

# Design for fire doors and fire exits



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In the building and construction industry the compliance to the specific requirements provided for by the building control bodies is paramount for the general safety of the occupants of the particular building and the general public. There are Approved documents that provide guidance for the usual situations in the design and construction of buildings. There are also regulations and guidance regarding the appropriate standards in relation to materials and workmanship. Materials used in the building and construction industry are regulated by specific certification bodies that issue guidance on the required standards.

The performance of a product in the event of fire largely depends upon its installation and maintenance at the site. The role of the certification bodies is to ensure acceptable standards are met in the installation and maintenance of the product and the workmanship involved (Department for Communities and Local Government 2006. p. 4-5). In the Approved Document B, there are clear guidelines on the issues of fire safety in relation to acceptable standards regarding means of escape including fire-doors and fire exits among other issues.

Fire safety is a fundamental safety issue that must be addressed with a view to minimize the risks accompanied by the hazards of fire to occupants in a building and/or the general public. It is paramount to appreciate that these fire safety requirements cannot be met in isolation from other safety requirements especially in the building and construction industry. It is important to note that the security measures put in place to restrict unauthorized access into the building could also jeopardize the rescue and

evacuation exercise in the event of fire. This should be dealt with in the designing of the building.

**Fire Exits and Means of Escape** The Approved Document highlights that buildings shall be constructed in a manner that makes adequate provisions for appropriate means of escape in the event of a fire outbreak, and persons in the building shall have access to a place of reasonable safety away from the building (Department for Communities and Local Government 2006. p. 12). The place of safety is preferably an open air space away from the effects of the fire. The escape routes and fire exits should be sufficient in number and able to accommodate the maximum capacity of human traffic in the event of fire.

These fire exits should be adequately protected from the destructive fire consequences to allow usage. It is important to ensure that the building is designed and constructed in a manner that the occupants will access safety without help from outside the building and not rely on external assistance (Department for Communities and Local Government 2006. p. 13). The designing and construction of the building in relation to fire safety should be done on the basis of a prior fire risk assessment exercise.

The basic criteria in the design of the means of escape and fire exits is governed by three fundamental principles. These principles are; the fire exits and means of escape should not be limited but there should be several conspicuous alternatives, there should always be some protected exit that falls within a reasonable travel distance from any point inside the building, in case the fire exit can only be accessed through one direction (referred to as

a dead end), then this must be in relation to the use of the building and relative fire risk, the size and height of the building.

Measures such as lifts, ladders and chutes are not recommendable (Department for Communities and Local Government 2006. p. 13). Protected and Unprotected Fire Exits To minimize the danger of persons crossing long distances to the final exit, thus being vulnerable to the hazardous effects of fire and smoke, the unprotected routes of escape should always be minimal. These unprotected areas in the route of escape are the parts in the escape route which the persons will have to cross before they access the final exit or the relative safety of a protected route of escape.

It is important to note that the structure of the building is not guaranteed to withstand the effects of the fire indefinitely (Department for Communities and Local Government 2006. p. 14). Therefore with this in mind it is important to limit the travel distances to the final exit point or to a protected section like a protected stairway. Travel distances are the real distance that a person must cover from any point within the floor area to the nearest exit. Protected stairways are therefore designed and meant to facilitate reasonable safety away from immediate danger of the fire to the place of safety away from the building.

The protected routes of escape must be free from effects of smoke, flames and gases. This is done by designing and incorporating fire-resistant construction, doors and smoke control systems (Department for Communities and Local Government 2006. p. 14). Provisions for Escape from the Ground Storey All rooms in the ground storey other than the kitchen should have direct access to a hall that leads to the exit of the building or

have a window or a door that enables any person who is fleeing the fire access a place of safety (Department for Communities and Local Government 2006. p. 17).

Provisions for Escape from Upper Floors A protected stairway for the upper storey should be provided and it must be in such a manner that it extends to the final exit point from the building. Alternatively the protected stairway in the upper storey of the building should facilitate access to at least two escape routes at the ground floor which must be separate and each leads to a final exit point. The separation of the two escape routes should have fire resisting construction and fire doors.

The two stories should be separated by fire resistant construction. The upper storey of the building should have an alternative escape route that will provide access to a place of safety. It is important to note that two adjoining rooms can be served by one window but the rooms need to have separate access to the stairs. A communicating door that would enable access to the window from either room would be appropriate (Department for Communities and Local Government 2006. p. 17).

There should also be provision of egress windows in the inner rooms as well as external rooms to allow easy escape from one room to the next as the persons make their way to the exit point. Inner rooms are those rooms whose only route of escape is through another room. Inner rooms should only be appropriate if the room serves as a kitchen, laundry/ utility room, a gallery, dressing room, bathroom, W. C, or shower room. The egress windows should be easily accessible and open able.

The open able area of the egress window should be at least 0.33m<sup>2</sup> and the dimensions should be 450mm in height and 450 mm in width. The bottom of the open able area of the egress window should not be more than 1100 mm above the floor (Department for Communities and Local Government 2006. p. 19). It is recommended that the egress window should open at an angle. The window in the building should also serve as fire exits and means of escape and therefore they should be designed in a manner that they can remain in the open position as the person making an escape passes through.

The windows serving as fire exits and means of escape should have a fire resisting duration of at least thirty minutes. The balcony should also be considered as a fire exit route or a means of escape and therefore it should be provided with guarding or guard rails (Department for Communities and Local Government 2006. p. 19-20). The building should be provided with an external escape stairway. The access doors to the external escape stairway should be fire resistant although the door at the head of the stair need not be fire resistant.

The external walls of the building that are within 1800mm of the staircase should be of fire resisting construction. The stair case should be protected from the destructive weather conditions depending on its location and the amount of protection accorded to it by the building. The maximum height of an unprotected staircase should not exceed six meters. The flights and landings should also be fire resistant. There should be adequate glazing on all the fire resisting construction in and attached to the building (Department for Communities and Local Government 2006. p. 22).

The enclosure to a protected stairway should be provided with a cavity barrier. The alternative cavity barriers could be in the roof space over the protected stairway (Department for Communities and Local Government 2006. p. 21). Fire Doors A fire door can be defined as a door or shutter that must meet specific performance criteria. The performance criteria for a fire door is that is fire resistant and cannot permit the passage of fire from one room to the next and it is able to resist the passage of combustible gaseous products when it is closed.

The fire door may have a covering for protection (Department for Communities and Local Government 2006. p. 71). Effective fire resisting doors are essential in ensuring that the occupants from the building can escape to a place of safety. The fire doors should hold back fire and smoke in order to facilitate the easy access and use of the escape routes and exits as well as the prevention of fire from spreading within the building.

The performance of the fire doors as with all non-load bearing elements in the construction of a building is measured in terms of integrity for duration of minutes. In the event that there needs to be restricted smoke leakage at ambient temperatures then a suffix (s) is added to such doors. Fire doors fall under the classifications recommended by BS EN 13501-2: 2003. These are the British Standards for classifications regarding construction products and building elements in relation to fire safety.

The doors are tested for exposure from either side. Fire resistance testing of a door should be in compliance to the required standards. Small differences in door components such as door frames, glazing, apertures, and ironmongery could affect the ratings in a significant manner. The fire doors

that serve an attached or integral garage must have some self-closing device. The hinges of a fire door must be manufactured from materials with a melting point of over 800°C (Department for Communities and Local Government 2006. p. 66).

Provisions for fire doors as per British standards and European standards are as follows; any door that is within the cavity barrier should have a fire resistance capacity of FD 30 according to British standards while the same door should have a fire resistance capacity of E30 according to European standards. Any door that is between a dwelling house and a garage should have a fire resistance capacity of FD 30s and in the European standards it should have a fire resistance capacity of E30Sa.

Any door that forms part of the enclosure to a protected stairway in a simple dwelling house is rated at FD 20 according to British standards and E20 according to European standards. Any door within any other fire-resisting construction is rated at FD 20 according to British standards and E20 according to European standards. These ratings are according to tests carried out by the relevant authorities and are provided as guidelines (Department for Communities and Local Government 2006. p. 67).