

MASTER'S DISSERTATION AT STRUCTURAL MECHANICS

DEPARTMENT OF CONSTRUCTION SCIENCES | FACULTY OF ENGINEERING LTH | LUND UNIVERSITY



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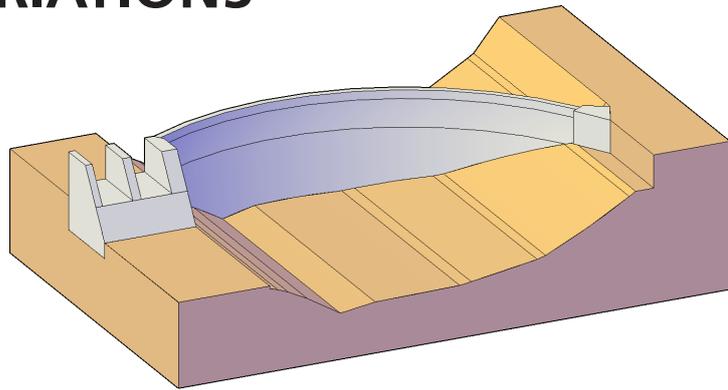
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FE ANALYSIS OF CRACKING OF A CONCRETE ARCH DAM DUE TO SEASONAL TEMPERATURE VARIATIONS



BACKGROUND

Dams in Northern countries are exposed to large temperature variations between summer and winter. In the north of Sweden many dams are subjected to variations of about 60-70 °C. These variations in temperature often result in cracking of the concrete. This causes challenges in the design of new dams and the maintenance of existing dams. This master thesis is a part of an initiative from the ICOLD-committee "Computational Aspects of Dam Analysis and Design" with the aim to find a suitable FE-methodology to better analyze these kinds of phenomena. The result will be presented on the "14th International Benchmark Workshop on Numerical Analysis of Dams" in Stockholm, September 2017.

OBJECTIVE AND METHOD

The objective is to analyze the risk for, and the extent of, cracking in a concrete arch dam subjected to seasonal temperature variations. The aim is to estimate the extent of cracking and how it affects the displacement of the dam.

A thermal analysis will be performed to determine the temperature distribution within the dam body caused by the ambient air temperature and the temperature of the water. The results will be used to make a mechanical analysis of the stress and strains levels in the concrete caused by the temperature difference. A linear elastic analysis will provide information about which areas of the dam where there is risk of cracking and the displacement of the dam. A non-linear analysis will take into consideration the non-linear material properties of concrete. This will also show crack patterns on the dam body.

By evaluating different assumptions and approaches for both linear analysis and non-linear analysis conclusions can be drawn regarding how these influence the extent of cracking and the response of the dam.

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