and equipment from the 1970s are still in service and are permitted to remain so in NFPA 25. The 50-year sample testing or replacement of standard response sprinklers in buildings starts to occur today in these early 70s buildings. This is a crucial time because only standard response sprinklers were available and installed back then across all occupancies. Today, and since the 1996 edition of NFPA 13, only fast response sprinklers are required in all light hazard occupancies, such as dwelling units.

1973 NFPA 13	2022 NFPA 13
Schedule 40 threaded or flanged steel pipe Copper tube with brazed fitting	Several schedules are available in steel, copper, and nonmetallic pipe. Grooved, threaded, brazed, soldered, and cemented connections
Standard response sprinklers	Standard and fast response sprinklers
Upright and pendent sprinklers	Upright, pendent, sidewall, and special sprinklers

Partial Systems – Partial Protection

Another product of the 1970s sprinkler requirements are partial systems in otherwise unsprinklered buildings. To avoid a full sprinkler system, code makers and stakeholders pushed for partial or limited area systems in new buildings and retrofitted into existing buildings across several codes. Areas such as windowless stories, trash chutes, and incidental areas are examples of partial systems in new construction. Retrofitting existing high-rises started with the 1991 NFPA 101 and in the 2021 IFC. Often a retrofitted high-rise, especially under NFPA 1 and NFPA 101, permitted partial systems as compliant with the intent of the code. Partial retrofitted systems have names like Engineered Life Safety Systems (ELSS) and Dorothy-Mae. These systems use some fire alarm and passive measures with sprinklers in corridors, public areas, and one sprinkler above the dwelling unit door have been implemented for over 40 years. Today, NFPA 101 is phasing out any new ELSS system and requiring full sprinkler systems to be retrofitted.

Model code	Partial systems
International Building Code (IBC)	New construction: Incidental areas, windowless stories, and per floor depending on the occupancy.
NFPA 1 and NFPA 101	New construction: Incidental areas, windowless stories, and per floor depending on the occupancy. Existing buildings: Retrofit existing high-rise and nightclub assemblies with partial engineered life safety systems (ELSS), Dorothy Mae systems.
International Fire Code (IFC)	Chapter 11 for all existing A-2 occupancies and high-rises are retrofitted per local approval.
International Existing Building Code (IEBC)	Level 2 and 3, and change of occupancy, work areas and floors of work areas.
International Property Maintenance Code (IPMC)	Does not have a partial system installation requirement but does require NFPA 25 for existing systems.

Does NFPA 13 allow partial systems and does NFPA 25 apply?

Chapter 4 of NFPA 13 starts out by requiring sprinklers in all areas of the building, but allows limited-area systems to comply with NFPA 13 rules where installed and permitted by the codes. Any partial or limited area system needs approval by the AHJ but every partial system should meet the definition a sprinkler system (2022 NFPA 13, Section 3.3.216, 2020 NFPA 25, Section 3.6.4) with:

1. Water supply
2. Control valve
3. Waterflow alarm
4. Drain

When the partial system meets the NFPA 13 and NFPA 25 definition above, then NFPA 25 would apply. Identifying and enforcing NFPA 25 on partial systems is difficult, but necessary.

The IBC, starting in the 2015 edition, (Section 903.3.8) lowered the extent of the limited area system with the following criteria:

1. Up to six sprinklers per fire area
2. Only in light or ordinary group 1 hazard fire areas
3. Connected to a wet standpipe or to domestic if capable of demand
4. Valves are indicating and supervised

5. Provide hydraulic calculations for approval

Industry Response to Partial Systems

Partial fire sprinkler systems provide limited protection and are not permitted to allow tradeoffs. There are some instances, such as in NFPA 101 and IEBC that allow a partial system per floor to tradeoff fire door and other passive system ratings. This incentive exists, but the advocacy to partially retrofitting existing high-rise buildings with ELSS and Dorothy Mae style systems is waning. The 2021 NFPA 101 prohibits new ELSS systems in existing business and residential high-rises retrofits and requires all existing residential high-rises to be fully sprinklered by January 1, 2033. The 2024 IEBC eliminated reference to any Dorothy-Mae style retrofit.

Grandfather and Biology

The 1970s to todays 65% sprinkler boom can be attributed to this industry's advocacy. Along the way, we supported grandfathering and partial systems as a compromise in the codes and standards arenas compared to nothing in the codes and standards. Today, we see some success in partially protected buildings, but at the end of the day, partial systems provide partial protection, often leaving occupants with a false sense of security. Any grandfathering and partial sprinkler protection should have an end in sight, such as a sunset date. As noted above, some existing building codes are eliminating options for partial systems and this can be attributed to actions of the NFSA and their technical representation across dozens of codes and standards.

Training and Education

Sign-Up for one of our Layout Technician Pathway Courses

NFSA's newly updated fire sprinkler Layout Technician Pathway (LTP) prepares fire sprinkler layout and design professionals for NICET Levels I & II certifications. It also provides a great refresher for those who have been designing systems but need a comprehensive refresher. Students will receive a hard copy of the recently updated and revised "Layout Book" as well as a copy of the 2022 edition of the NFPA 13 standard.

The LTP consists of two parts. Students must first complete the on-line Part 1: Fundamentals before attending the in-person Part 2: Application session. The 25 self-paced online modules cover everything from "Parts of a Sprinkler" to "Introduction to Fire Sprinkler Calculations." The 3-day in-person instructor-led Part 2: Application class applies the content learned in the previous Fundamentals course. There are four in-person and one virtual session offered in 2023.

NOTE: Students must register for Part 1: Application at least one month before the start of in-person Part 2: session in order to allow enough time to complete the on-line modules.

Layout Technician Pathway cost:
Members: $2,200.00
Non-members: $4,400.00 – **Join here** to save 50%!

2023 Registration Deadlines	Part 1: Fundamentals completion deadline	Part 2: Application session dates	Part 2: Application session locations
June 25	July 24	July 25-27	Shoreview, MN
Aug. 28	Sept. 25	Sept. 26-28	Tacoma, WA
Oct. 14	Nov. 13	Nov. 14-16	Linthicum Heights, MD

Check Out All Options Here

All 2023 Tech Tuesdays are NOW available for registration!

Our next Tech Tuesday will be June 20, 2023 from 12:30 pm to 1:30 pm eastern time. The topic will be Grandfathering and Partial Sprinkler Systems.

Existing buildings and existing fire sprinkler systems can have a "grandfather" status. Grandfathering is a practice in codes and standards to allow nonconforming buildings and systems to remain in service. Renovations, changes of occupancy, new processes, extending

systems, and more can trigger new construction requirements in existing buildings…or not. Often when new fire sprinkler systems are triggered for existing buildings, codes and standards permit partial systems to protect the new portion and not the entire building. Partial fire sprinkler systems, limited-area systems, engineered life safety systems, Dorothy-Mae and more are just a few terms used by codes and standards that mitigate the full application of NFPA 13.

**NFSA now uses Adobe Connect for Tech Tuesdays. The link to the virtual classroom will be included in your confirmation and reminder emails. When entering the virtual classroom, log on using your NFSA username and password. All participants must be individually registered and must individually access the class to receive credit.

You may find it easier to access the meeting if you download Adobe Connect.

Register for the next Tech Tuesday Here

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