

## **Structural Plans of Glass Reinforced Polyester (GRP) Water Tanks**

Water tanks constructed in glass reinforced polyester (abbreviated as GRP) are building works subject to control under the Buildings Ordinance. This practice note gives guidelines on the preparation of plans showing structural details of these GRP water tanks and the related test requirements.

### **Special Aspects of GRP**

2. Compared with a traditional structural material such as mild steel, the high strength and low stiffness of GRP laminates means that structural design will be influenced more strongly by stiffness than strength. Furthermore, in service conditions, the long-term performance of a load-bearing GRP component can be adversely affected by several factors including the creep properties and the environment. Appropriate allowance for these factors should therefore be made in design to avoid premature failure.

### **Plans Submission**

3. Except for small GRP water tanks where separate guidelines are given in paragraph 7, the following particulars are required to be included in the structural plans submitted for approval :

- (a) reference to design standards;
- (b) material specifications (e.g. material types, relevant compliance standards and mechanical properties etc);
- (c) general arrangement showing the maximum designed capacity, the principal dimensions and thicknesses;
- (d) fabrication details of the major structural components;
- (e) fixing arrangements and details of the tank supports.

Design calculations are also required to be submitted to substantiate the structural adequacy and integrity of the water tank and the base support.

## **Quality Control**

4. The following documents are required to be submitted prior to consent application for the commencement of GRP water tank installation works :

- (a) test reports issued by a recognised laboratory/organization to substantiate the mechanical properties of the fibre glass panel and its ability to withstand 6 times the design hydrostatic pressure; and
- (b) manufacturer's quality control details of the production of fibre glass panels and fabrication of the GRP tank.

## **Performance Tests**

5. Performance tests are required to be carried out upon completion of the GRP water tank to satisfy the following requirements. The water tank shall be filled with water up to the overflow level at ambient temperature for the testings:

- (a) Leakage tests - The assembled water tank should be tested to demonstrate that there will be no visible sign of leakage after standing for at least 48 hours.
- (b) Deflection test - The assembled water tank should be tested to satisfy that the deflection of the sides and bottom of the tank shall not exceed 1.0% of the depth of the tank and 10mm respectively after maintaining the full water load for at least 2 hours.

6. Upon satisfactory completion of the tests, the test reports should be submitted to the Building Authority appended with a statement signed by the Authorized Person/Registered Structural Engineer who prepared the plans to confirm that the water tank works have been carried out to satisfy the above-mentioned performance requirements.

## **Small GRP Water Tank**

7. For GRP water tanks with a volume capacity and the water head not exceeding 9m<sup>3</sup> and 2m respectively, requirements described in paragraphs 3 to 5 above would normally not be required. However, the following particulars should be included in the structural plans submitted for approval :

- (a) Location, principal dimensions, capacity and weight of the water tank;
- (b) Reference to design standards and material specification of the tank; and
- (c) Fixing arrangements and details, with calculations substantiating the structural adequacy of the tank supports.

8. For indoor GRP water tanks with a volume capacity and water head not exceeding 4m<sup>3</sup> and 1.2m respectively, only item (a) in paragraph 7 above needs to be included in the structural plans submitted for approval together with calculations substantiating the structural adequacy of the floor structure supporting the water tank.

### **Minor Works Relating to GRP Water Tanks**

9. Under the Minor Works Control System, certain works relating to GRP water tanks in an existing building have been designated as minor works, which may be carried out under the simplified requirements as an alternative to obtaining prior approval and consent from the Building Authority. For the list of minor works items and the simplified requirements, please refer to Schedule 1 of the Building (Minor Works) Regulation and PNAP APP-147 respectively.

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