Why Fire Safety Shouldn't be a Trade-off

This article discusses why fire safety shouldn't be a trade-off. Sprinklers can and have failed, which is why built-in protection with fire rated glass systems is important to achieving life safety goals.

The saying ´less is more´ can apply to a lot of things – but not when it comes to life and property protection in the event of a fire. A lot of attention has been given to active fire protection systems like fire sprinklers that are designed to suppress fires. Reports have shown that automatic sprinklers are indeed reliable – but not absolute nor infallible. According to NFPA's Report U.S. Experience with Sprinklers in June 2013,

"Sprinklers operated in 91% of all reported structures large enough to activate sprinklers… When sprinklers operated, they were effective 96% of the time, resulting in a combined performance of operating effectively in 87% of all reported fires where sprinklers were present in the fire area and the fire was large enough to activate them."1

In the same NFPA report, majority of sprinkler failures (where sprinklers did not activate at all) occurred because the system was shut off, and that majority of sprinkler ineffectiveness (where sprinklers activated but were not effective) was because water did not reach the fire or not enough water was released. This could be caused by a number of factors, including manual tampering, lack of maintenance, low water pressure or damage to the system, which is a real possibility during natural disasters such as earthquakes. FM Global reported "sprinkler system breakage puts your fire protection out of service at the time that you need it the most. After an earthquake, the threat of fire is greater due to the increased presence of ignition sources and, at some facilities, flammable material releases."2

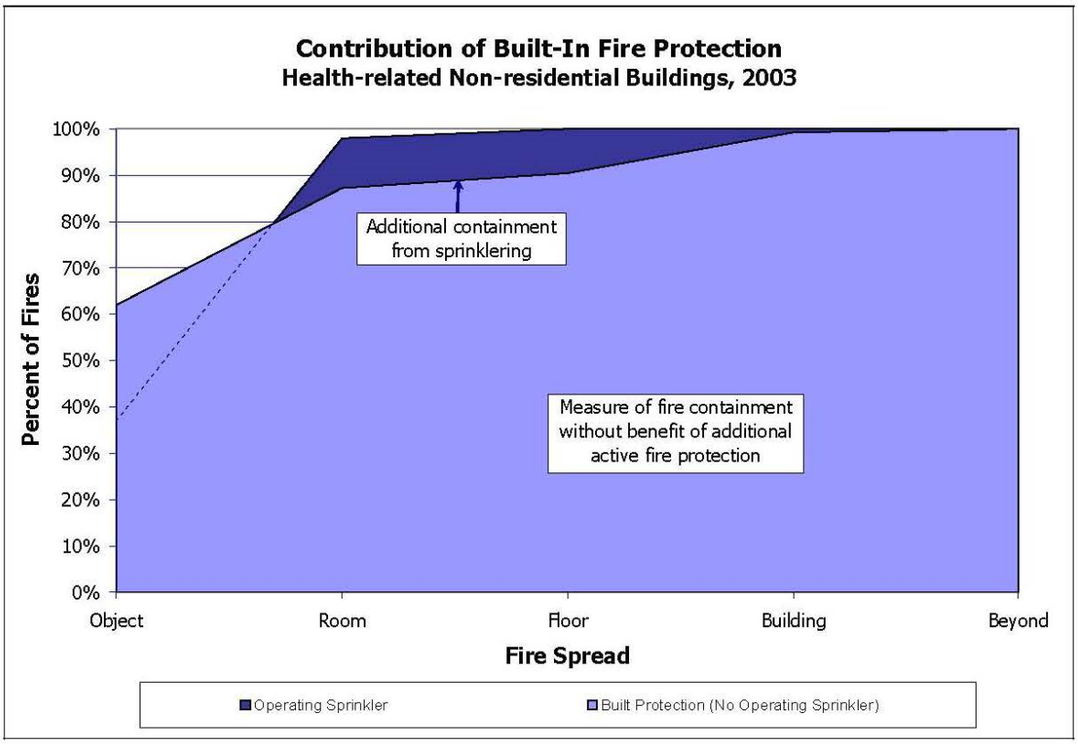
Knowing that sprinklers can and have failed, it doesn´t make a lot of sense to solely rely on sprinklers to protect people and property during a fire. The more sensible and safer way to go is employing a redundant or balanced approach by having both active fire protection systems (like sprinklers) and passive fire protection systems like fire resistive walls and doors that are built into the structure. These fire resistive building materials create fire barriers, firewalls, fire partitions, fire doors, protective openings and smoke barriers that form compartments, or occupancy separations, that contain flames, heat and gases at the point of origin so that building occupants may exit the building safely. Passive fire protection works 24/7 without the mechanical triggers that sprinklers need, which makes it reliable and virtually maintenance-free.

Key Benefits of Passive or Built-in Fire Protection

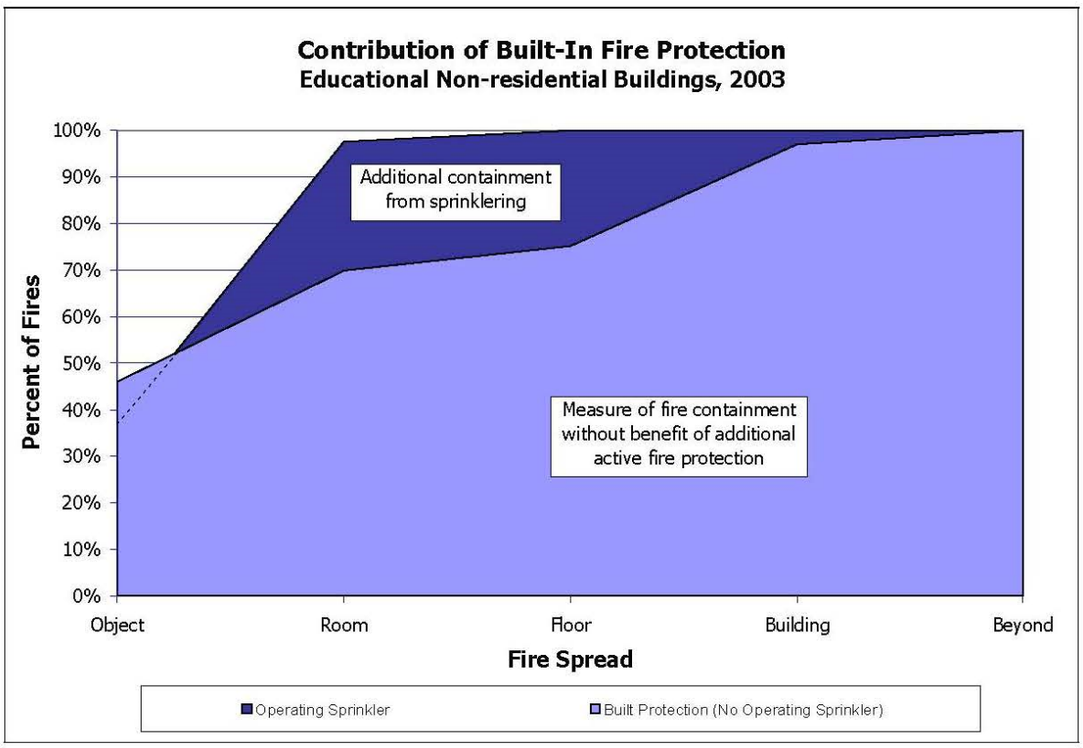
Perhaps the most important benefit of incorporating passive fire protection is the fact that fire resistive building materials are the best defense against dangerous radiant heat, which are invisible electromagnetic waves that travel at the speed of light with little resistance. When these waves strike an object, they are absorbed and their energy is converted to heat. If the object is a combustible material, a fire will start when the material´s ignition temperature is reached. Radiant heat is extremely dangerous to building occupants since it can quickly reach a level that causes unbearable pain, followed rapidly by second degree burns, preventing safe egress.

Another important benefit of having passive fire protection is compartmentalization. Fire resistive building materials are designed to contain, prevent or slow the spread of fire from the room of origin to other parts of the building. By limiting the spread of fire with fire resistive materials, damage to the building is reduced and building occupants gain time for emergency evacuation or movement to areas of refuge.

In System Planning Corporation´s report Fire Spread and Built-in Fire Protection, passive or built-in fire protection limited fire spread to the room of origin in 90% of health-related buildings. Active fire suppression systems, such as sprinklers, and speedy fire department response provided the other 10%3.



In the same report, passive fire protection limited fire spread to the room of origin in 87% of education-type facilities. Active suppression systems, such as sprinklers, and speedy fire department response provided the other 13%4.



In both instances, passive fire protection systems did majority of the work in protecting life and property, showing how critical and effective passive fire protection is when it comes to total building fire protection.

Sprinkler Trade-offs Can Compromise Fire Safety

Employing a balanced approach to fire protection becomes especially important when sprinklers are used to eliminate the need for fire resistant building materials. For instance, a combination of sprinklers and non-rated glass have been used in places where fire rated glass is typically required. This can put building occupants at risk because non-rated glass cannot protect people and property the way that fire rated glass can. Non-rated glass will fall out of the opening because it is not designed to withstand high temperatures, spreading smoke, flames and heat to other parts of the building. Knowing that sprinklers can and have failed to effectively suppress a fire or operate at all, this could significantly impact the ability of building occupants to either exit the building safely or seek safe harbor while awaiting rescue.

Fire rated glazing provides continuous passive fire protection without the need for triggers that require maintenance and are at risk of not working in an emergency or disaster situation. In addition, incorporating clear lines of sight through transparent walls, doors and openings is a significant benefit to first responders. It gives them an opportunity to visually assess the situation before charging in, greatly improving fire and life safety.

Fire Rated Glazing as Built-in Fire Protection

Fire rated glazing can be used to create 24/7, maintenance-free built-in fire protection in several areas within and outside of the building (based on the 2012 IBC):

- 1-hour exit corridors – 20 minute fire protective door vision panels and 45 minute fire protective sidelites, transoms and openings. If the glazed area exceeds 25% of the wall area, 60 minute fire resistive glazing must be used.
- 1-hour exit/stairwell enclosures – 60 minute fire protective door vision panel up to 100 sq. in. and 60 minute fire resistive sidelites, transoms and other openings. The door vision panel can exceed 100 sq. in. by using 60 minute fire resistive glazing.
- 2-hour exit/stairwell enclosures – 90 minute fire protective door vision panel up to 100 sq. in. and 120 minute fire resistive sidelites, transoms and other openings. The door vision panel can exceed 100 sq. in. by using 90 minute fire resistive glazing.
- 1-hour exterior walls (when permitted per Table 705.8 in the IBC) — 45 minute fire protective openings within specified limits. To exceed specified limits, 60 minute fire resistive glazing must be used.
- 2-hour exterior walls (when permitted per Table 705.8 in the IBC) — 90 minute fire protective openings within specified limits. To exceed specified limits, 120 minute fire resistive glazing must be used.

For a complete list of fire rated glazing applications, please refer to Tables 716.3, 716.5 and 716.6 of the 2012 IBC.

Conclusion

At the end of the day, when something as important as life safety is the issue, an either-or proposition to fire safety is hardly the answer. Having both active and passive fire protection systems may seem redundant, but it´s these redundancies that provide improved levels of safety.

References:

1John R. Hall, “US Experience with Sprinklers,” National Fire Protection Association, June 2013.

2”Understanding the Hazard: Lack of Earthquake Bracing on Sprinkler Systems,” FM Global, 2009.