Viscoplastic constitutive models for zero-thickness interface elements, formulation and applications

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ABSTRACT

An energy-based softening visco-plastic model for zero-thickness interface elements has been developed as an extension of an existing elastic-perfectly-viscoplastic formulation [1]. In the inviscid limit the model also collapses into a well-established fracture mechanics-based elasto-plastic model [2]. The new model is verified satisfactorily for common loading cases at interfaces such as pure tension (mode I) opening, and shear-compression (mixed-mode) sliding, with results that in the long term match the predictions of the fracture mechanics inviscid model.

The visco-plastic format of the model exhibits advantages for the analysis of physical time-dependent failure phenomena such as rate-dependent fracture in Wedge Splitting Tests of concrete and rocks. Other potential applications such as c-phi reduction geomechanical analysis and iterative techniques based on visco-plastic relaxation are also discussed.

REFERENCES

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