



MOUNTING OF LAMINATES TO FIRE DOORS

Field of the Invention

[0001] The present invention relates to fire doors, panels or walls.

[0002] In particular, this invention relates to mounting of laminates to fire doors.

Background of the Invention

[0003] Fire check doors, also commonly referred to as fire doors, are installed to prevent the spread of a fire from one part of a building to another. Fire doors are designed by manufacturers to meet certain national or international standards and fire doors are commonly specified in building codes for critical areas of buildings.

[0004] The duration for which a fire door can withstand a fire of fixed intensity is its rating and doors are designated by this rating.

[0005] Fire doors may be of the swinging or sliding types. Fire doors may also be made of wood or metal, usually steel or stainless steel. Metal fire doors, by virtue of being made of metal, have much higher ratings than wood fire doors.

[0006] However, metal fire doors suffer from being rather stark in appearance as only metal fittings or ironmongery may be installed on them.

[0007] Any other finishes, particularly those that are flammable, cannot be applied to metal fire doors. The surface finishes of metal fire doors are limited to paints or coatings that do not reduce their fire ratings.

[0008] Decorative high-pressure laminate (HPL) or laminated plastic (LP) sheets could conceivably be applied to metal fire doors to "soften" their hard appearance or to blend in with the décor. This is will be desirable, especially for the interior faces or sides of metal fire doors and it will give builders and decorators more options to blend fire doors with the interior of the building.



[0009] Unfortunately, current laminates are not as fire resistant as the metal door itself and may act as a conductor for fire propagation, reducing the rating of the fire door on which such laminates are applied.

Summary of the Invention

[0010] The present invention seeks to provide a method for mounting laminates to the surface of fire protective structures, such as metal fire check doors, that allows the laminates to detach from these structures during a fire.

[0011] The method includes the steps of using a suitable adhesive, pre-score lines of weakness on, and cutting holes in the laminate, and fitting edge capping such that the laminate is not clamped but can detach during a fire.

[0012] Another aspect of the invention is a metal fire check door with a laminate according to the method taught such that the laminate is not prevented from detaching by fittings or edge capping during a fire.

Brief Description of the Drawings

[0013] A preferred embodiment of the present invention will now be more fully described, by way of example, with reference to the drawings of which:

[0014] FIG. 1 illustrates a metal fire check door with common ironmongery fittings installed;

[0015] FIG. 2 shows a sheet of laminate for mounting to fire door with dotted lines that indicate score lines on the mounted laminate;

[0016] FIG. 3 shows a details of a cut scored onto a laminate mounted on a door; and

[0017] FIG. 4 shows the detail at an edge of a metal fire check door in accordance with the present invention.

Detailed Description of the Drawings

[0018] in accordance with a preferred embodiment of the invention are described. In the following description, details are provided to describe the preferred embodiment. It shall be apparent to one skilled in the art, however, that the invention may be practiced without such details. Some of these details may not be described at length so as not to obscure the invention.

[0019] In this application, the terms “fire protective door”, “fire check door” and “fire door” refer to the same thing. While the invention refers primarily to metal fire doors, it can also be applied to composite fire doors.

[0020] In the construction industry, high-pressure laminate (HPL) or laminated plastic (LP) are commonly used for as a protective or decorative exterior for furniture and building furnishings. One or more sheets of such laminates may be used to cover one skin of a door.

[0021] While the present invention refers to these two types of products, it can also be applied to similar products made of other materials but manufacturer for identical or similar applications, provided that they meet certain requirements that will be described below.

[0022] Application of the invention to different materials other than those mentioned here but which serve the same function as HPL or LP sheets remains within the scope of the present invention.

[0023] One aspect of the invention is the method of mounting such laminate sheets on fire protective structures such as metal fire doors in such a ways as not to compromise the fire rating of the fire door. The preferred embodiment is that of a fire door.

[0024] In another aspect, the present invention provides a metal fire door fabricated using the method described.

[0025] Fire doors usually have a hollow core supported with a honeycomb structure and which may be filled with material such as “mineral wool” to provide insulation. The panels on each side that make up the vertical surfaces of the door are commonly referred to in the industry as “skins”.

[0026] Metal skinned fire doors are stark in appearance and for non-industrial buildings such as residential homes, this is not welcome as they are hard to blend in to the décor.

[0027] Fire doors usually have an automatic door closer fitted to keep the door closed so that a fire cannot spread through a door that is open or even just ajar.

[0028] If a laminate that does not have a comparable fire rating of the door it is mounted on, it may catch fire. A fire in such a situation will help spread the fire instead of containing it.

[0029] The present invention recites a method of advantageously preparing and mounting suitable laminates using a suitable adhesive onto metal fire doors that allow the laminates to detach itself from the skin of the door when the temperature rises.

[0030] Thus, the three factors of choice of adhesive, choice of laminate and method of preparing the laminate are important.

[0031] The adhesive must first be strong enough to bond the laminate to the metal skin of the door at the usual ambient temperature range.

[0032] Secondly, the adhesive must lose its bonding qualities sufficiently when the temperature rises above normal to allow the laminate to peel off. This detachment of the laminate should occur well before the temperature rises to the point where the laminate catches fire.

[0033] The third requirement of the adhesive is that it must not have a flashpoint or temperature at which itself will ignite after it has fully cured.

[0034] An adhesive meeting these requirements will also be suitable for bonding laminates to metal skins of fire doors.

[0035] One suitable adhesive that meets these requirements at this time is the Fastbond 30-NF contact adhesive from the 3M Company. This adhesive has an additional advantage in that it is non-flammable even in the wet state. Other adhesives meeting the criteria listed above may also be used.

[0036] For the laminate, it too must meet certain requirements. A suitable laminate must have sufficient weight so that, as the bonding strength of the adhesive decreases with increasing temperature, the weight of the

laminate, aided by gravity, will contribute to its speedy detachment from the skin of the door.

[0037] One way to obtain sufficient weight for the laminate is to use a laminate of sufficient sheet thickness and density. Detachment of the laminate should also occur before the laminate catches fire. When the laminate detaches from the skins of a fire door, the fire rating of that door will be maintained.

[0038] A suitable laminate is the Formica brand of high-pressure laminate of between 0.5 to 1.5 mm in thickness. This is a laminate of melamine resins over kraft paper impregnated with phenolic resins and bonded under pressure and high temperature.

[0039] Any other suitable laminates meeting the requirements described above may also be used and is within the scope and spirit of the present invention.

[0040] With the use of suitable adhesives and laminates, a laminate mounted according to the present invention can be expected to fall cleanly from a smooth, vertically-place fire door skin during a fire so as not to compromise the protection offered by the fire door.

[0041] However, most fire doors have at least an automatic door closer **1.14** and may have additional ironmongery fittings such as handles **1.16**, knobs and locksets **1.18**, vision panels **1.20**, viewers **1.22** and edge caps **3.10**. These fittings may impede or prevent the clean detachment of the laminate from the door.

[0042] It can be seen that a handle **1.16** with two points of attachments to the door will trap or catch a section of the laminate between these points of attachment so that the laminate will not detach clear of the door skin.

[0043] The present invention provides a method of preparing the laminate to be mounted such that it will detach cleanly from the fire door in a fire in spite of any mounted fittings.

[0044] One aspect of the method is to pre-score lines **2.10** with a suitable cutting tool such as a knife, on the laminates in such a way that the

laminate will tear along these lines of weakness as it detaches from the door during a fire.

[0045] For a fitting such as a handle mounted onto the door at two points, a score line on the laminate joining these two mounting points will be cut to prevent the detaching laminate from being trapped by the door handle during a fire.

[0046] Such score lines may be plain lines or may have a "V" profile. These score lines 3.10 may be seen in the detailed diagram of a fire door in FIG. 3 where a piece of laminate 3.12 is mounted on a fire door 3.14. These pre-scored lines should not decrease the expected lifespan or durability of the laminate as the laminate is backed by the adhesive and the metal skin of the fire door.

[0047] While the score lines should preferentially be cut on the underside of the laminate for aesthetic reasons, scoring a fine line on the top surface of the laminate may also work, especially if the cut is very fine and a decorative pattern on the laminate camouflages and obscures the score lines.

[0048] Another aspect of the method is to cut holes 2.12 of suitable size and shapes in the laminate so that any fittings, when mounted on the door, is mounted directed onto the skin of the door and not over any part of the laminate. This will prevent the fittings from catching and preventing the laminate from detaching cleanly from skin of door.

[0049] Again, suitable score lines may be made to allow the laminate to detach around from these fittings.

[0050] Yet another aspect of the present invention is to address the capping of the edges of metal fire doors with regards to mounted laminates. In FIG. 4 of the present invention, the metal edge caps are carefully sized such that the edge 4.10 of the laminate itself is not clamped by the cap 4.12 but merely covered by the edge cap. This will allow the laminate to detach cleanly from the door 4.14 in the event of a fire.

[0051] Should it be difficult to fabricate precisely sized edge caps for this application such that there is likelihood that the edge of the laminate may

be caught by the cap, score lines again may be made around the perimeter of the door to allow detachment of the laminate.

[0052] It will be appreciated by anyone of ordinary skill in the art that the method taught regarding the use of an appropriate adhesive and preparation of laminates to metal fire door skins, particularly, the pre-scoring of lines of weakness in the laminate, is inventive.

[0053] The invention is non-obvious as witnessed by the absence of any attempt to enhance the appearance of metal fire doors with laminates in the building, construction and interior decorating industries.

[0054] It will be appreciated that although one preferred embodiment has been described in detail, various modifications and improvements can be made by a person skilled in the art without departing from the scope of the present invention.

[0055] An example of such a variation is that the present invention may also be similarly applied to panels of metal and other materials that are used to retard the spread fire in a burning building in order to enhance the appearance of these panels but not compromise their fire protective ratings.

CLAIMS

What is claimed is:

1. A method of mounting at least one sheet of laminate to metal fire doors, said method comprising:
 - using an adhesive that loses bonding qualities and releases laminate during a fire;
 - scoring at least one line on said laminate;
 - cutting holes in said laminate for mounting of fittings to said doors;
 - and
 - capping edges of said doors such that said laminate is covered by said capping to thereby allow said laminate to detach during a fire.
2. The method according to Claim 1, said method comprising selecting a non-flammable adhesive.
3. The method according to Claim 1, wherein said scoring allows said laminate to tear preferentially around said fittings.
4. The method according to Claim 1, wherein said cutting comprises cutting said holes such that said fittings do not clamp or catch said laminate.
5. A fire door comprising:
 - a metal or composite fire door,
 - at least one sheet of mounted laminate,
 - fittings and
 - edge capping,said laminate detachable during a fire.

6. The fire door of Claim 6, further comprising an adhesive for mounting said laminate, said adhesive able to lose its bonding qualities and release said laminate during a fire, thereby allowing said laminate to detach during said fire.
7. The fire door of Claim 6, wherein said laminate further comprising at least one pre-scored line to allow said laminate to tear preferentially around said fittings and said edge capping and thereby to detach during said fire.
8. The fire door of Claim 6, wherein said laminate further comprising at least one hole for said fittings such that said fittings do not clamp onto said laminate, thereby allowing said laminate to detach during said fire.
9. The fire door of Claim 6, wherein said fittings comprise knobs, handles, lock sets, door closers, vision panels and viewers.
10. The fire door of Claim 6, wherein said end capping is mounted such that said laminate is not clamped, thereby allowing said laminate to detach during a fire.
11. A fire protective structure comprising at least one sheet of mounted laminate that detaches during a fire.
12. A fire protective structure of Claim 12, said structure comprising panels and walls.