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(54) Titre : METHODE DE CONSTRUCTION DE BATIMENT
(54) Title: METHOD OF BUILDING CONSTRUCTION

(57) Abrégé/Abstract:
A method of construction. A first step involves stabilizing prefabricated load bearing walls for an underlying vertical level of a multi-story building. The walls have opposed surfaces and a top peripheral edge. A second step involves securing floor joists for an overlying vertical level to at least one of the opposed surfaces of the walls of one of the underlying vertical level. A third step involves installing prefabricated load bearing walls for the overlying vertical level along the top peripheral edge of the underlying vertical level. The walls have opposed surfaces and a top peripheral edge. The steps set forth above are repeated until a desired number of vertical levels are installed.

ABSTRACT OF THE DISCLOSURE

A method of construction. A first step involves stabilizing prefabricated load bearing walls for an underlying vertical level of a multi-story building. The walls have opposed surfaces and a top peripheral edge. A second step involves securing floor joists for an overlying vertical level to at least one of the opposed surfaces of the walls of one of the underlying vertical level. A third step involves installing prefabricated load bearing walls for the overlying vertical level along the top peripheral edge of the underlying vertical level. The walls have opposed surfaces and a top peripheral edge. The steps set forth above are repeated until a desired number of vertical levels are installed.

TITLE:

Method of building construction

FIELD

The present invention relates to a method of building construction, which makes it easier to incorporate prefabricated components into the building.

BACKGROUND

A building can be constructed more rapidly, if some portions of the building, such as load bearing walls, can be constructed off site and then incorporated on site into the building. However, problems have been experienced in incorporating such prefabricated components into the building with current building methods.

SUMMARY

Accordingly, there is provided a method of construction. A first step involves stabilizing prefabricated load bearing walls for an underlying vertical level of a multi-story building. The walls have opposed surfaces and a top peripheral edge. A second step involves securing floor joists for an overlying vertical level to at least one of the opposed surfaces of the walls of one of the underlying vertical level. A third step involves installing prefabricated load bearing walls for the overlying vertical level along the top peripheral edge of the underlying vertical level. The walls have opposed surfaces and a top peripheral edge. The steps set forth above are repeated until a desired number of vertical levels are installed.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features of the invention will become more apparent from the following description in which reference is made to the appended drawings, the drawings are for the purpose of illustration only and are not intended to in any way limit the scope of the invention to the particular embodiment or embodiments shown, wherein:

FIG. 1 is a detailed side elevation view, in section, of load bearing wall and floor joist detail in accordance with the present method of construction, using joist supports with upper attachment flanges.

FIG. 2 is a detailed side elevation view, in section, of load bearing wall and floor joist detail in accordance with the present method of construction, using a joist support with an upper attachment hook.

FIG. 3 is a detailed side elevation view, in section, of load bearing wall and floor joist detail in accordance with the present method of construction, using C channel joist supports.

FIG. 4 is a detailed side elevation view, in section, of load bearing wall and floor joist detail in accordance with the present method of construction, using a combination of a joist support with an upper attachment flange and a C channel joist support.

FIG. 5 is a detailed side elevation view, in section, of load bearing wall and floor joist detail in accordance with the present method of construction, using a combination of a joist support with an upper attachment hook and a C channel joist support.

FIG. 6 is a perspective view of a joist support with an upper attachment flange.

FIG. 7 is a perspective view of a joist support with an upper attachment hook.

FIG. 8 is a perspective view of a C channel joist support.

FIG. 9 is a side elevation view of a modular bathroom unit and exterior load-bearing wall.

FIG. 10 is a detailed side elevation view, in section, of load bearing wall and floor joist detail of **FIG. 9.**

FIG. 11 is a detailed side elevation view, in section, of an exterior load bearing wall.

DETAILED DESCRIPTION

A method of construction will now be described with reference to **FIG. 1** through **11**.

Load Bearing Wall Installation

This method was developed for use in a light gauge steel construction project of twelve stories. In that project all exterior and interior bearing walls were prefabricated off site and then incorporated into the building. In that project all bathrooms were delivered to the site as prefabricated bathroom modules. There will now be provided an explanation as to how the prefabricated bearing walls were incorporated into the building and an explanation as to how the bathroom modules were similarly incorporated into the building.

Referring to **FIG. 1**, an underlying wall 20 is stabilized as part of a multi-story

building. Underlying wall 20 is a prefabricated load bearing wall, underlying wall 20 having opposed surfaces 22 and 24, and a top peripheral edge 26. Underlying wall 20 is part of an underlying vertical level 28 in the multi-story building. In order to complete underlying vertical level 28, numerous underlying walls 20 may be needed. A floor joist 30 is secured to opposed surface 22 of underlying vertical level 28. The purpose of floor joist 30 is to support an overlying vertical level 32. Overlying vertical level 32 is defined by a floor 34. Numerous floor joists 30 may be necessary to support floor 34 adequately. Floor 34 may consist of a concrete topping on metal docking. An overlying wall 36 is then installed along top peripheral edge 26. Underlying and overlying walls 20 and 36, respectively may contain studs 37 and bracing 39. Studs 37 give multi-story building more structural support. Bracing 39 provides a suitable surface for securing floor joists 30 to. Overlying wall 36 is a prefabricated load bearing wall, overlying wall 36 having opposed surfaces 38 and 40, and a top peripheral edge 41. Overlying wall 36 and floor 34 make up overlying vertical level 32. The process of stabilizing underlying walls 20, securing floor joists 30, and installing overlying walls 36 is repeated until a desired number of vertical levels are installed to complete the multi-story building. As each overlying vertical level 32 is secured on top of underlying vertical level 28, overlying vertical level 32 becomes the next underlying vertical level 28, and the process is repeated. This construction method may be used to quickly and efficiently put up the structure of a multi-story building using prefabricated load bearing walls.

Floor joist 30 may be suspended from top peripheral edge 26 of underlying wall 20. This may be accomplished by using a joist support 42 that extends along all or a portion of underlying wall 20. Because joist support 42 extends along underlying wall 20, it may not be necessary to have floor joist 30 align with the studs in underlying wall 20. Joist support 42 has an upper attachment 44, a lower attachment 46, and a connecting web 48. Connecting web 48 extends between upper attachment 44 and lower attachment 46. There may be holes (not shown) on joist support 42, holes being used to secure joist support 42 to various materials using conventional methods. Upper attachment 44 engages top peripheral edge 26 of underlying wall 20 and lower attachment 46 engages floor joist 30. In this manner, floor joist 30 is secured to opposed surface 22 of underlying vertical level 28.

Referring to **FIG. 1,** upper attachment 44 of joist support 42 consists of a flange 49. This embodiment of joist support 42 is shown in greater detail in **FIG. 6**. The dimensions of upper attachment 44, lower attachment 46 and connecting web 48 may differ depending on the dimensions of both floor joist 30 and top peripheral edge 26. Referring back to **FIG. 1,** floor joist 30 is secured to joist support 42. This figure shows a side elevation view of adjacent interior rooms 50 and 52 in a multi-story building. Opposed surfaces 38 and 40 face interior rooms 50 and 52, respectively. Interior room 52 contains a floor 54, floor 54 having the same characteristics as floor 34. Floor 54 is also part of overlying vertical level 32. Supporting floor 54 is a floor joist 56 and a joist support 58. Floor joist 56 and joist support 58 share the same basic elements described above for floor joist 30 and joist support 42, respectively. Floor joist 56 may have a different depth than floor joist 30 as shown in **FIG. 1**. In the embodiment shown in **FIG. 1,** screws 60 are used to secure floor joists 30 and 56 to joist supports 42 and 58, respectively. Screws 60 secure floor joist 30 and joist support 42 to opposed surface 22 of underlying wall 20 through holes (not shown) in connecting web 48. Floor joist 30 is also secured to joist support 42 at lower attachment 46 using screws 60. In addition, upper attachment 44 is secured to top peripheral edge 26 directly using screws 60. Floor joist 56 and joist support 58 are secured in an identical fashion as described above for floor joist 30 and joist support 42. In the embodiment shown in **FIG. 1**, joist supports 42 and 56 are secured over top of each other to top peripheral edge 26 using screws 60.

Another embodiment of a joist support 62 is shown in **FIG. 7**. Joist support 62 shares all the same elements as joist support 42 and is intended to extend along all or part of an underlying wall, with the addition of a hook 64 connected to upper attachment 44. This embodiment of joist support 62 is used in **FIG. 2**. **FIG. 2** details a side elevation view of underlying and overlying vertical levels 28 and 32, respectively. In this figure, opposed surfaces 24 and 40 face an exterior 66 of the building, while opposed surfaces 22 and 38 face an interior room 68. Floor joist 30 is secured to joist support 62 as described above in the previous embodiment for joist support 42. Joist support 62 is secured to underlying wall 20 as described above for the previous embodiment, with the addition that hook 64 is secured to opposed surface 24 of underlying wall 20. By securing hook 64 to opposed surface 24, joist support 62 is given extra stability.

A further embodiment of a joist support 70 is shown in **FIG. 8**. Joist support 70 has an upper attachment 72, a lower attachment 74, a connecting web 75, and is designed to extend along all or part of a wall. Upper attachment 72 consists of a C channel support 76 as shown. C channel support 76 defines a joist-receiving cavity 78. Referring to **FIG. 3**, C channel support 76 is secured to opposed surface 24 of underlying wall 20. In this figure, opposed surfaces 24 and 40 face an interior room 80 of the building, while opposed surfaces 22 and 38 face an exterior 82. Joist receiving cavity 78 is used to secure floor joist 30 to opposed surface 24 of underlying wall 20 of underlying vertical level 28. Floor joist 30 is secured to joist support 70 using screws 60. Floor joist 30 and joist support 70 are also secured to opposed surface 24 through connecting web 75 using screws 60.

FIG. 4 details an embodiment of a method of construction using joist supports 42 and 70 in combination. Opposed surfaces 22 and 38 of underlying and overlying walls 20 and 36, respectively, face a corridor 84 of the building. Opposed surfaces 24 and 40 of underlying and overlying walls 20 and 36, respectively, face an interior 86 of the building. Opposed surface 22 of underlying wall 20 has secured to it C channel support 76 of joist support 70. Opposed surface 24 of underlying wall 20 has secured to it joist support 42 with flange 49. Joist support 42 is also secured to top peripheral edge 26. C channel support 76 and joist support 42 support floor joists 88 and 90, respectively. Floor joists 88 and 90 support floors 92 and 94, respectively. Floor joist 88 and 90 may be of different sizes, as shown in **FIG. 4**, in order to properly support different sizes of floors 92 and 94.

FIG. 5 details an embodiment of a method for construction using joist supports 62 and 70 in combination. In this embodiment, there are two underlying walls 96 and 98, and two overlying walls 100 and 102. Underlying wall 96 has opposed surfaces 104 and 106, and a top peripheral edge 108. Underlying wall 98 has opposed surfaces 110 and 112, and a top peripheral edge 114. Overlying wall 100 has opposed surfaces 116 and 118, while overlying wall 102 has opposed surfaces 120 and 122. Underlying walls 96 and 98 are part of underlying vertical level 28, and overlying walls 100 and 102 are part of overlying vertical level 32. Underlying walls 96 and 98 are secured under overlying walls 100 and 102, respectively. Opposed surfaces 104 and 116 of underlying and overlying walls 96 and 100, respectively, face an interior room 124 of the building. Opposed surfaces 112 and 122 of

underlying and overlying walls 98 and 102, respectively, face an interior room 126 of the building. Opposed surface 104 of underlying wall 96 has joist support 70 secured to it. Opposed surface 112 of underlying wall 98 has secured to it joist support 62 with hook 64. Joist support 62 is also secured to top peripheral edge 114, and hook 64 is secured to opposed surface 110. C channel support 76 and joist support 62 support a floor joist 127 and 128, respectively. Floor joists 127 and 128 support floors 130 and 132, respectively. Floor joists 127 and 128 may be of different sizes, as shown in **FIG. 5**, in order to properly support different sizes of floors 130 and 132. The configuration shown in **FIG. 5** is called a "party room" configuration. By using double the number of walls, effective soundproofing is achieved between interior rooms 124 and 126. Underlying walls 96 and 98 and overlying walls 100 and 102, may contain studs 134 and bracing 136. Opposed surfaces 106 and 110 of underlying walls 96 and 98, respectively, face each other. Opposed surfaces 118 and 120 of overlying walls 100 and 102, respectively, face each other. Top peripheral edge 108 is secured to top peripheral edge 114 using a centre support 133. Centre support 133 is secured to top peripheral edges 108 and 114 using screws 60.

Referring to **FIG. 11**, exterior cladding panels 200 may be attached to walls 20 and 36 on an exterior face of the building to provide protection from the external environment. Exterior cladding panel 200 is mounted on exterior grade drywall sheathing 202 such as by using an adhesive as is common with EIFS panels. Drywall 202 is in turn mounted on opposed surfaces 24 and 40. Drywall 202 may have an air vapour seal 203 applied to its surface. Cladding panel 200 may be, for example, 3" insulation that includes sloped metal through-wall flashing 204 installed along the base of cladding panel 200. Cladding panel 200 is installed by applying a bead of sealant 206 along the top edge of a lower panel 200. Liquid applied envelope seal 208 is also applied along the top of the exterior drywall 202 on the lower panel 200 to seal the joint between the drywall 200. Envelope seal is also applied along vertical joints between panels as well. Envelope seal 208 acts as an initial air barrier and a back-up water seal. A low expansion spray foam/air and vapour barrier type insulation 210 is applied to the horizontal and vertical joints to seal the joints and provide insulation at the joint locations. Caulking dams (not shown) should also installed at the ends of the through wall flashing to prevent moisture from flowing off the ends of the flashing. The joints may then be sealed using a high quality exterior sealant 212. When properly installed,

flashing 204 should overlap with any membrane flashing and air and vapour barrier. An exterior finish 214, such as an acrylic stucco finish is then applied to the outer surface of cladding panel 200.

Modular Bathroom Installation

FIG. 9 details a method of construction using modular structures. Overlying module 138 is stacked above underlying module 140. Both overlying and underlying modules 138 and 140 are prefabricated load bearing modular structures. By stacking overlying module 138 on underlying module 140, a column 142 of modular structures is formed, column 142 having a defining wall 144. An underlying wall 146 is stabilized in spaced relation to column 142. Underlying wall 146 is a prefabricated load bearing wall, underlying wall 146 having opposed surfaces 148 and 150, and a top peripheral edge 152. Underlying wall 146 is part of an underlying vertical level 154 of a multi-story building. In order to complete underlying vertical level 154, numerous underlying walls 146 may be needed. A floor joist 30 is secured to opposed surface 150 of underlying vertical level 154. Floor joist 30 is also secured to defining wall 144. The purpose of floor joist 30 is to support an overlying vertical level 156. Floor joist 30 may be secured to both defining wall 144 and opposed surface 150 using any of the above described embodiments of joist supports 42, 62 or 70. In **FIG. 9,** floor joist 30 is secured to opposed surface 150 using joist support 42. Overlying vertical level 156 is defined by a floor 158. Numerous floor joists 30 may be necessary to support floor 158 adequately. Floor 158 may consist of a concrete topping on metal docking. An overlying wall 160 is then installed along top peripheral edge 152. Overlying wall 160 is a prefabricated load bearing wall, overlying wall 160 having opposed surfaces 162 and 164, and a top peripheral edge 165. Overlying wall 160 and floor 158 make up overlying vertical level 156. The process described above is then repeated until a desired number of vertical levels are installed to complete the multi-story building. As each overlying vertical level 156 is secured on top of underlying vertical level 154, overlying vertical level 156 becomes the next underlying vertical level 154, and the process is repeated. This construction method may be used to quickly and efficiently put up modular structures of a multi-story building using prefabricated load bearing walls. All of the embodiments of construction methods described above may be included in this embodiment.

The modules 138 and 140 of **FIG. 9** may be bathroom modules. Within overlying module 138 is positioned a module floor 166. Below module floor 166 is positioned an underlying roof 168, so that there is a plumbing space 170 between module floor 166 and underlying roof 168. Underlying roof 168 forms part of underlying vertical level 154, and is lower than floor 158. The purpose of plumbing space 170 is to make room for a drainage system 172 to be installed below overlying module 138. Drainage system 172 may be any system of drainage or plumbing devices or pipes necessary for multi-story building. Underlying roof 168 may be supported by floor joists 30 (not shown). The embodiment of a method of building construction shown in **FIG. 9** is shown in more detail in **FIG. 10.** An opposed surface 174 is positioned on the side of column 142 opposite to defining wall 144. Opposed surface 174 faces a bathroom 176, while defining wall 144 faces an interior room 177. Secured to opposed surface 174 and defining wall 144 are joist supports 178 and 180, respectively. Joist supports 178 and 180 both share the same elements as joist support 70, described above. Secured to joist supports 178 and 180 are floor joists 182 and 184, respectively. Floor joists 182 and 184 support module floor 166 and floor 158, respectively. Below module floor 166 is positioned underlying roof 168. In the embodiment shown, underlying roof 168 is secured to underlying module 140. Plumbing space 170 is positioned between underlying roof 166 and module floor 166 in order to provide room for the appropriate drainage piping and plumbing elements.

In all embodiments of the disclosed method of building construction, screws 60 are used as a securing means, although other means of securing may be used. An example of an alternate means of securing may involve securing with nails or bolts.

In this patent document, the word "comprising" is used in its non-limiting sense to mean that items following the word are included, but items not specifically mentioned are not excluded. A reference to an element by the indefinite article "a" does not exclude the possibility that more than one of the element is present, unless the context clearly requires that there be one and only one of the elements.

It will be apparent to one skilled in the art that modifications may be made to the illustrated embodiment without departing from the spirit and scope of the invention as

hereinafter defined in the Claims.

What is Claimed is:

1. A method of construction, comprising the steps of:

stabilizing prefabricated load bearing walls for an underlying vertical level of a multi-story building, the walls having opposed surfaces and a top peripheral edge;

securing a joist support to at least one of the opposed surfaces of the wall;

securing floor joists for an overlying vertical level the joist support, the floor joist being supported vertically by the joist support;

installing prefabricated load bearing walls for the overlying vertical level along the top peripheral edge of the underlying vertical level, the walls having opposed surfaces and a top peripheral edge; and

repeating the steps set forth above until a desired number of vertical levels are installed.

2. The method of Claim 1, wherein the joist support is further secured to the top peripheral edge of the wall.

3. The method of Claim 1, the joist support having an upper attachment, a lower attachment and a connecting web extending between the upper attachment and the lower attachment, the upper attachment engaging the top peripheral edge of the walls of the underlying vertical level and the lower attachment engaging a bottom edge of the floor joists.

4. The method of Claim 3, the upper attachment being a flange.

5. The method of Claim 3, the upper attachment being a hook.

6. The method of Claim 1, the joist support comprising a C channel support defining a joist receiving cavity, the C channel support being secured to one of the opposed surfaces of the walls of the underlying vertical level with the joist receiving cavity used to secure the floor joist to one of the opposed surfaces of the walls of the underlying vertical level.

7. A method of construction, comprising the steps of:

stacking a prefabricated load bearing overlying modular structure on top of a prefabricated load bearing underlying modular structure to start the formation of a column of modular structures having a defining wall;

stabilizing prefabricated load bearing walls for an underlying vertical level of a multi-story building in spaced relation to the column of modular structures, the walls having opposed surfaces and a top peripheral edge;

securing joist supports to facing surfaces of opposed defining walls;

securing floor joists for the overlying vertical level to the joist supports between the defining walls of the column of modular structure and one of the opposed surfaces of the walls of the underlying vertical level, the floor joists being supported vertically by the joist support;

installing prefabricated load bearing walls for an overlying vertical level along the top peripheral edge of the underlying vertical level, the walls having opposed surfaces and a top peripheral edge;

stacking another modular structure on the column of modular structures and repeating the steps set forth above until a desired number of vertical levels are installed.

8. The method of Claim 7, wherein the joist supports are further secured to the top peripheral edge of the walls.

9. The method of Claim 7, the joist support having an upper attachment, a lower attachment and a connecting web extending between the upper attachment and the lower attachment, the upper attachment engaging the top peripheral edge of the walls of the underlying vertical level and the lower attachment engaging a bottom edge of the floor joists to secure the floor joists.

10. The method of Claim 9, the upper attachment being a flange.

11. The method of Claim 9, the upper attachment being a hook.

12. The method of Claim 7, including a step of using a C channel support defining a joist receiving cavity, the C channel support being secured to one of the opposed surfaces of the walls of the underlying vertical level with the joist receiving cavity used to secure the floor joist to one of the opposed surfaces of the walls of the underlying vertical level.

13. The method of Claim 7, at least one of the walls being an exterior wall, and further comprising the step of attaching at least one exterior cladding panel to the exterior wall.