International Conference on Computational &
Experimental Engineering and Sciences
ICCES'13
Seattle (USA), 24-28 May 2013
S.N. Atluri (Editor)
www.icces.org

A Cell Method Stress Analysis in Thin Floor Tiles Subjected to Temperature Variation

Elena Ferretti[1]

Abstract: One of the hottest trends in floor tile marketplace is the emergence of thin tiles. Made of porcelain, they start at thicknesses of about 2.5 *mm* for walls up to about 6 *mm* thick for floors, while, until recently, floor tiles have been 8 to 12 *mm* thick and tiles less than 7.5 *mm* were not intended for floors. Manufacturers benefit a range of advantages from tiles engineered to be thinner, including installation over existing floor or wall coverings, eliminating the need for ripping out existing finishing materials in renovation projects, saving time and money in labor costs. Thin tiles are strong and lightweight, reduce material consumption – which benefits the environment – and take fewer resources to manufacture and ship. They can also be easily cut with a wet saw, and in some cases with a glass cutter.

There are three categories of products being marketed as thin tiles. In the first category, tiles are formed using the traditional dust pressing methodology. In the second and third category, tiles are formed using a lamina process, reinforced with fiberglass or polymeric backing materials in the last case. Regardless of category, thin tiles have a much lower breaking strength than regular ceramic tiles. They also are less able to resist impact loading when unsupported. To date, there are no consensus standards for thin tiles. Efforts to develop ISO standards for thin tile and installation standards are afoot and recommendations for sustainability must come exclusively from the tile manufacturer.

The aim of the present paper is contributing to the definition of thin tile specifications, by modeling the failure mechanism given by underfloor heating as a contact problem [2] in a composite structure 0. The effects of two different installation procedures are estimated by means of the Cell Method and compared with performances of a radiant floor heating with regular ceramic tiles.

References:

[1] **Ferretti, E.; Casadio, E.; Di Leo, A.** (2008): Masonry Walls under Shear Test: a CM Modeling. *Computer Modeling in Engineering & Science*, vol. 30, pp. 163-190.

[2] **Ferretti, E.** (2004): A Cell Method (CM) Code for Modeling the Pullout Test Step-Wise. *Computer Modeling in Engineering & Science*, vol. 6, pp. 453-476.

[1] DICAM Department, University of Bologna, Italy