Design of Analysis of Reinforced Concrete Elevated Water Towers Using GTSTRUDL

by

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Abstract

The writer has attempted to design a 1250 m^3 elevated water tower using GT STRUDL method of finite element to see whether it is a viable. Design of (Intz type) elevated water towers is very common practice in Sri Lanka. The cost effectiveness of form work and concrete work of elevated water tower is preferred than esthetic view of the structure. Therefore, repetitive work is involved in the design and analysis of elevated water towers.

The British Standards of practices are the standards to be practiced legally in Sri Lanka. The standards used for the design of reinforced concrete structures are BS 8110 (design of Reinforced Concrete Structures) and BS 8007(Design of Liquid Retaining Structures).

The purpose of this work is to calculate the local stresses of components of structural elements of a 1250m^3 capacity elevated water tower using GT STRUDL finite element method.

More detail functions of this work using GT STRUDL are as follows

- Developing a program of this nature, by changing the input data to suit the capacity of the tank, height of the shaft etc differently. As a result simply changing the input data according to the project involved, the user can design and analyze an elevated water tower with less effort than before.

- The data such as Minimum Water Level (MWL), Maximum Water Level (HWL) and the capacity of the tank are being obtained from the water supply engineer extracted from the water-cad model. The bearing pressure is obtained from the Soil Investigation Report. The wind pressure is obtained from the code of practice.

- The initial sizing of the shaft diameter, thickness of water tank walls (Conical and cylindrical) and roof dome etc have done manually and fed as input data to the GTSTRUDL model. The liquid load has been fed as a force to each and every finite elements of the model

- The wind load and the soil bearing pressure have not been not fed to the model so far. However, the writer is attempting to feed soil pressure and wind load for the final presentation of the paper. The wind pressure is required to consider for the worst case which is when the tank is empty.

- Load combinations considered in the model are as follows:

    - 1.0 G_K + 1.0 Q_K
    - 1.4 G_K + 1.6 Q_K
    - 1.2 G_K + 1.2 Q_K + 1.2 W_K
    - The results generated from finite element method of GT STRUDL have been compared against the manual calculations for critical locations.