SYSTEMS AND METHODS FOR BUILDING CONSTRUCTION

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ABSTRACT

Systems and methods for building construction that utilize frame members (e.g., studs) having attachment portions to which construction panels can be secured. In one embodiment, a stud designed to support vertical wall panels consists of a pair of metal C-channel studs that are oriented back-to-back with a stiffener plate between them. The stiffener plate extends outward from the stud so that it can be used to secure the wall panels against the stud. The stiffener plate has slots through it that allow biscuits to be placed through the stiffener plate and into the edges of the wall panels that abut the stiffener plate. The biscuits hold the edges of the wall panels in alignment with each other, and, because the biscuits extend through the slots in the stiffener plate, the wall panels are held against the stud, thereby stiffening the wall formed by the panels.
"I" Stud Assembly

Fig. 3

Dimensions per design specifications.

Panel stiffener plate.

Slots for panel jointer discs. 322.

Size and position spacing per design specifications.

Spot welds per specifications.

Component parts separated for clarity.
SYSTEMS AND METHODS FOR BUILDING CONSTRUCTION

RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Patent Application 60/730,604, entitled “Systems And Methods For Building Construction” by Robert Olvera and George Stevenson, filed Oct. 27, 2005, which is incorporated by reference as if set forth herein in its entirety.

BACKGROUND

Field of the Invention

This disclosure relates generally to building construction and more particularly to systems and methods for constructing buildings using a frame structure that facilitates installation of wall panels to form the building enclosure.

SUMMARY OF THE INVENTION

This disclosure is directed to systems and methods that are used in the construction of residential, commercial or other types of buildings. One embodiment of the invention comprises a system in which a prefabricated construction panels are attached to a frame assembly to form a building. In this embodiment, a metal frame is constructed from prefabricated components, such as wall base tracks, “I” stud assemblies, and top beam assemblies. Building panels are then attached to the frame to form walls and complete the building enclosure.

One embodiment comprises a component for a use in a building system. The frame member is a substantially rigid, elongated member such as a stud. The frame member has an attachment portion extending outward so that construction panels can be secured to it. In a particular embodiment, the stud is designed to be used in a frame system to support vertical wall panels. The stud consists of a pair of metal C-channel studs that are oriented back-to-back with a stiffener plate between them. The stiffener plate extends outward from the stud so that it can be used to secure the wall panels against the stud. More specifically, the stiffener plate has slots through it that allow biscuits to be placed through the stiffener plate and into the edges of the wall panels that abut the stiffener plate. The biscuits hold the edges of the wall panels in alignment with each other and, because the biscuits extend through the slots in the stiffener plate, the wall panels are held against the stud, thereby stiffening the wall formed by the panels.

An alternative embodiment comprises a building system that incorporates frame members having an attachment portion such as that described above. The building system includes a frame consisting of a base track, a top beam, and one or more studs. The studs are vertically oriented with their lower ends connected to the base track and their upper ends connected to the top beam. The building system also includes a set of construction panels that are secured to the frame. Each construction panel has slots in its edges to accept biscuits which maintain alignment of the panel edges. The attachment portion of each stud has slots through which the biscuits are inserted so that the construction panels are held against the studs. Channels may be provided in the base track and/or top beam to receive the construction panels. The channel in the base track may include supports configured to elevate the construction panels above the bottom of the base track. The top beam may include tabs for attachment of trusses or other support members to the top beam.

Numerous other alternative embodiments are also possible.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and advantages of the invention may become apparent upon reading the following detailed description and upon reference to the accompanying drawings.

FIG. 1 is a set of illustrations showing the general structure of the assembled frame and panels in accordance with one embodiment.

FIG. 2 is a set of more detailed views of a wall base track in accordance with one embodiment.

FIG. 3 is a set of more detailed views of an “I” stud assembly in accordance with one embodiment.

FIG. 4 is a diagram illustrating the manner in which the wall panels, stiffener plate and biscuits fit together in accordance with one embodiment.

FIG. 5 is a set of more detailed views of a top beam in accordance with one embodiment.

While the subject matter of the present disclosure is subject to various modifications and alternative forms, specific embodiments thereof are shown by way of example in the drawings and the accompanying detailed description. It should be understood, however, that the drawings and detailed description are not intended to limit the subject matter to the particular embodiment which is described. This disclosure is intended to cover many modifications, equivalents and alternatives.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

One or more embodiments of the system are described below. It should be noted that these and any other embodiments described below are exemplary and are intended to be illustrative rather than limiting.

The present disclosure describes various systems and methods that are used in the construction of buildings. The buildings may be residential, commercial or other types of buildings.

The features described herein are part of an overall system in which a prefabricated construction panels are assembled to form a wall. In one embodiment, a frame is first constructed, and then the building panels are assembled to complete the building enclosure. The features described in this disclosure relate to the mechanisms employed in the frame to facilitate assembly of the panels or provide improvements in the resulting structure.

Referring to FIG. 1, a set of illustrations showing the general structure of the assembled frame and panels in accordance with one embodiment are provided. FIG. 1A shows the frame structure without the panels, and FIG. 1B shows the structure with the panels.
Referring to FIG. 1A, the frame consists generally of a wall base track 110, a series of "I" stud assemblies 120, and a top beam assembly 130. Base track 110 is described in detail below in connection with FIG. 2, while "I" studs 120 are described in detail in connection with FIG. 3, and top beam 130 is described in detail in connection with FIG. 5.

Wall base track 110 is normally fastened to the foundation of the building or, in the case of multi-floor construction, to the structure of the floor below. "I" studs 120 are positioned in a space in the center of wall base track 110 and are fastened to the track. Top beam assembly 130 is then positioned on top of the "I" studs and is fastened to the "I" studs to complete the frame. After the frame is assembled, wall panels 140 can be attached to the frame to form the walls of the building as shown in FIG. 1B.

Referring to FIG. 2, more detailed views of wall base track 110 are shown. At the top of the figure is a top view of the track, at the bottom is a side view, and at the left side of the figure is an end view of the track. Wall base track 110 has a pair of tracks or u-shaped channels 210. The bottom of each construction panel 140 fits into one of these tracks. In this embodiment, the panels in one of the tracks form an interior wall, while the panels in the other track form an exterior wall. Once a panel is properly positioned (i.e., at the correct location with its bottom edge in the track), the panel may be securely fastened to the track (e.g., by inserting a screw through the track and into the panel).

In the embodiment of FIG. 2, tracks 210 are each spot welded to a bottom plate 220. Each of tracks 210 in this embodiment has a one side that extends higher than the other. The tracks therefore have more of a "J" shape than a "U" shape. The higher side of the track is positioned toward the center of base track assembly 110 (toward the other track 210). This facilitates positioning of the panel in the track, as the panel can be lifted to clear the shorter, outer side of the track, without clearing the higher, inner side of the track.

It can be seen in FIG. 2 that each of tracks 210 includes multipurpose panel supports 230. Panel supports 230 are positioned inside tracks 210 so that, when a panel is placed in one of the tracks, the lower edge of the panel will rest on the panel supports instead of the bottom of the track. In other words, the panel supports lift the panel off the bottom of the track.

Keeping the panel above the bottom of the track serves several purposes. For instance, elevating the panel above the bottom of the track eliminates the need to provide waterproofing where the panel would otherwise come into contact with the foundation. This waterproofing would be necessary to prevent water damage to the panels if they were simply sitting on the bottom of the track. Additionally, by elevating the panel, a gap is provided between the panel and the bottom of the track so that the track can be bolted to the foundation on which it is installed. Since it is preferable to secure the track at its outer edge, providing the gap between the panel and the bottom of the track allows the bolt and the corresponding nut to be positioned in the gap under the panel and to thereby secure the edge of the track.

It can also be seen in FIG. 2 that tracks 210 are positioned on bottom plate 220 so that there is a space between the tracks. In this embodiment, the spacing is sufficient to allow the "I" stud to be placed between the tracks. In particular, the spacing is just large enough for the "I" studs, and when the panels are installed, the "I" studs contact the back sides of the panels.

Referring to FIG. 3, more detailed views of "I" stud assembly 120 are shown. At the top of the figure is a side view of the track, at the bottom is a front view, and at the left side of the figure is a top view of the track. The side and front views of the "I" stud are rotated 90 degrees from the installed, vertical position.

It can be seen from the front and top views in FIG. 3 that the "I" stud consists of three main components: two conventional C-channel studs (310 and 311); and a stiffener plate 320. These three components are spot welded together as illustrated in the side view of the figure. Each of C-channel studs 310 and 311 serves to provide vertical support for the top of the frame structure in the same manner as conventional studs. Obviously, however, the two C-channel studs provide additional support in comparison to a single C-channel stud.

Stiffener plate 320 is used between C-channel studs 310 and 311 to provide additional stiffness to the assembled wall panels. The additional stiffness is provided by configuring stiffener plate 320 so that a portion 321 of the plate extends forward from between C-channel studs 310 and 311, as can be seen in the side view of the "I" stud. Portion 321 of the stiffener plate extends forward by an amount that is just less than the thickness of the wall panels with which it is used. It can also be seen in the figure that portion 321 of the stiffener plate does not extend the full length of the "I" stud, as the ends of the "I" stud must fit between the tracks of wall base track assembly 110 and within the top track of top beam 130.

This portion of stiffener plate 320 that extends outward from the C-channel studs has several slots 322 that are sized to accommodate disks or "biscuits." Each of wall panels 140 has slots in its sides to accommodate these biscuits. The biscuits are used to maintain alignment of adjoining ones of the wall panels in essentially the same way wood biscuits are used in the joining of boards to form larger wooden panels. In the case of wall panels 140, the biscuits extend from a slot in the edge of one panel, through one of the slots 322 in the stiffener plate, and into a slot in the edge of an adjacent panel.

The manner in which the wall panels, stiffener plate and biscuit fit together is shown in FIG. 4. In this figure, biscuit 410 is fully inserted into a slot in panel 440. Biscuit 410 fits within a slot (indicated by the dotted lines) in stiffener plate 420. Biscuit 410 is shown partially inserted into the slot in the edge of panel 441. In the absence of stiffener plate 420, biscuit 410 would keep panels 440 and 441 in alignment with each other, but the panels would both be allowed to flex away from the C-channel studs of the frame. Stiffener plate 420 ties wall panels 440 and 441 to the "I" stud so that they cannot flex away from the "I" stud.

Referring to FIG. 5, more detailed views of top beam 130 are shown. At the top of the figure is a top view of the beam, at the bottom is a side view, and at the left side of the figure is an end view of the beam.

Referring to the end view, it can be seen that the body 510 of the beam consists of sheet metal that is formed
into a deep U-channel. A set of indentations 540 are made in the sides of beam body 510 in order to strengthen the beam. A top plate 520 is spot welded to the top of the beam (the open end of the U-channel.) A wall top track 530 is spot welded to the bottom of the beam.

[0032] Wall top track 530 is configured to fit over the tops of the “I” studs, as well as the tops of the installed wall panels. Top plate 520 includes several tabs 550 that extend upward from the beam. Tabs 550 may be formed, for example, by cutting three sides of each tab from the top plate and then bending the tabs upward, leaving corresponding holes in top plate 520. Tabs 550 are used to attach support members such as trusses to the top of the beam. These trusses may be roof trusses if the frame is for the uppermost floor of the building (or a single-story building,) or they may be floor trusses if additional floors will be built above the frame structure.

[0033] The components of the building system described above can be installed in various ways. Typically, at least a portion of the frame (wall base track, “I” studs and top beam) are assembled, and then the wall panels are installed in/on the frame. In one embodiment, the base track is installed, and then the “I” studs and wall panels are installed sequentially. In other words, a first “I” stud is installed, and an adjoining wall panel is installed with one or more biscuits extending from a groove in the edge of the panel through corresponding slots in the stiffener plate of the “I” stud. Then, another “I” stud is installed at the opposite edge of the installed wall panel. Biscuits are placed through the slots in the stiffener plate of the second “I” stud and into grooves in the edge of the installed wall panel. Then a second wall panel is installed so that the biscuits are positioned in grooves in the edge of the panel. This process is repeated for additional wall panels and “I” studs.

[0034] Because it may be necessary in the sequential installation of alternating “I” studs and wall panels to plumb each additional panel, it may be more efficient to install a more complete frame before installing the wall panels. In one embodiment, a portion of the frame for an entire wall may be assembled and then raised and made plumb. Partial frames for the adjoining walls may be assembled and joined together to form the frame for a room, or even an entire building. Having ensured that these wall frames are square and plumb, no additional labor is necessary for this purpose. The panels can simply be installed in/on the frame, knowing that the walls will be square and plumb.

[0035] In this second method of assembly, the initial wall frame may include only a portion of the studs that will ultimately be needed. After the initial frame is up, additional studs (e.g., “I” studs) can be installed, along with the adjoining wall panels, as described above. Alternatively, the initial frame may include incomplete studs (i.e., studs that do not yet have a stiffener plate.) In this case, the stiffener plate for a stud may be attached to the stud after the wall is erected, and the wall panels can be attached to the studs, stiffener plates and each other essentially as described above. There may, of course, be other ways in which the components of the present building system may be installed.

[0036] As noted above, the foregoing disclosure describes only exemplary embodiments of the systems and corresponding methods. There may be many alternative embodiments that are within the scope of this disclosure, such as the use of a base wall track that includes only a single U/J-channel track or has a different configuration than shown above, the use of a top beam that has no tabs or no strengthening indentations or has other configurations than shown above, the use of a stud that has only a single C-channel stud with the stiffener plate or has a different configuration, or other similar variations on the above system.

What is claimed is:

1. A component for a use in a building system comprising:
   a substantially rigid frame member which is elongated in a first direction; and
   an attachment portion extending outward from the frame member in a second direction which is substantially perpendicular to the first direction, wherein the attachment portion is configured to have one or more construction panels secured thereto.
2. The building system component of claim 1, wherein the frame member is configured to be vertically oriented and to support a horizontally oriented beam.
3. The building system component of claim 1, wherein the frame member comprises at least one metal stud.
4. The building system component of claim 3, wherein the metal stud comprises at least one C-channel stud.
5. The building system component of claim 4, wherein the metal stud comprises two metal C-channel studs that are secured together to form an I-stud.
6. The building system component of claim 5, wherein the attachment portion comprises a stiffener plate secured between the two C-channel studs.
7. The building system component of claim 6, wherein the stiffener plate includes one or more slots therethrough, wherein each slot is configured to enable a biscuit to be positioned in the slot and to extend on each side of the stiffener plate into cavities in the construction panels.
8. The building system component of claim 7, further comprising a base track and a top beam, wherein the frame member is vertically oriented with a lower end connected to the base track and an upper end connected to the top beam, wherein the frame member is vertically supported by the base track, and wherein the frame member supports the top beam.
9. The building system component of claim 8, further comprising the construction panels and the biscuits, wherein the biscuits extend through the slots and into the construction panels to hold the construction panels in alignment with the stiffener plate.
10. A building system comprising:
   a frame including
   a base track;
   a top beam; and
   one or more studs;

   wherein each of the studs is vertically oriented with a lower end connected to the base track and an upper end connected to the top beam and wherein each of the studs includes an attachment portion which
extends outward from the stud and is configured to have one or more construction panels secured thereto.

11. The building system of claim 10, further comprising the one or more construction panels, wherein the construction panels are secured to the studs.

12. The building system of claim 11, wherein the attachment portion of each stud includes one or more slots configured to accommodate biscuits therethrough and wherein the construction panels have recesses in the edges of the construction panels to accommodate the biscuits.

13. The building system of claim 10, wherein each stud comprises at least one C-channel stud.

14. The building system of claim 13, wherein the metal stud comprises two metal C-channel studs that are secured together to form an I-stud.

15. The building system of claim 14, wherein the attachment portion comprises a stiffener plate secured between the two C-channel studs.

16. The building system of claim 10, wherein the base track comprises one or more channels configured to accommodate lower ends of the construction panels therein.

17. The building system of claim 16, wherein each channel includes one or more construction panel supports configured to elevate construction panels placed in the channel above a bottom portion of the base track.

18. The building system of claim 10, wherein the top beam is configured to accommodate upper ends of the construction panels.

19. The building system of claim 18, wherein the top beam comprises one or more tabs configured to enable attachment of support members to the top beam.

20. The building system of claim 19, wherein the support members comprise roof trusses.

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