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Thermal induced stresses in thin-shell structures

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Abstract

Thin shell structures constructed from stabilised earth were assumed to be fully compressive structures as the loading conditions applied by the designers indicated this. However, it was found that these structures were experiencing extremely high tensile stresses and strains. These tensile stresses and strains are assumed to originate from thermal induced loading. This thesis investigates the temperature distribution and thermal induced stresses in a typical thin shell structure.

In order to determine the temperature distribution across a typical thin shell structure, a model was built and the temperature distribution was then determined. It was found that the temperature in the model was higher than expected. This temperature distribution was processed in a finite element model to produce typical magnitudes of the thermal induced stresses. It was found that thermal induced stresses are not negligible in these types of structures and a design engineer would need to account for theses stresses. This inspired the formulation of a design guide for these types of structures so as to adequately design these structures in the future.