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IMPROVED RETROSPECTIVE ANALYSIS OF THE VICTORIA DAM

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The Victoria dam is important for Sri Lanka because of its role in hydro-electricity generation and irrigation. Regular monitoring is essential to ensure its satisfactory performance, provide early warnings of potential problems, and assist in future operation and maintenance decisions. A doubly curved concrete arch dam having a maximum height of 122 m and a crest length of 520 m, Victoria is well instrumented for regular monitoring. The accumulated data shows that over the years there have been significant changes in its deformation pattern. It is important to understand these changes from a structural point of view. Developing a reliable model and validating it using available data, is important under these circumstances. The future behaviour of the structure also might be predicted using such a model.

A finite element model of Victoria dam was developed and tested previously. Even though the calculated displacement pattern was consistent with observed data the displacement values did not exactly match the observations. Several factors could be responsible for these discrepancies. The present study examined the effects of the following factors on the performance of the above finite element model.

1) The symmetry assumption used to limit the model to half of the dam.
2) Non-inclusion of galleries and spillway openings in the finite element model.
3) Possible deviation of material properties from the values used in the analysis.

To test the effect of the symmetry assumption, the full dam was modelled and compared against half dam results and the latter was revealed to be quite satisfactory. Based on this conclusion, the half dam model was used in further studies. Inclusion of galleries and spillway openings improved the performance of the finite element model. Records of the strength of the concrete used in the dam indicate that the corresponding values of elastic modulus would vary between 23 and 32 GPa. Even though these values would most probably increase with time they would be appropriate for the present study because the measured data used for comparisons had been obtained soon after the dam had been commissioned. Observed displacement results fell within the envelope of finite element results bounded by these limits of elastic modulus.

The study concluded that modelling half of the dam, assuming symmetry, is acceptable. It also demonstrated that the inclusion of details of galleries and spillway openings, and using appropriate and realistic values for the elastic modulus of concrete can improve the performance of finite element models of the Victoria dam.

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