

## ABSTRACT

**Title:** Diseño, cálculo y ejecución de tanques de ferrocemento  
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In the present thesis, is developed the design and the procedures in construction of ferrocement water tanks for developing countries. The study is concerned especially in the fact that these tanks will be built in these countries. Those countries have not the technology and the quality of materials that can be found in the developed countries. At the same time, the construction will be carried out by the same users of tanks (only with the supervision of a single technician). For that reason the study is focused to simplify the needed computation and assembly of the structure.

In the structure of the thesis is introduced firstly the concept of ferrocement. That involves, consequently, the analysis of its properties and components (aspects like type of reinforcement and the mix ratio), some elements used in the execution of the tanks (formwork, tools, needed equipment...). Then the general uses of the ferrocement as a construction material are revised with some examples. In this chapter it is also included the results of tests about the study on the Design of Rainwater Storage Tanks for use in Developing Countries.

After the general view of the actual state-of-the-art, a new formulation for sizing the thickness of tank wall is developed. This is tested in several practical examples. In these examples the base of the tank is analyzed with the Finite Element Method in order to obtain his optimal shape. The basis of the geometrical shape of the tank base is a spherical cap with a variable curvature radius depending in the contact angle between the base and the wall of the tank.

It is also included a chapter with several examples with tanks made with ferrocement. There are four detailed examples. A ten cubic meters ( $10 \text{ m}^3$ ) tank, a hundred and a half cubic meters ( $150 \text{ m}^3$ ), a partially bellow ground water tank of ten cubic meters ( $10 \text{ m}^3$ ) and the building of the a ferrocement tank roof. These examples are the result of an exhaustive bibliographical research that has been found very interesting for its didactical characteristics.

Finally the results are ranged in different tables in order to establish the geometrical and technical characteristics using the limits of height and radius of the tank. The main criteria to limit the tank results for tanks has been the fact of achieving reasonable heights for an easier construction. In another hand the diameters of the tanks have been set in a strict rank where this material seems to be much better than concrete for our purposes. In order to obtain a usable guide to build the ferrocement tanks have been made twelve tables with the construction variables as a thesis of the study. These tables have been checked with the measurements of real constructed tanks.

This thesis is a good tool to orientate the technicians of these developing countries in the sizing needed to design water tanks in their communities. It doesn't pretend to be a strict rule for their design but a useful guide in this field. It is also recommended that a technician have a supervision on the results given by the tables before constructing a tank with them, and see the details that they obviously don't give like tools, formwork, elements for tying the reinforcement,...