

Statistical modelling of the shrinkage behaviour of South African concretes

Petra Cornelia Gaylard

Abstract

A hierarchical non-linear model was developed for the time-dependent shrinkage behaviour of South African concretes, from historical laboratory data.

The fit of fifteen growth curve models to the shrinkage-time profiles was evaluated and MCDA was used to identify the best model. The three parameters of the chosen growth curve model were modelled in terms of covariates (relating to concrete raw materials, concrete composition and shrinkage testing conditions) by multivariate multiple regression to produce the WITS model. The model largely conformed to existing knowledge about the factors affecting concrete shrinkage.

Published models for concrete shrinkage were compared to the WITS model regarding their predictive ability with respect to the South African data set. The WITS model performed the best across a variety of graphical and numerical goodness-of-fit measures.

The importance of the study is two-fold:

- The concept of hierarchical non-linear modelling has been applied for the first time to the modelling of the time-dependent properties of concrete.
- This is the first comprehensive model to bring together laboratory data on the shrinkage of concrete generated in South Africa over a span of thirty years.