



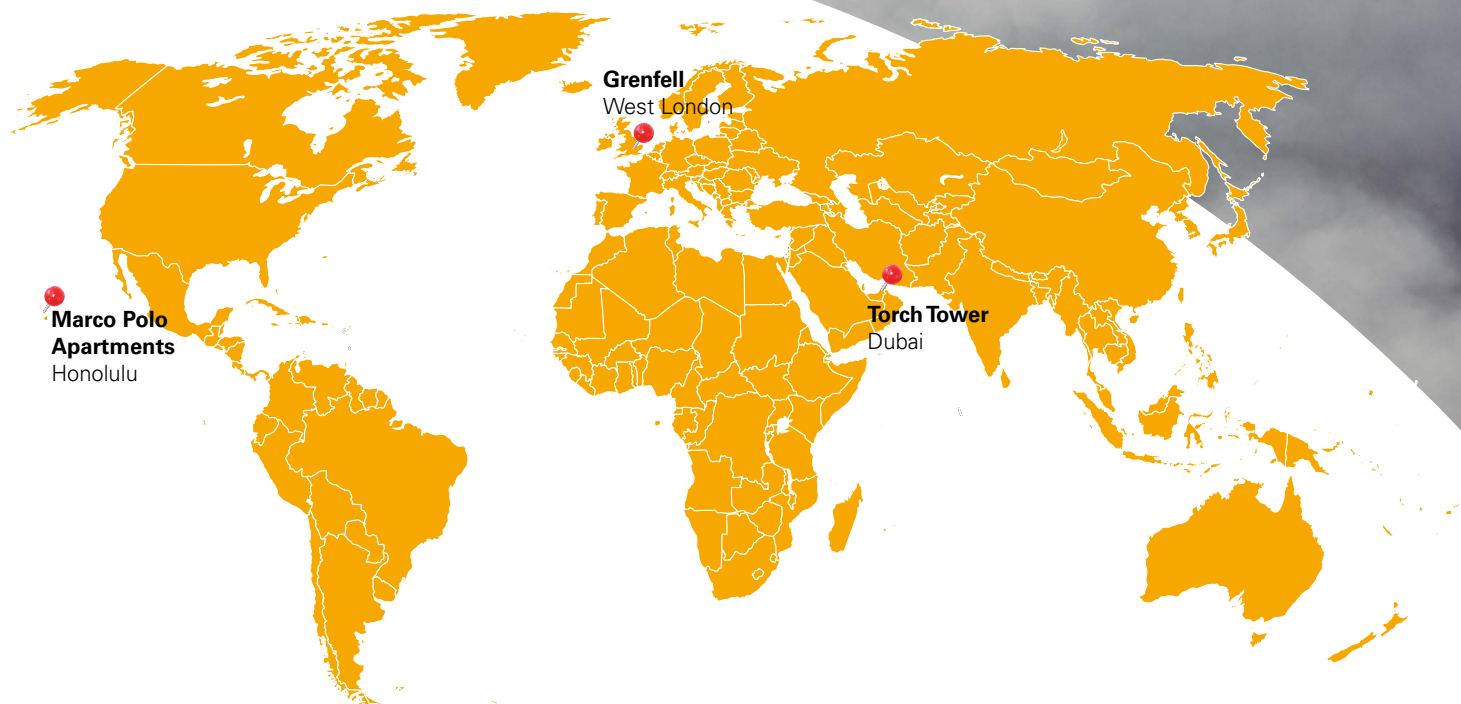
Grenfell: The Perfect Formula for Tragedy

Christopher J. Wieczorek, Ph.D.

Within 51 days, the world witnessed three unfortunate events in cities separated by thousands of miles around the globe: London, Honolulu, and Dubai. All three events can be described simply as preventable losses due to the lack of automatic fire sprinklers and/or the use of highly combustible exterior construction. These fires received ample local and international news coverage, while one combination of fire protection—sprinklered plus non-highly combustible construction—never captures headlines.

Numerous editorial, op-ed and technical declarations followed these massive losses, each citing the chain of events, cause of origin and lack of proper regulations. The Marco Polo Apartment fire (Honolulu) showed what can happen when no sprinklers are present in a building made of noncombustible exterior construction. The Torch Tower fire(s) (Dubai) exemplified the fire potential from highly combustible exterior construction used in conjunction with interior automatic fire sprinklers. Finally, the tragic Grenfell Tower fire (London) illustrated the impact of lack of automatic fire sprinklers and highly combustible exterior construction.





Grenfell Tower

Highly Combustible Exterior, No Automatic Fire Sprinklers

The 24-story Grenfell Tower, located in West London, experienced a tragic fire on June 14, 2017, in which at least 80 people died. The 1974 concrete building was renovated in 2016 and retrofitted with aluminum composite panel rainscreen cladding to improve energy efficiency and visual appearance. However, the renovation did not include the addition of sprinklers [1]. The cause of the fire is reported to be a refrigerator in a fourth-floor unit [2]. There were no automatic fire sprinklers to control the internal fire. The fire spread and reached external openings. Once ignited, the highly combustible new building cladding allowed the fire to spread rapidly up and along, and ultimately through, the entire building.

Torch Tower

Highly Combustible Exterior, Automatic Fire Sprinklers

On August 3, 2017, the 86-story Torch Tower in Dubai experienced its second fire in 2 1/2 years. The fire originated on the 26th floor and spread to the top of the building. It is reported that 38 units and 64 exterior floors of the tower were damaged [3]. The cause of the fire is reported as the result of cigarette butts discarded into a potted plant [4].

Similarly, on February 21, 2015, fire originated on the balcony of a unit on the 51st floor of the tower and spread rapidly along the exterior. Torch Tower, like most high-rise buildings in Dubai [5, 6], was sprinklered. Thus, fire was limited to the exterior of the building. No casualties were reported in either fire event at the Tower; and, according to reports, interior damage was minimal, with most residents returning within days [7].

Marco Polo Apartments

Noncombustible Exterior, No Automatic Fire Sprinklers

Marco Polo apartments, in Honolulu, is a 36-story, unsprinklered, reinforced-concrete building built in 1971. On July 14, 2017, a fire began on the 26th floor, again due to the lack of automatic fire sprinklers, the fire propagated from the room of origin, spreading internally and to the exterior of the building [8]. The noncombustible concrete exterior construction limited the external fire propagation to the 28th floor. There was no significant fire spread along the building exterior as occurred in the Grenfell and Torch Tower fires. In all three, it is reported that the exterior fire spread occurred within minutes [2], while with the noncombustible concrete construction, the exterior fire—after two hours—was limited to two floors of the 36-story Marco Polo building.

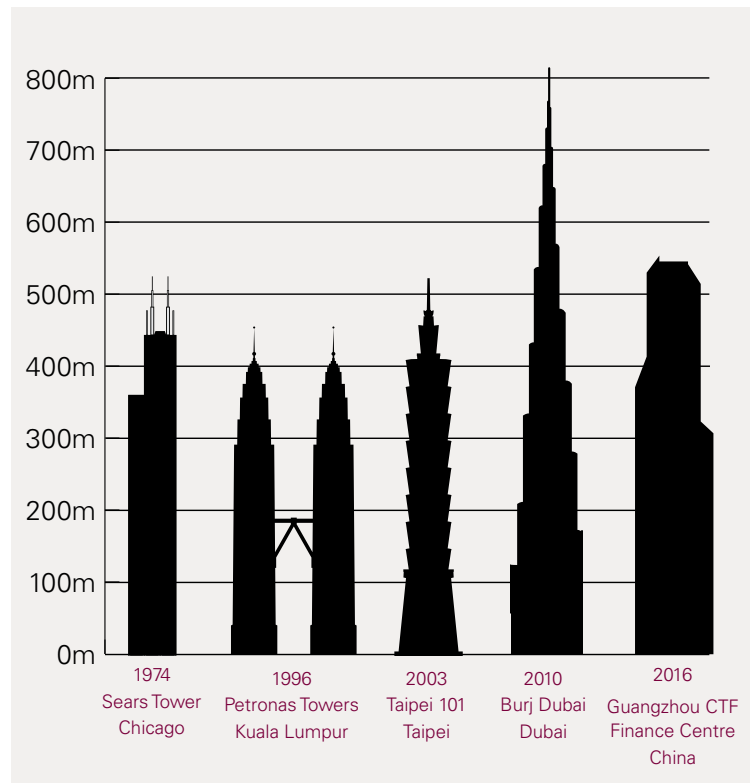
As modern construction practices drive buildings to new heights, no matter how efficient or resourceful the local fire service is, the different combinations of construction aspects always set the stage for fire service response and must be factored into building designs.

Comparison of Scenarios

When unfortunate events like these occur, the fire service plays a critical role. Response times vary globally. In Dubai, the average response time for 30 percent of fire incidents is four minutes [9], while in the U.K. the 2014 – 2015 average response time to nonresidential building fires was eight minutes and 28 seconds[10]. As modern construction practices drive buildings to new heights, no matter how efficient or resourceful the local fire service is, the different combinations of construction aspects always set the stage for fire service response and must be factored into building designs.

In Honolulu, the lack of automatic fire sprinklers allowed the fire to spread beyond the room of origin. Fortunately, the noncombustible exterior construction limited fire propagation, but not enough. The fire did result in three deaths and numerous injuries. Honolulu Fire Chief Manuel Neves is quoted as saying, “Without a doubt, if there was (sic) sprinklers in this apartment, the fire would be contained to the unit of origin”[11]. The mayor of Honolulu, Kirk Caldwell, added that “[a] sprinkler system could have contained the fire” and that this event was a “good example of what it means when you don’t have fire sprinklers” [12].

The two Torch Tower fires in Dubai demonstrated that the use of highly combustible exterior materials leads to rapid fire spread and propagation along the building; however, the use of automatic fire sprinklers prevented the fires from propagating internally, minimizing damage within the units and preventing fatalities.

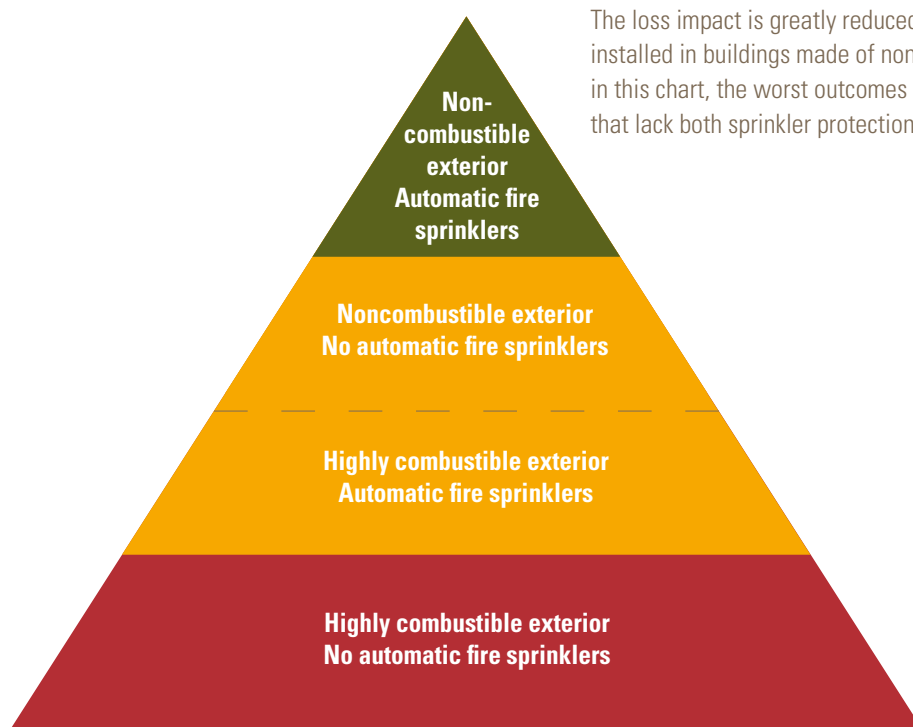


Over the past 45 years, building heights have risen dramatically around the world, particularly with the growth of urbanization in new industrial centers. The risk of fire loss is greater as a result, intensifying the need for regulatory change.

It needs to be noted that automatic fire sprinkler water supplies are not designed for multiple-ignition locations. With a highly combustible exterior, the fire will propagate unabated along the full exterior of a building and can result in multiple interior fires that can overtax the sprinkler system. This was evident in an earlier fire at The Address Downtown Dubai, which occurred on New Year's Eve, 2015 on the terrace of the 20th floor.

The building was sprinklered and the sprinklers operated; however, due to the rapid exterior fire spread, "the extent of the blaze was beyond the capacity of regular sprinkler systems to cope with a major fire across more than 40 floors. The pressure on the fire safety systems meant that the building had exhausted its water supply within 15 minutes." [13] In this case, the fire load exceeded the sprinkler system design; hence, it did not provide complete property protection.

The sprinkler system did, however, function as a life safety device by extending the time occupants had to safely evacuate the building. The result was an event with no fatalities attributed to the fire.* Further support that automatic fire sprinklers are critical to the life safety of building occupants comes from the BBC, which reported that "a spokesman for the Chief Fire Officers Association said that nobody had ever died in a fire in the U.K. in a property with a 'properly installed sprinkler system working the way it's meant to.'" [14]



The loss impact is greatly reduced when automatic sprinklers are installed in buildings made of noncombustible construction. As shown in this chart, the worst outcomes are when fires begin in buildings that lack both sprinkler protection and the proper construction.

Extent of Social and Economic Impact

The Grenfell Tower scenario was the most dangerous combination of factors, resulting in a total catastrophic loss. There were no automatic fire sprinklers; the fire that originated within the building was not controlled and therefore propagated both internally and externally. The highly combustible exterior resulted in rapid fire spread along the entire building. Had automatic sprinklers been installed, the fire would have likely been controlled to the room of origin, and the world would never have heard of Grenfell Tower.

This formula for tragedy has existed for years and there are numerous events that have proven it time and again.

A Glimpse of Recent Tower and Hotel Fire Losses

As figures show, a combination of automatic sprinklers and noncombustible construction is the most effective solution to minimize both property and casualty losses in high-rise buildings.

Date	Name	Location	Exterior Construction	Automatic Fire Sprinklers	Fatalities	Ref.
August 3, 2017	The Torch	Dubai, UAE	Combustible	Yes	0	
July 14, 2017	Marco Polo Apartments	Hawaii, USA	Noncombustible	No	3	
June 13, 2017	Grenfell Tower	London, UK	Combustible	No	80	
December 31, 2015	The Address	Dubai, UAE	Combustible	Yes	0*	
October 1, 2015	Nasser Tower	Sharjah, UAE	Combustible	No	0	
May 19, 2015		Baku, Azerbaijan	Combustible	No	17	15
February 21, 2015	Torch Tower	Dubai, UAE	Combustible	Yes	0	
November 25, 2014	Lacrosse building	Melbourne, Australia	Combustible	Yes	0	16
May 14, 2012	Mermoz Tower	Roubaix, France	Combustible	No	1	
October 1, 2010	Wooshin Golden Suites	Busan, South Korea	Combustible	Yes	0	17

**It is reported that one person suffered a heart attack while exiting the building.*

Highly Combustible Construction
+ Lack of Automatic Fire Sprinklers = *Tragic Catastrophic Loss*

The Need for Regulatory Change

Following each of these events, local governments were forced to react with investigations and evaluations of local building codes, standards, regulations and enforcement. [18, 19, 20] FM Global's International Codes and Standards team is fully aware of this formula for loss. The team is working in regions around the world to proactively establish sound requirements prohibiting the use of materials that have not illustrated adequate performance under 'end use' conditions [21,22], and mandating the use of automatic fire sprinklers.

These efforts will enhance regulations to prevent these tragic events from occurring [23].

Conclusion

Whether you are in the Middle East, on a tropical island or in a metropolitan area anywhere in the world, the formula for tragedy is as simple as $1 + 1 = 2$:

Highly Combustible Construction + Lack of Automatic Fire Sprinklers = Tragic Catastrophic Loss

Appendix

- 1 <https://www.thesun.co.uk/news/3804113/grenfell-london-tower-fire-cladding-fire-tests-latest-updates/>, accessed on August 25, 2017
- 2 <http://www.independent.co.uk/news/uk/grenfell-tower-block-design-caused-fire-unusual-investigation-reports-combustible-cladding-unsafe-a7806951.html>, accessed on August 22, 2017
- 3 <http://gulfnnews.com/news/uae/emergencies/video-torch-tower-fire-at-dubai-marina-put-out-38-flats-damaged-1.2068756>
- 4 <http://gulfnnews.com/news/uae/emergencies/dubai-police-reveal-cause-of-torch-tower-fire-1.2082198>, accessed on September 12, 2017
- 5 <https://www.thenational.ae/uae/external-sprinklers-part-of-new-fire-safety-rules-for-dubai-towers-1.561919>, accessed on August 22, 2017
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- 7 <https://www.bsabh.com/dubai-marina-torch-fire-what-next-who-pays/>
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- 11 <https://www.theguardian.com/us-news/2017/jul/15/honolulu-fire-more-than-60-firefighters-tackle-blaze-at-high-rise-building>, accessed on August 25, 2017
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- 14 <http://www.bbc.co.uk/news/uk-england-40293035>, accessed on August 22, 2017
- 15 <https://www.rt.com/news/260125-azerbaijan-building-fire-fatal/>, accessed on August 22, 2017
- 16 Genco, G., Lacrosse Building Fire, 673 La Trobe Street, Docklands on 25 November 2014, Municipal Building Surveyor, City of Melbourne, April 2015
- 17 White, N., and Delichatsios, M., "Fire Hazards of Exterior Wall Assemblies Containing Combustible Components." Fire Protection Research Foundation, NFPA, Quincy, MA, 2015
- 18 <https://www.clydeco.com/insight/article/the-uaes-hotly-anticipated-new-fire-code-a-change-is-nigh>, accessed on August 25, 2017
- 19 <https://www.theguardian.com/uk-news/2017/jul/28/government-announces-independent-review-building-regulations-grenfell-tower-fire>, accessed on August 25, 2017
- 20 <https://www.theatlantic.com/news/archive/2017/07/honolulu-fire/533796/>, accessed on August 25, 2017
- 21 Approval Standard 4880, Class 1 Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coatings, and Exterior Wall Systems, FM Global, Johnston, RI.
- 22 Approval Standard 4411, Cavity Walls and Rainscreens, FM Global, Johnston, RI.
- 23 Paving the Road Forward for Our Clients, FM Global International Codes and Standards 2016 Report, Publication #P17004, FM Global, Johnston, RI, 2017.

About FM Global

Established nearly two centuries ago, FM Global is a mutual insurance company whose capital, scientific research capability and engineering expertise are solely dedicated to property risk management and the resilience of its client-owners. These owners, who share the belief that the majority of property loss is preventable, represent many of the world's largest organizations, including one of every three Fortune 1000 companies. They work with FM Global to better understand the hazards that can impact their business continuity in order to make cost-effective risk management decisions, combining property loss prevention with insurance protection.

For additional information, please contact:

Steven Zenofsky

Assistant Vice President, Public Relations

Phone: +1 (1) 401 415 1945

Email: steven.zenofsky@fmglobal.com

fmglobal.com



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