CONVENTIONAL FIRE-RATED ONE-SIDED CONSTRUCTION

Inventor: Gary F. Miller, Palatine, IL (US)

Assignee: UNITED STATES GYPSUM COMPANY, Chicago, IL (US)

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ABSTRACT

A fire resistant membrane comprising a plurality of regularly spaced elongated parallel sheet metal framing elements, a first layer of fire rated wallboard attached directly to the framing elements with screws, a side of the framing elements opposite a side bearing the first wallboard layer being substantially free of any directly attached covering layer, a grid of elongated parallel sheet metal shafts overlying the first wallboard and secured to the studs with screws extending through the first wallboard layer, the shafts being oriented at right angles to the studs, and a second layer of fire rated wallboard overlying the shafts and being spaced from the first layer by the shafts, the second layer of wallboard being attached to the shafts with screws having a length insufficient to fully penetrate the first wallboard layer.
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BACKGROUND OF THE INVENTION

[0001] The invention relates to building structures and, in particular, to a fire resistant membrane.

PRIOR ART

[0002] Mechanical shafts, chases, and stairwells are examples of interior building areas requiring fire rated wall or ceiling membranes. Frequently, such areas have access for their construction available at only one side of the wall or membrane. Known methods and materials for constructing these restricted access membranes can be limited in their effectiveness in achieving satisfactory fire resistance.

SUMMARY OF THE INVENTION

[0003] The invention provides an effective fire rated membrane construction for walls, ceilings, mechanical shafts, chases, and like structures that can be assembled from one side of the membrane. The construction uses a novel combination of conventional sheet metal framing elements, fire rated wallboard or drywall sheets, and assembly techniques. A layer of the fire rated drywall sheets is secured to light gauge steel “C” studs or like framing elements. A second fire rated drywall layer and optional successive layers is/are separated from the preceding layers by resilient channels or like elements. The channels are oriented at right angles to the studs. The channels allow the successive drywall sheets to be secured with screws that do not penetrate the assembly and, therefore, do not directly transfer heat from one side of the membrane to the other. The air space between layers advantageously retards heat transfer from one layer to another thereby adding to the fire rating capacity of the membrane.

[0004] The inventive construction is scalable in the sense that additional protection can be obtained by adding layers of fire rated wallboard with or without intervening channels.

[0005] The terms wallboard and drywall are used interchangeably in the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. 1 is a fragmentary perspective view of a one-sided fire rated wall membrane constructed in accordance with the invention;

[0007] FIG. 2 is a fragmentary plan view of the wall of FIG. 1;

[0008] FIG. 3 is a fragmentary side elevational view of the wall of FIG. 1;

[0009] FIG. 4 is a fragmentary perspective view of a resilient channel used in the construction of the wall of FIG. 1; and

[0010] FIGS. 5A, 5B, and 5C represent optional alternative bracing arrangements for a wall embodying the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0011] A membrane or wall such as shown at 10 in the FIGS., is a “one sided construction” meaning that it is assembled by a person or persons standing or otherwise situated on only one side of the membrane. Such one sided construction can be necessitated by certain building areas and/or conditions that limit access to one side of the membrane. Examples of these situations are high rise elevator shafts, utility shafts, chases and reconstruction where the rating of an existing wall is unknown. The membrane or wall 10 includes sheet steel “C” studs typically made of light gauge stock and fire rated gypsum wallboard sheets 12. The studs 11 are conventional commercially available items as are the fire rated drywall sheets 12. Typically the drywall sheets are of a thickness of 3/8 in. and are available in a 4 ft. width and lengths of 8, 9, 10, 12, 14 and 16 ft. The studs 11 can be any commercially available unit typically ranging from 1½ in. to 6 in. in width and ranging in length, for example, between 8 ft. and 16 ft. Dimensions used herein can be substituted with industry metric equivalents. The term membrane, as used herein, comprehends a wall, ceiling or other like structure. Where the membrane serves as a ceiling such as in a corridor or stairwell, the studs 11 can serve as joists. The studs 11 can be used in vertical and horizontal orientations to frame a fire resistant chase or other structure.

[0012] The membrane 10 is ordinarily assembled by locating the studs 11, in conventional upper and lower U-shaped tracks (not shown) if it is to be a wall, in parallel relation on 2 ft. centers, for example. FIGS. 5A, 5B, and 5C illustrate optional conventional ways of bracing the studs 11 using a bridging member between adjacent studs 11. FIGS. 5A and 5B illustrate an elongated channel 16 fixed with screws 17 to successive studs.

[0013] The construction of FIG. 5A utilizes small clip angles 18 attached to aligned holes 19 in the webs of the studs 11. In FIG. 5B, a channel 16 is screw-attached to a flange of each stud 11. In FIG. 5C, a flat strap 22 is screw-attached to the stud flanges. A short section of track 23, known in the industry, shown in FIGS. 5B, 5C, is boxed in and screw-attached to a pair of adjacent studs 11. A similar track section 23 can be used at the ends of a wall and on, for example, 8 ft. centers. It will be appreciated that screw fasteners 17 used with the channels 16 or strap 22 and the track 23 can be driven by a person on a side of the studs 11 away from the channel or strap.

[0014] After any bracing 16 or 22 and 23 to be used is installed, the studs 11 are covered with a first layer 24 of the fire rated drywall. The layer 24 is attached to the studs 11 with conventional self-drilling drywall screws driven through the wallboard into the sides or flanges of the studs. Thereafter, elongated metal channels 26, preferably of a type called a resilient channel and illustrated in FIG. 4, are installed over the first layer 24. The channels 26 are oriented horizontally so that they are perpendicular or cross wise relative to the stud 11. The channels 26 are typically installed on 2 ft. centers. As illustrated in FIG. 4, a channel 26 has a web 27 and opposed divergent sides 28, 29. One of the sides 28 is relatively wide and, preferably, has oblong apertures 31 spaced along its full length. The longitudinal edge of the apertured side 28 distal from the web 27 has an associated flange 32 oriented in a plane parallel to the web 27. In a free state of the resilient channel 26, the shorter channel side 29 is spaced from the plane of the flange. The channels 26 are fastened to the studs...
by drywall screws 33 driven through the flanges 32 and wallboard 11 into the sides of the studs.

A second layer 34 of wallboard 12 is installed over the resilient channels. Drywall screws 36 fastening the wallboard 12 to the channels 26 are driven into the web 27 of the channel preferably at locations remote from the studs 11. The length of the screws 36 is adequate to penetrate and hold onto the channel web 27 but insufficient to fully penetrate the first wallboard layer 24.

The described membrane construction 10 affords many benefits towards a high fire rating and greater utility over prior art arrangements. Since none of the screws retaining the layers 24 and 34 penetrate the full thickness of the membrane 10, there is no direct heat conducting path from one side of the membrane to the other and which would create a hot spot to initiate a fire in a combustible. The channels 26, being fixed in cross relation to the studs 11, serve to brace the studs against buckling forces. This function allows the ends of the studs to be assembled tight against the ends of other studs or tight within runner tracks (top and bottom) without gaps for thermal expansion and thereby increase the limiting height. Ends of the studs tight fitted in runner tracks can be screw fastened together with head gauge studs can be used in load bearing walls when restricted to "Exposed to Fire on Gypsum Board Face Only" applications.

The air space, designated 39, between the wallboards 12 of the layers 24 and 34 serves as an insulator to reduce heat transfer from one board to the other. The perforations 31 in the channel side 28 allow air circulation over and through the channels 26 and reduce direct heat transfer through the channel side 28 from one wallboard to the other.

The illustrated membrane 10 can be supplemented in its fire rating. Depending on the application, another series of channels 26 can be mounted on the second layer 34 in the same manner as the illustrated channel 26 and a third fire rated wallboard can be fixed to this second series of channels 26. Again, it is important that the length of the screws be selected so as to not penetrate the full thickness of the membrane. Alternatively, for lesser requirements, a third layer of fire rated wallboard can be simply applied directly against the second layer 34. In these and other construction variants, it is important that none of the screws extend through the exposed surfaces of wallboard on both sides of the membrane.

It should be evident that this disclosure is by way of example and that various changes may be made by adding, modifying or eliminating details without departing from the fair scope of the teaching contained in this disclosure. The invention is therefore not limited to particular details of this disclosure except to the extent that the following claims are necessarily so limited.

What is claimed is:

1. A fire resistant membrane comprising a plurality of regularly spaced elongated parallel sheet metal framing elements, a first layer of fire rated wallboard attached directly to the framing elements with screws, a side of the framing elements opposite a side bearing the first wallboard layer being substantially free of any directly attached covering layer, a grid of elongated parallel sheet metal shafts overlying the first wallboard and secured to the studs with screws extending through the first wallboard layer, the shafts being oriented at right angles to the studs, and a second layer of fire rated wallboard overlying the shafts and being spaced from the first layer by the shafts, the second layer of wallboard being attached to the shafts with screws having a length insufficient to fully penetrate the first wallboard layer.

2. A fire resistant membrane as set forth in claim 1, wherein said studs are braced with elongated metal strips extending along a side of the studs opposite a side of the studs to which the first fire rated layer of wallboard is attached or through holes in webs of the studs, the bracing strips being attached to the studs with screws driven by an installer working from a side of the studs on which the wallboard is attached.

3. A fire resistant membrane as set forth in claim 1, wherein the shafts are elongated channels.

4. A fire resistant membrane as set forth in claim 3, wherein the channels have an asymmetrical cross section.

5. A fire resistant membrane as set forth in claim 4, wherein the channels each have two sides and an intermediate web, a longer one of said sides having a flange in a plane parallel to said web, the flange being attached by screws to said studs through said first fire rated layer of wallboard.

6. A fire resistant membrane as set forth in claim 5, wherein said channels are oriented with their respective flanges depending below the associated channel side.

7. A fire resistant membrane as set forth in claim 6, wherein said longer side is apertured in a regular pattern along its length.

8. A method of making a fire rated membrane including a wall or ceiling comprising aligning a plurality of sheet metal studs in a plane laterally spaced from one another, fastening a first fire rated wallboard with screws to one side of the studs while the opposite side remains substantially free of attached covering structure, fastening a plurality of elongate flat faced shafts on the layer of fire rated wallboard in laterally spaced locations parallel to one another and perpendicular to the studs, and fastening a second layer of fire rated wallboard to the shafts with screws of lengths limited to less than the distance between a face of the first layer adjacent the studs and a face of the second layer remote from the shafts.

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