

# **HIGH-RISE BUILDING FIRES**

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## **Abstract**

In 2005-2009, there were an average of 15,700 reported structure fires in high-rise buildings per year and associated losses of 53 civilian deaths, 546 civilian injuries, and \$235 million in direct property damage per year. Four property classes account for roughly half of high-rise fires: office buildings, hotels, apartment buildings, and facilities that care for the sick. Automatic fire protection equipment and fire-resistive construction are more common in high-rise buildings that have fires than in other buildings of the same property use that have fires. The risks of fire, fire death, and direct property damage due to fire tend to be lower in high-rise buildings than in shorter buildings of the same property use.

Keywords: fire statistics, high-rise, apartments, care of sick, office, hotel, fire protection, hospital, clinic, doctor's office

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## Executive Summary

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In 2005-2009, an estimated 15,700 reported high-rise structure fires per year resulted in associated losses of 53 civilian deaths, 546 civilian injuries, and \$235 million in direct property damage per year. An estimated 2.6% of all 2005-2009 reported structure fires were in high-rise buildings.

The trends in high-rise fires and associated losses (inflation-adjusted for property damage) are clearly down, but the sharp post-1998 reduction appears to be mostly due to the change to NFIRS Version 5.0, which is shifting estimates to lower levels that also appear to be more accurate.

Four property classes account for roughly half of high-rise fires: apartments, hotels, facilities that care for the sick, and offices. In 2005-2009, in these four property classes combined, there were 7,800 reported high-rise structure fires per year and associated losses of 30 civilian deaths, 352 civilian injuries, and \$99 million in direct property damage per year. The property damage average is inflated by the influence of one 2008 hotel fire, whose \$100 million loss projected to nearly \$40 million a year in the analysis.

This report emphasizes these four property classes. Some other property uses – such as stores and restaurants – may represent only a single floor in a tall building primarily devoted to other uses. Some property uses – such as grain elevators and factories – can be as tall as a high-rise building but without a large number of separate floors or stories. For these reasons, the four property use groups listed above define most of the buildings we think of as high-rise buildings, and their fires come closest to defining what we think of as the high-rise building fire problem.

By most measures of loss, the risks of fire and of associated fire loss are lower in high-rise buildings than in other buildings of the same property loss. This statement applies to risk of fire, civilian fire deaths, civilian fire injuries, and direct property damage due to fire, relative to housing units, for apartments, and risk of fire for hotels, offices, and facilities that care for the sick.

The usage of wet pipe sprinklers and fire detection equipment is higher in high-rise buildings than in other buildings, for each property use group. Even so, considering the extensive requirements in [NFPA 101®](#), [Life Safety Code](#), for fire and life safety features in both new and existing high-rise buildings, it seems clear that there are still major gaps, particularly in adoption and enforcement of the provisions requiring retrofit of automatic sprinkler systems and other life safety systems in existing high-rise buildings. NFPA 1®, [Fire Code](#), has sprinkler retrofit requirements.

This has implications for public officials and ordinary citizens in any city. Public officials should make sure that the latest editions of [NFPA 1®, Fire Code](#), and [NFPA 101®, Life Safety Code](#), are in place and that the codes they have are supported by effective code enforcement provisions, including plan review and inspection processes,

both for new construction and for continued supervision of code compliance in existing buildings. The public can take responsibility for their own safety by insisting that their public officials take these steps. As in so many areas of fire safety, we know what to do, but we still need to do it.

The trend had been toward a smaller share of fires being reported each year as occurring in buildings with fire-resistive construction, both for high-rise and other buildings, with the decline being most dramatic in facilities that care for the sick. This statistical decline could reflect any or all of the following: (a) a shift in construction between the two types permitted by codes, from Type I (442 or 332) construction, which is coded as fire-resistive, to Type II (222) construction, which is coded as protected non-combustible; (b) a shift to acceptable alternative designs using more sprinklers and less fire-resistive construction; or (c) enough success in containing fires that a rising fraction never are reported to fire departments, because the fires are caught and controlled so early by occupants.

Most high-rise building fires begin on floors no higher than the 6<sup>th</sup> story. The fraction of 2005-2009 high-rise fires that began on the 7<sup>th</sup> floor or higher was 32% for apartments, 22% for hotels and motels, 21% for facilities that care for the sick, and 39% for office buildings. The risk of a fire start is greater on the lower floors for apartments, hotels and motels, and facilities that care for the sick, but greater on the upper floors for office buildings.

High-rise apartments have a slightly larger share of their fires originating in means of egress than do their shorter counterparts (4% vs. 3%). The same is true of hotels (7% vs. 5%) and facilities that care for the sick (6% vs. 4%). In offices (4% vs. 6%), the differences in percentages are in the opposite direction, which means that high-rise buildings in those properties have a smaller share of their fires originating in means of egress. In all four property classes, the differences are so small that one can say there is no evidence that high-rise buildings have a bigger problem with fires starting in means of egress.

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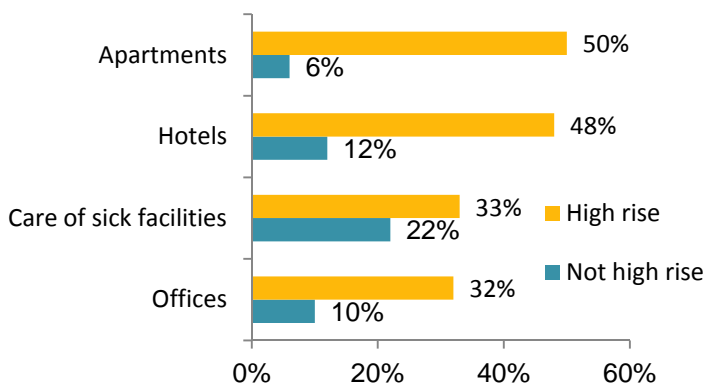


## U.S. High-Rise Building Fires Fact Sheet

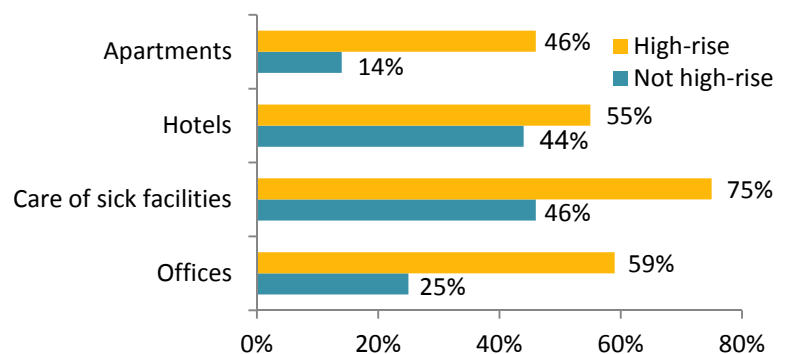
In 2005-2009, U.S. fire departments responded to an average of **15,700** structure fires in high-rise buildings.<sup>1</sup> These fires caused an annual average of

- 53 civilian fire deaths
  - 546 civilian fire injuries
  - \$235 million in direct property damage
- Four property use groups account for roughly half of high-rise fires:
    - Apartments (44% of all high-rise fires, 55% of deaths, 18% of damages)
    - Hotels (2% of high-rise fires, 2% of deaths, 21% of damages)
    - Facilities that care for the sick (2% of high-rise fires, 0% of deaths, 1% of damages)
    - Offices (2% of high-rise fires, 0% of deaths, 2% of damages)
    - The rest were nearly all property uses found in mixed-use residential or office buildings (such as restaurants, stores, and parking garages) or probable miscodes of properties that cannot be high-rise (such as dwellings and sheds)
  - By most measures, the risks of fire and of associated losses are **lower** in high-rise buildings than in other buildings of the same property use.
  - A major reason why risks are lower is probably the much greater use of fire protection systems and features<sup>2</sup> in high-rise buildings as compared to shorter buildings.
  - Further evidence of greater impact from fire protection systems and features in high-rise buildings is in *percentage of fires with flame damage beyond room of origin*:
    - Apartments (7% of high-rise fires vs. 10% in shorter buildings)
    - Hotels (7% of high-rise fires vs. 10% in shorter buildings)
    - Facilities that care for the sick (16% of high-rise fires vs. 19% in shorter buildings)
    - Offices (4% of high-rise fires vs. 7% in shorter buildings)

**Presence of Fire-Resistive Construction in Fires, 1994-1998**



**Presence of Wet-Pipe Sprinklers in Fires Excluding Partial Systems and Buildings Under Construction, 2005-2009**



Additional information can be found at [www.nfpa.org/highrise](http://www.nfpa.org/highrise)

<sup>1</sup> "High rise" is defined here as 7 stories above grade. This is roughly consistent with the Life Safety Code definition of high rise as 75 feet (23 meters) in height, measured from the lowest level of fire department vehicle access to the floor of the highest occupiable story.

<sup>2</sup> Construction type of building involved in fire is not reported after 1998.