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FIRE BARRIER SYSTEM FOR BUILDING PANELS

SPECIFICATION

5 CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority to U.S. Serial No. 10/701,289 filed November 4, 2003 entitled "Fire Barrier System for Building Panels"

FIELD OF THE INVENTION

10 The present invention relates generally to expansion joints for building panels and more particularly to expansion joints for building panels such as concrete floor slabs that provide the necessary flexibility for expansion and contraction and at the same time, block fire and heat flow between adjacent panels.

BACKGROUND OF THE INVENTION

15 It is generally understood that in building construction, it is necessary to provide expansion joints between abutting floor or wall panels to allow for expansion and contraction of the material under varying temperatures. In concrete construction, such joints typically comprise a strip of a relatively soft material interposed between the edges of abutting slabs of concrete when poured. Over time,
20 the joint material tends to dry out and pull away from the opposed concrete surfaces. While this effect poses little problem in concrete slabs poured on grade, it is a matter of significant concern when the slabs constitute the floors of a multilevel structure. Not only would the joint material tend to separate from the slabs over time, it could even fall out completely during periods of extreme contraction. In either event, this
25 would leave gaps between adjacent slabs that would act as chimneys in the event of a fire in the structure, thereby enabling the fire to rapidly spread to upper levels.

In one known form of expansion joint, described in U.S. Patent No. 4,756,945, a blanket of non-combustible, heat-expandable material is folded over on itself to form a barrier strip and inserted between adjacent building panels. The strip,
30 comprising inter alia, a combination of non-combustible fibrous material and heat expandable particles, is secured between the panels by backer rods pressed in on

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either side of the strip. Elastomeric sealing material is then added to cover the backer rods.

While the material described in the above-mentioned patent, manufactured and sold by Backer Rod Manufacturing, Inc. of Denver, Colorado, under the name Ultra Block, has suitable heat-resistance and expansion characteristics for building applications, the manner disclosed in the patent for securing the material between building panels is relatively complex and suffers the disadvantage that the sealing rods and elastomer used to retain the material in place are subject to drying over time and dropping out.

In another type of expansion joint, manufactured by the Watson Bowman Acme Corp. of Amherst, NY and marketed under the names Wabo Fire Flex and Wabo Flame Guard, heat-resistant material is formed into a U-shaped trough and secured between adjacent panels by sheet metal strips along the edges of each leg of the U. The material is otherwise unsupported or protected against accidental damage. A similar fire barrier is manufactured by MM Systems and sold under the name PYRO-FLEX.

SUMMARY OF THE INVENTION

The object of the present invention is to provide a fire-resistant joint for building construction that overcomes the disadvantages of prior art expedients.

In accordance with the invention, this object is achieved with a two-piece joint system comprising a strip of fire-resistant, flexible sheet material formed into a U-shaped trough or drape and an elongated mat of expandable fire-resistant mat retained within the drape. The edges of the flexible drape are bent outwardly to overlay the surfaces of the adjacent building panels and secured thereto by suitable fasteners. Little or no adhesives and no sealants are required to secure the joint in place and the impervious nature of the drape guards against the chimney effect. The savings in installation time and cost of the invention provides a further significant advantage over prior art systems.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing objects, features and advantages of the invention will become apparent from the following detailed description thereof, taken in conjunction with the appended drawings, in which:

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FIG. 1 is a pictorial representation, partially cut away, illustrating the installation of the expansion joint of the invention between adjacent building panels;

FIG. 2 is a cross-section taken along the lines 2-2 of FIG. 1;

FIGS. 3A, B and C are cross-sectional views similar to FIG. 2 showing the expansion joint as installed, under compression and when expanded, respectively; and

FIG. 4 is a cross-sectional view, similar to FIG. 2, showing a modification of the expansion joint of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, FIGS. 1 and 2 illustrate the novel expansion joint of the invention as installed between adjacent building panels of a structure. In this example, the building panels are shown as adjacent horizontal concrete slabs 12, 14 forming part of a floor of a structure, but it will be understood that the invention is applicable to adjacent vertical wall panels as well.

The joint structure 10 comprises a heat shield or drape 16 made of 2 mil (0.002 inch) thick impermeable stainless steel foil, formed into a longitudinally extending generally U-shaped trough, the opposite legs of which are indicated at 18 and 20. The legs 18, 20 are bent along their longitudinal edges at 90° to form flanges 18a and 20a. The drape 16 can be either metallic or woven ceramic. The drape 16 can also be woven from fire retardant fabric and should be flexible. When installed between slabs 12 and 14, the flanges overlay the upper surfaces of the adjacent slabs and bolts or other fasteners 22 secure the drape to the slabs. These fasteners may also serve to secure rails of a raised floor system installed over the slabs.

Between legs 18 and 20 of the U-shaped drape 16 is inserted an elongated mat 24 of expandable fire resistant material, such as the Ultra Block discussed above. The material is compressible at nominal (room) temperatures and is partially compressed when inserted between the legs 18, 20 of the drape, as shown in FIG. 3A. This permits the mat to be compressed when the adjacent slabs 12, 14 expand at elevated temperatures, as shown in FIG 3B, and to expand at cooler temperatures, as seen in FIG. 3C, without separating from the inner surfaces of legs 18, 20. No sealants or other inserts are required to maintain the joint structure between the slabs. The material is inherently resilient and, when installed under

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compression, will successfully cycle plus or minus 50% or more of the nominal joint width. This compression feature also serves to hold the legs 18, 20 tight against the concrete slabs 12 and 14, which in effect prevents hot gases from breaching the system.

5 As seen in the drawings, a space is left between the bottom of mat 24 and the curved bottom of drape 16. This allows the drape to flex without impediment during expansion and contraction of the joint. A small amount of adhesive may be applied to secure the mat to the drape after the mat is inserted.

10 The stainless steel foil drape 16 is impermeable to gases and thus forms an impenetrable fire and smoke barrier between the adjacent slabs. This prevents the occurrence of the so-called chimney effect, which would otherwise enable heat and fire to rise up through the floor and enter the space above the slabs. This increases the fire rating and safety of the structure and aids in compliance with Underwriters Laboratory standards.

15 It will be seen that the expansion joint of the invention is readily adaptable to different slab thicknesses and separation, because of the flexibility of the foil drape and the compressibility of the mat material. Moreover, the joint is assembled and installed on site, with minimal off-site preparation required.

20 Where the nominal separation between slabs is greater than 3 inches, it may be desirable to supplement the stiffness and fire resistance of the drape. This may be accomplished, as illustrated in FIG. 4, by adding a liner 28 to the inside surface of the drape. Liner 28 may be made of a flexible insulating material inserted within the drape 16 before insertion of mat 24. Liner 28 may be made of ceramic fiber blanket, for example, or other flexible insulation materials, and may be thicker
25 along the bottom of drape 16 than between the legs 18, 20 and mat 24, as shown in FIG. 4.

Although the invention has been described above as applied to horizontal concrete slabs in a building structure, it will be apparent that it has equal utility between vertical wall panels of a building, whether such panels are concrete
30 slabs or wallboard-covered framing.

Moreover, while the heat and fire resistance characteristics of the inventions have been discussed above, it will be realized that the enhanced flexibility of the inventive expansion joint enables it to retain its integrity when the adjacent

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panels are moved as a result of seismic activity, as well. This is yet another advantage of the invention not found in prior art devices.

Although the invention has been described above in connection with its preferred embodiments, it will be appreciated that other embodiments and variations
5 of the invention will occur to those skilled in the art. Accordingly, it is understood that the scope of the invention is to be limited only as set forth in the appended claims.

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I CLAIM:

1. A fire-barrier expansion joint for insertion between adjacent building panels comprising:
a strip of flexible heat-resistant impermeable sheet material shaped to
5 form an elongated trough with a generally U-shaped cross-section, and
an elongated mat of expandable fire-resistant material disposed within
said trough.
2. The expansion joint of claim 1 wherein the upper edge of each side of
said trough is bent outwardly at approximately a right angle to said side.
- 10 3. The expansion joint of claim 1 wherein said sheet material is stainless
steel foil.
4. The expansion joint of claim 3 further comprising a layer of insulating
material lining said trough.
5. The expansion joint of claim 1 wherein said mat comprises a
15 combination of non-combustible fibrous material and heat expandable particles.
6. The expansion joint of claim 1 wherein said mat disposed within said
trough is under compression.
7. The expansion joint of claim 6 wherein said mat under compression
seals said trough to said adjacent building panels.
- 20 8. The expansion joint of claim 6 wherein said mat under compression
holds said expansion joint against said adjacent building panels.
9. The expansion joint of claim 6 wherein said mat under compression
locks said expansion joint to said adjacent building panels.
10. The expansion joint of claim 1 wherein said mat disposed within said
25 trough is configured to remain under compression.
11. The expansion joint of claim 1 wherein said mat disposed within said
trough is configured to remain under compression when the distance between the

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adjacent building panels varies up to 50% from the distance between the adjacent building panels when said mat was inserted within said trough.

12. A method for inserting a fire-barrier expansion joint between adjacent building panels comprising:

5 (a) inserting between said adjacent building panels a strip of flexible heat-resistant impermeable sheet material shaped to form an elongated trough with a generally U-shaped cross-section, and

(b) inserting an elongated mat of expandable fire-resistant material within said trough.

10 13. The method of claim 12, further comprising inserting under compression said elongated mat of expandable fire-resistant material within said trough.

14. The method of claim 13, further comprising inserting under sufficient compression said elongated mat of expandable fire resistant material within said
15 trough so that said mat remains under compression when the distance between the adjacent building panels varies up to 50% from the distance between the adjacent building panels when said mat was inserted within said trough.

15. The method of claim 13, further comprising inserting under sufficient compression said elongated mat of expandable fire resistant material within said
20 trough so that said mat remains under compression when the distance between the adjacent building panels varies up to 50% from the distance between the adjacent building panels when said mat was inserted within said trough and said trough remains sealed to said adjacent building panels.

16. The method of claim 13, further comprising inserting under sufficient
25 compression said elongated mat of expandable fire resistant material within said trough so that said mat remains under compression when the distance between the adjacent building panels varies up to 50% from the distance between the adjacent building panels when said mat was inserted within said trough and said mat under compression holds said expansion joint against said adjacent building panels.

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17. The method of claim 13, further comprising inserting under sufficient compression said elongated mat of expandable fire resistant material within said trough so that said mat remains under compression when the distance between the adjacent building panels varies up to 50% from the distance between the adjacent building panels when said mat was inserted within said trough and said mat under compression locks said expansion joint to said adjacent building panels.
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