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The challenge of fire protection and life safety in historic New York City buildings - by Copeland and Colombini

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The devastating fire at Notre Dame Cathedral in Paris raises questions of how best to ensure the preservation of historic structures enjoyed by the public. As engineers who have worked on some of the most iconic buildings in NYC and many religious institutions, we understand the crucial importance of such historic landmarks and the need to preserve their aesthetics while ensuring their contemporary function.

The fact that the wooden attic at Notre Dame did not have a sprinkler system seems surprising, but each historic facility must decide the mix of risk and historic preservation that it is willing to tolerate. For every technological improvement, there is a trade-off in appearance, and sometimes technology has its own risks – of a burst waterpipe in a sprinkler system, for instance. In the Notre Dame fire, it's important to emphasize that no lives were lost. That's vital, because life safety is the top priority in any fire protection system. The fire protection systems and procedures in place reportedly failed to locate the fire initially, delaying the call for firefighting services and allowing the fire to spread in the meantime. Fortunately, many valuable artifacts were rescued, the result of heroic bravery and quick thinking by emergency responders.

The balance between risk of fire and preservation of historic aesthetics is a nuanced one, and each institution must make that decision for itself. In our work with historic houses of worship, we typically

recommend placing a sprinkler system in the attic and have designed a number of such systems. This provides a means of fire suppression in structures often built of combustible material. But the institution must determine its own risk tolerance. In one case, we recommended an attic sprinkler system, and the client declined due to the possibility of water damage. Unfortunately, a later fire in the attic caused far more damage than any water risk had posed.

We have not installed sprinklers in main sanctuaries, where the aesthetics would be adversely affected. There are, however, other strategies to save lives in sanctuaries such as automatic smoke control exhaust systems, and more passive solutions such as fire barriers and fireproofing of structural elements. It's important to remember that, with a religious institution, the sanctuary is meant to inspire, and that is fundamental to its purpose. Perhaps the most striking aspect of Notre Dame, even more than its presence in the urban landscape, is the awe that its sanctuary – with its towering stone columns and legendary stained-glass windows – has inspired for eight centuries.

A secular analogy in its interior can be found in Grand Central Terminal, whose Main Concourse is an unrivaled civic sanctuary. It inspires awe in its own towering presence.

At Grand Central, we engineered the life safety systems over several years. Sprinkler systems were installed in all spaces, except the Main Concourse. A sprinkler system in the Main Concourse would not only compromise the aesthetics of the ceiling, but because of its height, water would be an ineffective mist before it reached the occupant level. Instead, we focused on automatic smoke removal – to protect occupants, first and foremost.

As plans to rebuild Notre Dame emerge, they will inevitably involve incorporating 21st century technology. Clearly the use of fire detection systems will be important. Another technological advance that has been improved over several decades is fire modeling simulations, which likely will be used in rebuilding Notre Dame. They allow the engineers to project site-specific fire scenarios, thereby enabling all stakeholders, including fire departments, to anticipate how a fire could progress under different conditions.

NYC is now in the process of implementing a retroactive requirement that all office buildings 100 ft. tall or more install sprinkler systems by July 1st. The requirement applies to office buildings, even historic ones. Our firm has been working with 50 buildings to bring them into compliance. The law came in the wake of 9/11 and, in practice, applies to buildings built before 1984 – a time when sprinklers were not mandated in new high-rise buildings.

Tall office buildings are different from religious institutions and other historic structures, including civic and cultural institutions, in that – except for historic lobbies – the aesthetics play a different role. Office buildings are also populated on every floor and have limited egress. The role of regulation versus voluntary implementation of specific life safety and fire protection systems is, therefore, very different. Historic structures not covered by the July 1st sprinkler deadline must consider the appropriate level of risk and protection.

The circumstances in each facility vary, and a measured plan must be devised that should

incorporate historic and aesthetic considerations and the nature of the construction. In all cases, life safety should be paramount. As is now the case in Paris, even one of the most beloved buildings in the world can be rebuilt.

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