

PREFABRICATED BATHROOM AND METHOD FOR CONSTRUCTING AND INSTALLING THE SAME

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Technical Field

The invention relates to buildings, more specifically to a prefabricated bathroom and a method for constructing and installing the prefabricated bathroom. The invention can
10 be widely applied in a variety of high-rise buildings.

Background

Bathroom is an essential part of residential houses. Currently there are two ways for
15 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 materials used may be out of standard, quality of the bathroom thus built cannot be
20 satisfactorily ensured.

The other way is to prefabricate a whole-set bathroom at factories, and then delivery it to the construction site for installation. For example, Chinese Patent application No. 01116978 discloses a method for constructing and installing a whole-set bathroom
25 unit that can be installed in multiple-storey buildings. In this method, the bathroom unit is prefabricated in a place far away from the construction site, and then delivered to the construction site for use as needed at an appropriate time. Facility pipes, space for lighting control box and holes for windows and drainage pipes are casted in the walls of the bathroom unit. During installation of the bathroom unit, it is only required
30 to place the bathroom as a whole adjacent to the structural walls onto a predefined floor with a recess, and then fill cement slurry into the joint area. This method for prefabricating a whole-set bathroom, whilst can shorten the construction period and ensure the bathroom having a uniform quality standard, has the following drawbacks: the prefabricated bathroom is placed on the ground floor directly and is positioned by
35 a simple shape-complementary engagement, so that the bathroom is unstably positioned and thus is easily displaced; further, all of the walls, the bottom plate and the ceiling of the prefabricated bathroom will occupy a certain space in the width and the height directions, so that the space enclosed by the prefabricated bathroom is significantly less than that of the conventional cast-in-situ bathroom.

Summary

The invention aims to provide a prefabricated bathroom, which can save space and
5 has a firm structure, and a method for constructing and installing the prefabricated bathroom.

In order to solve the above technical problems, the invention provides a prefabricated bathroom, comprising a bottom unit, four wall units and a ceiling unit that are
10 connected to each other in a securing manner, all of the bottom unit, the four wall units and the ceiling unit being made from reinforced concrete, wherein the wall unit is provided with a window, in which water supply/drainage pipes, wiring pipes and a lighting control box are pre-buried therein, and wherein the bottom unit is provided with a squatting pan or a flush toilet, and the bottom unit and the lower portion of the
15 four wall units are coated with a water-resistant layer, and at least one of the four wall units is a full-prefabricated structural wall or a semi-prefabricated structural wall, and both of the full-prefabricated structural wall and the semi-prefabricated structural wall are provided with a bridging structure for secure connection with abutting structural walls.

20 The bridging structure of the full-prefabricated structural wall includes a connecting hole extending into the wall from the lower edge of the wall and a grouting hole arranged in the wall surface, wherein the connecting hole is communicated with the grouting hole and thus a grouting channel is formed.

25 The connecting hole of the full-prefabricated structural wall abuts in alignment with a connecting hole in the structural wall of adjacent floors, wherein the connecting holes are provided therein with inner steel bars, and the full-prefabricated structural wall forms a unitary body with the structural wall of adjacent floors through pouring
30 cement slurry into the grouting channel and the aligned connecting holes via the grouting hole.

The thickness of the semi-prefabricated structural wall is less than the full thickness of the structural wall of the buildings, and the outer surface of the semi-prefabricated
35 structural wall is a rough surface with concave portions and convex portions alternatively arranged, the outer surface being the bridging structure of the semi-prefabricated structural wall.

The semi-prefabricated structural wall connects with an outside cast-in-situ structural

wall as a unitary body and thus produces a complete structural wall, and the cast-in-situ structural wall is provided therein with a reinforcement mat, which connects to the exposed steel bars of the building structural wall in the next floor.

- 5 At least one of the bottom unit and the ceiling unit serves as a part of the structural floor plate, and at least one edge of the bottom unit or the ceiling unit serving as the part of the structural floor plate is provided with lateral steel bars, which extend outside for a certain distance along the horizontal direction and connect with the steel bars of the abutting floor plate in a secure manner.

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A second steel hook for the sake of convenient hoisting is arranged on the upper surface of the ceiling unit, and is hidden within the wall of the ceiling unit and securely connects to the reinforcement mat therein.

- 15 The invention further provides a method for constructing a prefabricated bathroom, comprising the following steps:

Step A: building a bottom unit and the lower portion of four wall units of the prefabricated bathroom with bottom steel moulds and vertical steel moulds, thus forming a unitary lower half part of the prefabricated bathroom, and allowing the reinforcement mat of the lower half part of the prefabricated bathroom extending a certain distance upwards from the top thereof, thus forming exposed vertical steel bars;

- 20 Step B: starting from the exposed vertical steel bars extending from the top of the lower half part of the prefabricated bathroom, building the reinforcement mats for the upper portion of four wall units and the ceiling unit, casting concrete to build the upper half part of the prefabricated bathroom after mounting an upper inner-side mould and an upper outer-side steel mould, thus enabling the previously built lower half part of the prefabricated bathroom and the posteriorly built upper half part of the prefabricated bathroom being firmly bonded with each other as a unitary body; and

- 30 Step C: coating water-resistant paint on the bottom unit and the portion of the four wall units that is lower than a pre-set height so as to form a water-resistant layer, and then mounting a squatting pan or a flush toilet and laying tiles.

Step A specifically includes the following steps:

- 35 Step A1: building the profile of the bottom unit and the lower portion of the four wall units by means of bottom steel moulds and vertical steel moulds;

Step A2: fastening lateral steel bars and vertical steel bars and fixing them into the bottom steel moulds and the vertical steel moulds respectively, then pre-burying a first steel hook and water supply/drainage pipes for the flush toilet into the bottom

steel moulds and the vertical steel moulds respectively, and at the same time firmly connecting the first steel hook with the lateral steel bars; and

Step A3: pouring suitable concrete into the inner space enclosed by the bottom steel moulds and the vertical steel moulds, and removing the vertical steel moulds after the concrete reaches a certain strength, thus forming the lower half part of the prefabricated bathroom.

Step B specifically includes the following steps:

Step B1: abutting the structural steel bars forming the profile of the upper half part of the wall units and the ceiling unit with the exposed vertical steel bars extending from the top of the lower half part of the prefabricated bathroom, thus forming a complete frame of the four wall units and the ceiling unit;

Step B2: arranging an upper inner-side mould on the inner side of the frame formed by the four wall units and the ceiling unit, weaving lateral reinforcing steel bars and vertical reinforcing steel bars on the outer edge of the upper inner-side mould, the lateral reinforcing steel bars and the vertical reinforcing steel bars being connected to the structural steel bars respectively so as to form a reinforcement mat;

Step B3: arranging an upper outer-side steel mould on the outer side the frame formed by the four wall units and the ceiling unit, keeping the upper outer-side steel mould vertical through an adjusting lever and firmly clamping the reinforcement mat between the upper inner-side mould and the upper outer-side steel mould, and at the same time mounting the cold water pipe, the hot water pipe and the lighting control box at suitable positions; and

Step B4: pouring suitable concrete into the inner space enclosed by the upper inner-side mould and the upper outer-side steel mould, removing the upper inner-side mould and the upper outer-side steel mould after the concrete reaches a certain strength, thus forming the upper half part of the prefabricated bathroom.

At least one of the four wall units is a semi-prefabricated structural wall or a full-prefabricated structural wall with a bridging structure.

When one of the four wall units of the prefabricated bathroom is the full-prefabricated structural wall, Step A1 further includes placing a hollow pipe into one of the vertical steel moulds to contact the bottom steel mould for producing the grouting channel extending into the wall from the lower edge of the wall, and Step A3 further includes removing the hollow pipe after concrete reaches a certain strength.

The method for constructing a prefabricated bathroom according to the invention further comprises, after Step C, the step: arranging two temporary securing nuts for

temporarily connecting the walls of adjacent floors during installation of the prefabricated bathroom on the outer surface of one of the four wall units, and arranging a second steel hook on the ceiling unit, the second steel hook being connected to the structural steel bars.

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The invention further provides a method for installing a prefabricated bathroom, comprising the following steps:

Step D: leveling out a floor for installing the prefabricated bathroom, and placing a structural floor plate at the edge of the floor;

10 Step E: laying a layer of cement slurry on the floor, and placing the fabricated bathroom on the layer of cement slurry and enabling it being snugly affixed to the cement slurry;

15 Step F: starting from the lateral steel bars that extend from the bottom unit of the fabricated bathroom, building a bottom reinforcement mat closely connecting to the lateral steel bars on the structural floor plate, and then casting suitable concrete on the bottom reinforcement mat, thus enabling the bottom unit of the fabricated bathroom being firmly bonded with the structural floor plate as a unitary body; and

Step G: bridging at least one of the wall units of the fabricated bathroom with wall units of floors vertically adjacent thereto.

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Step D specifically includes the following steps:

Step D1: defining a floor to be installed with the prefabricated bathroom, leveling out and cleaning the floor;

25 Step D2: arranging a bedding layer or a supporting block that has been adjusted in the horizontal direction on the floor; and

Step D3: building a supporting base and laying a structural floor plate adjacent to the floor on the supporting base.

30 Between Step E and Step F the method further includes: locking the fabricated bathroom and the floor vertically adjacent thereto together by means of temporary securing nuts and a fixing support in order to fix the fabricated bathroom temporarily.

35 When the wall unit is the full-prefabricated structural wall, Step G further includes: inserting inner steel bars into the grouting channel of the full-prefabricated structural wall; and pouring cement slurry into the grouting channel through the grouting hole of the full-prefabricated structural wall, thus causing the full-prefabricated structural wall being a unitary body with the structural wall of adjacent floors.

When the wall unit is the semi-prefabricated structural wall, Step G further includes:

providing steel bars on the outer side of the semi-prefabricated structural wall and connecting them to the exposed steel bars on the top of the structural walls of next floor in a securing manner, so as to form a cast-in-situ reinforcement mat; mounting cast-in-situ templates on the outer side of the outer wall reinforcement mat; pouring
5 suitable concrete into the outer wall reinforcement mat between the cast-in-situ templates and the semi-prefabricated structural wall, so as to form an in-situ structural wall, which is firmly bonded to the semi-prefabricated structural wall, thus finally forming a complete structural wall.

10 Compared with the prior arts, the invention has the following technical advantages:
1) the wall units of the prefabricated bathroom function as the structural walls of buildings or a part thereof, and the bottom unit and the ceiling unit function as a part of the structural floor plate, thus reducing the inner space of the bathroom occupied by the walls of the prefabricated bathroom and providing a relatively wide inner space; 2)
15 the prefabricated bathroom is constructed at the construction site, so that supervision of the construction quality can conveniently carried out, the product quality is significantly enhanced and the prefabricated bathroom can be hoisted to a desirable site for installation as needed at any appropriate time; and 3) the prefabricated bathroom is formed as a unitary body and the prefabrication made in factories can
20 ensure materials of different portions being uniform, thus reducing the risk of cracks generated in the walls due to uneven materials of different portions and contraction/expansion thereof when temperature varies.

Brief Description of Drawings

25 Fig. 1 schematically shows the whole structure of the prefabricated bathroom according to the invention.

Fig. 2 schematically shows the step of building the bottom unit and the lower half part of the prefabricated bathroom in the constructing method for the prefabricated
30 bathroom according to the invention.

Fig. 3 schematically shows the step of forming the inner grouting channel in the walls in the constructing method for the prefabricated bathroom according to the invention.

35 Fig. 4 schematically shows the step of connecting lateral and vertical steel bars in the constructing method for the prefabricated bathroom according to the invention.

Fig. 5 schematically shows the step of casting concrete, forming the bottom unit and

the lower half part of the prefabricated bathroom in the constructing method for the prefabricated bathroom according to the invention.

5 Fig. 6 schematically shows the step of removing the steel mould in the constructing method for the prefabricated bathroom according to the invention.

Fig. 7 schematically shows the step of hoisting the lower half part of the prefabricated bathroom in the constructing method for the prefabricated bathroom according to the invention.

10 Fig. 8 schematically shows the step of building the upper half part of the prefabricated bathroom and the ceiling unit frame in the constructing method for the prefabricated bathroom according to the invention.

15 Fig. 9 schematically shows the step of mounting the upper inner-side steel mould in the constructing method for the prefabricated bathroom according to the invention.

Fig. 10 schematically shows the connection way of lateral and vertical reinforcing steel bars in the constructing method for the prefabricated bathroom according to the invention.

20 Fig. 11 schematically shows the step of mounting the upper outer-side mounting steel mould in the constructing method for the prefabricated bathroom according to the invention.

25 Fig. 12 schematically shows the step of casting concrete, forming the upper half part of the prefabricated bathroom and the ceiling unit in the constructing method for the prefabricated bathroom according to the invention.

30 Fig. 13 schematically shows the step of removing the upper inner-side and the outer-side steel moulds in the constructing method for the prefabricated bathroom according to the invention.

Fig. 14 schematically shows the step of mounting the squatting pan or the flush toilet in the constructing method for the prefabricated bathroom according to the invention.

35 Fig. 15 schematically shows the bridging structure of the semi-prefabricated structural walls of the prefabricated bathroom according to the invention.

Fig. 16 schematically shows the structures and positions of the bridging structure of the semi-prefabricated structural walls and the exposed steel bars of the prefabricated bathroom according to the invention.

- 5 Fig. 17 schematically shows the step of hoisting the prefabricated bathroom through a hanger according to the invention through a hoisting beam.

- Fig. 18 schematically shows the step of defining the installation position (floor) and disposing a supporting block in the installing method for the prefabricated bathroom
10 according to the invention.

Fig. 19 schematically shows the step of building a supporting base in the installing method for the prefabricated bathroom according to the invention.

- 15 Fig. 20 schematically shows the step of laying the structural floor plates in the installing method for the prefabricated bathroom according to the invention.

- Fig. 21 schematically shows the step of pouring cement slurry onto the structural floor plates in the installing method for the prefabricated bathroom according to the
20 invention.

Fig. 22 schematically shows the step of hoisting the prefabricated bathroom in the installing method for the prefabricated bathroom according to the invention.

- 25 Fig. 23 schematically shows the connection of the lateral steel bars of the bottom unit in the installing method for the prefabricated bathroom according to the invention.

- Fig. 24 schematically shows the step of forming the bottom reinforcement mat in the installing method for the prefabricated bathroom according to the invention.
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Fig. 25 schematically shows the step of casting concrete and integrating the bottom unit with the structural floor plate in the installing method for the prefabricated bathroom according to the invention.

- 35 Fig. 26 schematically shows the position relationship of the grouting holes in the full-prefabricated structural walls of the prefabricated bathroom according to the invention.

Fig. 27 schematically shows the connection way of the full-prefabricated structural

walls of the prefabricated bathroom according to the invention.

Fig. 28 schematically shows the step of forming an outer wall reinforcement mat outside the semi-prefabricated structural walls in the installing method for the prefabricated bathroom according to the invention.

Fig. 29 schematically shows the step of building the cast-in-situ templates and the cast-in-situ outer wall reinforcement mat in the installing method for the prefabricated bathroom according to the invention.

Fig. 30 schematically shows the step of forming part of a cast-in-situ structural outer wall through casting concrete outside the semi-prefabricated structural walls in the installing method for the prefabricated bathroom according to the invention.

Preferred Embodiments of the Invention

In the following the invention will be discussed in details with reference to the attached drawings and embodiments in order to enable the objective, technical solution and advantages of the invention more distinct. It should be understood that the particular embodiments as set forth herewith are intended to be illustrative, not to limit the scope of the invention in any way.

As shown in Figs. 1, 23 and 29, the prefabricated bathroom according to the invention comprises a bottom unit 11, four wall units 12 and a ceiling unit 13 that are connected to each other in a securing manner. The bottom unit 11, four wall units 12 and the ceiling unit 13 are all made from reinforced concrete (RC). The wall unit 12 is provided with a window, in which water supply/drainage pipes, wiring pipes and a lighting control box are pre-buried therein. The bottom unit 11 is provided with a squatting pan or a flush toilet 37. The bottom unit 11 and the lower portions of four wall units 12 are coated with a water-resistant layer. The above technical features of the prefabricated bathroom are generally the same as those in the prior arts. The prefabricated bathroom according to the invention differs from that in the prior arts as follows:

At least one of the four wall units 12 serves as a structural wall of the building, or a part thereof. According to the invention, the wall unit is referred to as full-prefabricated structural wall 121 when used as the structural wall of the building (see Fig. 27), and as semi-prefabricated structural wall 122 when used as a part of the structural wall of the building (see Fig. 29). The semi-prefabricated structural wall

122 has to be combined with part of a cast-in-situ structural wall for forming a complete structural wall (see Fig. 29). Both of the full-prefabricated structural wall 121 and the semi-prefabricated structural wall 122 are provided with bridging structures securely connected with abutting structural walls. One skilled in the art can
5 be able to determine whether the prefabricated bathroom is provided with the full-prefabricated structural wall or the semi-prefabricated structural wall and which of the walls should be designed as the structural wall, based on the load received by the walls of the buildings.

10 At least one of the bottom unit 11 and a ceiling unit 13 serves as a part of the structural floor plate. According to an embodiment of the invention, the bottom unit 11 of the bathroom serves as a part of the structural floor plate. At least one edge of the bottom unit 11 is provided with lateral steel bars 18 (see Fig. 23), which extend
15 outside for a certain distance along the horizontal direction and connect with the steel bars of the abutting floor plate in a secure manner. That is to say, in the embodiment of the invention, through connecting the lateral steel bars 18 extending from the edge of the bottom unit 11 of the bathroom to the steel bars of the structural floor plate located at the outer edge thereof and casting concrete thereon, the bottom unit 11 can
20 form a unitary body with the structural floor plate. Therefore, the bottom unit 11 of the bathroom is of good quality and a firm bond, with little displacement.

As shown in Fig. 27, the bridging structure of the full-prefabricated structural wall 121 includes a connecting hole 1211 extending into the wall from the lower edge of the wall and a grouting hole 1212 arranged on the wall surface, wherein the
25 connecting hole 1211 is communicated with the grouting hole 1212 and thus a grouting channel 1214 is formed. The connecting hole 1211 abuts in alignment with the connecting hole in the structural wall of adjacent floors. The grouting channel 1214 and the abutted connecting hole are provided therein with inner steel bars 38. By means of pouring cement slurry into the grouting channel 1214 and the abutted
30 connecting hole through the grouting hole 1212, the full-prefabricated structural wall 121 and the structural wall of adjacent floors can be formed in a unitary body together.

As shown in Fig. 15, the semi-prefabricated structural wall 122, having a rough outer
35 surface with concave and convex portions alternatively arranged, is thinner than the whole structural wall of the buildings. The rough outer surface with concave and convex portions alternatively arranged is used as the bridging structure of the semi-prefabricated structural wall 122, which connects to the outside cast-in-situ structural wall so as to form a unitary body, thus producing a complete structural wall.

As shown in Figs. 16, 29 and 30, the semi-prefabricated structural wall 122 connects with the outside cast-in-situ structural wall, forming a unitary body and thus producing a complete structural wall. The cast-in-situ structural wall is provided therein with an outer wall reinforcement mat 43, which connects to the exposed steel bars 39 of the structural wall in the next floor.

As shown in Figs. 4 and 12, a first steel hook 141 and a second hook 142 are arranged on the upper surfaces of the bottom unit 11 and the ceiling unit 13 respectively for the sake of convenience hoisting. The second hook is hidden within the wall of the bottom unit 11 and the ceiling unit 13, and securely connects to the lateral steel bars 18.

In the following the constructing method of the prefabricated bathroom according to the invention will be discussed with the full-prefabricated structural wall as example. As shown in Figs. 2-16, the constructing method includes the following steps:

- 1) Building the bottom unit 11 and the lower half part of the four wall units 12 of the prefabricated bathroom by means of bottom steel moulds 16 and vertical steel moulds 17 (Fig. 2);
- 2) Placing a hollow pipe 31 into one of the vertical steel moulds 17 to contact the bottom steel mould 16 for producing the grouting channel 1214 extending into the wall inside from the lower edge of the wall (Fig. 3);
- 3) Fastening the lateral steel bars 18 and the vertical steel bars 19 and fixing them into the bottom steel moulds 16 and vertical steel moulds 17 respectively, then pre-burying the first steel hook 141 and the water supply/drainage pipes 15 within the bottom steel moulds 16 and vertical steel moulds 17 respectively, and at the same time firmly connecting the first steel hook 141 and the lateral steel bars 18 (Fig. 4);
- 4) Pouring suitable concrete into the inner space enclosed by the bottom steel moulds 16 and the vertical steel moulds 17 (Fig. 5);
- 5) Removing the vertical steel moulds 17 and the hollow pipe 31 after the concrete reaches a certain strength, thus forming the bottom unit 11 of the prefabricated bathroom and the lower half part 51 of the prefabricated bathroom (Fig. 6);
- 6) Hoisting the bottom unit 11 and the lower half part 51 of the prefabricated

bathroom obtained from the above steps to another construction site for constructing the upper half part 52 and the ceiling unit 13 of the prefabricated bathroom (Fig. 7). Of course, the upper half part 52 and the ceiling unit 13 of the prefabricated bathroom can be also constructed in one single construction site.

5 Therefore, this step 6) may be unnecessary;

7) Abutting the structural steel bars 32 forming the profile of the upper half part of the wall units 12 and the ceiling unit 13 with the exposed vertical steel bars extending from the top of the lower half part 51 of the prefabricated bathroom,
10 thus forming a complete frame of the four wall units 12 and the ceiling unit 13 (Fig. 8);

8) Arranging an upper inner-side aluminum mould 20 on the inner side of the frame formed by the four wall units 12 and the ceiling unit 13 (Fig. 9);
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9) Weaving lateral reinforcing steel bars 21 and vertical reinforcing steel bars 22 on the outer edge of the upper inner-side aluminum mould 20, the lateral reinforcing steel bars 21 and the vertical reinforcing steel bars 22 being connected to the structural steel bars 32 respectively so as to form a reinforcement mat (Fig. 10);
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10) Arranging an upper outer-side steel mould 23 outside the frame formed by the four wall units 12 and the ceiling unit 13, keeping the second steel mould 23 being vertical through an adjusting lever 35, and firmly clamping the reinforcement mat between the upper inner-side aluminum mould 20 and the upper outer-side steel mould 23 (Fig. 11);
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11) Mounting the cold water pipe 33, the hot water pipe 34 and the lighting control box 36 at suitable positions on the frame of the four wall units 12, connecting the out edge of the second steel hook 142 that is buried into the upper inner-side aluminum mould 20 with the structural steel bars 32, and then pouring desirable concrete into the inner space enclosed by the first steel mould 20 and the second steel mould 23 (Fig. 12);
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12) Removing the upper inner-side aluminum mould 20 and the upper outer-side steel mould 23 after the concrete reaches a certain strength, thus forming the upper half part 52 of the prefabricated bathroom (Fig. 13);
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13) Coating water-resistant paint on the bottom unit 11 and the portion of the four wall units 12 that is lower than a pre-set height so as to form a water-resistant layer,

and then mounting the squatting pan or a flush toilet 37 and laying tiles 41 (Fig. 14).

Through the above-mentioned steps the prefabricated bathroom according to the invention can be built, the four wall units obtained all being full-prefabricated structural walls. The building method of the semi-prefabricated structural walls is substantially similar to that of the full-prefabricated structural walls, except that no arrangement and removal of the hollow pipe 31 is necessary when constructing the semi-prefabricated structural walls, i.e., no grouting channel 1214 is needed; rather, it is only necessary to enable the wall units of the semi-prefabricated structural walls having rough surfaces with concave and convex portions arranged alternatively through a special designed mould.

In the embodiment of the invention, in order to facilitate hoisting of the prefabricated bathroom produced, on the ceiling unit 13 of the prefabricated bathroom a second steel hook 142 is provided, which is connected to the structural steel bars 32. Therefore, through a hanger 40 engaging with the second steel hook 142 (as shown in Fig. 17), the prefabricated bathroom can be hoisted and thus delivered to any destination for installation. Moreover, according to the invention, the outer surface of one of the four wall units 12 is provided with two temporary securing nuts 24 for temporarily connecting the wall units of adjacent floors during installation of the prefabricated bathroom. The temporary securing nuts 24 and the locking structure thereof can be removed after the bathroom to be prefabricated closely connects to the structural wall of next floor.

In the following the installation method of the prefabricated bathroom according to the invention will be discussed. The installation method is shown in Figs. 18 to 25, comprising the following steps:

- 1) Defining a floor 25 to be installed with the prefabricated bathroom, leveling out and cleaning the floor 25 (Fig. 18);
- 2) Arranging a bedding layer or a supporting block 28 that has been adjusted in the horizontal direction on the floor 25 (Fig. 19);
- 3) Building a supporting base 29, and laying a structural floor plate 26 adjacent to the floor 25 on the supporting base 29 (Fig. 20);
- 4) Laying a layer of cement slurry 27 on the floor 25 (Fig. 21);

- 5) Hoisting the fabricated bathroom with a hanger 40 so that the fabricated bathroom is laid on the layer of cement slurry 27 and snugly affixed thereto (Fig. 22);
- 5 6) Locking the fabricated bathroom and the adjacent floor together by means of temporary securing nuts 24 and a fixing support 30 (Figs. 23 and 24);
- 7) Starting from the lateral steel bars 18 that extend from the bottom unit 11 of the fabricated bathroom, building a bottom reinforcement mat 42 on the structural floor plate 26 and connecting the bottom reinforcement mat 42 with the lateral steel bars 18 (Figs. 23 and 24 again);
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- 8) Casting desirable concrete on the bottom reinforcement mat 42, thus enabling the bottom unit 11 of the fabricated bathroom being firmly bonded with the structural floor plate 26 (Fig. 25).
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Through the above steps the bottom unit 11 of the fabricated bathroom according to the invention can be installed and fixed. In the following the installation method for the wall units of the fabricated bathroom according to the invention will be explained with the full-prefabricated structural walls 121 and the semi-prefabricated structural walls 122 as examples.

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When the wall units use the full-prefabricated structural wall 121, the installation method includes: inserting inner steel bars 38 into the grouting channel 1214 of the full-prefabricated structural wall 121; pouring cement slurry into the grouting channel 1214 through the grouting hole 1212 of the full-prefabricated structural wall 121 (Figs. 26 and 27), thus causing the full-prefabricated structural wall 121 being a unitary body with the structural wall of adjacent floor.

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30 When the wall units use the semi-prefabricated structural wall 122, the installation method includes, as shown in Figs. 28 to 30: starting from the exposed steel bars 39 on the top of the structural wall in the lower floor with respect to the semi-prefabricated structural wall 122, providing steel bars in the upward direction outside of the semi-prefabricated structural wall 122 and connecting them to the exposed steel bars 39, so as to form the outer wall reinforcement mat 43 (Fig. 28); installing the cast-in-situ templates 1223 on the outer side of the outer wall reinforcement mat 43 (Fig. 29); pouring suitable concrete into the outer wall reinforcement mat 43 being fixed so as to form an in-situ structural wall, which is firmly bonded to the semi-prefabricated structural wall 122, thus finally forming a

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complete structural outer wall (Fig. 30); lastly, after forming the complete structural outer wall, removing the cast-in-situ templates 1223 that serves for holding and securing, and removing the temporary securing nuts 24 and the fixing support 30.

- 5 While the invention has been described in conjunction with the preferred embodiments outlined above, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art. Various changes may be made without departing from the spirit and scope of the invention as defined in the following claims.

Claims

1. A prefabricated bathroom, comprising a bottom unit (11), four wall units (12) and a ceiling unit (13) that are connected to each other in a securing manner, all of the
5 bottom unit (11), the four wall units (12) and the ceiling unit (13) being made from reinforced concrete, wherein the wall unit (12) is provided with a window, in which water supply/drainage pipes, wiring pipes and a lighting control box are pre-buried therein, and wherein the bottom unit (11) is provided with a squatting pan or a flush toilet (37), and the bottom unit (11) and the lower portion of the four wall units (12)
10 are coated with a water-resistant layer,

characterizing in that, at least one of the four wall units (12) is a full-prefabricated structural wall (121) or a semi-prefabricated structural wall (122), and both of the full-prefabricated structural wall (121) and the semi-prefabricated structural wall (122) are provided with a bridging structure for secure connection with
15 abutting structural walls.

2. The prefabricated bathroom according to claim 1, characterizing in that, the bridging structure of the full-prefabricated structural wall (121) includes a connecting hole (1211) extending into the wall from the lower edge of the wall and a grouting hole (1212) arranged in the wall surface, wherein the connecting hole (1211) is
20 communicated with the grouting hole (1212) and thus a grouting channel (1214) is formed.

3. The prefabricated bathroom according to claim 2, characterizing in that, the
25 connecting hole (1211) of the full-prefabricated structural wall (121) abuts in alignment with a connecting hole in the structural wall of adjacent floors, wherein the connecting holes are provided therein with inner steel bars (38), and the full-prefabricated structural wall (121) forms a unitary body with the structural wall of adjacent floors through pouring cement slurry into the grouting channel (1214) and
30 the connecting holes via the grouting hole (1212).

4. The prefabricated bathroom according to claim 1, characterizing in that, the thickness of the semi-prefabricated structural wall (122) is less than the full thickness of the structural wall of the buildings, and the outer surface of the semi-prefabricated
35 structural wall (122) is a rough surface with concave portions and convex portions alternatively arranged, which is the bridging structure of the semi-prefabricated structural wall (122).

5. The prefabricated bathroom according to claim 4, characterizing in that, the

semi-prefabricated structural wall (122) connects with an outside cast-in-situ structural wall as a unitary body and thus produces a complete structural wall, and the cast-in-situ structural wall is provided therein with an outer wall reinforcement mat (43), which connects to the exposed prefabricated steel bars (39) of the structural wall
5 in the next floor.

6. The prefabricated bathroom according to any one of claims 1 to 5, characterizing in that, at least one of the bottom unit (11) and the ceiling unit (13) serves as a part of the structural floor plate, and at least one edge of the bottom unit
10 (11) or the ceiling unit (13) serving as the part of the structural floor plate is provided with lateral steel bars (18), which extend outside for a certain distance along the horizontal direction and connect with the steel bars of the abutting floor plate in a secure manner.

15 7. The prefabricated bathroom according to claim 6, characterizing in that, a second steel hook (142) for the sake of convenient hoisting is arranged on the upper surface of the ceiling unit (13), and is hidden within the wall of the ceiling unit (13) and securely connects to the reinforcement mat therein.

20 8. A method for constructing a prefabricated bathroom, comprising the following steps:

Step A: building a bottom unit (11) and the lower portion of four wall units (12) of the prefabricated bathroom with bottom steel moulds (16) and vertical steel moulds (17), thus forming a unitary lower half part (51) of the prefabricated bathroom, and
25 allowing the reinforcement mat of the lower half part (51) of the prefabricated bathroom extending a certain distance upwards from the top thereof, thus forming exposed vertical steel bars;

Step B: starting from the exposed vertical steel bars extending from the top of the lower half part (51) of the prefabricated bathroom, building reinforcement mats for
30 the upper portion of four wall units (12) and the ceiling unit (13), casting concrete to build the upper half part (52) of the prefabricated bathroom after mounting an upper inner-side mould (20) and an upper outer-side steel mould (23), thus enabling the previously-built lower half part (51) of the prefabricated bathroom and the posteriorly-built upper half part (52) of the prefabricated bathroom being firmly
35 bonded with each other as a unitary body; and

Step C: coating water-resistant paint on the bottom unit (11) and the portion of the four wall units (12) being lower than a pre-set height so as to form a water-resistant layer, and then mounting a squatting pan or a flush toilet and laying tiles (41).

9. The method for constructing a prefabricated bathroom according to claim 8, characterizing in that, Step A specifically includes:

Step A1: building the profile of the bottom unit (11) and the lower portion of the four wall units (12) by means of bottom steel moulds (16) and vertical steel moulds (17);

Step A2: fastening lateral steel bars (18) and vertical steel bars (19) and fixing them within the bottom steel moulds (16) and the vertical steel moulds (17) respectively, then pre-burying a first steel hook (141) and water supply/drainage pipes (15) for the flush toilet into the bottom steel moulds (16) and the vertical steel moulds (17) respectively, and at the same time firmly connecting the first steel hook (141) with the lateral steel bars (18); and

Step A3: pouring suitable concrete into the inner space enclosed by the bottom steel moulds (16) and the vertical steel moulds (17), and removing the vertical steel moulds (17) after the concrete reaches a certain strength, thus forming the lower half part (51) of the prefabricated bathroom.

10. The method for constructing a prefabricated bathroom according to claim 9, characterizing in that, Step B specifically includes:

Step B1: abutting and fixing the structural steel bars (32) forming the profile of the upper portion of the wall units (12) and the ceiling unit (13) with the exposed vertical steel bars extending from the top of the lower half part (51) of the prefabricated bathroom, thus forming a complete frame of the four wall units (12) and the ceiling unit (13);

Step B2: arranging an upper inner-side mould (20) on the inner side of the frame formed by the upper portion of the four wall units (12) and the ceiling unit (13), weaving lateral reinforcing steel bars (21) and vertical reinforcing steel bars (22) on the outer edge of the upper inner-side mould (20), the lateral reinforcing steel bars (21) and the vertical reinforcing steel bars (22) being connected to the structural steel bars (32) respectively so as to form a reinforcement mat;

Step B3: arranging an upper outer-side steel mould (23) on the outer side of the frame formed by the four wall units (12) and the ceiling unit (13), keeping the upper outer-side steel mould (23) vertical through an adjusting lever (35) and firmly clamping the reinforcement mat between the upper inner-side mould (20) and the upper outer-side steel mould (23), and at the same time mounting the cold water pipe (33), the hot water pipe (34) and the lighting control box (36) at suitable positions; and

Step B4: pouring suitable concrete into the inner space enclosed by the upper inner-side mould (20) and the upper outer-side steel mould (23), removing the upper

inner-side mould (20) and the upper outer-side steel mould (23) after the concrete reaches a certain strength, thus forming the upper half part (52) of the prefabricated bathroom.

5 11. The method for constructing a prefabricated bathroom according to claim 10, characterizing in that, at least one of the four wall units (12) is a semi-prefabricated structural wall (122) or a full-prefabricated structural wall (121) with a bridging structure.

10 12. The method for constructing a prefabricated bathroom according to claim 11, characterizing in that, when one of the four wall units (12) of the prefabricated bathroom is the full-prefabricated structural wall, Step A1 further includes placing a hollow pipe (31) into one of the vertical steel moulds (17) to contact the bottom steel mould (16) for producing the grouting channel (1214) extending into the wall from
15 the lower edge of the wall, and Step A3 further includes removing the hollow pipe (31) after concrete reaches a certain strength.

13. A method for installing a prefabricated bathroom, comprising the steps:

Step D: leveling out a floor (25) for installing the prefabricated bathroom, and
20 placing a structural floor plate (26) at the edge of the floor (25);

Step E: laying a layer of cement slurry (27) on the floor (25), and placing the fabricated bathroom on the layer of cement slurry (27) and enabling it being snugly affixed to the cement slurry (27);

Step F: starting from lateral steel bars (18) that extend from the bottom unit (11)
25 of the fabricated bathroom, building a bottom reinforcement mat (42) closely connecting to the lateral steel bars (18) on the structural floor plate (26), and then casting suitable concrete on the bottom reinforcement mat (42), thus enabling the bottom unit (11) of the fabricated bathroom being firmly bonded with the structural floor plate (26) as a unitary body; and

30 Step G: bridging at least one of the wall units (12) of the fabricated bathroom with wall units of floors vertically adjacent thereto.

14. The method for installing a prefabricated bathroom according to claim 13, characterizing in that, Step D specifically includes:

35 Step D1: defining a floor (25) to be installed with the prefabricated bathroom, and leveling out and cleaning the floor (25);

Step D2: arranging a bedding layer or a supporting block (28) that has been adjusted in the horizontal direction on the floor (25); and

Step D3: building a supporting base (29), and laying a structural floor plate (26)

adjacent to the floor (25) on the supporting base (29).

15 15. The method for installing a prefabricated bathroom according to claim 13, characterizing in that, between Step E and Step F the method further includes: locking the fabricated bathroom and the floor vertically adjacent thereto together by means of temporary securing nuts (24) and a fixing support (30) in order to fix the fabricated bathroom temporarily.

10 16. The method for installing a prefabricated bathroom according to claim 15, characterizing in that, when the wall unit is the full-prefabricated structural wall (121), Step G specifically includes:

 inserting inner steel bars (38) into the grouting channel (1214) of the full-prefabricated structural wall (121); and

15 pouring cement slurry into the grouting channel (1214) through the grouting hole (1212) of the full-prefabricated structural wall (121), thus causing the full-prefabricated structural wall (121) being a unitary body with the structural wall of adjacent floor.

20 17. The method for installing a prefabricated bathroom according to claim 15, characterizing in that, when the wall unit is the semi-prefabricated structural wall (122), Step G specifically includes:

 providing steel bars on the outer side of the semi-prefabricated structural wall (122) and connecting them to the exposed prefabricated steel bars (39) on the top of structural wall of next floor in a securing manner, so as to form a cast-in-situ reinforcement mat (43);

 mounting cast-in-situ templates (1223) on the outer side of the outer wall reinforcement mat (43);

30 pouring suitable concrete into the reinforcement mat (43) between the cast-in-situ templates (1223) and the semi-prefabricated structural wall (122), so as to form an in-situ structural wall being firmly bonded to the semi-prefabricated structural wall (122), thus forming a complete structural outer wall.