



Title: Fire door with a doorframe surrounding said door

Description

The present invention relates to a fire rated door comprising a surrounding door frame according to the generic part of patent claim 1. In this application two glass panes are proposed for a fire rated door including a frame spacing apart the glass panes.

Today, fire rated doors are frequently executed as metal doors, the reason for said execution type are cost reduction effects.

Such fire rated door is for example disclosed by EP 0 401 555 A2, where a glass pane is mounted within a metal frame equipped with a circumferential groove. In this case, the glass pane ends before the frame and is connected with the metal frame by means of additional metal edge strips serving as compensating adapters. In this case, the metal strips are connected with traditional fire rated glue, for example made on water-glass base.

A door frame profile for fire rated doors is disclosed by EP 0 444 393 A2, where a glass pane is retained in a strong door frame profile. The door frame profile is executed as hollow section and it presents, inserted into its chambers, fire rated plates that guarantee the fire resistance of such a door.

A fire-resistant glazing is described in DE 296 45 259 A1. In this case, silicate glass panes made from tempered glass are used on the one side, and, on the other side of an intermediate air gap, a reinforced silicate glass pane is used. The construction of such fire-resistant glazing is realised by means of a metal frame embracing and overlapping the border edge.

DE 297 42 665 A1 reveals a fire retarding swing door or center pivoted door, where the door frame respectively the borders of the door leaves present a thermal insulative material, extending over the entire length respectively the entire width. This thermal insulative material will expand when heat develops, such that in the event of a fire, the door component includes a secure fire barrier. This door is composed of plane material, which is not transparent and, in a partial region, is interrupted by a window to be mounted.

As the above state-of-the-art shows, such technical designs today no longer match contemporary architecture. Today's goal is to give the impression that de-materialised transparent structures are used, which can no longer be achieved with the constructions known from the state-of-the-art. It is therefore the object of the invention to propose a solution realising the conception under economical aspects likewise of the region of the required fire protection partitions with its passageways, such that the observer does not notice that the present zone is actually a fire protection partition including a fire rated door. Simultaneously the solution of this task should include at the same time an increased safety feature aspect.

The present invention solves the problem with the characteristic of patent claim 1. The sub-claims represent a further embodiment of the inventive idea. It is proposed to



conceive a fire rated door according to the principle of "structural glazing" such that the door leaf consists of spaced plane glass panes. The glass panes are spaced apart by means of an intermediate frame made from profiles. In this case, the glass panes extend as far as almost to the border of the door leaf, only the proper edges are protected from damage by a small overhang of the intermediate profiles. As this protection applies just to the edges, the whole area of the spaced glass panes is free from any other material. In this case, a transparent fire protection medium is included between the spaced glass panes. For example a fire rated gel or any other suitable transparent fire protection medium can be used as fire protection medium. Depending on the fire rating class, it is however also possible to abandon the fire protection medium.

Furthermore according to the inventive idea, it is possible to include, between both spaced exterior glass panes by means of corresponding spacers, a fire protection glass pane of the known type. To make the frame profiles, which are placed between the glass panes, invisible, the glass panes are provided with an enamelling on the interior side in the region where the profiles are placed. By doing so, the aspect of increased safety is respected, and the complete fire rated door is realised as transparent construction unit.

Simultaneously, due to the fact that no profiles are visible, the complete appearance of said architectural structures as "structural glazing" is realised.

The profiles are preferably executed as solid profiles and can be manufactured from metal, plastic, steel or wood. In case of a fire rated door in plastic execution, a glass fiber reinforced plastic is preferably used. This plastic is composed such that endless glass fiber rovings oriented in axial direction are used in the plastic profiles. Simultaneously in radial direction, the profiles are reinforced with a glass fiber complex. These glass fibers are impregnated with a resin matrix and hardened within a heated mould. The resin matrix moreover includes fire-retarding fillers. Simultaneously appropriate fittings are incorporated within the profiles, likewise at the same time invisible for the observer.

In order such door corresponds to fire protection requirements, so-called fire protection laminates in form of tapes are either incorporated into the profiles or they are also included within the door frame surrounding the fire rated door. Therefore, in the event of a fire, under the effect of heat development, the tapes will intumesce, which action simultaneously guarantees a tight barrier with regard to the source of the fire.

According to the invention, such fire rated door is suitable for retrofitting. For this purpose, an existing jamb will be capped with corresponding fire resisting material, for example with gypsum plasterboards or likewise with corresponding additional profiles, which are executed such that two identical profiles are placed against each other over an existing jamb, and they are interconnected by means of an appropriate element, which may act at the same time as a fire protection laminate.

Such designed fire rated doors can also be executed as skylight above the door frame, and likewise as fixed side panels. Such execution of complete fire rated walls addresses the idea to create a de-materialised fire rated wall.

The proposed fire rated door can be manufactured as single action door (swing door) with a rebate, or as center-pivoted door. Besides the execution with a single leaf, likewise a double leaf execution with an inactive and an active leaf is possible.

In case of an execution as single action door, one of the two spaced glass panes is larger than the other one, and a connection between them is guaranteed by means of a gradual profile.

Hereinafter, the invention is explained on the basis of different diagrammatically represented embodiment examples. It shows:

- Figure 1: a view of a single leaf fire rated door.
- Figure 2: a vertical section through a fire rated door according to Figure 1.
- Figure 3: a fire rated door in a vertical section according to Figure 1.
- Figure 4: a fire rated door according to Figure 1 represented as horizontal section with capped jamb.
- Figure 5: like Figure 1, as horizontal section with an existing door frame.
- Figure 6: a horizontal section through a double leaf center pivoted door system where the door frame is executed with fire rated plates.
- Figure 7: a horizontal section through a double leaf center pivoted door with capped frame.

Figure 1 illustrates in a front view a fire rated door with a door leaf 2 and with a door frame 31 surrounding the door leaf. Reference numeral 3 identifies an enamelling on the glass panes 4 and 5 stretching alongside the edges of the door leaf 2. A vertical section of a single leaf door according to Figure 1 is represented in Figure 2. As here it is only question of the fire rated door's technical structure, all non-relevant parts have been omitted.

The door leaf 2 is composed as structural glazing, that means the door leaf 2 includes two glass panes 4 and 5, they are building quasi the entire door leaf. In the upper part, the glass panes 4 and 5 are spaced apart by means of a profile 6 and in the lower part, close to a floor 24, they are spaced apart by means of a profile 7. As it is evident from the illustration in Figure 2, the glass panes 4 and 5 extend with their glass pane edges 10 over the entire height and thus over the entire width of the door leaf 2, and they are simultaneously secured by means of profile projections 11 provided at the profile 6, and by means of profile projections 28 provided at the profile 7. Therefore, in this embodiment example, the glass pane edges 10 are provided with a small chamfer, which is covered at the same time by profile lips. These provide an optimum protection, especially in the region of the edges, for the glass panes 4 and 5, which are preferably manufactured from safety glass (single layer safety glass, ESG). The profile 6 is executed as solid profile and is, likewise the profile 7, preferably manufactured from light metal, plastic or wood or from any other appropriate material. In this case, the profile 6 presents in its exterior closing region an exterior edge 14 with a rounded (ball-shaped) form. On the air gap 30 side, between the glass panes 4 and 5, the profile 6 is executed with a deepening 12 arranged between projections 13 on either side, which provide a locating for the glass panes 4 and 5 and thus for the connection of the glass panes 4 and 5 with the profile 6.

Oriented towards the space between the glass panes 4 and 5, the profile 7 has got the same cross section as the profile 6. However, in the exterior region of the door leaf 2 in further continuation of the profile projection 28, legs 15 are conformed pointing towards the floor 24. In their center, the legs 15 include a deepening 16. The deepening 16 is

provided to mount for example door rails to connect a door closer or to connect other fittings. The legs 15 are provided to adapt the prefabricated fire rated door on site to the required dimension. By correspondingly cutting the legs 15, the optimum length will be achieved for such fire rated door type without dismounting the door leaf on site.

An enamelling 3 is provided on the glass panes 4 and 5, in the connection region between the profiles 7 and 6, whereby said profiles 6 also run vertically. By doing so, it is guaranteed that the profiles 6 and 7, installed within the air gap 30, are not visible to the exterior side. As only the exterior edge zone is concerned, despite the enamelling 3, the entire door leaf's 2 appearance is not damaged in a completely de-materialised wall manufactured only from glass, as frame parts and moreover fittings are invisible. Simultaneously it is guaranteed that the glass panes 4 and 5 are not executed with boreholes, to ensure an increased fire protection.

The air gap 30 is partially filled by a fire rated glass pane 9. The fire rated glass pane 9 is supported by means of spacers 8, leaning on the glass panes 4 and 5. The ends of the fire rated glass pane 9 engage in this case into the deepenings 12, such that if the fire rated glass pane respectively the profiles 6 and 7 expand, a destruction of the fire rated glass pane 9 will not occur.

The upper part of Figure 2 illustrates a door frame 31, which is mounted on an existing jamb identified by numeral 18 and which is installed within mortar 23 over masonry 17. In this case, the door frame 31 is realised from two almost L-shaped additional profiles 19. On the one end, at the mortar 23, a sealing 21 seals the profile 19, whereby in the center region of the door leaf 2, a gap remains between the additional profiles 19. This gap is closed by means of a fire protection laminate in form of a sealing profile 22. The additional profile 19 is simultaneously sealed and fastened in this zone with regard to the existing jamb 18 by means of a sealing 20. In the event of a fire, an automatic sealing of the door frame 31 with regard to the door leaf 2 would be achieved thanks to the intumescence of the fire protection laminate 22.

In another embodiment example, in Figure 3, the fire protection effect of the door leaf 2 is realised in another way. Instead of proceeding like in Figure 2 and using a fire rated glass pane 9, in this case a fire protection material 26 is employed, which is preferably transparent and liquid. To introduce the fire protection material 26 into the door leaf, spacer sections 25 are incorporated with a certain distance 29 into the air gap 30, whereby they immerse simultaneously into the deepenings 12. As shown in Figure 3, the spacer section 25 is executed as double-wall spacer section in order to compensate corresponding expansion coefficients of the fire rated material 26. The structure of this door, and likewise of the one displayed in Figure 2, clearly reveals that the observer does not recognise this door-type, constructed according to the principle of dematerialised door leafs, from the outside as a fire rated door and that nevertheless, in the event of a fire this door type guarantees sufficient and corresponding protection within a fire protection partition.

Due to the fact, that the deepening 12 situated within the frame is provided in the profiles 6 and 7, an increased safety potential is given, as in the event of a fire, for example the fire protection material represented in Figure 3 will stiffen and will persist as plane material, thanks to the profiles 6, 7 blocked on the exterior side in the door frame 31, even if one of the two glass panes 4, 5 should burst. This is likewise applicable to the fire protection glass pane 9 of Figure 2.

A center-pivoted door, which can be realised without any problem for example from profiles 6 in conjunction with a fire rated glass pane 9, is illustrated in Figure 4. In a horizontal section, the center-pivoted door 32 is arranged inside the additional profiles 19 of the door frame 31. Here again, it is evident that in the event of an outbreak of fire and an increase in temperature, the sealing profile 22 seals the center-pivoted door 32 with regard to the door frame 31.

In an application where the center pivoted door 32 is installed inside an appropriate fire resistant jamb 18, sealing profiles 1, in form of fire protection laminates, are incorporated into the exterior edges 14 of the profiles 6 oriented towards the jamb 18.

Figure 6 represents a double leaf center-pivoted door 32 including two leaves, located between a door frame made from gypsum plasterboards 27 mounted on a sub-structure 33. In this case again, the center-pivoted doors 32 are executed with sealing profiles 1 in the zone of the door frame as well as in the central region. Figure 7 illustrates an example analogous to Figure 6, whereby in this case fire protection laminates are only included in the central region in the profiles 6 and in the region of the capped jamb 18 between the additional profiles 19, the sealing profile 22 provides properly sealing in the event of a fire.

The description clearly reveals that said designed fire rated door is absolutely conform to its final purpose and simultaneously provides a free view which is usually not the case with a fire rated door made from steel or sheet metal.

References

1. Sealing profile (fire protection laminate)
2. Door leaf
3. Enamelling
4. Glass pane
5. Glass pane
6. Profile
7. Profile
8. Spacer
9. Fire rated glass pane
10. Glass pane edge
11. Profile projection
12. Deepening
13. Projection
14. Exterior edge
15. Leg
16. Deepening
17. Masonry
18. Jamb
19. Additional profile
20. Sealing
21. Sealing
22. Sealing profile (fire protection laminate)
23. Mortar
24. Floor
25. Spacer sections
26. Fire protection material
27. Gypsum plasterboard
28. Profile projection
29. Distance (air)
30. Air gap
31. Door frame
32. Center pivoted door
33. Sub-structure

Claims

1. A fire rated door with a surrounding door frame, consisting of a glass pane, which is embedded within its circumferential metal frame, characterised in that the fire rated door consists of at least one door leaf (2, 32) built from two glass panes (4, 5) spaced apart by means of profiles (6, 7), said glass panes (4, 5) almost extend as far as to the border of the door leaf (2, 32).
2. A fire rated door according to claim 1, characterised in that a transparent fire protection material (9, 26) is comprised between the spaced glass panes (4, 5).
3. A fire rated door according to claim 1, characterised in that the profile (6) presents a rounded exterior edge (14) continuing on either side respectively in a profile projection (11), which are respectively executed such that just the glass pane edges (10) (thickness of the glass panes 4, 5) of the glass panes (4, 5) are covered.
4. A fire rated door according to claim 1, characterised in that the profile (7) is arranged in the horizontal lower part of the door leaf (2, 32), and respectively presents two recesses (28) having almost the dimension measure of the thickness of the glass panes (4, 5), into which recesses the glass panes (4, 5) are embedded, and deflecting legs (15) with intermediate deepening (16) are realised underside.
5. A fire rated door according to one or several claims, characterised in that the profiles (6, 7) present a deepening (12) oriented towards an air gap (30) between the glass panes (4, 5).
6. A fire rated door according to claim 1 and 5, characterised in that the fire protection material is a fire rated glass pane (9) and inserted into the deepening (12), said fire rated glass pane (9) is supported by spacers (8) with regard to the lateral glass panes (4, 5).
7. A fire rated door according to claim 1 and 5, characterised in that a circumferential spacer section (25) engages into the deepening (12), leaning at the same time on the glass panes (4, 5) and a space created by means of the spacer section (25) is filled in with a fire protection material (26).
8. A fire rated door according to claim 7, characterised in that the fire protection material (26) is a fire rated gel.
9. A fire rated door according to claim 7, characterised in that the spacer section (25) is installed at a distance (29) with regard to the profiles (6, 7).
10. A fire rated door according to claim 7, characterised in that the spacer section (25) is executed as double wall with intermediate air gap.
11. A fire rated door according to the preceding claims, characterised in that a circumferential frame is realised between the glass panes (4, 5) by means of the profiles (6, 7), which frame is covered through an enamelling (3) on the glass panes in the region of the profiles (6, 7).

12. A fire rated door according to the preceding claims, characterised in that the profiles (6, 7) are made from plastic, metal, steel or wood.
13. A fire rated door according to the preceding claims, characterised in that fittings are incorporated within the profiles (6, 7).
14. A fire rated door according to the preceding claims, characterised in that a fire protection laminate (1, 22) is installed into the exterior edge (14) of the profiles (6, 7), which laminate will intumesce when heat develops.
15. A fire rated door according to claim 1, characterised in that the door frame consists of a divided additional profile (19) with intermediate fire protection laminate (22).
16. A fire rated door according to claim 15, characterised in that the door frame is mounted over an existing jamb (18).
17. A fire rated door according to claim 1, characterised in that the door frame is built by gypsum plasterboards (27).
18. A fire rated door according to the preceding claims, characterised in that the door leaf (2) is a single leaf or a double leaf swing door.
19. A fire rated door according to the preceding claims, characterised in that the door leaf (2) is a single leaf or a double leaf center pivoted door (32).
20. A fire rated door according to the preceding claims, characterised in that the glass panes (4, 5) consist of safety glass.
21. A fire rated door according to the preceding claims, characterised in that the fire rated door's fire protection efficacy is achieved by means of the fire protection laminate (1, 22) introduced into the profiles (6, 7) respectively between the additional profiles (19).
22. A fire rated door according to the preceding claims, characterised in that the plastic is a glass fiber reinforced plastic.