6th European Conference on Computational Mechanics (ECCM 6)
7th European Conference on Computational Fluid Dynamics (ECFD 7)
11-15 June 2018, Glasgow, UK

DETERMINISTIC SIZE EFFECT IN CONCRETE SIMULATED WITH TWO VISCOPLASTIC MODELS

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Keywords: *Concrete, Size effect, Viscoplasticity, FEM*

There is an ample experimental evidence of size effect existing for plain concrete elements. Since its origin in Galileo's works the knowledge of size effect laws for brittle and quasi-brittle materials has matured. Nowadays, it is believed that size effect has at least two sources: a deterministic one as described by the fracture mechanics and a statistical one, cf. [1].

The aim of the paper is an examination of the ability of two selected viscoplastic models to reproduce the deterministic size effect in plain concrete specimens. The first one is the concrete damaged plasticity model, based on [2], available in the ABAQUS package. In this model a viscous term is included following the Duvaut-Lions approach. The second one is the Hoffman viscoplastic consistency model programmed in FEAP by authors. This model has been reworked, in comparison to its original concept [3], by introduction a new plastic potential, i.e. the non-associated formulation.

Rate dependency existing in both models serves as a localization limiter leading to mesh independent results for reasonably high values of viscosity. However, to the authors' knowledge, till now neither of the aforementioned models has been assessed in terms of ability to reproduce the deterministic size effect. Therefore authors have decided to analyze numerically size effect in three point bending tests using both models. The results for three point bending are compared with the experiment performed by [4].

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