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ARTICLE

How Fire Disaster Shaped the Evolution of the New York City Building Code

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Illustration of the great New York City fire of 1835. Courtesy of the Library of Congress.

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Building codes often come about as a response to hard-learned lessons. The history of disastrous fires in New York City is an acute illustration of that fact.

Conflagration

Three times fire destroyed the heart of New York. On September 21, 1776, fire destroyed one-quarter of the young city.[1] On December 16, 1835, a second great fire consumed 52 acres in the financial district, 674 buildings in all.[2] A decade later, fire again devastated Lower Manhattan. In the early morning of Saturday, July 19, 1845, fire broke out in a whale oil store at 34 New Street, a block south of Wall Street, and spread quickly.[3] By the time the flames were contained, 4 firefighters and 26 civilians had been killed,[4] and 345 buildings destroyed.[5]

To limit the spread of fire between buildings, government officials restricted the construction of wood frame structures,[6] ultimately banning all new wood frame construction within the densest parts of New York City in 1815.[7] Exterior warehouse doors similarly had to be made of metal, and all non-residential buildings had to have iron or copper shutters that had to be closed nightly.[8]

This approach did not provide immediate benefits – but as older buildings gave way to new development, and as areas devastated by fire were rebuilt, sturdy masonry structures rose, limiting the spread of future fire.

A line of well-built structures along the northern side of Wall Street, in part, kept the Great Fire of 1835 from spreading. One observer noted this line of fire resistant buildings "did more for the safety of that part of the city than anything within the power of human effort."[9]

As the Great Fire of 1845 spread east into areas devastated in 1835 and subsequently rebuilt in brick and stone, the advance of the fire was checked. The wall of fire was defeated where South William Street curves into Beaver Street, sparing the famed

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Features

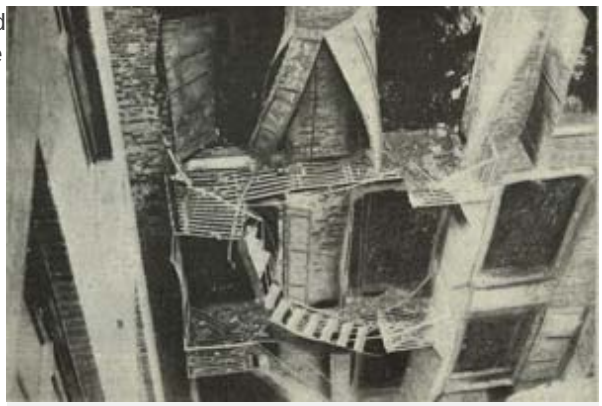
Delmonico Steakhouse, which had risen from the ashes of 1835, complete with marble columns imported from the ruins of Pompeii.[10] Here, solidly built structures at numbers 8, 10, and 12 South William Street aided firefighters. Its iron roof and fireproof shutters similarly saved 46 Beaver Street, which shut out all flames.[11]

Fire Escapes

With the risk of conflagration reduced, public attention turned towards the danger fire posed to individual life and property.

In 1860, two separate fires – the first on February 2, 1860, the second on March 28, 1860 – destroyed two crowded tenement houses. In both cases, fire and smoke blocked the sole stairway, trapping those on the upper floors. In total, the two fires claimed 30 lives.[12][13][14]

Following the twin tragedies, newspapers provided stories of survival, death, and bodies pulled from the wreckage, keeping the fires at the forefront of public attention.[15] [16] [17]The subsequent public outcry forced the legislature to pass a law requiring fire escapes on all newly constructed tenement houses.[18] In 1862, the law required fire escapes to be retroactively installed on all existing tenements.[19] In 1871, the requirement for fire escapes was expanded to include hotels, boarding houses, office buildings and factories.[20]



Fire escape of Asch building after the Triangle fire, New York City, 1911. Photo courtesy of the Library of Congress.

Fire escapes provided a second means of egress, but they were not an ideal solution – fire department records from the 19th and early 20th-centuries overflow with accounts of people unable or unwilling to climb down a fire escape.[21] In large buildings, fire escapes could not meet demand. On March 25, 1911, fire broke out in the Triangle Shirtwaist Factory in Manhattan. Of the two stairwells in the building, one was locked to prevent employee theft, and the second quickly filled with smoke and flame. Dozens of terrified individuals, mostly women and young girls employed at the factory, rushed onto the fire escape, which collapsed under the weight. In the end, 146 individuals perished in the fire, many of whom jumped into the street below after all other means of escape had vanished.[22]

Stairs

The Triangle Shirtwaist Factory fire resulted in sweeping changes to the New York State Labor Law. One change was a mandate that no point in a newly constructed factory could be more than 100 feet from an exit, and where the floor area exceed 5,000 square feet, an extra stairwell had to be provided for each additional 5,000 square feet of floor area. In existing factories, fire escapes had to be upgraded to support a live load of 90 pounds per square foot, with a safety factor of four.[23] Other laws passed in 1913 mandated that exit doors in factories be kept unlocked and swing outward, and for fire drills to be conducted on a regular basis.[24]

Parallel efforts were made in the early years of the 20th century regarding stairs in multi-family residential buildings. To eliminate exceedingly narrow and steep stairs, the 1901 Tenement House Act established dimensions for stair width, treads, and risers.[25] This was followed by the 1929 Multiple Dwelling Law, which mandated at least two fully enclosed stairwells in all newly constructed residential buildings over 75 feet in height.[26]

As high-rise office buildings pushed the skyline of New York City to ever-greater heights, provisions were enacted to ensure adequate egress. The 1916 New York City

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The Heart of the Matter

Building Code required one stairwell for each 2,500 square feet of floor area in an office building.[27] The 1938 Building Code introduced a less absolute approach, mandating a minimum of two stairwells in an office building,[28] but specifying that the maximum travel distance to the stairwells could be no more than 150 feet, [29] and that the stairwells had to accommodate the egress load of the floor, [30] which, depending on the layout and capacity of the floor, could result in more than two stairwells being required. The 1968 Building Code employed similar logic,[31] but it increased maximum travel distances to 200 feet in unsprinklered office buildings and 300 feet in sprinklered buildings.[32]

The terrorist attacks of September 11, 2001, destroyed all three stairwells in the North Tower of the World Trade Center, and two of the three stairwells in the South Tower – all of which were enclosed with gypsum wallboard. Of the 1,462 civilians who perished within the North Tower and the 630 civilians who died within the South Tower, all but 107 in the North Tower and 11 in the South Tower are believed to have been trapped at or above the impact zone.[33]

In the aftermath of September 11, the New York City Building Code was amended, requiring stairwells in newly constructed office buildings be encased in masonry, concrete, or similar impact resistant materials.[34]

Sprinklers

The invention of the first automatic sprinkler system in 1874 provided a groundbreaking tool to protect life and property.[35]

On December 5, 1876, the Brooklyn Theater on Washington Street in Brooklyn caught fire, trapping 296 people inside.[36] Following this disaster, inspections of theaters in Brooklyn and Manhattan uncovered numerous firetraps.[37][38][39] In 1882, as part of a major rewrite of the New York City Building Code, extensive provisions for theaters were enacted, including a requirement that sprinklers be installed[40] – making theaters the first buildings in New York City to require automatic sprinklers.[41]
After the Triangle Shirtwaist Factory fire in 1911, sprinklers were required in factories over seven stories or 90 feet in height.[42]

The 1968 Building Code expanded the requirements for automatic sprinkler systems to high hazard storage, mercantile spaces, showrooms, and hotels – but most significantly, high-rise office buildings, nightclubs, and residential buildings were exempted.[43]
Over the coming decades, tragedies in all three classes of these buildings would force a change.

On December 18, 1975, fire swept through the Blue Angel nightclub on East 54th Street in Manhattan, killing seven.[44] The fire resulted in amendments to the building code, including a strengthening of provisions for places of public assembly, and a requirement that sprinklers be retroactively installed in existing nightclubs.[45]
Residential fires occur in New York City each year, but two back to back tragedies in December 1998 – the first on December 19, which claimed the lives of three firefighters, and a second on December 24, which killed four civilians – galvanized media and public attention,[46] resulting in a law mandating sprinklers in newly constructed residential buildings with four or more units and a retroactive requirement for sprinklers to be installed in similar residential buildings undergoing a gut rehab.[47]

No modern sprinkler system would have been able to contain the massive fires that erupted in the Twin Towers on September 11, 2001.[48] However, following the attack the city, moved to expand the sprinkler requirements of the building code, requiring sprinklers for all newly constructed office buildings, and requiring the installation of sprinklers in existing office buildings over 100 feet in height by 2019.[49] [50]

Conclusion

Drawing on centuries of experience, today's New York City Building Code provides an invisible foundation for the city, safeguarding life and property, and working to ensure that the tragedies of the past are not repeated.

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[6] McGoldrick, Joseph; Graubard, Seymour; and Horowitz, Raymond. Building Regulation in New York City: A Study in Administrative Law and Procedure. The Commonwealth Fund. New York, NY. 1944. Page 35.

[7] Chapter 155 of the Laws of New York State 1815 §1

[8] Chapter 291 of the Laws of New York State 1830 §8; Chapter 220 of the Laws of New York State 1834 §5; Chapter 470 of the Laws of New York State 1860 §33; and Chapter 356 of the Laws of New York State 1862 §18

[9] Costello, Augustine. Our Firemen: A History of the New York Fire Departments, Volunteer and Paid. First published by A.E. Costello. New York, NY. 1887. Republished by Knickerbocker Press. New York. 1997. Page 276.

[10] Burrows, Edwin and Wallace, Mike. Gotham: A History of New York City to 1898. Oxford University Press. New York, NY. 1999. Page 599.

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[12] New York Daily Tribune. "Terrible Calamity!" New York Daily Tribune. New York, NY. February 3, 1860. Page 5.

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[16] New York Daily Tribune. "Shocking Calamity." New York Daily Tribune. New

York, NY. March 29, 1860. Page 8.

[17] New York Daily Tribune. "More Tenement Slaughters." New York Daily Tribune. New York, NY. March 29, 1860. Page 4.

[18] Chapter 470 of the Laws of New York State 1860 §25

[19] Chapter 356 of the Laws of New York State 1862 §27

[20] Chapter 625 of the Laws of New York State 1871 §28

[21] De Forest, Robert and Veiller, Lawrence, Editors. The Tenement House Problem: Volume 1. The Macmillan Company. New York, NY. 1903. Pages 281 – 282.

[22] Stein, Leon. The Triangle Fire. Cornell University Press. Ithaca, NY. 2001. First published, J. B. Lippincott. 1962. Pages 11 – 21, 55 – 58, 109, 177 – 203.

[23] 1913 New York State Labor Law §§ 79-a, 79-b

[24] Von Drehle, David. Triangle: The Fire that Changed America. Atlantic Monthly Press. New York, NY. 2003. Page 215.

[25] Chapter 334 of the Laws of New York State 1901 §12(6)

[26] Chapter 713 of the Laws of New York State 1929 §102

[27] 1916 New York City Building Code §152.3.c

[28] 1938 New York City Building Code §C26-273.0(b)(3)

[29] 1938 New York City Building Code §C26-273.0(d)(3)

[30] 1938 New York City Building Code §C26-273.0(c)(1)(h)

[31] 1968 New York City Building Code §§27-357, 27-360, 27-363, 27-366

[32] 1968 New York City Building Code, Table 6-1

[33] NIST. "NIST NCSTAR 1." Reports of the Federal Building and Fire Investigation of the World Trade Center Disaster. US Government Printing Office. Washington, DC. 2005. Pages 26, 42.

[34] Local Law 26 of 2004 §12, Chapter 1 of the Rules of City of New York §32-05, 2008 New York City Building Code Section BC 403.15, and Chapter 1 of the Rules of the City of New York §403-01

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[43] 1968 New York City Building Code §27-954

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