On the Use of a Regular Yield Surface for the Analysis of Unreinforced Masonry Walls

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ABSTRACT

A complete methodology for the non-linear macroscopic analysis of unreinforced masonry (URM) shear walls under biaxial stress state is presented, using the finite element method. The methodology focuses on the definition / specification of a general anisotropic (orthotropic) failure surface of masonry under biaxial stress, using a cubic tensor polynomial, as well as on the numerical solution of this non-linear problem. The characteristics of the polynomial used, ensure the closed shape of the failure surface which is expressed in a unique mathematical form for all possible combinations of plane stress, making it easier to include it into existing software for the analysis of masonry structures. The validity of the method, using the derived failure surface, is demonstrated by comparing the results from the study of the non-linear behaviour of URM wall panels, under uniform compressive and shear loading, against results derived by other investigators.

KEYWORDS
Anisotropic behaviour, masonry, non-linear analysis, shear wall, yield pattern, yield surface.