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2. Water Tank with Structural Form of a Space Satellite (India)

Owner: Indian Space Research Organisation (ISRO), Bangalore
Architect: ISRO, Bangalore
Consulting engineers: GERAME, Bangalore
Contractors: The Designers and Builders, Bangalore
Work's duration: 6 months
Service date: 1982

Introduction

An RCC overhead water tower with a capacity of 70 m³ over a staging of 20 m was proposed to supply drinking water to the residents in the housing colony of ISRO at Hassan, Karnataka. A platform inside the shaft at a height of 15 m was provided for sighting antenna as per the requirements of Indian Space Research Organisation (ISRO). The container is a prismoidal folded plate structural form resembling a space satellite and is supported on a star shaped hollow concrete shaft. The Contractors were awarded the work on contractors own designs, keeping the structural form proposed by ISRO, which was found to be lower by over 20% in cost compared to Departmental Designs.

Design

The sixteen sided star shaped reinforced concrete tower shaft (Fig. 1) was supported on RC raft foundation. The container with a prismoidal folded plate member was designed as such with a diaphragm to resist hoop tension in between the lower prism and vertical portion of the container (Fig. 2 and Fig. 4).

Construction

The sixteen vertical lines (at the intersection of sixteen vertical plates) continuing as the intersecting lines of the prismoidal folded plate members of the container had to lie exactly on eight symmetrical vertical planes. This necessitated the formwork to be designed in such a way that no corner should be pushed out of position due to vibration. This concept was achieved in the shaft (Fig. 3) by preparing form boards with joint at the centre of the alternate folds. The plywood boards were connected by bolts and at every lift it was checked with reference to vertical plane passing through a heavy plum bob at the centre of the shaft and the opposite intersecting lines with a tolerance of plus or minus 3 mm.

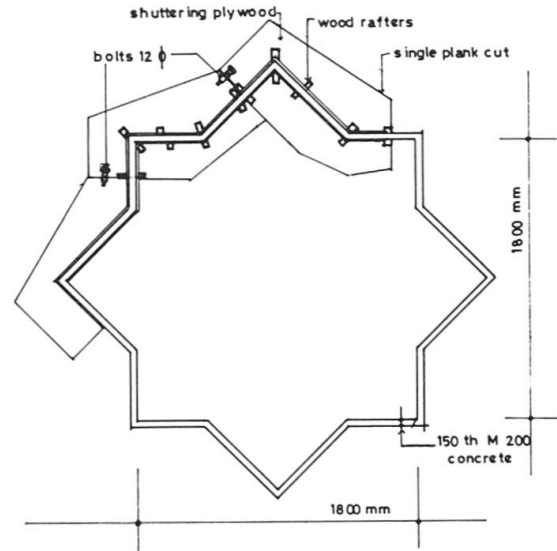


Fig. 1. Plan, shuttering details of shaft

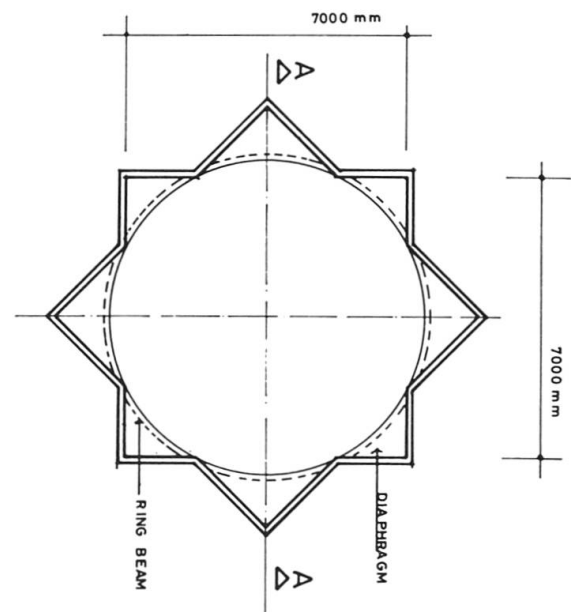


Fig. 2. Plan, above diaphragm

For the shaft inside form board was fixed for a height of 2.5 m and outside form board was two of 1.25 m height, casting lower 1.25 m height (0.15 m thick concrete) before fixing the 2nd outside board of 1.25 m height. Climbing formwork method was used.

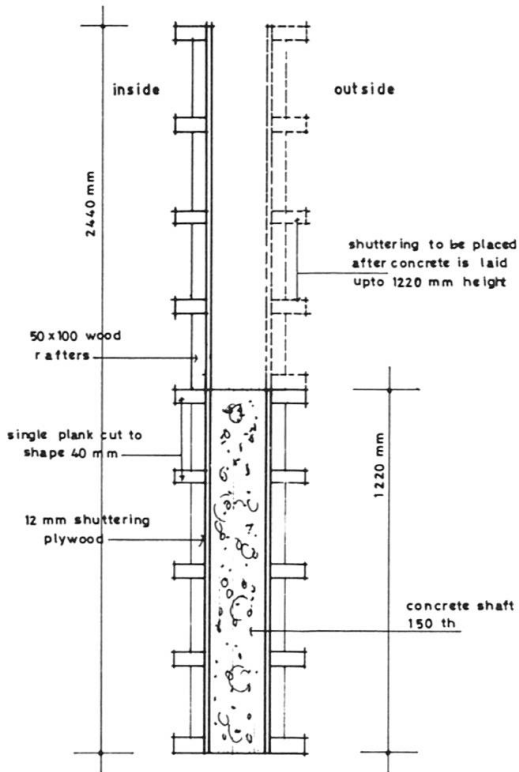


Fig. 3. Section, details of climbing formwork

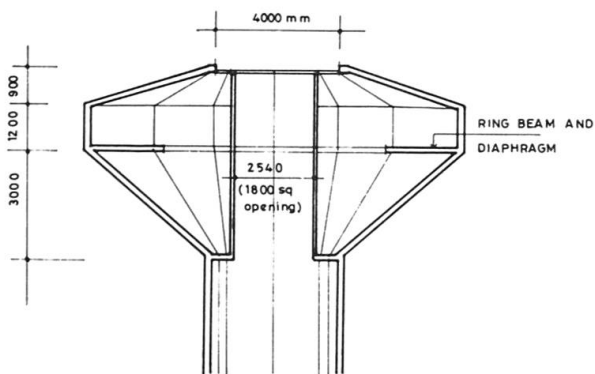


Fig. 4. Section A-A

As the vertical angle of the top and bottom portion of the prismatic folded plate did not exceed 40 degree, no top formwork was found necessary. Pipe scaffolding was used for the tower with an electrical hoist to lift materials. Structural concrete was of M 200 and 415 grade steel rods were used. Only interior of the container is plastered in cement mortar with water proofing compound and all other surfaces were of exposed formwork.

(H. R. Viswanath. H. K. Nanjunda Swamy.)

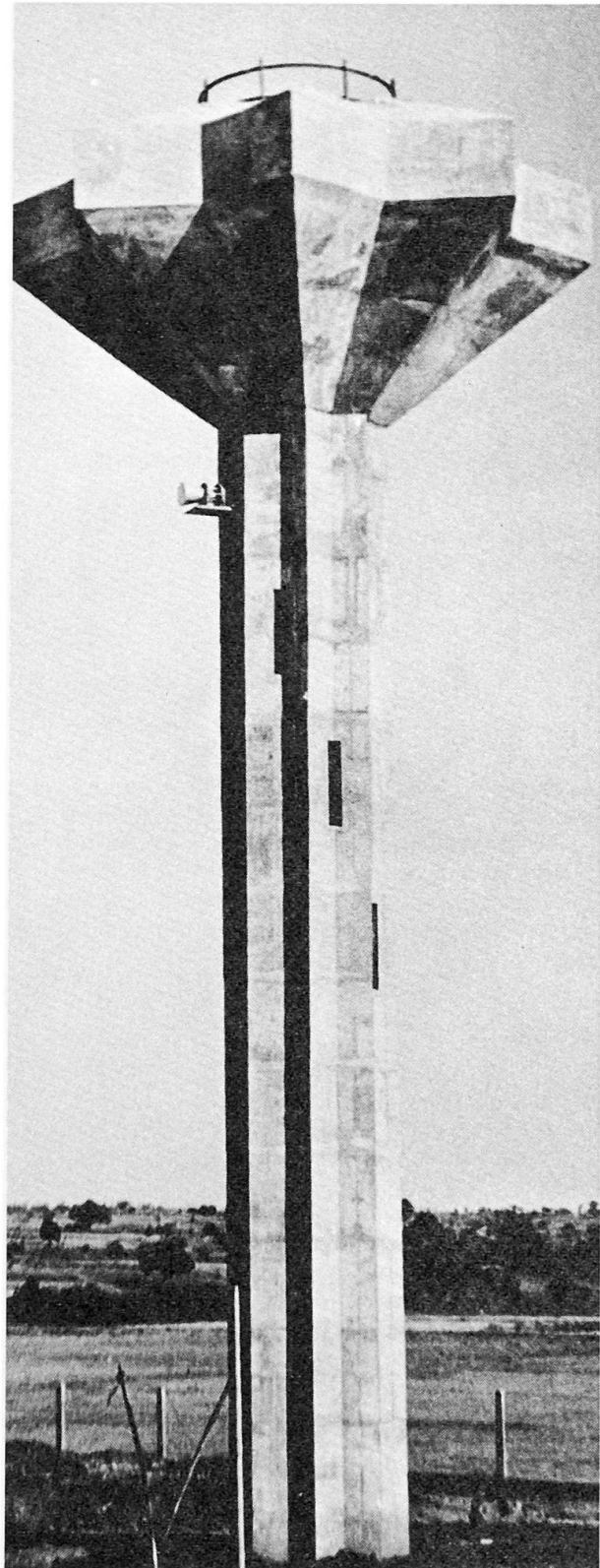


Fig. 5. Water tank with structural form of a space satellite