

Inner space



They may be common in rented apartments, but inner bedrooms pose a fire escape conundrum. Could water mist provide the fire protection key? asks **Dr Alan Hart**

RANCH-STYLE layouts are common in rented properties, from private apartments to social housing, but they can throw up some difficult issues for fire safety, particularly when it comes to escaping from inner bedrooms.

These kinds of layouts feature only a limited number of interior walls and combine several areas. In the event of a fire, escape from bedrooms is often through the living/dining/kitchen area. However, this goes against the guidance

that supports two major pieces of fire safety related legislation in England: the Housing Act 2004 and the Regulatory Reform (Fire Safety) Order 2005.

Housing and fire law

When introduced a few years ago, this legislation imposed new responsibilities on landlords and housing organisations, but there were concerns that the requirements of these two laws were sometimes confusing or in conflict.

In a bid to clarify the situation, Local Authorities Coordinators of Regulatory Services (LACoRS) – part of the Local Government Association – issued a guide entitled *Housing – Fire Safety: Guidance on fire safety provisions for certain types of existing housing*.

Aimed at landlords and fire safety enforcement officers in local housing and fire authorities, it offers practical advice on fire risk assessment and contains case studies with suggested fire safety solutions. The document, which



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was first published in 2008 and updated a year later, is endorsed by the Government ministers for housing and fire safety, and by the Chief Fire Officers Association.

A key aspect of the Housing Act and the Fire Safety Order is to ensure that rented properties have adequate fire escape routes and fire safety in general. The LACoRS guide sets out how this may be achieved.

Some key facts:

- although the LACoRS guide itself does not have legal force, it is now regarded as the standard interpretation manual for the legislation
- unlike changes to the building regulations, the legislation applies retrospectively to all rented properties
- properties that do not meet the requirements may remain in use only where it is 'not reasonably practicable' for the landlord to remedy the problem
- landlords found to be in violation of the laws can be imprisoned or face an unlimited fine

What's the problem?

The LACoRS guide defines an inner room as a room where the only escape route is through another 'access' room. Figure 1 shows a social housing property featuring an inner bedroom, based on a real example.

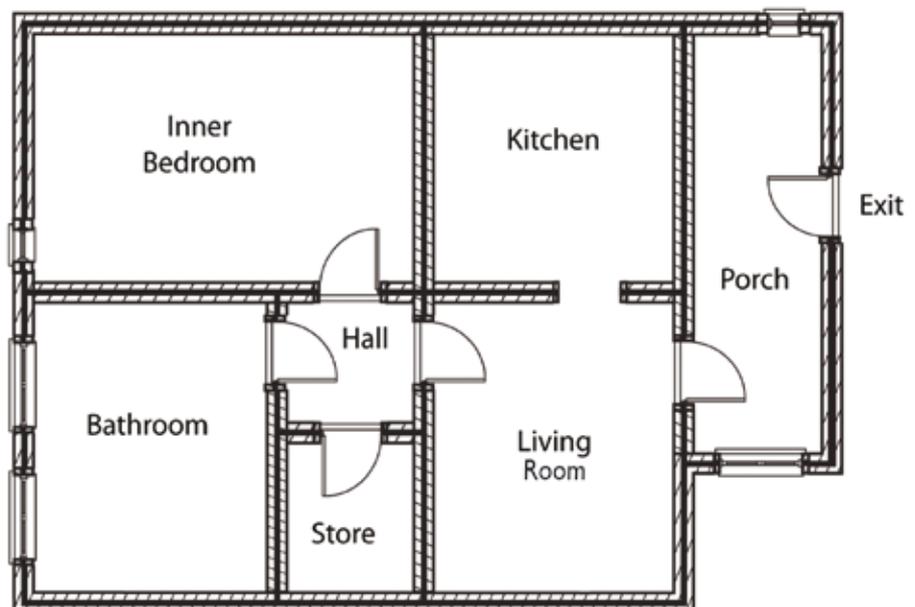
There is clear risk to life safety if a fire starts unnoticed in the access room, particularly if the occupant is asleep – or perhaps intoxicated – in the inner bedroom when the fire breaks out.

A closed bedroom door is a mixed blessing. Although it may hold back smoke for a time, it also reduces the sound level of any alarm that activates in the outer room. If slow to rouse, occupants may wake to discover a fast-developing fire and thick smoke on the exit route.

Section 12.2 of the LACoRS guide makes it clear that inner bedrooms and even living rooms 'should be avoided wherever possible' above the first floor level', with the preferred layout being a hallway directly linking the bedroom with the exit door.

The guidance goes on to state: 'However, where unavoidable, it may be accepted where the inner room is a kitchen, laundry or utility room, a dressing room, bathroom, WC or shower room.'

Figure 1: Example layout of a property featuring an inner bedroom



‘Where the inner room is any other type of habitable room (for example, a living room, sleeping room, workroom or study), it should only be accepted if:

- the inner room has access to a suitable door opening onto an alternative safe route of escape, or it is situated on a floor which is not more than 4.5m above ground level and has an escape window leading directly to a place of ultimate safety; and
- an adequate automatic fire detection and warning system is in place; and
- a fire-resisting door of an appropriate standard is fitted between the inner and outer rooms (typically FD30S standard for non-high-risk outer rooms)’

Suppression options

When it comes to addressing the problem, the guide says the provision of automatic fire suppression is allowable as a compensatory feature against such layout shortcomings. ‘A suitable

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water suppression system can, in some circumstances, allow for relaxed provision of certain other fire safety measures, [such as] relaxed requirements for inner rooms,’ it explains.

A fire suppression system, such as a water mist or sprinkler system, aims to control and suppress fire, significantly reducing the risk of injury, loss of life and property damage by maintaining tenable conditions for as long as possible while occupants evacuate. This is achieved by reducing room temperature in the region of the fire, reducing the amount of smoke and toxic gases, preventing flashover by constraining room temperatures to 100°C or less, and providing cooling to structural elements of the home that are in the spray path, allowing them to resist fire for longer.

The benefits of sprinklers are well known, but there are concerns about the costs that housing associations would incur in retrofitting these systems in properties with potentially dangerous layouts, as well as the disruption to tenants during installation.

Water mist offers another option when it comes to retrofitting fire protection. These systems reduce room temperature near a fire by consuming much of the fire’s energy in converting water to steam. They also reduce smoke and toxic gases by producing copious amounts of inert steam in the immediate vicinity of the fire, locally excluding oxygen, reducing temperatures and thus slowing the oxidation reactions of the fire. Indeed, several innovative and affordable retrofittable

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water mist devices have now emerged on the market, which can be fitted without compromising building layout or aesthetics and with minimal disruption.

Fitness for purpose

Fire protection must be fit for purpose. PD 7974: *Application of fire safety engineering principles to the design of buildings* allows design flexibility through a careful analysis of where the fire risks are, how fire and smoke will spread, and how passive and active fire protection and detection/alarm systems will function in a given layout.

This standard-type document highlights the most important aspects to be considered in a fitness for purpose assessment. The most relevant for residential settings are:

What are the fire characteristics of the area to be protected? In an inner bedroom, there is a greater risk of fire than in a room with ready access to the outside.

What are the objectives of protecting the area? To suppress the fire so that it does not spread and flashover, ensuring that heat and smoke output is limited and occupants can safely escape.

What impact will the environment have on the suppression system and vice-versa? Electrical fires can result in power loss to suppression systems that plug into a mains socket. Some suppression systems can be aesthetically obtrusive to domestic environments, independent of the risk or coverage.

Is there a likely conflict with processes in the protected environment? As with all domestic suppression systems, an alarm should indicate the presence of fire and should not hinder the means of escape in any way.

What is the impact of a false discharge? Traditional sprinkler systems can output over 100 litres per minute, whereas alternatives pose less risk of water damage. The robustness to false alarms is very important; water mist systems are more reliable than smoke alarms in this regard because they are heat triggered.

Duty of care

Landlords and housing groups that permit inner bedroom layouts must ensure that risks are properly assessed and adequate protection measures put in place, as required by the legislation.

Failure to do so can have serious consequences. For instance, in March 2010, two property landlords in the north London borough of Haringey were each sentenced to serve six months in prison and ordered to pay £5,000 costs after a fire in their property revealed inadequate safety measures. The failures included inadequate fire detection, lack of proper fire doors to bedrooms and a communal kitchen, and no emergency lighting in the stairwell.

In addition, a case in Suffolk resulted in a prison sentence and a £204,000 fine for failing to ensure a hotel met fire safety standards. The ground-floor function room had been subdivided into three bedrooms, and the conversion was arranged so that one bedroom could only be reached by going through another room. In the event of a fire in the outer room, anyone in the inner bedroom could be trapped without an escape route.

When weighing up the protection options, individuals and organisations with a duty of care should give active consideration to water mist technology ■

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For more info, go to www.plumis.co.uk

Water mist protection example

AUTOMIST from Plumis is one water mist solution that combines low cost and ease of retrofit with good aesthetics. It is designed to be installed in an open-plan living area and can protect occupants of inner rooms off that space.



The system uses a high-pressure pump to generate a fine water mist from nozzles mounted under a kitchen monobloc tap, on a work surface or in a wall. Versions are available for protecting living rooms, kitchens, and open or semi-open kitchen/diners.

In the event of a fire, the system is triggered automatically by a heat alarm or a fire panel output. Where desired, manual activation can be provided through a manual call-point. It can also be stopped manually by pressing a button on its control panel.

Automist is safe to fit in kitchen areas. Adding water to a cooking oil fire can greatly exacerbate the fire; the same is not true of water mist, as the up-draught from the flame and the evaporation of the tiny droplets prevents water from reaching and collecting in the pan ■