

The remains of the Torre Windsor, Madrid after its devastating fire – access and operability of adjacent properties, roads and underground rail networks was severely affected



The Societal Impact of Fire Sprinklers

Two Fires With Very Different Outcomes

At around 11 pm on a Saturday night in February 2005, a small fire started in a room on the 21st story of the Torre Windsor high-rise office building in downtown Madrid, Spain.

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By morning, and despite the efforts of the permanent security staff and the professional fire brigade, the 32 storey, 100 metre high building had been fully engulfed in flames, leaving in its wake, a partially collapsed and ultimately destroyed building. Due to fears of further collapse, a 500 metre exclusion zone was established around the building. As a result, nearby commercial property was forced to close for several days affecting some 30 thousand workers while the underground road, suburban and metropolitan rail networks feeding this important business district

were also shutdown causing long delays to commuters. Around six million litres of water were used in the fire-fighting efforts to prevent it spreading to adjacent neighbouring properties. The estimated cost of this fire, including the insured damages to third parties, was expected to be in excess of €300 Million. Given the location, the demolition had to be carried out by a gradual dismantling of the building which resulted in continued significant disruption to the general area for a further six months. This highly publicised catastrophe was not favourable to Madrid's image

*The limited impact of a sprinkler-controlled fire in an office – normal operations recommenced the following day.
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as the business capital of Spain's thriving economy and an important tourism destination. And it certainly wasn't welcome in the midst of the selection process of the host city for the 2012 Olympic Games, in which Madrid was a front-running contender.

A few years earlier, again in Madrid on New Year's Day, 2002, a short circuit from an operating portable electrical heater started a fire in an unattended seven-storey office building. Unlike the Torre Windsor, however, this facility was fitted with a fire sprinkler system. Three sprinkler heads operated which successfully controlled and indeed extinguished the fire by the time the public fire brigade arrived, who had received notification thanks to the water flow alarm. An estimated 26,000 litres of sprinkler water were applied, or in other words, 230 times less than that consumed by hose streams in the Torre Windsor office fire. The estimated total loss cost was €175,000, or at least 1,700 times less than the measurable cost of the Torre Windsor fire. In this case, the staff returned to their workplace the following day as usual, without any significant interruption to their livelihoods or to those in the immediate community.

The Societal Impacts of Fire

Just last year, 2007, there were many examples of catastrophic fires right across Europe and around the globe in facilities with very different types of activities and levels of fire hazards.

In Denmark, separate fire incidents in April and July destroyed two large, pork-product processing facilities. As a result, more than 1300 workers were made redundant for the duration of the demolition, rebuilding and repairs. The can create uncertainty for workers which in turn can impact the local economy. This equally applies to the staff of those companies supplying raw materials and

services to affected facility, further compounding the impact. In addition, unemployment benefit costs incurred by the state during this period can also be significant. A further aggravating factor in cases like these is the interim and even sometimes permanent closure of facilities with the relocation of jobs to another country with lower costs. Such was the fate of 200 jobs following a major fire at an electrical manufacturing plant in the UK in 2001. The plant closed and the operations were transferred to a facility in Greece. Therefore not only can such fires impact the local economy but there are also losses at a national level.

In Treviso, Italy a domestic appliance manufacturing facility employing 800 staff suffered a catastrophic fire in April. The thick black smoke emanating from the plant resulted in orders to evacuate and close nearby schools and to keep windows closed in the surrounding urban area. A local prosecutor has subsequently considered a case against the firm involved for not having taken due measures to prevent this event and its consequences.

In Atherstone-on-Stour, Warwickshire, UK in November, a fire at a vegetable goods packing and storage facility tragically claimed the lives of four fire-fighters.

The Societal Impact of Sprinklers

Each of the recent cases highlighted above had one thing in common; the buildings involved were not fitted with an automatic fire sprinkler system. Had an adequately designed, installed and maintained sprinkler system been provided, the outcome and overall impact would almost certainly have been far different. Fire sprinklers, a well proven technology, can prevent these types of catastrophes. They very effectively limit the consequences of fires to minor proportions. They do this by automatically responding to and attacking

A full-scale rack storage fire test at FM Global's Research Campus: such tests determine the design criteria necessary to adequately and cost-effectively protect warehouses.
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fires in their early stages, limiting their size to proportions such that the responding emergency services are typically faced with the task of extinguishing a minor residual fire. Without sprinklers, more often than not, the only viable and safe alternative is to deploy defensive tactics in an attempt to prevent spread to adjacent properties, often with no appreciable impact on the building of fire origin.

This was further demonstrated to great effect one Friday evening in August 2007; following an argument with some colleagues, a disgruntled employee at an 8,000 square metre spare parts warehouse in France decided to set fire to the facility by igniting high rack storage of cartoned goods. Four sprinkler heads operated promptly which limited fire damage to one bay of the rack. All of the employees safely evacuated the building and, upon arrival, the fire brigade's task was to extinguish a small incipient-sized fire. The results: there was no reported impact to the environment, either in the form of air-borne pollutants or contaminated fire water run-off. Operations at the facility recommenced as usual the following Monday.

The main conclusion from studying and comparing the above types of incidents is clear: automatic fire sprinkler systems do

prevent catastrophic events from occurring and hence, reduce and indeed often eliminate the very significant impact and consequences a fire can have beyond a property's boundary to society as a whole.

The Full Cost of Fire

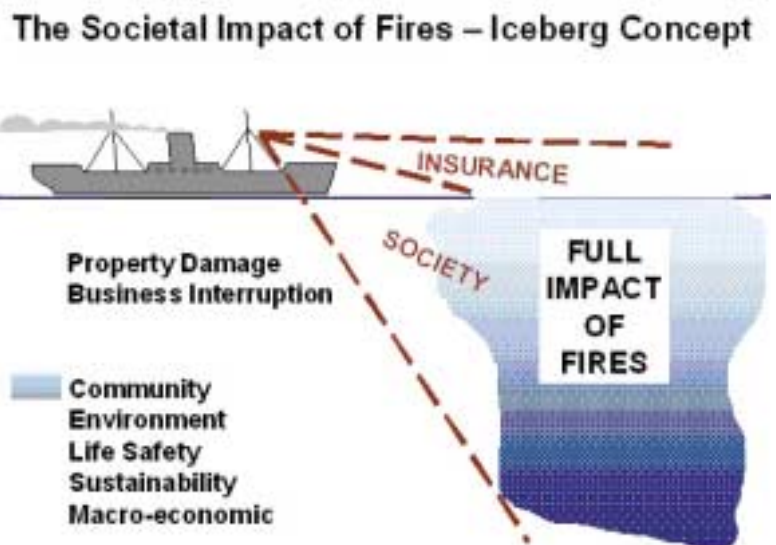
While the property insurance costs of major fire events are readily quantifiable, the total economic cost and the broader impact on society, in terms of the safety of occupants and emergency services, the disruption to the community and the ensuing environmental damage is not. While further studies are planned, the "tip of the iceberg" concept, where the visible property and business interruption loss costs represent only a portion of the total impact and cost of fires to society, appears to be a valid one.

Viewed from this perspective, automatic fire sprinklers make sense. They are not just a device for the protection of properties and the assets they house, but also for people, their livelihoods, the environment, the local community, the economy and hence its sustainability.

Given both the impact of fires on today's society – estimated by several macro-economic level studies at between 1 to 2% of a country's GDP – and the potential benefits of sprinklers, it is appropriate that legislation should regulate for positive change in this area. This can be achieved through the provision of requirements and incentives in building codes for the installation of fire sprinklers in public, commercial and industrial buildings.

Regulatory Environment

It is true that there are some existing requirements for the installation of sprinklers in national building codes in Europe. These are often targeted, though, at a relatively small number of applications which are considered to be beyond the traditional and perceived abilities of the responding professional fire services. Currently, building codes mostly focus on detection and passive measures which by themselves, as demonstrated by the examples above, do not prevent major fires occurring and their ensuing societal consequences. The reality is that fire-fighting challenges have greatly increased, notably due to the increased use of plastics both in construction and also in the



products and materials handled in many buildings nowadays. All of this contributes to today's current environment where accessing a burning building is an extremely challenging and hazardous task. The UK's Chief Fire Officers Association (CFOA) strongly advocates the use of Automatic Water Suppression Systems (sprinklers) in potentially all premises as "these represent the single most significant aspect of a fire management program".

By requiring sprinklers per codes, this would mean that new buildings (above a certain size and fire hazard thresholds) would be provided with an automatic sprinkler system right from its inception. An adequately designed, installed and maintained sprinkler system provides the ultimate protection against the fire hazards, which are present in practically every type of building and activity. This greatly contributes to a building's resilience, sustainability and the benefits the property itself brings to society.

Cost Impact

By requiring fire sprinklers in building codes, their design and installation is significantly simpler and most importantly, cheaper. Typically, savings of

reduce – if not eliminate – many of the societal impacts highlighted in the examples above.

A subject of much study is the overall reliability and effectiveness of sprinklers. The above figures show how effective adequate sprinkler protection is when provided. This begs the question, how often do sprinklers systems reliably and effectively control fires? FM Global data concludes that the reliability of the most common type of sprinkler installation, a wet-pipe system, ranges between 94 and 98%. When adjusted for an estimated number of successfully yet unreported sprinkler-controlled fires, these figures increase to over 99%. This is line with the findings of other studies e.g. Marryatt, Australia (99%) and the Association of German Property Insurers' (97.9%).

Common misconceptions

Cinema films showing all the sprinklers in a building operating at once is one of the many myths associated with this safety device. Another myth is that their installation is a matter solely for insurance companies and their policy holders. The reality is that the insurance premium incentives for their installation vary widely depending on the

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around 40% are achieved when these are incorporated in to a new building's design and installed during its construction compared to retro-fitting them in an existing facility. A sprinkler system protecting an office building and its occupants can be installed for half the price of its comfort-providing carpet. Overall, sprinklers can represent as low as 1 to 2% of a new building's cost. Further savings and architectural advantages are achievable with sprinklers as these can allow relaxed requirements for internal fire-rated partitions and longer egress travel distances.

Research and data

Sprinklers are very effective in reducing the impact of fires. FM Global's fire loss data, measured in terms of property damage and business interruption costs, shows that in the 10 year period 1997 to 2007, the average fire loss to an adequately sprinklered FM Global insured location was US\$ 600,000; the average fire loss to locations needing sprinklers was US\$ 3.4 Million. I.e. sprinklers reduced the impact of fire losses by a factor of 5.7. Note: many successfully sprinkler-controlled fires – estimated as at least 80% – are unreported due to their loss cost being below insurance policy deductibles. Therefore, the average sprinkler-controlled fire loss value is far less and hence, this reduction in impact is even greater. And in the same way that sprinklers greatly reduce the cost of fires when measured in terms of policy-holder claims, they also greatly

conditions of market and the competitive pressures at any particular time. While a properly designed and installed sprinkler system will reduce both the probability and severity of a major fire, savings in insurance premiums for an individual premise will rarely justify the cost on a traditional cost/benefit analysis. Those enlightened companies that decide to install sprinklers are doing so to protect their highest value-creating assets – their business and their people – and insurance savings are a secondary consideration. However such companies will certainly benefit from better and more stable insurance premiums compared to those that do not see the value of sprinklers. Sadly, the latter approach will leave many unprotected facilities at increased risk of a major fire, with the wider economic, societal and sustainability consequences should it occur.

Conclusion

Providing automatic sprinklers in a building protects the occupants and its activity making it a far more resilient facility and hence, makes a major contribution to sustainable development. Sprinklers protect society against the broader impact of fires and therefore should ultimately be the starting point and mainstay of a building's fire protection philosophy. It is therefore appropriate that legislation have, through building codes, requirements and incentives for the provision of fire sprinklers in all public, commercial and industrial buildings. **IFP**

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