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FIRE RATED DOORS

FIELD OF THE INVENTION

This invention relates to fire rated doors (referred to hereinafter as "fire doors") and more particularly to fire doors fitted with apertures to provide ventilation.

BACKGROUND OF THE INVENTION

Fire doors have to meet the integrity clauses in fire regulations.

Under the ISO and British Standards, two of the integrity clauses are:-

1. Where the cotton wool pad test cannot be conducted because of the level of heat radiation from the specimen, a through gap into furnace exceeding 6 mm in width and 150 mm in length exists or develops in the specimen.
2. When a through gap into furnace exceeding 25 mm in diameter exists or develops in the specimen.

When a fire door is fitted with a ventilation aperture, clearly the ability to meet the above integrity clauses is suspect if adequate ventilation is to be provided.

An object of the present invention is to provide a ventilated fire door which meets the integrity requirements.

DESCRIPTION

According to the present invention, there is provided a fire door having at least one ventilation aperture, with the or each ventilation aperture being closed by an incombustible barrier having at least one aperture with the or each barrier aperture arranged such that a 6 mm diameter rod cannot penetrate the barrier in excess of 150 mm in any direction and at any angle and without any through gap exceeding 25 mm in diameter existing in the specimen.

The barrier may be a single-skin barrier, in which case at least one dimension of the or each barrier aperture is less than 6 mm.

The or each aperture in the barrier may be of any shape, for example round, square or rectangular, and if more than one aperture is employed, they may be arranged in any desired configuration.

According to another aspect of the present invention, there is provided a fire door having at least one ventilation aperture, with the or each ventilation aperture being closed by an incombustible barrier having at least one aperture, at least one dimension of the or each barrier aperture being less than 6 mm.

If increased ventilation is required, the barrier may be a double-skin barrier comprising spaced sheets one or other, or both, of which may have one or more apertures having a dimension exceeding 6 mm but with the sheets arranged such that one such aperture in one sheet is fully or partially misaligned with another such aperture in the second sheet, such that a 6 mm diameter rod cannot penetrate the skins in excess of 150 mm in any direction and at any angle which otherwise would fail the integrity test. For example, generally horizontal apertures can be used in one sheet and generally vertical apertures in the other sheet, with at least one dimension of each aperture being in excess of 6 mm.

Thus according to another aspect of the invention, there is provided a fire door having at least one ventilation aperture, with the or each ventilation aperture being closed by an incombustible barrier having at least one aperture, the barrier comprising two skins arranged such that the or each aperture in one skin is fully or partially misaligned with the or each aperture in the other skin such that a 6 mm diameter rod cannot penetrate the skins in excess of 150 mm in any direction and at any angle.

In another alternative, the barrier may comprise a plurality of superimposed blades of non-planar section and spaced apart such that a 6 mm diameter rod cannot penetrate the barrier in excess of 150 mm in any direction and at any angle. This means that that spacing between blades may be greater than 6 mm to increase ventilation.

The blades may be, for example, of V-shaped, S-shaped or Z-shaped section.

Thus according to yet another aspect of the present invention, there is provided a fire door having at least one ventilation aperture, with the or each ventilation aperture being closed by an incombustible barrier having at least one aperture, the barrier comprising a plurality of superimposed blades of non-planar section and spaced apart such that a 6 mm diameter rod cannot penetrate the blades in excess of 150 mm in any direction and at any angle.

The barrier provided in any aspect of the invention may be formed from a metallic sheet, or sheets in the case of a double-skin barrier. The metal used may, for example, be steel, stainless steel, galvanised metal, electro-galvanised metal, pre-finished metal sheets, or wire mesh. In one alternative, the barrier may comprise one or two bonds such as, for example, calcium silicate, cement fibre, or gypsum boards. When using such boards, care has to be taken that they are of sufficient density and/or thickness to prevent them splitting or cracking when subjected to heat.

If the fire-door is timber-faced, the thickness of the selected board needs to be increased to prevent the timber facing igniting.

The barrier may, for example, be clamped, screwed, nailed, riveted, welded or held in place by channels, angles or mouldings. Any such fastening means should be incombustible.

The barrier may be covered, for cosmetic purposes, by apertured covering means such as louvres, for example.

Brief Description of the Drawings

Fire doors in accordance with the invention will now be described in greater detail, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a front elevation of a fire door in accordance with the present invention and fitted with a ventilation aperture;

Figure 2 is an enlarged section along the line A-A of Figure 1;

Figures 3 to 10 are similar sections to Figure 2 but each showing a different embodiment of the invention.

Referring first to Figures 1 and 2, these show a fire rated door 1 having a ventilation aperture 2. The ventilation aperture 2 is fitted with a fire rated barrier 3 which, in this embodiment, comprises a U-shaped, incombustible metallic sheet 4 formed with ventilation slots 5, the smaller dimension of which slots 5 is less than 6 mm in order to meet the fire integrity regulations. This means that a 6 mm diameter rod cannot penetrate the barrier in excess of 150 mm in any direction and at any angle.

The barrier 3 is fitted into the ventilation aperture 2 using the limbs 3a of the U-shaped barrier which are screwed, nailed, riveted, welded or otherwise fixed to the body of the door 1 by incombustible means.

The barrier 3 could be provided with limbs or flanges 3a on all four sides, if desired, with all four flanges being secured to the body of the door.

The barrier may be of sheet steel, stainless steel, galvanised metal, electro-galvanised metal, pre-finished metal sheets, or of wire mesh. In the case of wire mesh, this may also be of steel, stainless steel, etc. as above.

Figure 3 shows an alternative arrangement of barrier 3 in that the latter is planar, ie. it does not have the limbs or flanges 3a of the Figures 1 and 2 embodiment, with the barrier 3 secured within the door aperture 2 using top and bottom pairs of U-shaped incombustible channels 6 and sealant 7. The channels 6 are clamped, nailed, screwed, riveted, welded or otherwise fixed to the body of the door 1.

The apertures 5 may be slots as in Figure 1 but alternatively may be round or square holes, for example, with at least one dimension being less than 6 mm. The holes may be arranged in any desired pattern if more than one are provided. Also a mixture of differently shaped apertures may be employed.

The barrier may be metallic using, for example, the same materials recited in connection with the embodiment of Figures 1 and 2. Alternatively, the board may be made from incombustible board such as, for example, calcium silicate, cement fibre or gypsum board. When using a board for the barrier 3, care has to be taken to ensure that the board does not crack or split when heated. If the door 1 is timber faced, a thicker board needs to be employed to provide the necessary thermal insulating properties to prevent the timber facing on the non-fire side of the door from igniting.

The embodiment of Figure 4 is similar in all respects to that of Figure 3 save for the barrier fixing channels being replaced by angle or L-shaped member 8.

Figure 5 shows the use of a double-skin barrier 3, although one of the skins may be dispensed with if desired. Each skin 4 is planar and attached by clamping, nails, screws, rivets, welding or otherwise secured to one face of the door 1.

Each skin 4 may be metallic or in the form of a board as discussed in connection with the Figure 1 and Figure 3 embodiments, respectively. Also, the shape of ventilation apertures 5 may be as discussed in relation to the Figure 3 embodiment. However, although one or more of the apertures may have one dimension greater than 6 mm, the skins 4 are arranged such that the apertures 5 in one are fully or partially misaligned with the apertures 5 in the other skin 4 so that a 6 mm diameter rod cannot penetrate the skins in excess of 150 mm in any direction and at any angle.

As already mentioned, only one skin 4 may be employed to form the barrier 3 and this is also the case in the embodiment of Figure 6 in which each skin 4 is generally planar but formed with cranked upper and lower edges 9 which provide flanges 11 by which the skins are clamped, nailed, screwed, riveted, welded or otherwise fixed to the respective faces of the door 1.

Each skin is metallic and may be of the materials discussed in relation to the Figure 1 and 2 embodiment.

Figure 7 shows a still further embodiment in which a barrier 4 in the form of a board is employed and which is secured in the door aperture 2 by pairs of upper and lower mouldings

12 and by sealant 7. The board may be of the materials discussed in relation to the embodiment of Figure 3 and the mouldings may be secured to the door 1 in like manner.

Another embodiment of the present invention is shown in Figure 8 and is another double-skin barrier arrangement using two planar skins 4 which may be metallic or boards as discussed above in relation to the other embodiments. Each skin 4 is secured with the door aperture 2 using upper and lower spacers 13, mouldings 11 and sealant 7. Again, one skin 4 may be dispensed with and each skin may be metallic or formed by a board as discussed above in relation to the other embodiments. Also, the shape and arrangement of the apertures 5 can be as in the other embodiments and the mouldings attached to the door 1 in a similar manner.

If the barrier 4 of any of the embodiments of Figures 1 to 8 need cosmetic dressing, they may be covered by louvres, for example.

Figure 9 shows another embodiment in which the barrier 3 is formed essentially from inverted V-shaped metallic blades 15 secured in side channels 16 having appropriately shaped slots 17. The blades 15 may be spaced apart by a distance greater than 6 mm whilst still meeting the fire integrity regulations in that a 6 mm diameter rod cannot penetrate the blades in excess of 150 mm in any direction and at any angle.

An alternative configuration of blade 15 is shown in Figure 10 (which is a view similar to that of Figures 1 to 8) in which the blades are of S- or Z-shaped section. Again, the spacing between the blades 15 can exceed 6 mm, if desired, whilst maintaining the integrity of the barrier 4.

It will be understood that the embodiments of Figures 9 and 10, like the double-skin barriers of Figures 5, 6 and 8, provide increased ventilation, if required. The blades 15 in Figures 9 and 10 may be metallic and composed of similar materials to those discussed in relation to the embodiment of Figures 1 and 2.



CLAIMS

1. A fire door (1) having at least one ventilation aperture (2), with the or each ventilation aperture (2) being closed by an incombustible barrier (3) having at least one aperture (5), with the or each barrier aperture (5) arranged such that a 6 mm diameter rod cannot penetrate the barrier in excess of 150 mm in any direction and at any angle.
2. A fire door according to Claim 1, wherein the or each aperture (5) in the barrier (3) is elongated, round or square.
3. A fire door according to Claim 1 or 2, wherein a plurality of apertures (5) are provided in the barrier (3) and arranged in any desired pattern.
4. A fire door according to claim 3, wherein apertures (5) of different shapes are employed.
5. A fire door according to any of the preceding claims, wherein at least one dimension of the or each barrier aperture (5) is less than 6 mm.
6. A fire door according to any of the preceding claims, wherein the barrier (3) is metallic.
7. A fire door according to Claim 6, wherein the barrier (3) is formed from sheet (4) of steel, stainless steel, galvanised metal, electro-galvanised metal, pre-finished metal sheets, or wire mesh.
8. A fire door according to any of Claims 1 to 5, wherein the barrier (3) is formed from an incombustible board.
9. A fire door according to Claim 8, wherein the incombustible board is a calcium silicate, cement fibre or gypsum board.
10. A fire door according to any of the preceding claims, wherein the barrier (3) is of a double skin construction, with the or each aperture (5) in one skin (4) being misaligned with the or each aperture (5) in the other skin (4) in a direction rod cannot penetrate the skins in



excess of 150 mm in any direction and at any angle.

11. A fire door according to any of the preceding claims, wherein the barrier (3) is formed with a flange (3a) by which the barrier (3) is attached to the body of the door (1).

12. A fire door according to any of Claims 1 to 10, wherein the barrier (3), or each skin (4) of the barrier (3), is secured within the ventilation aperture of the door by channels (6), angles (8) or mouldings (12; 14) secured to the door (1).

13. A fire door according to any of Claims 1 to 10, wherein the barrier (3), or each skin (4) of the barrier (3), is mounted flush with one face of the door (1).

14. A fire door according to any of Claims 1 to 7, wherein the barrier (3) is formed from superimposed blades (15) of non-planar section.

15. A fire door according to Claim 14, wherein the blades (15) are of V-shaped, S-shaped or Z-shaped section.

16. A fire door according to Claim 14 or 15, wherein the blades (15) are spaced apart by more than 6 mm.

17. A fire door (1) having at least one ventilation aperture (2), with the or each ventilation aperture (2) being closed by an incombustible barrier (3) having at least one aperture (5), at least one dimension of the or each barrier aperture (5) being less than 6 mm such that a 6 mm rod cannot penetrate the barrier in excess of 150 mm in any direction and at any angle.

18. A fire door (1) having at least one ventilation aperture (2), with the or each ventilation aperture (2) being closed by an incombustible barrier (3) having at least one aperture (5), the barrier (3) comprising two skins (4) arranged such that the or each aperture (5) in one skin (4) is fully or partially misaligned with the or each aperture (5) in the other skin (4) such that a 6 mm diameter rod cannot penetrate the skins in excess of 150 mm in any direction at any angle.

19. A fire door (1) having at least one ventilation aperture (2), with the or each ventilation aperture (2) being closed by an incombustible barrier (3) having at least one aperture (5), the



barrier (3) comprising a plurality of superimposed blades (15) of non-planar section and spaced apart such that a 6 mm diameter rod cannot penetrate the blades in excess of 150 mm in any direction and at any angle.

20. A fire door according to Claim 17 or 18, wherein the or each aperture in the or each skin (4) of the barrier (3) is elongated, round or square.

21. A fire door according to Claim 17, 18 or 20, wherein a plurality of apertures (5) are provided in each skin (4) of the barrier (3) and arranged in any desired pattern.

22. A fire door according to claim 21, wherein apertures (5) of different shapes are employed.

23. A fire door according to any of Claims 17 to 22, wherein the barrier (3) is metallic.

24. A fire door according to Claim 23, wherein the barrier (3) is formed from a sheet steel, stainless steel, galvanised metal, electro-galvanised metal, pre-finished metal sheets, or wire mesh.

25. A fire door according to any of Claims 17, 18, 19, 20, 21 or 22, wherein the or each skin (4) of the barrier (3) is formed from an incombustible board.

26. A fire door according to Claim 25, wherein the incombustible board is a calcium silicate, cement fibre or gypsum board.

27. A fire door according to any of Claims 17 to 26, wherein barrier (3) is formed with a flange (3a) by which the barrier (3) is attached to the body of the door (1).

28. A fire door according to any of Claims 17 to 25, wherein the barrier (3) is secured within the ventilation aperture of the door by incombustible channels (6), angles (8) or mouldings (12; 14) secured to the door (1).

29. A fire door according to any of Claims 17, 18, 20 to 28, wherein the or each skin (4) of the barrier (3) is mounted substantially flush with one face of the door (1).



30. A fire door according to any of Claims 1 to 12, 17, 18 or 20, wherein the barrier (3) is covered, for cosmetic purposes, by apertured covering means.
31. A fire door according to Claim 30, wherein the covering means are louvres.
32. A fire door substantially as herein particularly described with reference to Figures 1 and 2, or Figure 3, or Figure 4, or Figure 5, or Figure 6, or Figure 7, or Figure 8, or Figure 9, or Figure 10 of the accompanying drawings.