Concrete and Masonry Industry Firesafety Committee
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Position Paper and Information Sheet on NFPA 13R: Installation of Sprinkler Systems in Residential Occupancies up to Four Stories in Height

Position: Responsible use of sprinkler systems designed and installed within the scope and intent of the National Fire Protection Association (NFPA) 13R sprinkler standard, will lead to improved firesafety conditions in multifamily housing. The concrete and masonry industry supports this activity, but strongly opposes revisions to building code provisions that encourage the installation of 13R systems at the expense of sacrificing other proven fire-protection features such as compartmentation, detection, noncombustible construction, and structural fire resistance.

Introduction and Background

The development and release of NFPA Standard 13R: Installation of Sprinkler Systems in Residential Occupancies up to Four Stories in Height has virtually coincided with the actions of model code organizations to mandate sprinklers in low-rise multifamily, and hotel or motel buildings. Through NFPA's adoption of the standard in November 1988, an economical means of satisfying this mandate was created. Affordability was addressed by permitting certain areas within the building to remain unsprinklered and by allowing a reduced water demand from that which would normally be required by NFPA 13. NFPA's justification for omitting sprinklers in certain areas was based on data indicating that the percentage of deaths and injuries resulting from fires originating in these areas was small compared to the total.

Scope of the 13R Standard

Sprinkler systems designed and installed in accordance with NFPA 13R are intended for residential occupancy buildings no more than four stories in height. Residential occupancies are defined in the standard as apartment buildings; lodging and rooming houses; hotels, motels, and dormitories; prompt-evacuation board-and-care facilities; and board-and-care facilities with 16 or fewer occupants of the slower evacuation type. In cases where dwelling units are located in occupancies classified as other than residential, sprinklers shall be installed per NFPA 13.

Appropriateness of Tradeoffs with 13R Installations

With the arrival of the 13R sprinkler standard onto the codes scene, traditional tradeoffs that have been permitted for NFPA 13 sprinkler systems should be reviewed to determine if they are suitable for 13R sprinkler installations. Trading off code features that are primarily intended to provide property protection should not be permitted with 13R installations. Some examples of inappropriate tradeoffs are

Increases in allowable building height

Allowing the use of 13R systems in residential buildings more than four stories in height, which is beyond the scope of the 13R standard

Area increases resulting in larger building areas; fewer or no firewalls or area separation walls

Reducing draft-stopping protection of combustible concealed spaces by increasing minimum spacing requirements (even though sprinklers are not required in these spaces by the 13R standard)

Reducing the structural fire resistance of corridors, stair enclosures, exterior walls, and floor or ceiling assemblies and walls constructed as tenant separations

Areas of Coverage

NFPA 13R specifies that sprinklers be installed in all areas, with four significant exceptions. Areas not requiring sprinklers include

- Bathrooms that do not exceed 55 sq ft in floor-area, that have noncombustible plumbing fixtures
- Closets where the smallest dimension does not exceed 3 feet, and the floor area does not exceed 24 sq ft, and the walls and ceilings are surfaced with noncombustible or limited combustible materials

BIA Brick Institute of America
ESCSI Expanded Shale, Clay and Slate Institute
NCMA National Concrete Masonry Association
NRMCA National Ready Mixed Concrete Association
PCA Portland Cement Association
PCI Precast/Prestressed Concrete Institute

- Open, attached porches, balconies, corridors, and stairs

- Attics, penthouse equipment rooms, crawl spaces, elevator shafts, and other concealed spaces that are not used or intended for use as living or storage space

Although the impact of allowing these unsprinklered areas may seem insignificant at first, this really isn't the case. For example, bathrooms and closets are typically located adjacent to dwelling-unit separation walls in multifamily dwellings. If the fire resistance of the wall is reduced, this may result in two contiguous, nonsprinklered rooms or areas in different tenant spaces, separated by a wall offering only one-half the fire resistance required in nonsprinklered buildings.

Even more serious is the omission of sprinklers from combustible concealed spaces in conjunction with tradeoffs. Fires originating in such spaces may go undetected for a considerable period of time, thus affording the fire an opportunity to spread laterally or vertically to remote areas. According to NFPA statistics, these fires cause a disproportionately higher amount of property damage than fires originating in areas that are normally occupied.

Lack of sprinkler coverage of open, attached porches, balconies, corridors, and stairs is also a concern, since multifamily occupancies are generally more susceptible to arson and outdoor cooking fires than other occupancies. Reducing the fire resistance of exterior walls or balconies can only increase the extent of property damage caused by these incidents and other exterior-origin fires.

All these scenarios strike at the heart of the fundamental sprinkler tradeoff issue; that is, tradeoffs pertaining to property protection should not be permitted with partial sprinkler systems such as 13R.

Arguments Against Property-Protection Tradeoffs with 13R Installations

1. The 13R standard already represents a tradeoff since it evolved primarily as a means of providing an affordable lifesafety sprinkler system in multifamily buildings. Affordability issues are addressed mainly through reductions in water supply and sprinkler coverage requirements, as compared to NFPA 13 systems. Because the 13R system is a partial system, it does not warrant the same type of tradeoffs that have traditionally been permitted with full coverage NFPA 13 installations.

2. The 13R system is essentially a lifesafety system When the standard was first developed, sprinklers were targeted for specific areas, based on the impact that fires originating in those areas had on lifesafety. Commentary in the 13R Appendix states "the standard is designed to provide a high, but not absolute, level of lifesafety and a lesser level of property protection."

3. While fires originating in areas not required to be sprinklered under 13R account for only 8.5% of the injuries and 5.6% of the fire deaths in multifamily dwellings, they account for a disproportionately high amount of property damage. NFPA statistics reveal that these same fires (14.9% in number) are responsible for 23.1% of the total dollar losses from all fires in multifamily buildings.

4. Residential sprinklers are "listed" based on their ability to provide appropriate lifesafety protection when tested against a limited number of reasonably severe fire scenarios. However, the 13R Appendix indicates that 13R systems may not be expected to control a fire involving fuel loads higher than 10 pounds per square foot (psf) of floor area. Studies conducted by the National Institute of Standards and Technology (NIST)* have shown that the mean fire load in single-family dwellings is 13 psf. It follows that the fire load in multifamily dwellings should be equal or even greater than this, due to the tendency toward smaller room sizes.

5. Residential sprinklers installed in dwelling units are designed for lifesafety purposes. Standard sprinkler heads, as required by NFPA 13, are designed for property protection. While neither type is 100% effective, most of the statistical data to date regarding sprinkler-system performance has been based on the experiences of standard sprinkler heads installed in industrial and commercial applications (NFPA 13 systems). The 13R system is intended for an occupancy that has not typically been sprinklered. The lack of a formal inspection and maintenance program, as is usually in place in industrial and commercial occupancies, could be significantly detrimental to the performance record of the 13R system. It is inappropriate to predict the effectiveness of residential sprinkler systems based on the past performances of the more traditional NFPA 13 sprinkler systems.

Conclusions

Evidence has been presented that shows the NFPA 13R sprinkler standard is truly lifesafety oriented. For this reason and because 13R systems only provide partial sprinkler coverage, tradeoffs that may compromise property protection are unjustified. The concrete and masonry industry does not oppose building code provisions that permit the use of 13R systems, as long as the installations comply with the scope and intent of the standard and no tradeoffs of property-protection features are granted.

*Issen, L. A., "Single-Family Residential Fire and Live Loads Survey," National Institute of Standards and Technology (formerly National Bureau of Standards), U.S., BSIR 80-2155, 1980.