Title: A prefabricated wall panel and method of constructing a building therefrom

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ABSTRACT

A prefabricated building panel (10) for forming at least part of a wall of a building having a first leg (11) and a second leg (12) extending substantially at right angles from one end of the first leg (11) so that the panel (10) is of a substantially L-shaped configuration and is adapted to be abutted with a further panel (10) to define an opening (23) therebetween, the opening (23) being adapted to define a window or door opening of the building.
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COMPLETE SPECIFICATION
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Invention title: A PREFABRICATED WALL PANEL AND METHOD OF CONSTRUCTING A BUILDING THEREFROM

Details of Associated Provisional Application No: 2006900180 filed 16 January 2006

The following statement is a full description of this invention, including the best method of performing it known to me:-
A PREFABRICATED WALL PANEL AND METHOD OF CONSTRUCTING A BUILDING THEREFROM

Technical Field

The present invention relates to a prefabricated wall panel for a building and a method of constructing a building using prefabricated wall panels. The present invention further relates to a wall constructed of a plurality of prefabricated wall panels.

Background Art

Traditional brick and mortar construction methods for housing are time consuming and costly, with houses traditionally taking many months to build from start to finish with the most costly factors being the materials and labour costs particularly with brick constructions where each brick needs to be placed, one by one. Additionally, if a house is built over a number of months, shortage of materials may mean that the same materials may not be available to finish the house.

The slowness and reliance on labour is disadvantageous when housing is needed quickly, for instance rebuilding a community that has been devastated by storm, earthquake, fire or flood. In such cases, there is a need to build many properties quickly to ensure as many members of the community as possible having housing and shelter quickly after an emergency.

For example, prefabricated homes were popular after World War two, due to the shortage of building supplies and labour. In more modern times, tsunamis, floods and hurricanes have flattened communities, requiring a large number of houses to be rebuilt as quickly as possible to house populations.

Further in remote and inaccessible areas, such as farmland or rural areas, it can be expensive to have labourers and builders working on buildings, where a quicker and less expensive structure would better suit the environment.

In addition, third world areas such as slums in Brazil, South Africa and India would benefit from having a cheaper housing alternative available, such that houses could be constructed for low cost, with little skilled labour and in a short space of time to replace the abundance of shanties and lean-tos currently providing shelter. Such communities would greatly benefit from such a low cost housing alternative that would allow them to build a community quickly and cheaply greatly improving the standard of living.
While weatherboard houses are an example of lower cost housing, materials are still expensive and they must be constructed either plank by plank or panel by panel, which is still very time consuming.

**Summary Of The Invention**

The present invention is directed to a building panel and system of constructing a building therefrom, which may at least partially ameliorate or overcome the abovementioned problems or provide the consumer with a useful commercial choice.

According to a first aspect of the invention, there is provided a prefabricated building panel for forming at least part of a wall of a building, said panel having a first leg and a second leg extending substantially at right angles from one end of said first leg so that said panel is of a substantially L-shaped configuration, said panel being adapted to be abutted with a further panel to define an opening therebetween, said opening being adapted to define a window or door opening of said building.

The further panel may also comprise a similar L-shaped panel and the L-shaped panels may be oriented relative to each other such that they define all sides of the opening or may be oriented such that they define a side and top of the opening.

One L-shaped panel may oppose the other panel with the legs of the L-shaped panels being uppermost with the end faces of the legs being abutment. In this configuration, the uprights of the panels define the opposite sides of the opening and the legs defining an upper side of the opening. An opening of this configuration may comprises an opening for a door. The door for example may be a sliding door and a frame for the sliding door may be installed within the opening.

To vary the size of the opening also define the lower side of the opening, an infill panel may be installed between the opposing panel and extend between the uprights of opposing panels.

In another configuration, one panel may be inverted relative to the other panel with one leg of one L-shaped panel being uppermost and the leg of the other panel being lowermost with the end of the leg of one panel abutting the upright of the panel of the opposing panel. In this configuration, the panels define all sides of the opening. An opening of this configuration may comprises an opening for a window of any form which may be installed in conventional manner within the opening.

For formation of a door opening, one L-shaped panel may be oriented with
its leg uppermost with its end abutting an adjacent upright of a panel. In this configuration, the one L-shaped panel defines one side and the top of the door opening with the other side of the door opening defined by the upright.

Preferably adjacent panels are joinable using at least one planar member which spans the join between the panels and is attached to the respective panels on opposite sides of the join. Preferably the planar member comprises a plate which is attachable to the panels by screw bolts or other fasteners.

In an alternative manner of connection, adjacent panels are joined with a capping which locates the upper ends of the panels relative to each other. The capping suitably comprises an elongated channel member which receives the upper ends of the panels, the width of the channel of the channel member being substantially the same as the width of the panels.

According to another aspect of the invention, there is provided a wall comprising at least one pair of panels, each said panel having a first leg and a second leg extending substantially at right angels from one end of said first leg such that each said panel is of a substantially L-shaped configuration, said panels being in substantial abutment with each other to define an opening therebetween, said opening being adapted to define a window or door opening of said building.

Preferably the wall is adapted to support a structure such as a roof structure.

According to yet a further aspect of the invention, there is provided a method of constructing a building from prefabricated building panels, each said building panel having a first leg and a second leg extending substantially at right angels from one end of said first leg such that each said panel is of a substantially L-shaped configuration, said method comprising the steps of:

- laying a footing or foundation
- arranging said panels in opposing relationship to each other such that said panels define door or window openings in said building and supporting said panels on said footing or foundation;
- joining adjacent said prefabricated panels together; and
- attaching a roof structure to the building.

Preferably the method also includes the steps of forming a slab on said footing.

Preferably conduits are attachable to the panels to support electrical wiring.
Preferably, plasterboard can be attached to at least one surface of the panel.

**Brief Description Of Drawings**

In order that the invention may be more readily understood and put into practical effect, reference will now be made to the accompanying drawings in which:

- Fig. 1 illustrates a prefabricated panel according to an embodiment of the invention;
- Fig. 2 illustrates two joined prefabricated panels of the type illustrated in Fig. 1;
- Fig. 3 illustrates a wall formed from a number of joined prefabricated panels of the type illustrated in Fig. 1;
- Fig. 4 illustrates the exterior of a building incorporating a wall of the type illustrated in Fig. 3;
- Fig. 5 is a side view illustrating a pair of joined panels using one form of connection;
- Fig. 6 is an enlarged view of the region X of Fig. 5 showing details of the connection between the joined panels;
- Fig. 7 illustrates two joined prefabricated panels joined using an alternative connection arrangement;
- Fig. 8 is an end view of the joined panels of Fig. 7;
- Fig. 9 illustrates a pair of joined prefabricated panels and an associated infill panel; and
- Figs. 10, 11 and 12 illustrate alternative footings to support prefabricated panels associated with a floor slab.

**Detailed Description Of The Preferred Embodiments**

Referring to the drawings and firstly to Fig. 1, there is illustrated in isometric view, one embodiment of a prefabricated wall panel 10 according to the present invention which is of generally L-shaped configuration and which has a first leg 11 and a second leg 12 which extends substantially at right angles from one end of the first leg 11. The legs 11 and 12 are of substantially the same cross-sectional configuration and typically are formed integrally and rigid with each other. In one embodiment, the panel 10 is constructed of precast concrete and incorporates suitable reinforcing such as a reinforcing mesh to provide stiffness and strength to the panel 10. Alternatively the panel 10 may be a laminated panel and include inner and outer skins provided on
opposite sides of an infill material such as a foam plastics material. The panel 10 however may be formed of any other material and either moulded integrally for example from a lightweight concrete or other mouldable material such as that known as Hebel (RTM) or fabricated in one or more layers.

The leg 11 has a lower end face 13 and has an inner side face 14 and an outer side face 15. The leg 12 has a top face 16 and bottom face 17 and an outer end face 18. The front and rear of the legs 11 and 12 are coplanar and define in the panel 10 a front face 19 and a rear face 20. The respective faces 19 and 20 are substantially planar.

Identical panels 10 of the type illustrated in Fig. 1 are adapted to be used in pairs and oriented relative to each other to define an opening such as a door or window opening in a wall constructed of at least a pair of panels 10.

For example as shown in Fig. 2, panels 10 of the type illustrated in Fig. 1 are arranged in an upright attitude and in an opposing relationship to each other with the bottom faces 13 of the respective panels 10 seating on a foundation, which for example may be defined by a footing or which may comprise a floor slab, to support the weight of the panels 10. The end faces 18 of the panels 10 abut each other as at 22 and the panels 10 may be joined at this location such that the panels 10 are substantially coplanar. It will be seen in this configuration that the legs 11 of the panels 10 are oriented substantially vertically and the legs 12 of the panels 10 are oriented substantially horizontally and the panels 10 combine to define a rectangular opening 23 which may comprise a door or window opening, the legs 12 defining a lintel above the opening 23. The top and bottom faces 16 and 17 of the panels 10 are substantially coplanar and the coplanar top faces 16 can be used to support a roof structure or elevated floor structure.

After assembling the panels 10 as in Fig. 2, a door frame such as a door frame of a sliding door may be installed within the opening in conventional manner as shown in dotted outline. Alternatively the opening 23 may receive a fixed panel.

Fig. 3 illustrates a wall 24 constructed of a series of L-shaped panels similar to the panels described in Fig. 1 which each panel being of the same height with the wall 24 being erected on a floor slab 25 or other foundation. L-shaped panels 26 in section A of the wall 24 are arranged in the orientation of Fig. 2. In addition, a rectangular panel 27 of the same width as the panels 26 and of a length substantially the same as the distance between the opposing faces 28 of the panels 26 is located between
the faces 28 to define a reduced height opening 29 which can accept a window or transparent panel.

In the section B of Fig. 3, one panel 26' is inverted relative to the other panel 26 such that the end face 30 of the leg 31 of one panel 26 or 26' abuts the inner side face 32 of the opposing panel 26' or 26. The panels 26 and 26' thus combine to define therebetween an opening 33 for a window or the like. It will be additionally noted that one of the panels 26 is in back to back abutment with a panel 26 in the section A of the wall 24. Further the end face 34 of the inverted panel 26' seats on the floor slab or foundation 25 to support the panel 26' in an upright attitude.

In the section C of the wall 24, a further L-shaped panel 35 is oriented in a similar configuration to the adjacent panel 26 in the section B with in this case the horizontal leg 36 of the panel being of an increased width. The end of the leg 36 abuts the outer side face 37 of the adjacent panel 26 to define a door opening 38 extending upwardly from the floor slab or foundation 25.

A further L-shaped panel 35 is arranged in back to back abutting relationship with the panel 35 in the section C and abuts a further panel 35 in section E arranged in the same orientation to form a further door opening 38 in the section D.

In the section E, panels 35 and 35' are arranged in a similar orientation to the panels 26 and 26' of section B to form an opening 37 for a window or the like. The opening 37 however is substantially smaller than the opening 33 in section B as the legs 36 are of increased width compared to the legs 31 of the panels 26 and 26'.

The upper faces of the panels in the respective sections A to E are substantially coplanar for providing a support to a roof or elevated floor structure.

It will be noted that the panels 26 and 26' in the section A define the top and sides of the opening 29 with the bottom of the opening 29 being defined by the infill panel 27. In sections B and E however the opposing panels 26 and 26', and 35, and 35' define all sides of the respective openings 33 and 37. The door openings 38 in sections C and D are defined between an upright outer side of one panel and the horizontal and vertical legs of an adjacent inverted panel 35.

As shown in Fig. 4, the wall 24 typically is a side wall of a building 38 erected on the floor slab or foundation 25 with the wall 24 having a number of openings for doors and windows defined by the respective L-shaped panels supported on the slab 25 and the roof structure 39 of the building 38 supported on the upper faces of the
The L-shaped panels are typically of a height of 2400mm and width of 1200mm with the horizontal leg of 600mm width and the vertical leg of 300mm width. These dimensions however can be varied as described with reference to Fig. 3. Where the panels are constructed of precast concrete, they are suitably reinforced with vertical reinforcing bars and stirrups. Alternatively reinforcing mesh may be used as the reinforcing.

In one method of connection between the panels as shown in Figs. 5 and 6, adjacent L-shaped panels which are arranged in back to back relationship in a similar arrangement to the back to back panels 35 of Fig. 3 are joined using joining plates 41 which span abutting panels 40 and are joined thereto by screw bolts 42 driven through the plates into the panels 40. The plates 41 are of rectangular configuration and include four holes 43 for receiving the screw bolts 42. The plates 47 are positioned such that they lie flat against the corresponding faces of abutting panels 40 with one pair of holes 43 positioned over one panel 40 and the other pair of holes 43 is positioned over the other panel 40 after which the screw bolts 42 can be used for securing the plates to the panels 40 to hold them in abutment. Typically the joining plates 41 are steel plate of dimensions 300 x 120 x 5 mm however it will be appreciated that the plates 41 may be of various sizes. The joining plates 41 are also provided on opposite sides of the panels 40. At any location where the panels are in abutment, joining plates 41 may be provided to hold the panels in abutment. Further the panels may be drilled through for receipt of bolts passed through the panels and plates 41 to hold the panels together.

At the lower ends of the panels, further brackets 44 are provided to secure the panels to a floor slab or foundation.

Figs. 7 and 8 illustrate an alternative manner in which panels may be held in alignment and abutment with each other. In this case a capping 44 of U-shaped configuration is provided over the upper edges of abutting panels 40, the capping 44 locating the panels laterally and being of a width substantially the same as the width of the panels 40. The panels 40 in this embodiment define an enlarged opening therebetween which may comprise an opening for a sliding door.

It will of course be appreciated that other methods of joining adjacent panels can be used as would be understood by a person skilled in the art.

As in the embodiment of Figs. 3 and 4, and in-fill panel 46 may be provided
between opposing L-shaped panels 40 as shown in Fig. 9 to reduce the area of the opening 46 between the panels 40. Reduced size openings 46 of this type may in a building typically be used for a window opening for a bathroom or the like.

The respective L-shaped panels may be supported directly on a floor slab or other floor construction or frame in an upright position. The L-shaped panels however may be supported on footings which support a floor slab as illustrated in Figs. 10 to 12.

In Fig. 10, a concrete slab 48 is constructed on a perimeter footing 49 which is provided with an external recess 50 which can receive the lower end of the upright leg 51 of a L-shaped panel 52. The leg 51 is secured in position by means of a bracket 53 secured by fasteners 54 such as screw bolts to the panel 52 and footing 49 such that the panel 52 is flush with the end of the slab 48.

In Fig. 11, the panel 52 is secured to the footing 49 by screw bolts 54. The arrangement of Fig. 12 is similar to that of Fig. 10 except that external screw bolts 54 are used to secured the panels 52 to the footing 49.

The outer faces of the respective panels may include a fascia, or other surface finish to form the exterior wall of a building. For example the panel fascia may include acrylic paneling, sandstone finish, or rendering to provide an exterior finish to the walls of a building. The inner layer may support conduits for wiring, or water pipes such that electricity and water conduits can be supported by the panels. The inner layer may also provide an anchor such that plasterboard can be attached to the panel enclosing the reinforced layer, any conduits, insulation and spacers, to provide a flat interior wall surface.

An advantage of the present invention is it allows housing to be provided quickly to ensure to communities devastated by fire, flood or other catastrophes to ensure victims have shelter without substantial delay. Further the panels used provide a quick and inexpensive method of erecting housing. Panels can be easily constructed and many different configurations of building can be constructed using L-shaped panels of one size. The L-shaped panels whilst typically being of a height of 2400mm may be of any height and also may be of any width. The plate connection described in Figs. 5 and 6 is only one possible arrangement for connecting the panels. Many other arrangements may be used for this purpose. In some situations also it is not necessary to interconnect the panels such as in the arrangement described in Figs. 7 and 8.

The terms "comprising" or "comprises" as used throughout the specification and
claims are taken to specify the presence of the stated features, integers and components referred to but not preclude the presence or addition of one or more other feature/s, integer/s, component/s or group thereof.

Whilst the above has been given by way of illustrative embodiment of the invention, all such variations and modifications thereto as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit of the invention as described in the appended claims.
Claims

1. A prefabricated building panel for forming at least part of a wall of a building, said panel having a first leg and a second leg extending substantially at right angles from one end of said first leg so that said panel is of a substantially L-shaped configuration, said panel being adapted to be abutted with a further panel to define an opening therebetween, said opening being adapted to define a window or door opening of said building.

2. A building panel as defined in claim 1 in combination with said further panel and wherein said further panel comprises an L-shaped panel and wherein said L-shaped panels are oriented relative to each other such that they define all sides of said opening or oriented such that they define at least a side and top of the opening.

3. The combination of claim 2 wherein said L-shaped panel opposes the other said panel with the legs of the L-shaped panels being uppermost with the end faces of the legs being abutment whereby the uprights of said panels define the opposite sides of the opening and the legs defining an upper side of the opening.

4. The combination of claim 3 and including an infill panel extending between the uprights of the opposing panel to reduce the size of said opening.

5. A building panel as claimed in claim 1 in combination with said further panel and wherein said further panel comprises an L-shaped panel and wherein one said panel is inverted relative to the other panel such that said panels define all sides of said opening.

6. The combination of claim 5 wherein one leg of one L-shaped panel is uppermost and the leg of the other said panel is lowermost with the end of the leg of one panel abutting the upright of the panel of the opposing panel.

7. A building panel as defined in claim 1 in combination with said further panel, said building panel being oriented having its leg uppermost with its end abutting an adjacent upright of a panel, said L-shaped panel defining one side and the top of the
8. The combination as claimed in any one of claims 2 to 7 wherein adjacent said panels are joinable using at least one planar member which spans the join between the panels and is attached to the respective panels on opposite sides of the join.

9. The combination as claimed in any one of claims 2 to 7 wherein adjacent said panels are joined with a capping which locates the upper ends of the panels relative to each other.

10. The combination as claimed in claim 9 wherein said capping comprises an elongated channel member which receives the upper ends of the panels.

11. A wall comprising at least one pair of panels, each said panel having a first leg and a second leg extending substantially at right angles from one end of said first leg such that each said panel is of a substantially L-shaped configuration, said panels being in substantial abutment with each other to define an opening therebetween, said opening being adapted to define a window or door opening of said building.

12. A method of constructing a building from prefabricated building panels, each said building panel having a first leg and a second leg extending substantially at right angles from one end of said first leg such that each said panel is of a substantially L-shaped configuration, said method comprising the steps of:

- laying a footing or foundation
- arranging said panels in opposing relationship to each other and supporting said panels on said footing or foundation;
- joining adjacent said prefabricated panels together; and
- attaching a roof structure to the building.

13. A prefabricated building panel substantially as hereinbefore described with reference to the accompanying drawings.

14. A method of constructing a building from prefabricated building panels
substantially as hereinbefore described with reference to the accompanying drawings.

Dated this sixteenth day of January 2007

ADRIAN PAUL PENNY
PAUL BAYDEN WILLIAMS
By Our Patent Attorney

John R G Gardner