

ROOF CISTERN AND METHOD FOR MANUFACTURING AND CONSTRUCTING THE SAME

5 **Field of the Invention**

The present invention relates to a roof cistern, and a method for manufacturing and constructing the roof cistern, wherein not only a cover of the cistern is prefabricated, but also a wall and a floor of the cistern are semi-prefabricated.

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Background of the Invention

Traditionally, a roof cistern is formed through cast-in-situ construction. In the construction, a working platform is established on the roof, and inner and outer wall
15 molds are fixed thereon. Then, all the reinforcing bars and fittings are bounded, and concrete is cast thereafter. This procedure needs a large amount of working at heights, and workers have to enter the cistern for dismantling the inner wall mold. In the current solutions of prefabricating the cistern, only the cover of the cistern is prefabricated, whereas the wall and the floor thereof still have to be built on site. The
20 above cast-in-situ construction renders construction steps complex, quality control difficult, labor cost relatively high, potential risks increased, and construction progress relatively slow.

Summary of the Invention

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The technical problem to be solved by the present invention is to provide a technical solution, wherein the wall and the floor of the cistern are semi-prefabricated, thus reducing the procedures for mounting and dismantling inner and outer molds. It is only necessary to mount the inner wall mold and binding a single layer of
30 reinforcing bars for the cast-in-situ wall. The cover of the cistern is full-prefabricated, thus reducing the procedures for mounting and dismantling molds, binding reinforcing bars, and casting concrete. Workers are only required to dismantle the scaffold for mounting. Therefore, the operation safety is significantly increased. In addition, the prefabricated members can be produced at factories with high quality, thus greatly

reducing the on-site construction operations and shortening the on-site construction period.

5 In order to solve the above technical problem, the present invention provides a roof cistern, including a floor, a wall and a cover. The floor and the wall are semi-prefabricated members, and include an integral housing consisting of a prefabricated floor and a prefabricated wall, and a cast-in-situ floor and a cast-in-situ wall located inside the housing. The cover is a full-prefabricate member. The prefabricated wall is provided at an inner surface thereof with a fixing device extending inwardly for fixing
10 an inner wall mold.

According to an embodiment of the roof cistern, the prefabricated floor is provided with floor reserved holes, through which support reserved reinforcing bars of a roof support pass respectively so as to connect the wall and the floor with the roof
15 support. In addition, the cover is provided at a region for connection with the wall with cover reserved holes, through which wall reserved reinforcing bars pass respectively so as to connect the cover with the wall.

According to an embodiment of the roof cistern, the fixing device is a mold
20 screw.

According to an embodiment of the roof cistern, portions of the prefabricated floor and the prefabricated wall for respective engagement with the cast-in-situ floor and the cast-in-situ wall each have a shape formed by convex and concave regions
25 arranged alternately.

According to an embodiment of the roof cistern, the cover is provided with exposing reinforcing bars for connection with surrounding floor slabs.

30 According to an embodiment of the roof cistern, each of the prefabricated floor, the prefabricated wall and the cover is formed by splicing two or more prefabricated plates.

The present invention further provides a method for manufacturing and

constructing a roof cistern, comprising the following steps:

Step S1, semi-prefabricating a floor and a wall required by the roof cistern, and forming an integral housing of the floor and the wall according to a size of the cistern at factory, with the prefabricated wall being provided with a fixing device for fixing
5 an inner wall mold;

Step S2, prefabricating a cistern cover according to the size of the cistern at factory;

Step S3, during construction of the roof, placing the prefabricated wall and the prefabricated floor on a roof support, mounting a cistern support on the support and
10 the prefabricated wall, binding reinforcing bars of cast-in-situ portions of the wall and the floor after adjustment of position of the cistern, mounting an inner wall mold, casting concrete for the wall and the floor, and removing the inner wall mold (40) after the concrete is set; and

Step S4, placing the prefabricated cistern cover (30) on the wall by hoist, and
15 after adjustment of position of the cover, closing the cistern with the cover.

According to an embodiment of the method, in Step S1, the prefabricated floor is provided with floor reserved holes, through which support reserved reinforcing bars pass respectively; in Step S2, the cover is provided at a region for connection with the
20 wall with cover reserved holes, through which wall reserved reinforcing bars pass respectively; in Step S3 the support reserved reinforcing bars pass through the floor reserved holes respectively when the prefabricated floor and the prefabricated wall are placed on the roof support, so as to connect the wall and the floor with the roof support; and in Step S4 the wall reserved reinforcing bars pass through cover reserved
25 holes of the cover when placing the cover by hoist, so as to connect the cover with the wall, and then completing the casting between the cover reserved holes and the wall reserved reinforcing bars.

According to an embodiment of the method, in Step S2 the cover is further
30 provided with exposing reinforcing bars for connection with surrounding floor slabs; and in Step S4 field reinforcing bars around the cover are bounded, and then concrete is cast between surrounding floor slabs.

According to an embodiment of the method, the prefabricated floor, the

prefabricated wall and the cover are all produced by steel molds, and the inner wall mold is a steel mold.

5 According to an embodiment of the method, in Step S1 portions of the prefabricated floor and the prefabricated wall for respective engagement with the cast-in-situ floor and the cast-in-situ wall each have a shape formed by convex and concave regions arranged alternately.

10 According to an embodiment of the method, the prefabricated wall and the cover is formed by splicing two or more prefabricated plates.

Compared with the prior arts, in the present invention the floor and the wall of the cistern are semi-prefabricated, so that the on-site operations associated with inner and outer wall molds are no longer necessary. Therefore, the difficulties for on-site construction can be greatly reduced, the construction procedures can be simplified, and the on-site labor cost, pollution and construction period can be reduced. Since the inner wall mold is a steel mold, it can be directly positioned on the prefabricated members accurately, thus simplifying the operations associated with the inner wall mold. Moreover, with the prefabricated steel molds, the production precision and surface quality can be also significantly increased.

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Brief Description of the Drawings

Fig. 1 is a longitudinal cross-sectional view of a roof cistern according to the present invention;

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Fig. 2 is a lateral cross-sectional view of the roof cistern according to the present invention, showing a wall and a floor;

30 Fig. 3 schematically shows the wall of the roof cistern according to the present invention, with an inner wall mold being mounted;

Fig. 4 is a cross-sectional view along line B-B of Fig. 2;

Fig. 5 is a cross-sectional view along line C-C of Fig. 2;

Fig. 6 is a plan view of the roof cistern according to the present invention;

5 Fig. 7 is a cross-sectional view along line A-A of Fig. 6;

Fig. 8 schematically shows a supporting device for the roof cistern according to the present invention; and

10 Fig. 9 schematically shows the mounting of a cover on the roof cistern according to the present invention.

Detailed Description of the Embodiments

15 The present invention will be described in further detail with reference to the accompanying drawings and the embodiments, in which the objectives, technical solutions, and advantages of the present invention will become more apparent. It is to be understood that the specific embodiments described herein are merely to illustrate the present invention but are not intended to limit the present invention.

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As shown in Fig. 1, the roof cistern according to the present invention includes a floor, a wall, and a cover 30. The floor includes a prefabricated floor 10 and a cast-in-situ floor 11, and the wall includes a prefabricated wall 20 and a cast-in-situ wall 21. To ensure a stable connection between the prefabricated members and the cast-in-situ members of the floor and the wall, the portions of the prefabricated floor 10 and the prefabricated wall 20 for respective engagement with the cast-in-situ floor 11 and the cast-in-situ wall 21 can each have a saw-tooth shape formed by convex and concave regions arranged alternately. On the inner side of the prefabricated wall there are provided with fixing elements such as mold screws, etc., in order to fix the inner wall mold that should be used during cast-in-situ. As shown in Fig. 2, the prefabricated floor 10 is provided with at least one floor reserved hole 101, through which a support reserved reinforcing bar of a roof support passes to connect the floor, the wall, and the roof support. As shown in Fig. 7, the cover 30 is provided with at least one cover reserved hole 301, through which a wall reserved reinforcing bar 202 passes to

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connect the wall and the cover 30. The cover 30 is further provided with a passageway port, through which workers can be in or out the cistern by means of a ladder disposed at a corresponding position of the wall. The cover 30 may be further provided with exposing reinforcing bars (not shown) for connection with surrounding floor slabs. Moreover, in view of the requirements on transportation of normally over-sized cistern, the prefabricated floor 10, the prefabricated wall 20 and the cover 30 can be formed by two or more prefabricated plates, which are spliced together.

The above roof cistern can be manufactured and constructed through a method comprising the following steps. First, the floor and the wall of the cistern are semi-prefabricated at factories, as shown in Fig. 1, forming an integral housing. To ensure a stable connection between the prefabricated members and the cast-in-situ members of the floor and the wall, the portions of the prefabricated floor 10 and the prefabricated wall 20 for respective engagement with the cast-in-situ floor 11 and the cast-in-situ wall 21 can each have a saw-tooth shape formed by convex and concave regions arranged alternately, as shown in Fig. 2. The prefabricated floor 10 is provided with floor reserved holes 101. As shown in Figs. 4 and 5, when the prefabricated floor 10 is mounted on a roof support 50, support reserved reinforcing bars 501 will pass through respective floor reserved holes 101 to connect the floor and the wall of the cistern with the roof support 50. The cast-in-situ wall 21, the cast-in-situ floor 11, the prefabricated floor 10 and the prefabricated wall 20 of the cistern and the support 50 are completely bounded together by means of the support reserved reinforcing bars 501.

As shown in Fig. 3, the prefabricated wall 20 is provided with reserved fixing elements such as mold screws 20, so as to fix an inner wall mold 40. The inner wall mold 40 is preferably a steel mold, which can be directly and accurately positioned on the prefabricated members, but also increase the product precision and surface quality.

With the prefabricated wall 20 and the prefabricated floor 10 of the cistern, the constructions of the outer wall mold and the bottom mold are no longer necessary, thus increasing the construction efficiency. According to the requirements on transportation of the normally over-sized cistern, each of the prefabricated floor 10 and the prefabricated wall 20 can be formed by jointing two or more portions along a

lateral direction. In the embodiment as shown in the drawings, for the prefabricated floor 10, it is laterally separated into two portions along a middle line in view of overdue width; and for the prefabricated wall 20, the upper portion thereof is formed by cast-in-situ in view of overdue height. Of course, the upper portion of the prefabricated wall 20 can be prefabricated also.

Then, the cover 30 of the cistern will be completely prefabricated. As shown in Fig. 1, the cover 30 is prefabricated with a size conforming to the cistern at factories. As shown in Figs. 6 and 7, a region of the cover for connecting the wall is provided with cover reserved holes 301, through which wall reserved reinforcing bars 202 can pass respectively so as to connect the cover 30 and the wall. The cover 30 *per se* can be further provided with reserved reinforcing bars for connecting with surrounding floor slabs.

With the prefabricated cover 30, the inner wall mold can be conveniently dismantled. In addition, the cover 30 can be rapidly mounted in position after the inner wall mold is dismantled. According to the requirements on transportation of the normally over-sized cistern, the cover 30 can be formed by jointing two or more portions. As shown in Fig. 6, the cover 30 can be also provided with a passageway port, through which worker can be in or out of the cistern conveniently by means of a ladder disposed at a corresponding position of the cast-in-situ portion of the wall.

In order to ensure the precision of the prefabricated members and quality of concrete, the prefabricated floor 10, the prefabricated wall 20 and the cover 30 as mentioned above are preferably produced with steel molds.

Finally, the wall and the floor are cast in-situ and the cover 30 is mounted. As shown in Fig. 1, the housing formed by the prefabricated floor 10 and the prefabricated wall 20 is transported to the construction site, and placed on the roof support 50 by hoist. As shown in Figs. 4 and 5, the support reserved reinforcing bars 501 of the support 50 pass through respective floor reserved holes 101 of the prefabricated floor 10, so as to connect the floor 10, the wall 20 and the support 50 together. In order to place the prefabricated floor 10 on the support 50 stably, a perforated rubber cushion 51 can be arranged between the prefabricated floor 10 and

the support 50. The cast-in-situ wall 21 and the cast-in-situ floor 11 are securely connected with the prefabricated wall 20 and the prefabricated floor 10 respectively through reserved reinforcing bars 501.

5 Before the cast-in-situ, the prefabricated wall 20 and the prefabricated floor 10 should be fixed on the support 50. As shown in Fig. 8, cistern supports 60 are arranged between the outer surface of the prefabricated wall 20 and the support 50 so as to fix the prefabricated wall 20 and the prefabricated floor 10. After the position of the cistern is adjusted and fixed, the reinforcing bars for the cast-in-situ portions of the
10 wall and the floor are bounded.

As shown in Fig. 3, the inner wall mold 40 is mounted. After positioned, the inner wall mold 40 is fixed on the prefabricated wall 20 through mold screws 201 or other fixing elements, and then concrete is cast for the wall and the floor.

15 As shown in Fig. 9, after the concrete is set, the inner wall mold 40 is dismantled, and the cover 30 is mounted by hoist. The cover 30 is placed on the wall of the cistern after adjustment of position, and thus the cistern is accurately closed. In addition, a cover supporting device such as door scaffold 70 is arranged in the cistern for
20 supporting the cover 30. As shown in Fig. 7, wall reserved reinforcing bars 202 pass through the cover reserved holes 301 of the cover 30 respectively, so as to connect the cover 30 with the wall. The gap between the cover 30 and the wall is filled completely with join sealant as required. The field reinforcing bars around the cover are bounded, and then concrete is cast for surrounding floor slabs.

25 The foregoing is merely preferred embodiments of the present invention, but is not intended to be limitation of the present invention. It will be apparent to those skilled in the art that various changes and modifications can be made to the present invention. Any modifications, equivalent substitutions, improvements, and the like
30 within the spirit and principles of the present invention are intended to be included within the scope of the present invention.

Claims

1. A roof cistern, including a floor, a wall and a cover (30),
wherein the floor and the wall are semi-prefabricated members, and include an
5 integral housing consisting of a prefabricated floor (10) and a prefabricated wall (20),
and a cast-in-situ floor (11) and a cast-in-situ wall (21) located inside the housing;
the cover (30) is a full-prefabricate member; and
the prefabricated wall (20) is provided at an inner surface thereof with a fixing
device extending inwardly for fixing an inner wall mold (40).

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2. The roof cistern according to claim 1, wherein the prefabricated floor (10) is
provided with floor reserved holes (10), through which support reserved reinforcing
bars (501) of a roof support (50) pass respectively so as to connect the wall and the
floor with the roof support (50); and

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wherein the cover (30) is provided at a region for connection with the wall with
cover reserved holes (301), through which wall reserved reinforcing bars (202) pass
respectively so as to connect the cover (30) with the wall.

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3. The roof cistern according to claim 1, wherein the fixing device is a mold
screw (201).

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4. The roof cistern according to claim 1, wherein portions of the prefabricated
floor (10) and the prefabricated wall (20) for respective engagement with the cast-in-
situ floor and the cast-in-situ wall each have a shape formed by convex and concave
regions arranged alternately.

5. The roof cistern according to any one of claims 1 to 4, wherein the cover (30)
is provided with exposing reinforcing bars for connection with surrounding floor slabs.

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6. The roof cistern according to any one of claims 1 to 4, wherein each of the
prefabricated floor (10), the prefabricated wall (20) and the cover (30) is formed by
splicing two or more prefabricated plates.

7. A method for manufacturing and constructing a roof cistern, comprising the

following steps:

Step S1, semi-prefabricating a floor and a wall required by the roof cistern, and forming an integral housing of the floor and the wall according to a size of the cistern at a factory, with a prefabricated wall (20) being provided with a fixing device for
5 fixing an inner wall mold (40);

Step S2, prefabricating a cistern cover (30) according to the size of the cistern at a factory;

Step S3, during construction of the roof, placing the prefabricated wall (20) and the prefabricated floor (10) on a roof support (50), mounting a cistern support (60) on
10 the support (50) and the prefabricated wall (20), binding reinforcing bars of cast-in-situ portions of the wall and the floor after adjustment of position of the cistern, mounting an inner wall mold (40), then casting concrete for the wall and the floor, and removing the inner wall mold (40) after the concrete is set; and

Step S4, placing the prefabricated cistern cover (30) on the wall, and after
15 adjustment of position of the cover, closing the cistern with the cover (30).

8. The method according to claim 7, wherein

in Step S1, the prefabricated floor (10) is provided with floor reserved holes (101), through which support reserved reinforcing bars (501) pass respectively;

20 in Step S2 the cover (30) is provided at a region for connection with the wall with cover reserved holes (301), through which wall reserved reinforcing bars (202) pass respectively;

in Step S3 the support reserved reinforcing bars (501) pass through the floor reserved holes (101) respectively when the prefabricated floor (10) and the
25 prefabricated wall (20) are placed on the roof support (50), so as to connect the wall and the floor with the roof support (50); and

in Step S4 the wall reserved reinforcing bars (202) pass through cover reserved holes (301) of the cover (30) when placing the cover (30) by hoist, so as to connect the cover (30) with the wall, and completing the casting between the cover reserved
30 holes (301) and the wall reserved reinforcing bars (202).

9. The method according to claim 7 or 8, wherein

in Step S2 the cover (30) is provided with exposing reinforcing bars for connection with surrounding floor slabs; and

in Step S4 field reinforcing bars around the cover (30) are bounded, and then concrete is cast for surrounding floor slabs.

10. The method according to claim 7 or 8, wherein the prefabricated floor (10),
5 the prefabricated wall (20) and the cover (30) are all produced by steel molds, and the inner wall mold is a steel mold.

11. The method according to claim 7 or 8, wherein in Step S1 portions of the prefabricated floor (10) and the prefabricated wall (20) for respective engagement
10 with the cast-in-situ floor and the cast-in-situ wall each have a shape formed by convex and concave regions arranged alternately.

12. The method according to claim 7 or 8, wherein each of the prefabricated floor (10), the prefabricated wall (20) and the cover (30) is formed by splicing two or
15 more prefabricated plates.