The requirements of the Building Regulations 2010 with regard to smoke control in staircases and lobbies of High Rise Residential Buildings

AUTHOR	BEN MEEK
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APPROVED BY	ALLAN MEEK
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The evacuation of smoke from the common areas of apartment buildings (staircases and lobbies) is an important component of the overall fire safety regime of such buildings.

In the UK the legislation is contained within The Building Regulations 2010 and specific guidance on how to comply with them with regard to fire safety is given within Approved Document B 2018. The paragraph dealing with smoke control in the common areas of apartment buildings is repeated below.

2.26 In buildings, other than small ones complying with Diagram 9, the corridor or lobby adjoining the stair should be provided with a vent. The vent from the corridor/lobby should be located as high as practicable and such that the top edge is at least as high as the top of the door to the stair.

There should also be a vent, with a free area of at least 1.0m^2, from the top storey of the stairway to the outside.

In single stair buildings the smoke vents on the fire floor and at the head of the stair should be actuated by means of smoke detectors in the common access space providing access to the flats. In buildings with more than one stair the smoke vents may be actuated manually (and accordingly smoke detection is not required for ventilation purposes). However, where manual actuation is used, the control system should be designed to ensure that the vent at the head of the stair will be opened either before, or at the same time, as the vent on the fire floor.

Vents should either:

a. Be located on an external wall with minimum free area of 1.5m^2 (see Appendix C); or

b. discharge into a vertical smoke shaft (closed at the base).

Smoke can be evacuated from buildings using extract fans or by opening ventilators to outside which rely on the buoyancy of the hot smoke. For many years this has been achieved utilizing existing building openings. This "natural" smoke extraction is supported by the fact that the corresponding building openings are already present in the form of windows and doors and that the buoyancy effect can be used at the same time. This approach has been used throughout Europe for many years and most countries have guidance contained within national regulations as seen in paragraph 2.26 of the Building Regulations above.

Electric drives are used worldwide to open the windows, flaps and roof windows for this purpose. These opener units are usually designed in 24 Volt DC, as this also ensures a simple and cost-effective emergency power supply in the event of a fire. If such a smoke extraction system is implemented, one of the most important questions is the required opening area. Natural smoke extraction only works if sufficient areas are created in the building envelope for the fire gases escaping into the air. The relevant free areas specified within ADB are *1.0m^2* for stairwells and *1.5m^2 for* lobbies. These are long standing “rule of thumb” areas that are not based on a detailed assessment of the individual circumstances of the building but a generalization designed to be effective in the majority of cases. It is also important to note that no further requirements are placed on these openings apart from the geometrically effective area.

It is a widespread misconception that these smoke extraction openings must meet the requirements of an NSHEV according to EN 12101 Part 2. This harmonized European standard defines exclusively the requirements for a construction product and not the regulations for its use. The determination of the necessary use of such NSHEVs is a task of the legislator.

The EN12101 series of European Standards specify the requirements for such system. The primary aim of such systems is given in the introduction reproduced below.

Introduction

In a fire situation, smoke and heat exhaust ventilation systems create and maintain a smoke free layer above the floor by removing smoke. They also serve simultaneously to exhaust hot gases released by a fire in the developing stages. The use of such systems to create smoke-free areas beneath a buoyant layer has become widespread. Their value in assisting in the evacuation of people from buildings and other construction works, reducing fire damage and financial loss by preventing smoke damage, facilitating access for firefighting by improving visibility, reducing roof temperatures and retarding the lateral spread of fire is firmly established. For these benefits to be obtained it is essential that smoke and heat exhaust ventilators operate fully and reliably whenever called upon to do so during their installed life. A smoke and heat exhaust ventilation system (referred to in this standard as a SHEVS) is a system of safety equipment intended to perform a positive role in a fire emergency.

The product standard EN 12101 Part 2 clearly regulates the area of application. The NSHEVs are designed to create a smoke-free layer in a section of a building that is considered to be one storey. It is clear that this requirement cannot be achieved in a residential lobby or stairwell where there is insufficient height and indeed no system design has been undertaken to arrive at the prescribed ventilator free area.

While this requirement is sometimes specified (an NSHEV in a staircase or lobby as a smoke extraction opening), it is clear that an NSHEV is neither intended for the staircase or lobby nor can it facilitate the formation of a smoke free clear layer in a lobby with average ceiling height.

Existing facade or roof openings in the building envelope to be used as smoke extraction openings are absolutely legally compliant and there is no obligation under current legislation to apply EN12101 to opening vents for residential apartment buildings.