PREFABRICATED BATHROOM AND METHODS FOR BUILDING AND INSTALLING THE SAME

Field of the Invention

The present invention relates to buildings, and particularly to a prefabricated bathroom and methods for building and installing the prefabricated bathroom. The prefabricated bathroom of the present invention can be widely applied in a variety of high-rise buildings.

Background of the Invention

Bathroom is an essential part of residential houses. Currently, there are two ways for constructing the bathroom. One is to use cast-in-situ concrete at construction sites and then build the bathroom one plate by one plate. This is the most conventional bathroom constructing method widely used, which, however, takes a long construction period with a high construction cost. Moreover, since the building material used may be out of standard, quality of the bathroom thus built cannot be satisfactorily ensured. The other way is to prefabricate a whole-set bathroom at factories, and then delivery it to the construction site for installation.

A prefabricated bathroom and methods for constructing and installing thereof are disclosed in CN201110064450.3 entitled “Prefabricated Bathroom and Method for Constructing and Installing the Same.” The method for constructing the prefabricated bathroom can be summarized as follows. A bottom unit and the lower portion of four wall units of the prefabricated bathroom are built by means of bottom steel moulds and vertical steel moulds. Then, concrete which meets a certain requirement thereof is poured into the inner space surrounded by the bottom steel moulds and the vertical steel moulds, and the vertical steel moulds and the hollow pipe are removed when the concrete reaches a certain strength, so that the bottom unit and the lower portion of the prefabricated bathroom are formed. The structural steel bars forming the profile of the upper half part of the wall units and the ceiling unit are abutted with the exposed

vertical steel bars extending from the top of the lower half part of the prefabricated bathroom, so that a complete frame of the four wall units and the ceiling unit are formed. An upper inner-side aluminum mould is arranged on the inner side of the frame formed by the four wall units and the ceiling unit. The lateral reinforcing steel bars and vertical reinforcing steel bars are erected on the outer edge of the upper inner-side aluminum mould, and connected to the structural steel bars respectively so as to form a reinforcement mat. An upper outer-side mould is arranged outside the frame formed by the four wall units and the ceiling unit, a second steel mould is kept vertical through an adjusting lever, and the reinforcement mat is firmly clamped between the upper inner-side aluminum mould and the upper outer-side mould.

The above method for building the prefabricated bathroom has the following disadvantages.

1) When the structural reinforced bars of the profile of the upper part of the wall units and the ceiling unit are jointed with the lower part of the prefabricated bathroom in an overlapping manner, the upper inner-side aluminum moulds need to be arranged on the inner surfaces of the frame formed by the four wall units and the ceiling unit. The inner-side aluminum moulds are installed in the structural reinforced bars of the profile of the prefabricated bathroom through manual labor. Since the space in the prefabricated bathroom is limited, it is difficult for operators to install the inner-side aluminum moulds. Moreover, since the inner-side aluminum moulds comprise a large number of components, it is difficult and time-consuming to install the inner-side aluminum moulds. Considering the inner-side aluminum moulds are installed through manual labor, the inner-side aluminum moulds are light in weight in order to facilitate the uplifting and the installation thereof. However, after the concrete is poured therein, the inner-side aluminum moulds would deform easily due to the pressure of the concrete. In this case, when the moulds are removed after the concrete sets, the wall units and ceiling unit which are made from concrete should be further polished for the flatness thereof.

2) When the upper outer-side mould is arranged outside the frame formed by the

four wall units and the ceiling unit, it is difficult for the lower part of the outer-side mould to be installed satisfactorily to form a flat surface. Hence, a seam would exist in this part of the wall units. In addition, after the outer-side mould is installed, the second steel mould should have to be kept vertical through the adjusting lever. However, it is difficult to adjust the verticality of the outer-side mould, and thus the outer-side mould often tilts to some extent.

3) According to the above method for building the prefabricated bathroom, two sets of mould, which are used for constructing the lower part of the wall units and the bottom unit of the prefabricated bathroom and for constructing the upper part of the wall units and the ceiling unit of the prefabricated bathroom respectively, are needed. The moulds comprise a large number of components, consequently, the installation and disassemble thereof are difficult. The integrality and earthquake resistance of the prefabricated bathroom are poor, and thus seams would be generated easily.

Moreover, the method for installing the prefabricated bathroom in the prior art has some defects. According to the method for installing the prefabricated bathroom in the prior art, when the cast-in-situ template is installed on the outside of the semi-prefabricated structural wall, multiple positioning adjustments are needed in order to obtain the preset thickness of the structural wall. It is difficult to perform such positioning adjustments. In addition, according to the traditional method for installing the prefabricated bathroom, when the cast-in-situ template is installed on the outside of the semi-prefabricated structural wall, the alignment and installation thereof are performed by the screw nuts pre-buried in the semi-prefabricated structural wall. In this case, the phenomena that some of the screw nuts are not mounted or some of the screw nuts are hidden would be caused easily.

Summary of the Invention

The technical problem to be solved by the present invention is to provide a prefabricated bathroom which is firm and stable and which can be built and installed conveniently, as well as methods for building and installing thereof.

In order to solve the aforesaid technical problem, the present invention provides a prefabricated bathroom, said prefabricated bathroom comprising: a bottom unit, four wall units and a ceiling unit that are connected with each other in a securing manner, each of the units being made from reinforced concrete, said wall units being provided with a door and a window, wherein at least one of said four wall units or part of at least one of said four wall units is a semi-prefabricated structural wall, and a thickness of said semi-prefabricated structural wall is less than a total thickness of a structural wall of a building; wherein said semi-prefabricated structural wall is provided with a plurality of positioning stubs on an outside surface along a normal line thereof, and a sum of a height of said positioning stubs and the thickness of said semi-prefabricated structural wall is equal to the total thickness of the structural wall of the building; and wherein a top surface of each of the plurality of positioning stubs is parallel with the outside surface of said semi-prefabricated structural wall, and each of said positioning stubs is provided with a screw bolt on its top surface for locating and installing a cast-in-situ wall template.

The ceiling unit is a semi-prefabricated structural floorslab, in which pipes and a lighting control box are pre-buried, and a thickness of said semi-prefabricated structural floorslab is less than a total thickness of a structural floorslab of the building; wherein said ceiling unit is provided with a plurality of protrusions on its upper surface vertically, and a sum of a height of said protrusions and a thickness of said semi-prefabricated structural floorslab is equal to the total thickness of the structural floorslab of the building; and wherein a top surface of each of said protrusions forms a leveling surface for in-situ casting the structural floorslab.

The positioning stubs are concrete cylindrical stubs, and each of the concrete cylindrical stubs is provided with a central through hole, through which said screw bolt passes; and wherein each screw bolt, which is fixed on said prefabricated bathroom, passes through and protrudes from a corresponding concrete cylindrical stub, and is used for installing a cast-in-situ wall template in a securing manner.

The leveling protrusions are concrete rectangular columns distributed on edges of the upper surface of said ceiling unit.

The present invention further discloses a method for building a prefabricated bathroom, comprising the following steps:

step A: building a bottom unit and four wall units of the prefabricated bathroom with a bottom steel mould and vertical steel moulds; and

step B: installing a prefabricated ceiling on tops of the four wall units, and pouring concrete to form a ceiling unit, so that a closed prefabricated bathroom is built.

The step A further comprises:

step A1: building an outer profile of said bottom unit and outer profiles of said four wall units with an outer bottom steel mould and outer vertical steel moulds;

step A2: fastening horizontal reinforced bars and vertical reinforced bars and fixing them on inner surfaces of said outer bottom steel mould and said outer vertical steel moulds respectively, so as to form structural reinforced bars of a profile of said four wall units and said bottom unit;

step A3: installing a window frame on the structural reinforced bars of a wall unit;

step A4: installing inner vertical steel moulds and an inner bottom steel mould on inner surfaces of the profile of said four wall units and said bottom unit, adjusting flange braces so that said inner vertical steel moulds are kept in vertical direction and said structural reinforced bars are clamped between said inner vertical steel moulds and said outer vertical steel moulds firmly, and installing a top fixing frame to fix tops of said inner vertical steel moulds and said outer vertical steel moulds; and

step A5: pouring concrete into an inner space surrounded by said outer bottom steel mould, said inner bottom steel mould, said outer vertical steel moulds, and said inner vertical steel moulds, and removing said top fixing frame, outer vertical steel moulds, adjustable flange braces, inner vertical steel moulds, and inner bottom steel mould when the concrete reaches a certain strength, so as to form four wall units and the bottom unit of the prefabricated bathroom.

The step B further comprises:

step B1: placing an inner top steel mould on tops of said wall units, supporting said inner top steel mould with temporary support steel frames, and placing a prefabricated roof on the inner top steel mould;

step B2: connecting said prefabricated roof with said wall units in a securing manner through exposed reinforced bars on tops of said wall units, and placing an outer top steel mould on said prefabricated roof;

step B3: pouring concrete into the outer top steel mould which is placed on said prefabricated roof; and

step B4: removing said outer top steel mould, inner top steel mould, and temporary support steel frames when the concrete reaches a certain strength, so as to form said ceiling unit and thus obtain a complete prefabricated bathroom.

The said step B1 further comprises:

sub step B11: laying a reinforced bar network on a steel mould frame;

sub step B12: pre-burying a lighting control box and pipes in said reinforced bar network;

sub step B13: pouring concrete into said steel mould frame; and

sub step B14: removing said steel mould frame when the concrete reaches a certain strength, so that said prefabricated roof is built.

The present disclosure further discloses a method for installing a prefabricated bathroom, comprising the following steps:

step D: defining a floor to be installed with the prefabricated bathroom, laying a layer of cement slurry on a location of the floor to be installed with the prefabricated bathroom, hoisting said prefabricated bathroom with a hoister, so that the prefabricated bathroom is placed on said cement slurry and fitted with said cement slurry closely;

step E: connecting at least one wall unit or part of one wall unit of said prefabricated bathroom with a wall unit of an adjacent floor;

step F: building scaffold for supporting crossgirders on the floor where said prefabricated bathroom is placed;

step G: installing a cast-in-situ floor template on an upper surface of the ceiling unit of said prefabricated bathroom and said crossgirders, and constructing an

integrated reinforced bars of structural floorslab of a building in said cast-in-situ floor template; and

step H: pouring concrete into said cast-in-situ floor template, and removing said cast-in-situ floor template when the concrete reaches a certain strength, so that a complete structural floorslab of the building is formed.

The step E further comprises:

step E1: erecting vertical reinforced bars on an outside surface of a semi-prefabricated structural wall of said prefabricated bathroom, so that the vertical reinforced bars and horizontal reinforced bars on the outside surface of said semi-prefabricated structural wall form a structural reinforced bars of an outside wall of the building; and

step E2: installing a cast-in-situ wall template in a securing manner with screw bolts which are fixed into said prefabricated bathroom and which pass through and protrude from the concrete cylindrical stubs, pouring concrete into said cast-in-situ wall template, and removing said cast-in-situ wall template when the concrete reaches a certain strength, so that a complete structural wall of the building is formed.

Compared with the prior art, the prefabricated bathroom of the present invention has the following beneficial technical effects.

The semi-prefabricated structural wall of the prefabricated bathroom is provided with concrete cylindrical stubs on an outside surface thereof, and a sum of a height of the concrete cylindrical stubs and the thickness of the semi-prefabricated structural wall is equal to the total thickness of the structural wall of the building. Therefore, when the prefabricated bathroom is installed at a construction site, it is not necessary to measure the distance between the cast-in-situ wall template and the semi-prefabricated structural wall so as to ensure the total thickness of the structural wall of the building. Instead, the cast-in-situ wall template can be placed to abut against the top surface of the concrete cylindrical stubs and then fixed by the screw bolts which pass through the concrete cylindrical stubs. According to the method in the prior art, when the cast-in-situ wall template is fixed on the outside surface of the semi-

prefabricated structural wall, the semi-prefabricated structural wall and the cast-in-situ wall template need to be perforated correspondingly to form through holes therein, through which the screw bolts pass so that the semi-prefabricated structural wall and the cast-in-situ wall template can be connected firmly. The procedure of perforating the semi-prefabricated structural wall and the cast-in-situ wall template in corresponding positions is complicated and time consuming. In addition, the screw bolts would be destroyed or deformed if the installation method is not proper, and consequently, the whole assembly thereof would be adversely affected. According to the present invention, the cast-in-situ wall template is connected firmly through the screw bolts which pass through the concrete cylindrical stubs. In this manner, the procedure of perforating the semi-prefabricated structural wall and the cast-in-situ wall template in corresponding positions can be saved, so that the construction time can be saved and the construction efficiency can be improved. Moreover, the concrete cylindrical stubs are designed in a manner such that the screw bolts provided therein are visible. In this case, the phenomena that parts of the screw bolts are not mounted or parts of the screw bolts are hidden can be avoided. The screw bolts, which pass through the concrete cylindrical stubs, cannot be destroyed easily. The cast-in-situ wall template can be placed and installed easily through the screw bolts, and the installation procedure thereof become more convenient and easier.

The ceiling unit of the prefabricated bathroom is provided with leveling protrusions, which would facilitate the accurate positioning and pouring of the horizontal structural floorslab at construction sites. In addition, during the construction procedure of the ceiling unit, the prefabricated roof is accurately positioned on the wall units, and then the concrete is poured therein, so that the ceiling unit which completely combines with the wall units is constructed. In this manner, the complete and closed prefabricated bathroom is built, and the seams which would be generated during traditional construction procedure can be avoided.

According to the present invention, the prefabricated bathroom is built by integral moulds, which would facilitate the installation and disassemble thereof. The integrality and earthquake resistance of the prefabricated bathroom are satisfactory, and no seams

would be generated. Moreover, since the integral moulds are used, the shapes, sizes and relative positions of the components thereof can be ensured. The surfaces of the integral moulds are flat, the seaming thereof is tight, and the concrete poured therein would not leak out. At the same time, the requirements for strength, rigidity, and stability during construction can be met. According to the present invention, since the prefabricated bathroom is built integrally, the reinforced bars of the structural wall can be moulded through one step. In this manner, not only the integrality of the prefabricated bathroom can be ensured, but also the waste of reinforced bars can be avoided. The integral construction of the prefabricated bathroom would facilitate the stirring and vibration of the concrete during construction procedure, and moreover, the maintenance temperature and humidity of the concrete can be controlled more easily.

Brief Description of the Drawings

The present invention can be understood better with reference to the drawings. In the drawings:

Fig. 1 schematically shows a whole structure of a prefabricated bathroom according to the present invention;

Fig. 2 schematically shows the step of constructing an outer bottom steel mould of a bottom unit and outer vertical steel moulds of wall units of the prefabricated bathroom in the method for building the prefabricated bathroom according to the present invention;

Fig. 3 schematically shows the step of constructing horizontal reinforced bars and vertical reinforced bars of the bottom unit and the wall units of the prefabricated bathroom respectively in the method for building the prefabricated bathroom according to the present invention;

Fig. 4 schematically shows the step of constructing a window frame of the prefabricated bathroom in the method for building the prefabricated bathroom

according to the present invention;

Fig. 5 schematically shows the step of constructing an inner bottom steel mould of the bottom unit, inner vertical steel moulds of the wall units, adjustable Flange braces, and a top fixing frame of the prefabricated bathroom in the method for building the prefabricated bathroom according to the present invention;

Fig. 6 schematically shows the step of pouring concrete to form the bottom unit and the wall units of the prefabricated bathroom in the method for building the prefabricated bathroom according to the present invention;

Fig. 7 schematically shows the step of removing steel moulds in the method for building the prefabricated bathroom according to the present invention;

Fig. 8 schematically shows the step of hoisting the moulded bottom unit and wall units of the prefabricated bathroom in the method for building the prefabricated bathroom according to the present invention;

Fig. 9 schematically shows the steps of constructing temporary support steel frames, positioning pre-buried screw nuts, and hoisting and installing the prefabricated roof in the method for building the prefabricated bathroom according to the present invention;

Fig. 10 schematically shows the steps of fixing the prefabricated roof and installing an outer top steel mould in the method for building the prefabricated bathroom according to the present invention;

Fig. 11 schematically shows the step of pouring concrete to form a ceiling unit in the method for building the prefabricated bathroom according to the present invention;

Fig. 12 schematically shows the step of removing the inner top steel mould, outer top steel mould, and temporary support steel frames in the method for building the

prefabricated bathroom according to the present invention;

Fig. 13 schematically shows the step of hoisting the prefabricated bathroom according to the present invention;

Fig. 14 schematically shows exposed reinforced bars of the prefabricated bathroom according to the present invention;

Fig. 15 schematically shows the step of fixing the prefabricated bathroom through the temporary support steel frames in the method for installing the prefabricated bathroom according to the present invention;

Fig. 16 schematically shows the step of forming an outside wall reinforced bar network outside a semi-prefabricated structural wall in the method for installing the prefabricated bathroom according to the present invention;

Fig. 17 schematically shows the steps of constructing an outside cast-in-situ wall template, and pouring concrete therein to form an outside structural wall of a building in the method for installing the prefabricated bathroom according to the present invention;

Fig. 18 schematically shows the step of constructing scaffold and crossgirders that are supported by the scaffold in the method for installing the prefabricated bathroom according to the present invention;

Fig. 19 schematically shows the step of constructing a reinforced bar network of a floor where the ceiling unit of the prefabricated bathroom is located in the method for installing the prefabricated bathroom according to the present invention; and

Fig. 20 schematically shows the step of pouring concrete to form the ceiling unit and a structural floorslab into one piece in the method for installing the prefabricated bathroom according to the present invention.

Detailed Description of the Embodiments

The present invention will be illustrated in more detail hereinafter with reference to the drawings and the embodiments to further clarify the objectives, technical solutions and beneficial effects of the present invention. It should be noted that, the specific embodiments described herein are used for interpreting the present invention, not for limiting the present invention.

The present invention will be illustrated in detail hereinafter with reference to the embodiments.

As shown in Fig. 1, the prefabricated bathroom of the present invention comprises a bottom unit 11, four wall units 12 and a ceiling unit 13 that are connected with each other in a securing manner, and each of the units is made from reinforced concrete. One of the wall units 12 is provided with a window. The wall units 12 are pre-buried with water supply/drainage pipes, wiring pipes and a lighting control box. The bottom unit 11 and the lower portions of four wall units 12 are coated with a water-resistant layer.

At least one of the four wall units 12 or part of at least one of the four wall units 12 serves as a part of a structural wall of a building. According to the present invention, when the wall unit or part of the wall unit serves as a part of the structural wall of the building, it is referred to as a semi-prefabricated structural wall 122; and when the wall unit serves as the structural wall of the building, it is referred to as a full-prefabricated structural wall. The semi-prefabricated structural wall 122 needs to be combined with part of a cast-in-situ structural wall to form a complete structural wall of the building. A thickness of the semi-prefabricated structural wall 122 is less than a thickness of the complete structural wall of the building. According to the embodiment of the present invention, a part of one wall unit of the four wall units 12 is the semi-prefabricated structural wall 122, while the other part of said wall unit is the full-prefabricated structural wall. The outside surface of the semi-prefabricated

structural wall 122 is a rough surface, which is provided with a plurality of positioning stubs 121 along a normal line thereof. A sum of a height of the positioning stubs 121 and the thickness of the semi-prefabricated structural wall 122 is equal to the total thickness of the structural wall of the building. A top surface of each of the plurality of positioning stubs 121 is parallel with the outside surface of the semi-prefabricated structural wall 122, and each of the positioning stubs 121 is provided with a screw bolt (which is not shown in Fig. 1) on its top surface for locating and installing a cast-in-situ wall template accurately. The positioning stubs 121 are concrete cylindrical stubs, and each of the concrete cylindrical stubs is provided with a central through hole (which is not shown in Fig. 1), through which the screw bolt passes. Each screw bolt, which is fixed on the prefabricated bathroom, passes through and protrudes from a corresponding concrete cylindrical stub 121, and is used for installing a cast-in-situ wall template in a securing manner. The semi-prefabricated structural wall 122 is further provided with a plurality rows of horizontal curved reinforced bars on its outside surface, which are jointed with vertical reinforced bars of the cast-in-situ structural wall in an overlapping manner to form an outside wall reinforced bar network of the structural wall of the building. The vertical reinforced bars of the cast-in-situ structural wall are connected with exposed reinforced bars of the structural wall of the lower floor of the building. Concrete is poured into the outside wall reinforced bar network, so that the semi-prefabricated structural wall and the cast-in-situ structural wall are connected together into one piece, so that a complete outside structural wall of the building is formed. In this manner, the connection thereof is tight, and displacement would not occur easily.

The bottom unit 11 or the ceiling unit 13 serves as a part of a structural floorslab of the building. According to the present embodiment, the ceiling unit 13 serves as a part of the structural floorslab of the building. The ceiling unit 13 is a semi-prefabricated structural floorslab, in which pipes and a lighting control box are pre-buried. A thickness of the semi-prefabricated structural floorslab is less than a total thickness of the structural floorslab of the building. The semi-prefabricated structural floorslab needs to be combined with part of a cast-in-situ structural floorslab to form a complete structural floorslab of the building. The ceiling unit 13 is provided with a

plurality of protrusions 131 on its upper surface vertically, and a sum of a height of said protrusions 131 and a thickness of the semi-prefabricated structural floorslab is equal to the total thickness of the structural floorslab of the building. A top surface of each of the protrusions 131 forms a leveling surface for in-situ casting the structural floorslab. The leveling protrusions 131 are concrete rectangular columns distributed on edges of the upper surface of the ceiling unit 13. Preferably, four rectangular columns are provided. It can be understood that, the specific shape and number of the protrusions 131 are not limited by this, and instead can be arranged according to specific situation. The ceiling unit 13 is provided with vertical reinforced bars extending upwards from one edge thereof, which are jointed with vertical reinforced bars of a cast-in-situ outside structural wall of the prefabricated bathroom at an adjacent floor in an overlapping manner. The ceiling unit 13 is provided with horizontal reinforced bars extending inwards from the edges thereof, which are jointed with horizontal reinforced bars of the cast-in-situ structural floorslab in an overlapping manner. The ceiling unit 13 is provided with second hoisting rings on its upper surface to facilitate the hoist thereof. The second hoisting rings are hidden inside the ceiling unit 13.

The method for building the prefabricated bathroom of the present invention will be illustrated hereinafter, and the steps of the method are shown in Figs. 2 to 13. The method comprises the following steps.

1) An outer bottom steel mould 22 of the bottom unit 11 and outer vertical steel moulds 21 of the four wall units 12 are constructed (as shown in Fig. 2). The outer vertical steel moulds 21 each are provided with cylindrical holes to form the concrete cylindrical stubs 121. The outer bottom steel mould 22 and outer vertical steel moulds 21 are all integrated moulds, whereby the requirements for strength, rigidity, and stability during the construction of the prefabricated bathroom can be met. In this manner, it can be guaranteed that the prefabricated bathroom would not be deformed, damaged or collapsed during construction procedures. The outer bottom steel mould 22 and outer vertical steel moulds 21 are installed and disassembled as a whole, whereby the shapes, sizes and relative positions of the components of the moulds can

be ensured. The structure of the prefabricated bathroom is simple, the installing and disassemble thereof are easy, the surfaces thereof are flat, the seams therein is tight, and the concrete poured therein would not leak out.

2) Horizontal reinforced bars 23 and vertical reinforced bars 24 are fastened and fixed on inner surfaces of the outer bottom steel mould 22 and the outer vertical steel moulds 21 respectively, whereby structural reinforced bar network of a profile of the four wall units 12 and the bottom unit 11 can be formed (as shown in Fig. 3). First steel hoisting rings 124 and water supply/drainage pipes are pre-buried in the structural reinforced bar network, and the first steel hoisting rings 124 are connected firmly with the horizontal reinforced bars 23. Therefore, the structural reinforced bar network, which forms the profile of the four wall units 12 and the bottom unit 11, can be obtained in one step. In this manner, not only the integrality of the prefabricated bathroom can be ensured, but also the waste of reinforced bars can be avoided.

3) A window frame 25 is installed on the structural reinforced bars of a wall unit (as shown in Fig. 4).

4) Inner vertical steel moulds 26 and an inner bottom steel mould 27 are installed on inner surfaces of the structural reinforced bar network of the profile of the four wall units 12 and the bottom unit 11. Through adjustment of flange braces 28 the inner vertical steel moulds 26 can be kept in vertical direction and the structural reinforced bars can be clamped between the inner vertical steel moulds 26 and the outer vertical steel moulds 21 firmly. A top fixing frame 29 is installed to fix tops of the inner vertical steel moulds 26 and the outer vertical steel moulds 21, as shown in Fig. 5.

5) Concrete which meets a requirement thereof is poured into an inner space surrounded by the outer bottom steel mould 22 and the inner bottom steel mould 27, as well as the outer vertical steel moulds 21 and the inner vertical steel moulds 26. According to the present invention, the prefabricated bathroom is prefabricated with integral wall units, which would facilitate the stirring and vibration of the concrete during construction procedures, whereby the quality of the prefabricated bathroom can

be improved significantly, and the maintenance temperature and humidity of the concrete can be controlled more easily (as shown in Fig. 6).

6) The top fixing frame 29, outer vertical steel moulds 21, adjustable flange braces 28, inner vertical steel moulds 26, and inner bottom steel mould 27 are removed when the concrete reaches a certain strength, so that the four wall units 12 and the bottom unit 11 of the prefabricated bathroom can be formed (as shown in Fig. 7).

7) The bottom unit 11 and wall units 12 that are constructed in the above steps are hoisted to another construction site (as shown in Fig. 8), where the ceiling unit 13 of the prefabricated bathroom is installed and constructed, as shown in Fig. 7. Of course, the ceiling unit 13 of the prefabricated bathroom can be installed at the same construction site, and therefore the present step 7) is not a necessary step.

8) An inner top steel mould 210 is placed on tops of the wall units 12 through the pre-buried screw nuts, and supported by temporary support steel frames 211. A prefabricated roof 4 is placed on the inner top steel mould 210 (as shown in Fig. 9).

9) The prefabricated roof 4 is connected with the wall units 12 in a securing manner through exposed reinforced bars on tops of the wall units 12, and an outer top steel mould 212 is placed on the prefabricated roof 4 (as shown in Fig. 10).

10) The concrete which meets a requirement thereof is poured into the outer top steel mould 212 which is placed on the prefabricated roof 4 (as shown in Fig. 11).

11) The outer top steel mould 212, inner top steel mould 210, and temporary support steel frames 211 are removed when the concrete reaches a certain strength, so that the ceiling unit 13 can be formed, thus forming and a complete prefabricated bathroom, as shown in Fig. 12.

The prefabricated bathroom of the present invention can be built through the above steps. According to the embodiment of the present invention, the first steel

hoisting rings 124 can be held by a hoister 3 in order to facilitate the hoisting of the prefabricated bathroom (as shown in Fig. 2), whereby the prefabricated bathroom can be hoisted to a designated location for installation.

The prefabricated roof 4 is constructed in advance. The method for constructing the prefabricated roof 4 comprises steps of: 1) laying a reinforced bar network on a steel mould frame; 2) pre-burying a lighting control box and pipes in said reinforced bar network; 3) pouring the concrete which meets a requirement thereof into said steel mould frame; and 4) removing the steel mould frame when the concrete reaches a certain strength, so that the prefabricated roof is built. When the reinforced bar network of the prefabricated roof 4 is arranged, load-bearing reinforced bars thereof are arranged along a spanning direction thereof. In this manner, the load-bearing reinforced bars are located in tensile regions so as to bear a pulling force generated by a bending moment thereof. The arrangement of the load-bearing reinforced bars meets the requirement thereof, which would facilitate the construction on sites. According to the method of the present invention, the prefabricated roof is constructed in advance, and the ceiling unit is constructed afterwards. Therefore, the method of the present invention is simpler and more convenient to perform than the traditional method, in which the ceiling unit is constructed directly. In this case, the construction efficiency of the prefabricated bathroom can be indirectly improved significantly.

The method for installing the prefabricated bathroom of the present invention will be illustrated hereinafter, and the steps of the method are shown in Figs. 15 to 20. The method comprises the following steps.

1) A floor 5 to be installed with the prefabricated bathroom is defined, leveled out and cleaned.

2) A layer of cement slurry is laid on a location of the floor 5 to be installed with the prefabricated bathroom.

3) The prefabricated bathroom is hoisted with a hoister 3, so that the

prefabricated bathroom is placed on the cement slurry horizontally and fitted with said cement slurry closely.

4) The prefabricated bathroom and the floorslab 5 are fixed by a temporary fix frame 61, as shown in Fig. 15.

5) Vertical reinforced bars 127 are erected on an outside surface of the semi-prefabricated structural wall 122 of the prefabricated bathroom, so that the vertical reinforced bars 127, the horizontal reinforced bars 125, and the horizontal curved reinforced bars 126 on the outside surface of the semi-prefabricated structural wall 122 form a reinforced bar network of the cast-in-situ structural wall, as shown in Fig. 16. The vertical reinforced bars 127 are jointed with and fixed on exposed reinforced bars at a top of the structural wall of the lower floor of the building in an overlapping manner.

6) The cast-in-situ wall template (which is not shown in Fig. 17) is installed on the outside surface of the reinforced bar network of the cast-in-situ structural wall through the concrete cylindrical stubs 121 arranged on the outside surface of the semi-prefabricated structural wall 122 of the prefabricated bathroom. The concrete which meets a requirement thereof is poured into the cast-in-situ wall template, so that a cast-in-situ structural wall is formed. The cast-in-situ structural wall is combined with the semi-prefabricated structural wall 122 firmly, so that a complete outside structural wall is formed, as shown in Fig. 17.

7) Scaffold 63 for supporting crossgirders 62 is built on the floor 5 where said prefabricated bathroom is placed, and the crossgirders 62 serve as the crossgirders of the structural floorslab of the top of the prefabricated bathroom, as shown in Fig. 18.

8) A cast-in-situ floor template 65 is installed on an upper surface of the ceiling unit 13 of the prefabricated bathroom and the crossgirders 62, and an integrated reinforced bar network of structural floorslab of the building is constructed in said cast-in-situ floor template 65, as shown in Fig. 19.

9) The concrete which meets a requirement thereof is poured into the cast-in-situ floor template 65, so as to form a cast-in-situ structural floorslab. The cast-in-situ structural floorslab is combined with the ceiling unit firmly, so that a complete structural floorslab is built, as shown in Fig. 20.

The preferred embodiments of the present invention are stated hereinabove, while the embodiments are not used for limiting the present invention. Various alternatives and modifications can be made by a person skilled in the art. Any modifications, equivalent replacements, or improvements made without departing from the spirit and scope disclosed herein shall fall within the protection scope of the present invention.

Claims

1. A prefabricated bathroom, comprising a bottom unit (11), four wall units (12) and a ceiling unit (13) that are connected with each other in a securing manner, each of the units being made from reinforced concrete, said wall units being provided with a door and a window,

wherein at least one of said four wall units (12) or part of at least one of said four wall units (12) is a semi-prefabricated structural wall (122), and a thickness of said semi-prefabricated structural wall (122) is less than a total thickness of a structural wall of a building;

wherein said semi-prefabricated structural wall (122) is provided with a plurality of positioning stubs (121) on an outside surface along a normal line thereof, and a sum of a height of said positioning stubs (121) and the thickness of said semi-prefabricated structural wall (122) is equal to the total thickness of the structural wall of the building;

wherein a top surface of each of the plurality of positioning stubs (121) is parallel with the outside surface of said semi-prefabricated structural wall (122), and each of said positioning stubs (121) is provided with a screw bolt on its top surface for locating and installing a cast-in-situ wall template;

wherein said positioning stubs (121) are concrete cylindrical stubs, and each of the concrete cylindrical stubs is provided with a central through hole, through which said screw bolt passes; and

wherein each screw bolt, which is fixed on said prefabricated bathroom, passes through and protrudes from a corresponding concrete cylindrical stub, and is used for installing a cast-in-situ wall template in a securing manner.

2. The prefabricated bathroom according to claim 1, wherein said ceiling unit (13) is a semi-prefabricated structural floorslab, in which pipes and a lighting control box are pre-buried, and a thickness of said semi-prefabricated structural floorslab is less than a total thickness of a structural floorslab of the building;

wherein said ceiling unit (13) is provided with a plurality of protrusions (131) on its upper surface vertically, and a sum of a height of said protrusions (131) and a thickness of said semi-prefabricated structural floorslab is equal to the total thickness

of the structural floorslab of the building; and

wherein a top surface of each of said protrusions (131) forms a leveling surface for in-situ casting the structural floorslab.

3. The prefabricated bathroom according to claim 2, wherein said leveling protrusions (131) are concrete rectangular columns distributed on edges of the upper surface of said ceiling unit (13).