

Influence of the temperature on the structural behaviour of masonry buildings

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ABSTRACT

Unlike linear elastic materials whose mechanical behaviour in the presence of thermal variations has been investigated in-depth [1], masonry materials in non-isothermal conditions are scarcely explored.

A first contribution is given in [2], where the influence of temperature changes on the stress field in masonry bridges is analysed. More recently, finite element simulations of the static behaviour of the Basilica of San Vitale in Ravenna have been conducted [3], taking seasonal thermal variations into account.

The presence of thermal strains affects not only the static behaviour of masonry structures, but also their dynamical properties, as shown in [4], [5] and [6]. In fact, long-term ambient vibration monitoring on masonry towers have proved the influence of environmental parameters, such as temperature and humidity, on the measured natural frequencies, which tend to increase with temperature, as an effect of the closing of micro-cracks due to the thermal expansion.

Using the constitutive equation for masonry materials in non-isothermal conditions proposed in [7] and implemented in the finite element code NOSA-ITACA [8], this paper investigates the influence of temperature on the mechanical behaviour of some simple masonry structures subjected to their own weight and thermal dilatations due to seasonal temperature variations.

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