

Modular Room

This invention relates to a modular room for use in domestic and commercial buildings.

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Background

The building industry has for many years considered construction techniques to render more efficient and more economical building processes. These processes embrace the building of domestic dwellings such as houses, flats and apartments, and commercial buildings including multi storey and high rise buildings. Prefabrication has been often suggested as a means for assembling components offsite for installation on site. It is generally considered that the more work that can be done offsite the more efficient is the process resulting in building projects being completed in a shorter period of time and at reduced cost.

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It is these issues that have brought about the present invention.

Summary of the Invention

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According to one aspect of the present invention there is provided a method of forming a modular room, the modular room defining a wet area, including: prefabricating a base suitable for a wet area, including providing upstanding reinforcement members to be exposed from the base; erecting and fixing a wall frame onto a periphery of the base; locating plumbing and wiring in a wall frame cavity in the wall frame; cladding opposing sides of the wall frame; and pouring concrete into the wall cavity and embedding the exposed reinforcement members, and allowing the concrete to set.

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In accordance with another aspect of the present invention there is further provided a modular room
5 defining a wet area, comprising a prefabricated base suitable for a wet area, and a wall frame erected and fixed on top of the base through reinforcement members and positioned about a periphery of the base; plumbing and wiring located within the wall frame and embedded in
10 concrete that has been poured and set in the wall frame in between cladding on opposing sides of the wall frame.

In accordance with another aspect of the present invention there is still further provided a method of
15 forming a modular room, the modular room defining a wet area, including: prefabricating a base suitable for a wet area, including providing upstanding reinforcement members to be exposed from the base; and erecting and fixing a wall onto a periphery of the base, wherein the wall is
20 made of fibre compressed sheet wall components.

Still another aspect of the invention provides a modular room defining a wet area, comprising a prefabricated base suitable for a wet area, and a wall
25 erected and fixed on top of the base and positioned about a periphery of the base; plumbing and wiring located on an outside of the wall and an internal side of the wall is provided with cladding; wherein the wall is made of fibre compressed sheet wall components.

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Brief Description of the Figures

Embodiments of the present invention will now be
35 described by way of example only with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a modular room in

accordance with an embodiment of the invention,

Figure 2a is a perspective view of a wall frame mounted on a floor of the modular room,

Figure 2b is an enlarged view of a middle portion of Figure 2a,

Figure 3a is a side section elevation of a first embodiment of the modular room,

Figure 3b is a plan sectional view of a corner of the first embodiment of the modular room taken at section A-A of Figure 3a,

Figure 4a is a side section elevation of a second embodiment of a modular room, and

Figure 4b is a plan sectional view of a corner the second embodiment of the modular room taken at section B-B of Figure 4a.

Detailed Description of Embodiments

The modular room 10 illustrated in the accompanying drawings is an improvement of an earlier modular room by the applicant and described in published Australian innovation patent no. 2012101549 as a "Bathroom Module", the entirety of which specification including description and drawings is incorporated herein by reference.

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In the accompanying drawings, two embodiments of the modular room are illustrated, which could be defined as bathroom modules, or pods, but may also be defined as another kind of modular room, particularly a room having a wet area, such as a laundry, or mud room. The modular room is designed to be an independent structure that can be moved and placed within a larger building, such as a domestic dwelling, multi-storey dwelling, hospital, or the like.

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In the first embodiment illustration in Figures 2a to 3b, a modular room 10 is illustrated having a

prefabricated base suitable for a wet area, in the form of a floor structure 20, and a wall frame erected on the base where the wall frame comprises a concrete infill to form a concrete wall 55.

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The second embodiment of the modular room 10 is internally and externally of a similar structural appearance to the concrete filled version of the first embodiment but with the difference that the wall of the second embodiment is made of fibre compressed sheet wall components 38, and may or may not comprise a steel frame.

Both embodiments of the modular room 10 illustrated comprises a substantially rectangular structure with a front wall 11, rear wall 12 and two side walls 13 and 14. The walls 11 to 14 are supported by a floor structure 20. A ceiling 17 defined by joist 18 is located at the top of the room 10. The front wall 11 incorporates a door opening 16, which could be provided as a sliding or swinging door, and which defines an entrance 19 to the room 10.

In the first embodiment illustrated in Figures 2a to 3b, the floor structure 20 is prefabricated from lightweight fibre reinforced material such as fibre reinforced plastics or fibre reinforced concrete. One specific example of floor structure material is glass reinforced concrete (GRC). Alternatively, the floor structure base may be made of fibre compressed sheet (also referred to 'cement sheet'), which is a cellulose cement product compressed into sheet or block form.

The thickness of the floor structure varies from about 7mm to 80mm and the majority of the floor is kept as thin as possible to reduce the weight of the structure whilst at the same time providing adequate support. The floor structure 20 has a hob 21 that extends peripherally

around the exterior of the pod except at the entrance 19 in the front wall 11. The floor has a fall extending away from the entrance towards a drainage point in the floor, namely the shower drain 15. The floor 20 is manufactured in fibre reinforced concrete and is a single slab that joins the walls 11 to 14.

In the first embodiment, all the walls 11 to 14 comprise a wall frame 24 that is defined by steel framework (see Figures 2a and 2b) that includes the steel uprights 25 joined by cross members at the top 26 and bottom 27. Mid height cross members 28 and diagonal bracings may also be provided between the top and bottom cross members in the walls, but these are not illustrated in the drawings.

The base floor structure 20 in the first embodiment is prefabricated, by moulding or heat compression, to form a single base structure having predetermined falls and a hob. Reinforcement members 33 are included to be upstanding and exposed from the base. This could be done by directly moulding the reinforcement members into the base during fabrication or by moulding/setting ferrules into the base and inserting the reinforcement members into the base afterwards. The reinforcement members provided strength to the concrete wall 55.

Once the base is prefabricated the wall frame 24 is erected and fixed onto a periphery of the base 20, and with the hob 21 locating within the lower part of the wall frame structure. Fixing can be carried out by screwing the frame directly into the base, and/or by use of brackets, and with the assistance of adhesive. The reinforcement members 33 protrude upward into a wall cavity 23 between the wall framework.

At this point plumbing 43 and wiring (not shown)

services can be fitted and finished off in the wall cavity.

5 The internal and external walls of the wall frame are then clad with internal cladding 29 and external cladding 28. The cladding may be permanent or sacrificial cladding, or may be temporary cladding that is removed once the concrete wall has set. Plumbing outlets are exposed through cut outs in the internal cladding and wiring is
10 pulled through the cladding or the top of the wall frame as required.

 The plumbing, now finished aside from the fittings, can then be pressure tested to ensure there are no
15 leakages or other problems. Similarly, the wiring can also be tested.

 With the cladding in place forming formwork for the wall cavity 23, and plumbing and/or wiring in position,
20 wet concrete is poured into the wall cavity 23 and allowed to set thereby embedding the plumbing and/or wiring, as well as the reinforcement members that provide strength to the concrete wall 55.

25 Once set, the cladding can be removed to leave exposed an internal and external surface of the concrete wall 55. The internal exposed wall can usefully be finished off by tiling or covering over with panels. Providing a concrete wall as the surface on which internal
30 cladding can be applied is particularly useful where it may be desired to remove one cladding and replace it with another, for example when renovating or updating the appearance of the modular room.

35 In the first embodiment shown in the drawings the external surfaces 28 of the walls 11 to 14 are clad as are the internal surfaces of the walls 11 to 14, which are

further completed to the extent that they include fittings and fixtures.

While not illustrated in the drawings it is
5 understood that the modular room 10 when fitted as a modular bathroom pod will be finished with an internal surface, such as tiles or panels, and will include a shower enclosure, a washbasin, cabinets, a lavatory, mirrors, plumbing fixtures, lighting and any other
10 fittings commonly provided in wet area rooms.

The floor is substantially flat with a fall towards an entrance of the shower that is provided a stainless steel shower grate 37 with an outlet (not shown) below the
15 base of the module that defines the drain 15.

As illustrated in Figure 2a, the side wall 14 is designed to carry plumbing, namely a control tap and shower head. The wash basin is tap and drain (not shown)
20 are plumbed into the rear wall 12 and the lavatory (not shown) is plumbed into a part of side wall 14 that is stepped in from the shower, while the lavatory's sewerage output (not shown) is located in the base of the floor structure.

25 As shown in Figures 3a and 3b the surrounding hob 21 of the floor structure 20 is positioned outside the internal cladding 29 of the wall structure. A sealing caulk is applied at the join between the cladding 29 and
30 the floor 20 to ensure a totally water tight structure. The floor 20 has a built in fall towards the shower grate 37 which houses the shower 30.

The modular room 10 may incorporate a variety of
35 different claddings. In one embodiment an aluminium foam substrate is coated with a stone veneer to provide a stone finish. Alternatively, a substrate could be tiled or

covered in a tile veneer.

The exterior of the stepped side wall 14 provides service access for plumbing and electricity and also
5 allows the pods to be positioned in a vertical stack in a multi storey building with the plumbing and electrical conduits passing up through the floors whilst located in the service access. In a single floor environment modular rooms can be put end to end so that each service access
10 abuts the other to again provide easy access to plumbing and electrical conduits.

In the first embodiment of the modular room, two rooms can be placed abutting each other without the need
15 for a concrete partition wall in-between. This is because the concrete filled walls of the modular rooms serve as fire-rated and acoustic-rated barriers, thus eliminating the need for a concrete partition wall. Eliminating concrete partition walls between room modules provides
20 space savings and savings in material costs.

In the second embodiment of the modular room 10 as illustrated in Figures 1, 4a and 4b, the prefabricated
25 base floor structure 20 may be made from either fibre reinforced concrete or from fibre compressed sheet (cement sheet), which are both suitable for wet areas. Fabrication involves heating and compressing under pressure cement sheet particulates to form a floor structure having the
30 required dimensions and shape. The hob 21 may be formed at the time of moulding, or may be formed afterwards by either routing excess material or joining additional cement sheet components, or blocks, to the base through adhesive or fasteners such as screws. Accordingly, the
35 floor structure can be built from a combination of block cement sheet floor components 46 laminated together using adhesive 41 as illustrated in Figure 4a.

A seat 35 is routed by machining the seat into the top of hob 21 for locating a lip 36 of the cement sheet wall component 38 to thereby assist in the interconnection of the wall component 38 onto hob 21. The wall component 38 also has an outer peripheral skirt 39 that locates on the outer side of hob 21 to properly seat wall component 38 onto the hob 21 and interconnect the wall component 38 with the floor structure 20. A number of wall components 38 forming wall panels are positioned around the periphery of the floor structure to form the front wall, 11 rear wall 12 and side walls 13, 14.

Reinforcement members similar to reinforcement members 33 of the first embodiment are not shown in the Figures 4a and 4b because they are not required in the cement sheet component version of the modular room illustrated by Figures 4a and 4b. However, it is understood that a modification of that embodiment could include reinforcement members extending between cement sheet floor structure 20 and cement sheet wall components 38. In that modification, provision for reinforcement members can be provided when forming the floor structure 20 from cement sheet. Ferrules (not shown) for reinforcement members, or reinforcement members themselves, can be moulded into the base during fabrication.

The modular room 10 of the second embodiment need not have a wall frame structure, such as that made of steel, as the arrangement of panels is self-supporting and replaces any frame. However, if a frame was desired to be erected in combination with the cement sheet panel system it could frame the panels internally or externally or between the panels, or a combination of all three.

Wiring and plumbing (not shown) in the second

embodiment is provided on the outside of the module and fed through holes drilled in the cement sheet panels to take the plumbing and wiring to the fitting points on the inside of the module. Conduit for electrical wiring fed
5 through a drilled hole to inside.

Once completed the modular room having solid walls made of fibre compressed sheet can be used to clad off interior wall furnishings directly onto the fibre
10 compressed sheet walls. For example, tiles may be applied directly onto the interior side of the cement sheet walls.

The modular room 10 is fabricated off site and then delivered to an existing building where it is lowered into
15 position. The module 10 is delivered substantially complete, that is containing all the internal fittings, plumbing and electrical wiring. The top of the wall structures may support removable lifting eyes (not shown) that allow the pod to be lifted and lowered into position
20 within a building. The lifting eyes would be positioned in each corner of the pod

The pod 10 is delivered to the site and then lowered into position in the building using an adjustable frame
25 that is attached to the removable lifting eyes. The adjustable lifting frame would in turn be supported by a crane via a chain. The pod would then be moved and lowered into position.

30 The floor structure 20 is thin, stepless and lightweight. There is no requirement for predesigned allowances or stepdown on the floor on which the pod 10 is to be placed. The combination of the upstanding hob and the use of caulking between the cladding panels and the
35 floor ensures a watertight compartment with a precast fall.

It is understood that different combinations of floor structure to wall material/infill can be used. The embodiments of the modular room illustrated specifically show, firstly, a fibre reinforced concrete base joined to a wall formed of poured and set concrete, and secondly, a fibre compressed floor structure (cement sheet component) joined to a wall formed of fibre compressed components, which could be blocks or panels. However, the combinations are interchangeable such that it could be possible to provide a concrete wall on a floor structure of fibre compressed components, or to provide a wall of fibre compressed components (cement sheets) on a base of fibre reinforced concrete.

The modular room 10 described above in both embodiments has the advantage that most of the assembly is done offsite. The pod is delivered fully plumbed and wired ready for installation. It is understood that the preferred embodiment merely illustrates one form of bathroom pod and it is understood that the pod may have many other shapes and forms incorporating many other fixtures and fittings. It is further understood that a whole variety of different claddings can be used to finish the pod and the pod is not restricted to the sliding door arrangement that is shown in the preferred embodiment. Furthermore, the modular room allows for changes in internal wall furnishings without compromising the structural integrity of the modular room.

It is further understood that where appropriate windows may be placed in the wall structure provide natural light to the interior. A suitable ceiling would then be placed on the pod to finish the structure. The height of the pod would be selected to accommodate the floor height of the building in which the pod is to be installed. Once the pod has been placed in position it is then secured to the floor structure using appropriate

fasteners and attached to the plumbing and wiring to provide a fully functional bathroom.

In the claims which follow and in the preceding
5 description of the invention, except where the context
requires otherwise due to express language or necessary
implication, the word "comprise" or variations such as
"comprises" or "comprising" is used in an inclusive sense,
i.e. to specify the presence of the stated features but
10 not to preclude the presence or addition of further
features in various embodiments of the invention.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method of forming a modular room, the modular room defining a wet area, including:

5 prefabricating a base suitable for a wet area, including providing upstanding reinforcement members to be exposed from the base;

 erecting and fixing a wall frame onto a periphery of the base;

10 locating plumbing and/or wiring in a wall frame cavity in the wall frame;

 cladding opposing sides of the wall frame; and

 pouring concrete into the wall cavity and embedding the exposed reinforcement members, and allowing the
15 concrete to set.

2. The method claimed in claim 1, including using a prefabricated base comprising a fibre reinforced material.

20 3. The method claimed in claim 2, including using a prefabricated base comprising a fibre reinforced concrete.

4. The method claimed in claim 1, including using a prefabricated base comprising fibre compressed sheet.

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5. The method claimed in any one of the preceding claims, including pouring concrete over the plumbing and wiring.

30 6. The method claimed in claim 5, including pressure testing the plumbing before pouring the concrete into the wall cavity.

7. The method claimed in claim 5 or 6, including
35 testing electrical function of the electrical wiring before pouring the concrete into the wall cavity.

8. The method claimed in any one of the preceding claims, including cladding the opposing sides using wall cladding or sacrificial formwork.

5 9. The method claimed in any one of the preceding claims, including finishing an interior surface of the wall.

10 10. The method claimed in any one of the preceding claims, including prefabricating the base to include a hob.

11. A modular room defining a wet area, comprising a prefabricated base suitable for a wet area, and a wall
15 frame erected and fixed on top of the base through reinforcement members and positioned about a periphery of the base; plumbing and wiring located within the wall frame and embedded in concrete that has been poured and set in the wall frame in between cladding on opposing
20 sides of the wall frame.

12. A method of forming a modular room, the modular room defining a wet area, including:
prefabricating a base suitable for a wet area; and
25 erecting and fixing a wall onto a periphery of the base, wherein the wall is made of fibre compressed sheet wall components.

13. The method claimed in claim 12, including providing
30 upstanding reinforcement members to be exposed from the base and fixing the wall to the base through reinforcement members.

14. The method claimed in claim 12 or 13, including
35 using adhesive to fix the wall to the base.

15. The method claimed in any one of claims 12 to 14, including machining wall profiles into the wall

components.

16. The method claimed in any one of claims 12 to 15,
including prefabricating the base from fibre compressed
5 sheet.

17. The method claimed in any one of claims 12 to 16,
including prefabricating the base to include a hob.

10 18. The method claimed in any one of claims 12 to 17,
including prefabricating the hob by laminating one or more
blocks of fibre compressed sheet onto a floor of fibre
compressed sheet.

15 19. A modular room defining a wet area, comprising a
prefabricated base suitable for a wet area, and a wall
erected and fixed on top of the base and positioned about
a periphery of the base; plumbing and wiring located on an
outside of the wall and an internal side of the wall is
20 provided with cladding; wherein the wall is made of fibre
compressed sheet wall components.