

Accepting the challenge

William Makant discusses alternative fire protection measures

Loft conversions and other similar refurbishment projects in residential properties frequently struggle to meet Building Regulations requirements for fire safety. Homeowners or developers are not willing to implement aesthetically displeasing measures during a refurbishment which aims to improve aesthetics. The prescriptive nature of the Regulations and lack of insight into their objectives limits the flexibility on applying compensatory measures to the default requirements.

The only clearly stated compensatory measure in AD B is sprinklers. Although these are highly cost-effective on tall buildings and newbuilds, they can become significantly disruptive and costly in smaller building developments. As a result, homeowners or developers may choose not to implement the recommended passive or active measures and instead obtain building control compliance by agreeing to limit the use of the converted rooms. This creates a fire safety grey area where occupants may be living in a higher-risk home because they change the use of the converted room without considering the consequences.

Building control surveyors aim to ensure that a building allows occupants to safely escape from a fire. If sprinklers were free, they would probably be required in every home to improve tenability and reduce fire spread. Because they are not, there has to be a combination of (passive only) fire and smoke control and containment and alarm systems. However, there are a series of alternative fire suppression systems that can be used as compensatory measures in lieu of sprinkler systems (as stated by AD B):

'0.18 There are many alternative or innovative fire suppression systems available. Where these are used it is necessary to ensure that such systems have been designed and tested for use in domestic buildings and fit for their intended purpose.'

There is very little information on how this can be easily achieved, so a compensatory measure requires independent judgement from both the proposer and building control. This drastic departure from such a prescriptive text significantly reduces the chances that an alternative system will be used, regardless of its benefits.

Furthermore, because only sprinklers have a standard for their installation (due to their long-term existence), less 'experience-based guarantees' and more judgement responsibilities are placed on the proposer and building control, who have two challenges:

- is it worth the effort and risk to consider a compensatory measure?
- is the proposed system fit for purpose?

These questions are usually only answered by adopting a fire-engineered approach, such as in PD7974, where the benefits of suppression systems can be realised. Careful analysis of the fire risks, how fire and smoke will spread, and implementation of passive and active fire protection as well as detection and alarm systems allow for cost-effective solutions to complex fire safety problems. But fire-engineering approaches are not cost-effective for small residential refurbishments and are generally not carried out.

Nevertheless, PD7974 can help in the decision process to implement a suppression system as a compensatory measure. This can allow both specifiers and building control surveyors to ensure that any alternative system under consideration is being well applied and will ultimately improve tenability and means of escape. A cost-effective alternative suppression system may satisfy the requirement without the need to use other undesirable prescriptive solutions or fit sprinklers. PD7974 states the objectives of different suppression systems are to:

A. extinguish the fire
B. control a fire until firefighters are summoned
C. provide fire control equivalent to other safety and protection strategies.

Take a two-storey loft conversion where a sprinkler system is required on the ground floor if there is an open-plan layout. From AD B, it is evident that a sprinkler is proposed to control the fire (objective C) so that people can safely escape using the first floor without having to travel through the ground floor. The attempt, either through suppression or the passive alternative (enclosure) is to 'seal' the ground floor stopping the fire, which originated in either the open-plan living room or kitchen, from growing unchecked by the absence of fire doors. Consequently, an alternative to a sprinkler system has to fulfil the same objective of ground-floor fire control.

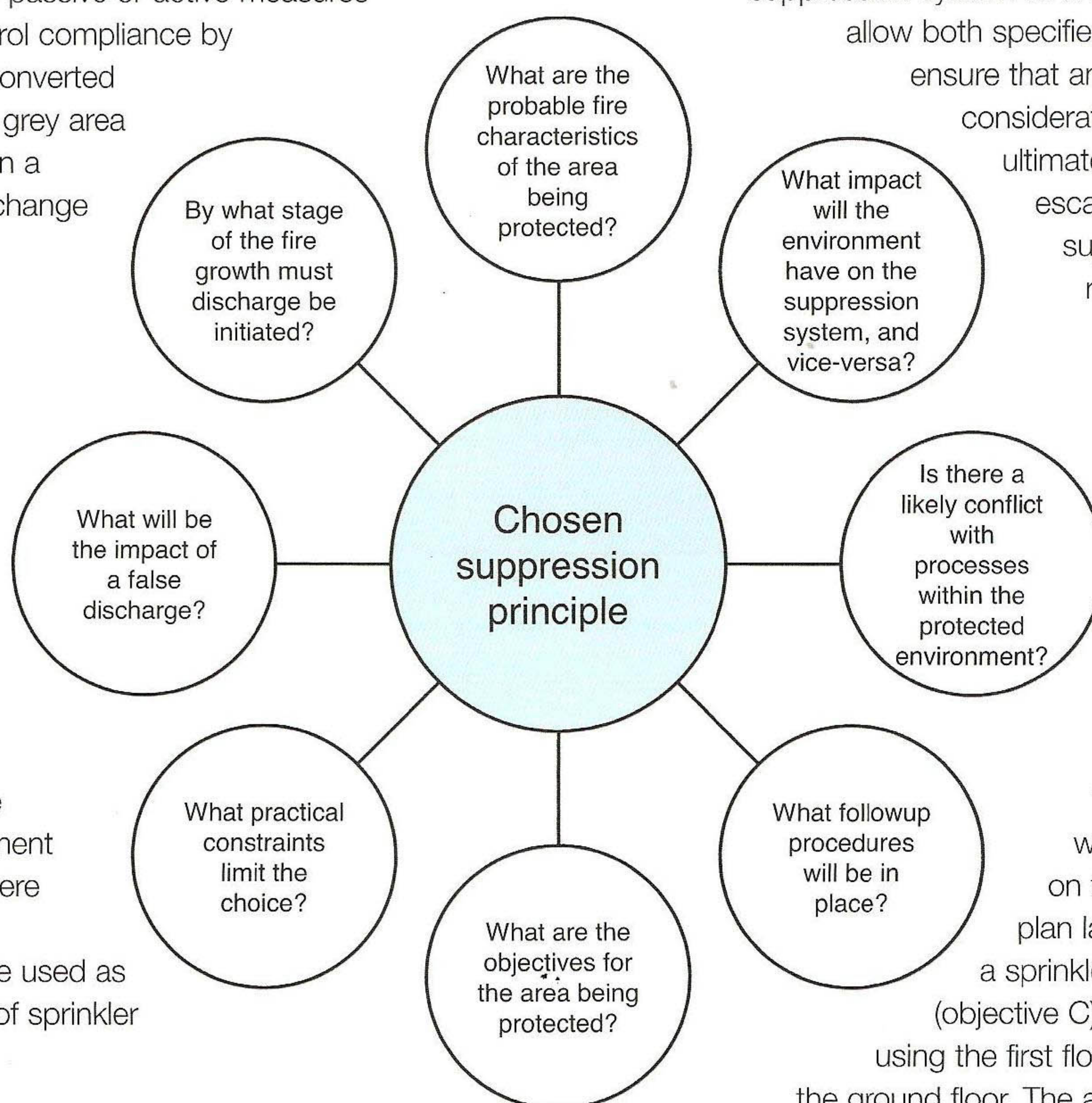
PD7974 also highlights the most important aspects to be considered as 'fit for purpose' shown on the diagram in the centre of this page:

1. What are the fire characteristics of the area to be protected?

In an open-plan space with a kitchen, TV, couch, and curtains there is more fire risk and load than just an enclosed kitchen hob.

2. What are the objectives of protecting the area?

To suppress fire and limit heat and smoke so occupants can escape.



3. What impact will the environment have on the suppression system and vice versa?

Electrical fires can result in power loss to mains-powered suppression systems. Suppression systems can be very aesthetically obtrusive to domestic environments, independent of the risk or coverage.

4. Is there a likely conflict with processes within the protected environment?

As with all domestic suppression systems, an alarm should indicate the presence of fire and not hinder escape in any way.

5. What practical constraints limit choice?

In a domestic refurbishment scenario, cost, aesthetics and ease of installation are critical.

6. What is the impact of a false discharge?

Traditional sprinklers can output over 100 litres per minute; alternatives can be effective in a fire scenario with much less water damage. The robustness to false alarms is very important and sprinklers are much more reliable than smoke alarms because they are heat-triggered.

7. At what stage of the fire growth must discharge happen?

A suppression system should not trigger automatically if the fire is not life threatening. On the other hand, late triggering may result in the fire having reached an uncontrollable level. Suppression systems have to demonstrate both robustness and reliability, ideally through third-party testing.

Building control surveyors now approve several innovative fire-suppression devices where it would be expensive and disruptive to fit sprinklers. For example, Q-Fog offers water-mist suppression for a single room in a large free-standing 'pillar' format that incorporates a water tank, while Kitchensafe fits into a kitchen cupboard and tackles hob fires using a pressurised liquid fire suppressant.

Plumis's product, Automist, is another such product (5). It is a water-mist unit automatically triggered by a standard heat alarm and has been shown by BRE to suppress fires in an 80m³ volume with open doors which might otherwise have flashed-over (1, 2, 4, 7). It consumes only five litres per minute of water when activated (5, 6). Although it requires an electrical supply, the risk of supply failure can be greatly reduced by ensuring that the suppression unit is not powered by a circuit breaker or RCD that might be affected by the fire (3).

Automist fully satisfies the criteria set by PD7974 for the chosen example. This same analysis can easily be carried out for other scenarios and alternative suppression systems so that the best fit between purpose and performance can be selected.

So is it worthwhile considering such an alternative? The answer will often depend on the next best solution available. Having the doors replaced and a protected stairway created may meet AD B's prescriptive requirements but in many instances this will defeat the aesthetic objectives that drove the proposed layout. In these situations, when conventional compensatory measures create poor spaces, alternative suppression systems can achieve both compliance and life protection.

Sprinklers are a well-established and effective means of controlling fire, even if they do not necessarily extinguish them. However, their high cost and disruption explain their low penetration in domestic properties. Alternative fire-suppression systems can provide the opportunity for cost-effective compliance and fire safety.

Further information

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