

**Luciano, Raimondo; Sacco, Elio**

**Homogenization technique and damage model for old masonry material.** (English)

Zbl 0942.74610

Int. J. Solids Struct. 34, No. 24, 3191-3208 (1997).

Summary: Masonry is a composite material realized by the inclusion of bricks into the matrix of mortar. In the present paper, a micromechanical approach for defining the properties of a periodic masonry material is proposed. A damage model for old masonries is presented. In fact, it is assumed that the damage is due to the coalescence and growth of the fractures only in the mortar. A repetitive unit cell is chosen and eight possible undamaged and damaged states for the masonry are identified. The homogenization theory for material with periodic microstructure is used to define the overall moduli of the uncracked and cracked masonry. Variational formulations of the periodic problem are given. A numerical procedure for the computation of the elastic properties of the undamaged and damaged masonry material is developed. Then, the damage evolution of the masonry, which accounts for the exact geometry and for the mechanical properties of the constituents of the composite, is obtained. Energy and local strength criteria for the mortar are proposed. The behavior of a typical masonry material is studied and the results are put in comparison with the ones available in the literature. Finally, a simple structural application is developed.

**MSC:**

- 74Q99 Homogenization, determination of effective properties in solid mechanics
- 74R99 Fracture and damage
- 74E30 Composite and mixture properties

Cited in **17** Documents

**Full Text:** [DOI](#)