An insulation panel for a poured concrete wall and a method of constructing an insulated concrete wall provide a pre-finished concrete wall structure that is ready for drywall installation and/or direct mounting of heavy objects such as cabinets or the like. The insulation panel includes a rigid structural substrate sheet, an insulation sheet secured to the rigid substrate sheet in substantially overlapping relationship, and a plurality of anchor members projecting from the insulation sheet, the anchor members being configured to be securely anchored in a poured concrete wall.
FIG. 3
COMPOSITE BOARD FOR INSULATED CONCRETE WALLS

FIELD OF THE INVENTION

This invention relates to building construction materials and methods, and more particularly to a composite board useful for insulating poured concrete walls.

BACKGROUND OF THE INVENTION

To reduce energy consumption for heating purposes, especially in those areas that typically experience prolonged cold weather, it is common to employ insulation on basement and other exterior walls. Poured concrete walls can be formed more quickly and at a lower cost than comparable alternative wall structures, while providing excellent durability, structural integrity, and other desirable aesthetic and functional characteristics. Accordingly, it has become increasingly desirable to integrate insulation panels into a poured concrete wall during construction of the wall.

Conventional techniques of integrating insulation panels to a poured concrete wall during construction of the wall have generally involved locating and retaining insulation panels between wall forms, pouring concrete into a space defined between the wall forms, and removing the wall forms after the concrete has cured. Various systems and methods utilizing wall ties and retaining strips have been employed for holding the insulation panels in place during construction and for securing the insulation panel to or within the wall.

Insulation panels, such as plastic foam insulation panels, can be embedded within the wall, on the exterior side of the wall, or on the interior side of the wall. However, embedding the insulation panels within the concrete wall, i.e., between an interior concrete layer and an exterior concrete layer, can be difficult. Generally, a more complex retaining system is needed to hold the insulation panels in the proper position during pouring of the concrete layers of the wall, and care must be taken to balance forces on opposite sides of the insulation panels during pouring of the concrete to prevent rupturing of the insulation panels due to excessive differential hydrostatic pressure on the opposite sides of the insulation panels. A problem with positioning the insulation panels on the exterior side of the concrete wall is that termites can tunnel from a lower end of the insulation panel through to an upper end of the insulation panel unless the lower ends are capped with a material that is tough enough to resist termite penetration. It is also undesirable to expose the insulation panels on the exterior side of the concrete wall for aesthetic reasons. Accordingly, it is generally preferred to position the insulation panels on the interior side of a poured concrete wall.

Many systems and methods for securing insulation panels to the interior side of a poured concrete wall during construction of the wall require fabrication of a framework adjacent the insulation panels in order to facilitate installation of cabinets, drywall or other interior wall coverings. The remaining systems and methods for securing insulation panels to the interior side of a poured concrete wall during construction of the wall provide only a relatively limited ability to mount objects over the insulation panels. For example, U.S. Pat. No. 6,438,917 B2 discloses a poured concrete wall system incorporating elongated retaining strips constructed of wood or plastic, or any other building material which would accommodate screws, nails or other fasteners, so that the retaining strips may function as a device for attaching drywall or the like. However, the retaining strips are relatively insubstantial and are not capable of supporting relatively heavy objects, such as wall-mounted cabinets, bookcases or the like. Further, the retaining strips are relatively narrow, and are spaced apart both vertically and horizontally. As a result, great care and effort must be expended to insure that nails, screws or other fasteners are properly located to penetrate the relatively narrow retainer strips when mounting drywall or the like to the insulated wall.

Accordingly, it would be desirable to provide an insulation panel for a poured concrete wall, and a method of constructing a poured concrete wall to which the insulation panel is secured, that eliminates the need for constructing a framework to facilitate installation of drywall or the like, and which allows drywall, cabinets and the like to be easily fastened to an insulated poured concrete wall without regard to fastener position relative to the insulation panels. It would also be desirable to provide an insulation panel for a poured concrete wall, and a method of constructing an insulated poured concrete wall that utilizes a sturdier construction that allows relatively heavy objects to be fastened directly to the insulated wall without requiring construction of a framework adjacent the wall, and without regard to the position of the fasteners relative to the insulation panels.

SUMMARY OF THE INVENTION

The invention provides an insulation panel for a poured concrete wall, a method of constructing an insulated concrete wall, and the resulting insulated poured concrete wall, which overcome the above-noted problems with conventional insulation panels, and systems and methods for constructing a poured concrete wall. In particular, the invention provides a pre-finished concrete wall that is ready for drywall installation and/or direct mounting of heavy objects such as cabinets and the like. Further, the invention eliminates the need for framing, such as with lumber, prior to installation of drywall, cabinets and the like. Another important advantage is that the invention allows drywall, cabinets and the like to be mounted directly to an insulation panel without any concern relating to the position of fasteners relative to the insulation panel, i.e., fastener locations can be based on the most desirable location with respect to the drywall, cabinet or other object being mounted to the wall, substantially without regard to the features of the underlying insulation panels.

In an aspect of the invention, an insulation panel for a poured concrete wall includes a rigid structural substrate sheet having opposite sides, a sheet of insulation material having opposite sides, a first side of the sheet of insulation material secured to a first side of the substrate sheet in substantially overlapping relationship; and a plurality of anchor members projecting from a second side of the sheet of insulation material, the anchor members being configured to be securely anchored in a poured concrete wall.

In accordance with another aspect of the invention, insulated poured concrete wall is constructed by a method including steps of arranging wall forms in spaced relation-
ship to form opposing wall surfaces defining a cavity; arranging insulation panels adjacent one of the opposing wall surfaces, each of the insulation panels comprising a rigid structural substrate sheet having opposite sides, a sheet of insulation material having opposite sides, a first side of the sheet of insulation material secured to a first side of the substrate sheet in substantially overlapping relationship, and a plurality of anchor members projecting from a second side of the sheet of insulation material, the anchor members being configured to be secured anchored in a poured concrete wall, pouring concrete into the cavity, whereby each of the projecting anchor members is surrounded by the poured concrete; and allowing the concrete to cure, whereby the projecting anchor members are embedded within the concrete.

[0010] In another aspect of the invention, an insulated poured concrete wall comprises a concrete wall layer having opposing wall surfaces; and a plurality of insulation panels arranged adjacent at least one of the opposing wall surfaces, each of the insulation panels including a rigid structural substrate sheet having opposing sides, a sheet of insulation material having opposite sides, a first side of the sheet of insulation material secured to a first side of the substrate sheet in substantially overlapping relationship, and a plurality of anchor members projecting from a second side of the sheet of insulation material, wherein the anchor members are configured so that they are securely anchored in the concrete wall layer.

[0011] These and other features, advantages and objects of the present invention will be further understood and appreciated by those skilled in the art by reference to the following specification, claims and appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. 1 is a perspective view of an insulated concrete wall system in accordance with the methods and features of the invention.

[0013] FIG. 2 is a perspective view of an insulation panel for a poured concrete wall in accordance with the invention.

[0014] FIG. 3 is a transverse cross-sectional view of an insulated poured concrete wall in accordance with the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0015] In FIG. 1, there is shown a perspective view of a portion of a poured wall forming system 10. The system includes a plurality of wall forms 12 which are arranged to form two series of coplanar wall forms held in opposing spaced-apart, parallel relationship. Spaced apart wall forms 12 are held in a coplanar relationship by connecting pins 14, and the two series of coplanar wall forms are held in opposing spaced-apart parallel relationship by wall ties 16. Wall forms 12 may be constructed of wood, aluminum, iron, steel, or various other materials or combinations thereof.

[0016] Forms 12 are typically from about 2 to 6 feet wide and from about 2 to about 10 feet high. Connecting pins 14 are well known in the art. Insulating panels 18 are positioned adjacent the interior surfaces of at least one of the series of wall forms 12. Grooves 20 are formed in opposing vertical edges of insulating panel 18. A long edge 28 of a T-shaped retaining strip 22 is received in groove 20. Insulating panels 18 are held in place at their edges between laterally spaced-apart retaining strips 22. As shown in FIG. 2, rather than extending between vertically spaced-apart ties 16, retaining strip 22 may extend the full height of the poured wall, typically 8 or 9 feet. This is achieved by providing a series of vertically spaced-apart notches 24 through which ties 16 pass. Thus, in the illustrated poured concrete wall construction system, retaining strips 22 extend uninterrupted past wall tie 16. However, alternative retaining strip configurations may be used. For example, several short retaining strips may be used instead of a single retaining strip having notches. As another alternative, flat retaining strips may be used rather than the illustrated T-shaped retaining strips.

[0017] Retaining strips 22 are temporarily held in place by engagement of notches 24 with notches in edges of wall tie 16 until the concrete has been poured and cured. This reduces the number of retaining strips needed, thus simplifying installation and reducing construction costs.

[0018] The illustrated forms and retainers used for holding insulation panel 18 immediately adjacent form 12 merely represent a means for defining a cavity for a poured concrete wall and for retaining insulation panels at the desired position within the cavity. However, alternative forms or means for defining the cavity and for retaining the insulation panels in a desired position within the cavity may be employed without departing from the principles of the invention.

[0019] Shown in FIG. 2 is a perspective view of insulation panel 18, illustrating details thereof. Insulation panel 18 includes a rigid structural substrate sheet 30 having opposite sides. A sheet 31 of insulation material is secured to a first side of substrate sheet 30 in substantially overlapping relationship. A plurality of anchor members 38 project from a side or surface of the sheet of insulation material that is opposite of the side of the insulation material that is secured to substrate sheet 30. Each of the anchor members is configured to be securely anchored in a poured concrete wall. More specifically, as shown in greater detail in FIG. 3, the portion of the anchor member 38 which projects away from the surface of the sheet 31 of insulation material includes an enlarged head portion 46 and an elongated anchor portion 44 located between the head portion 46 and the surface of insulation sheet 30. This allows concrete to get behind surfaces of head portion 46 that face toward insulation sheet 30, thereby securely anchoring member 38 in the concrete, and in turn securely holding panel 18 against concrete wall layer 40.

[0020] As shown in FIG. 3, insulation sheet 31 may be provided with recesses 35, whereby the portion of anchor member 38 projecting from a surface of insulation sheet 31 need not extend beyond the overall thickness of insulation panel 18. This feature has the advantage of allowing insulation panels 18 to be stacked directly on top of each other during shipment and storage, whereby less space is needed for shipment and storage, and the need for spacers between stacked sheets is eliminated. Further, the risk of damage to anchor member 38, and the risk of damaging an adjacent panel surface by contacting the panel surface with head portion 46 of anchor member 38, are significantly reduced or eliminated by confining the projecting portion of anchor member 38 within recess 38 defined in the surface of insulation sheet 31.
Rigid structural substrate sheet 30 should be sufficiently rigid to facilitate receipt of a fastener, such as a nail or screw, and transfer a load, such as drywall, cabinets or the like, from the fastener to anchor member 38 without any significant distortion. Examples of suitable rigid structural substrate sheets include relatively rigid construction materials such as sheets made of lumber, plywood, pressboard, strand board, oriented strand board, wood laminates, particle board, fiberboard, and the like. A suitable thickness for rigid structural substrate sheet 30 is about \( \frac{3}{16} \) inch to about \( \frac{1}{2} \) inch, although thicker or thinner substrate sheets may be used.

Insulation sheet 31 may be generally any sheet material commonly employed for thermal insulation purposes. Suitable insulation materials include various expanded or foam plastic materials, such as expanded polystyrene and expanded polyurethane. The thickness of insulation sheet 31 will depend on the desired insulation value for panel 18, the insulation value of substrate 30, and the particular material selected for insulation sheet 31. However, suitable thicknesses for expanded polystyrene or expanded polyurethane insulation sheets 31 are about \( \frac{1}{4} \) inches to about \( \frac{3}{4} \) inches, with a typical value being about 2 inches.

Anchor member 38 may be made of any material suitable for firmly securing insulation panel 18 to concrete wall layer 40. Examples of suitable materials include metals such as steel, and plastics such as fiber-reinforced or particle-reinforced nylon. As shown in FIG. 3, anchor member 38 extends through both substrate sheet 30 and insulation sheet 31. This facilitates assembly of insulation panels 18. Loads may be transferred through substrate sheet to anchor member 38 and through anchor member 38 to concrete wall layer 40. In addition to having an enlarged head portion 46 and/or reduced diameter neck portion 44, which present surfaces having a component that faces the surface of insulation sheet 31 whereby anchor member 38 may be securely anchored in concrete wall layer 40, anchor member 38 also includes an enlarged or flared foot portion 42 having surfaces with a component that faces toward concrete wall layer 40.

Anchor member 38 may be secured to insulation panel 18 by a compression fit, interference fit, or other frictional engagement of surfaces of anchor member 38 with substrate sheet 30. Alternatively, or in addition, anchor member 38 may be at least partially threaded, and/or adhesives may be employed.

Rigid structural substrate sheet 30 may be secured to insulation sheet 31 using a variety of commercially available or otherwise known adhesive formulations.

The above description is considered that of the preferred embodiments only. Modifications of the invention will occur to those skilled in the art and to those who make or use the invention. Therefore, it is understood that the embodiments shown in the drawings and described above are merely for illustrative purposes and not intended to limit the scope of the invention, which is defined by the following claims as interpreted according to the principles of patent law, including the doctrine of equivalents.

The invention claimed is:

1. An insulation panel for a poured concrete wall, comprising:
   a rigid structural substrate sheet having opposite sides;
   a sheet of insulation material having opposite sides, a first side of the sheet of insulation material secured to a first side of the substrate sheet in substantially overlapping relationship; and
   a plurality of anchor members projecting from a second side of the insulation material, each anchor member being configured to be securely anchored in a poured concrete wall.
2. The insulation panel of claim 1, wherein the sheet of insulation material has grooves in its opposite vertical edges for receipt of a retainer.
3. The insulation panel of claim 1, wherein the rigid structural substrate sheet comprises lumber, plywood, pressboard, strand board, wood laminate, particle board, or fiberboard.
4. The insulation panel of claim 1, wherein the rigid structural substrate has a thickness for about \( \frac{3}{16} \) inch to about \( \frac{1}{2} \) inch.
5. The insulation panel of claim 1, wherein the sheet of insulation material comprises an expanded plastic material.
6. The insulation panel of claim 1, wherein the sheet of insulation material comprises expanded polystyrene or expanded polyurethane.
7. The insulation panel of claim 1, wherein the thickness of the sheet of insulation material is from about 1\( \frac{1}{2} \) inches to about 2\( \frac{1}{2} \) inches.
8. The insulation panel of claim 1, wherein each anchor member is position within a recess defined in the surface of the sheet of insulation material.
9. The insulation panel of claim 1, wherein the anchor member is configured so that it has an enlarged head portion, a tapered neck portion, or both an enlarged head portion and a tapered neck portion.
10. A method of constructing an insulated poured concrete wall comprising:
   arranging wall forms in spaced relationship to form opposing wall surfaces defining a cavity;
   arranging insulation panels adjacent at least one of the opposing wall surfaces, each of the insulation panels comprising a rigid structural substrate sheet having opposite sides, a sheet of insulation material having opposite sides, a first side of the sheet of insulation material secured to a first side of the substrate sheet in substantially overlapping relationship, and a plurality of anchor members projecting from a second side of the sheet of insulation material, the anchor members being configured to be securely anchored in a poured concrete wall;
   pouring concrete into the cavity, whereby each of the projecting anchor members is surrounded by the poured concrete; and
   allowing the concrete to cure, whereby the projecting anchor members are embedding within the concrete.
11. The method of claim 10, wherein the sheet of insulation material has grooves in its opposite vertical edges for receipt of a retainer.
12. The method of claim 10, wherein the rigid structural substrate sheet comprises lumber, plywood, pressboard, strand board, wood laminate, particle board, or fiberboard.

13. The method of claim 10, wherein the rigid structural substrate has a thickness for about ¾ inch to about ½ inch.

14. The method of claim 10, wherein the sheet of insulation material comprises an expanded plastic material.

15. The method of claim 10, wherein the sheet of insulation material comprises expanded polystyrene or expanded polyurethane.

16. The method of claim 10, wherein the thickness of the sheet of insulation material is from about 1½ inches to about 2½ inches.

17. The method of claim 10, wherein each anchor member is position within a recess defined in the surface of the sheet of insulation material.

18. The method of claim 10, wherein the anchor member is configured so that it has an enlarged head portion, a tapered neck portion, or both an enlarged head portion and a tapered neck portion.

19. An insulated poured concrete wall, comprising:

- a concrete wall layer having opposing wall surfaces; and
- a plurality of insulation panels arranged adjacent at least one of the opposing wall surfaces, each of the insulation panels including a rigid structural substrate sheet having opposite sides, a sheet of insulation material having opposite sides, a first side of the sheet of insulation material secured to a first side of the substrate sheet in substantially overlapping relationship, and a plurality of anchor members projecting from a second side of the sheet of insulation material, wherein the anchor members are configured so that they are securely anchored in the concrete wall layer.

20. The wall of claim 19, wherein the sheet of insulation material has grooves in its opposite vertical edges for receipt of a retainer.

21. The wall of claim 19, wherein the rigid structural substrate sheet comprises lumber, plywood, pressboard, strand board, wood laminate, particle board, or fiberboard.

22. The wall of claim 19, wherein the rigid structural substrate has a thickness for about ¾ inch to about ½ inch.

23. The wall of claim 19, wherein the sheet of insulation material comprises an expanded plastic material.

24. The wall of claim 19, wherein the sheet of insulation material comprises expanded polystyrene or expanded polyurethane.

25. The wall of claim 19, wherein the thickness of the sheet of insulation material is from about 1½ inches to about 2½ inches.

26. The wall of claim 19, wherein each anchor member is position within a recess defined in the surface of the sheet of insulation material.

27. The wall of claim 19, wherein the anchor member is configured so that it has an enlarged head portion, a tapered neck portion, or both an enlarged head portion and a tapered neck portion.

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