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Structural behavior of unreinforced masonry piles of different thicknesses subject to compression loads

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ABSTRACT

Many historic buildings emplaced in seismic regions have as structure main, unreinforced masonry walls with significant thicknesses. Research works oriented to evaluate the structural response of these constructions discard the thickness of the walls in the structural response of the building. This paper studies the influence of the thickness of the wall under compressive loads on piles of unreinforced masonry. The walls tested with this thickness correspond to those actually found in historic buildings located on the province of Mendoza, Argentina. These buildings are currently in service and do not have an earthquake resistant structure that meets current design regulations. The tested piles were constructed using bricks and mortars similar to those found in historic buildings in order to correlate the analytical response to the determined through laboratory testing. Ultimate load predictions were made from a finite element model in the Abaqus code, which includes the plastic behavior of the bricks and mortars. The values obtained from the tests were calibrated with numerical models. The results show that the failure modes are dependent the position of the vertical joints of the walls and the linear variation of the thickness of the walls does not correspond to a linear variation of the determined ultimate load.

REFERENCES

[1] Abaqus 6.4-1. *Theory Manual. Hibbit, Karlson and Sorenson*, Inc.: Pawtucket, U.S.A., 2003.
[2] Atkinson, R.H., Amadei, B.P., Saeb, S., Sture, S. – Response of masonry bed joints in direct shear, *Journal of Structural Engineering*, 115 (9), 2277-2296, 1989.
[3] Lourenço P. Computational strategies for masonry structures. *Thesis Delft University of Technology*. Delft University Press, (1996).
[4] Page, A. W., A Biaxial Failure Criterion for Brick Masonry in the Tension-Tension Range, *Int. Journal Masonry Constr.*, 1980, 1 (1), pp. 26-29.
[5] Roca, P., Cervera M., Giuseppe G., Pela L. Structural Analysis of Masonry Historical Constructions, *Arch Comput Methods Eng* (2010) 17: 299–325.
[6] Samarasinghe W, Page AW, Hendry AW. Behaviour of masonry shear walls. *Struct Eng* 1981;59B(3):42–8.