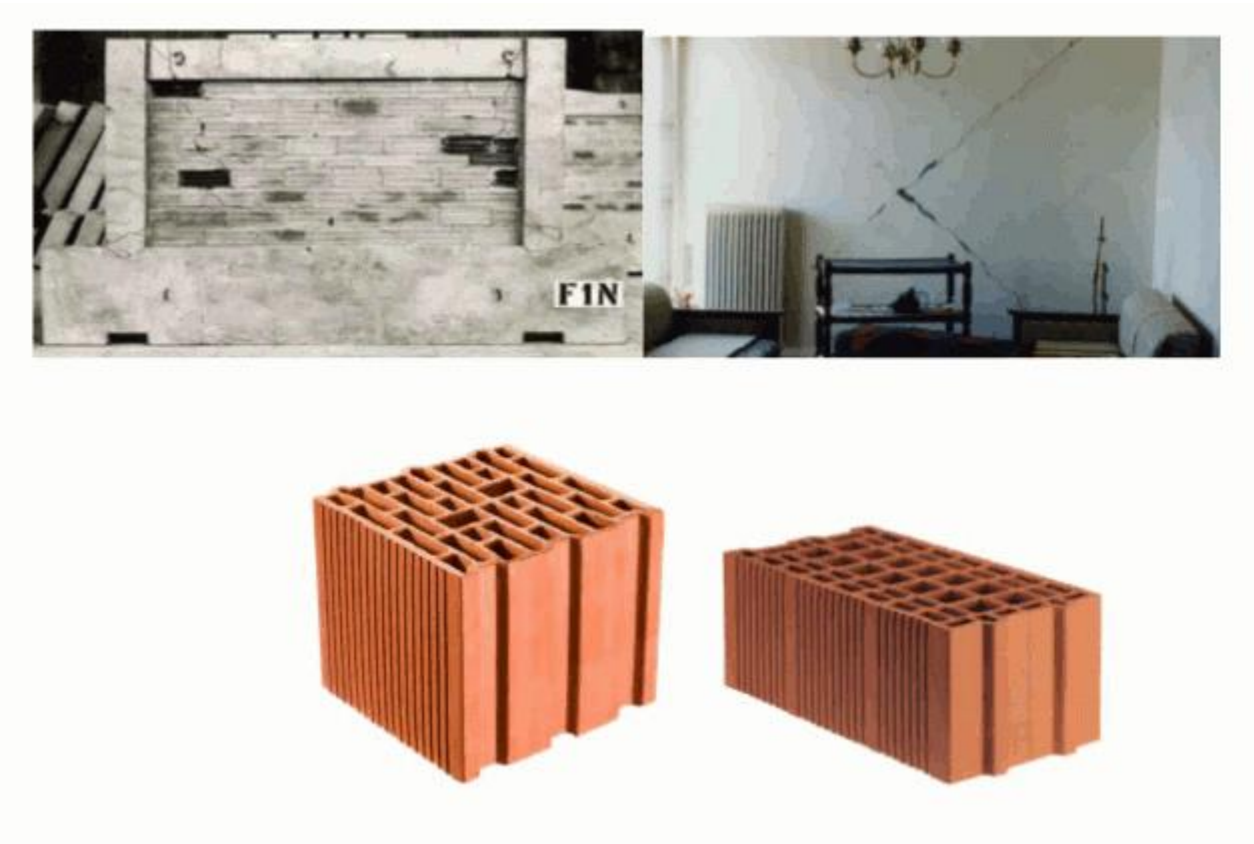
SUMMARY OF STUDY ENTITLED:

ASSESSMENT OF THE CONTRIBUTION OF MASONRY INFILLS TO THE LOAD BEARING CAPACITY OF REINFORCED CONCRETE FRAMES UNDER SEISMIC ACTIONS



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ASSESSMENT OF THE CONTRIBUTION OF MASONRY INFILLS TO THE LOAD BEARING CAPACITY OF REINFORCED CONCRETE FRAMES UNDER SEISMIC ACTIONS

SUMMARY

Masonry infills constitute a significant element of building structures, since they are at the forefront of the defense against seismic actions. Consequently, much attention should be given to the selection of their materials and their construction procedure.

This study investigates analytically the contribution of five types of masonry infills to the strength of three forms of moment resisting reinforced concrete frames under horizontal loading. From the composition of the selections for the framing system and the masonry infills, 15 infilled frames result for assessment.

A single-storey, one-bay frame made of C25/30 category reinforced concrete was selected as the representative system, common for all the frames with respect to the opening, height and cross-section of its beam (25/50cm) [Figure 1]. The cross section of the columns is a parameter of the present study. 30/30, 50/50 and 80/80cm columns were chosen, representative of low, medium and high rise constructions.

Masonry infills composed of normal to high strength KEBE bricks were used as the representative masonry infills. Three systems built with horizontal hole No. 90, No. 180 and No. 250 bricks and conventional, general purpose M2.5 category mortar and two systems built with vertical hole ORTHOBLOCK MK200 and ORTHOBLOCK NK250 bricks and thin layer M10 category mortar were used.

The hinged diagonal compression strut was selected (Figure 2) for the simulation of the masonry infills.

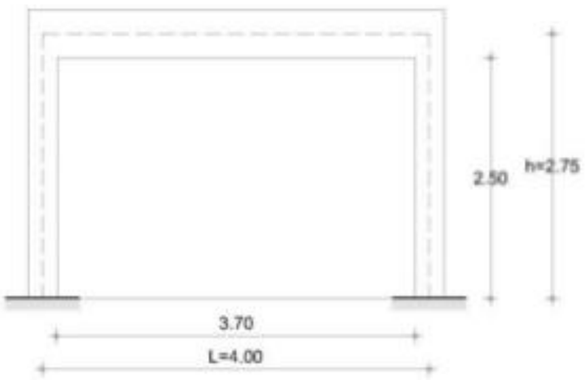

Figure 1: Typical reinforced concrete moment resisting frame

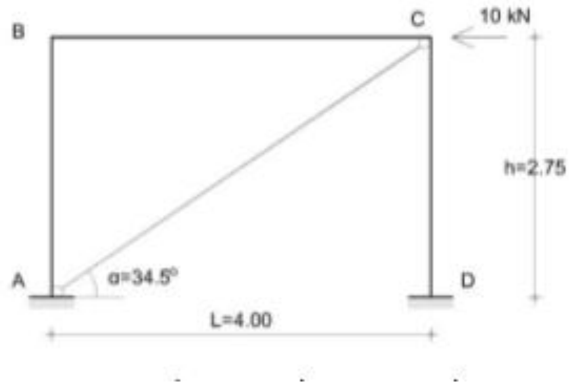

Figure 2: Computer simulation of masonry infilled frame

It is clear from the results of the analyses that the stronger the compression strut is (larger cross section and bigger modulus of elasticity), the more load it can undertake, thus relieving the columns, the shear load of which is reduced. Moreover, the stronger the frame is (larger cross sections of the columns), the more the load of the compression strut is reduced and the shear load of the column is increased.

Figure 3 shows the most important index of the contribution of masonry infills to the load bearing capacity of the system. This index, called overstrength index, depicts the multiplier of the external load in order for the shear load of each column to be equal to the shear load of the bare frame.

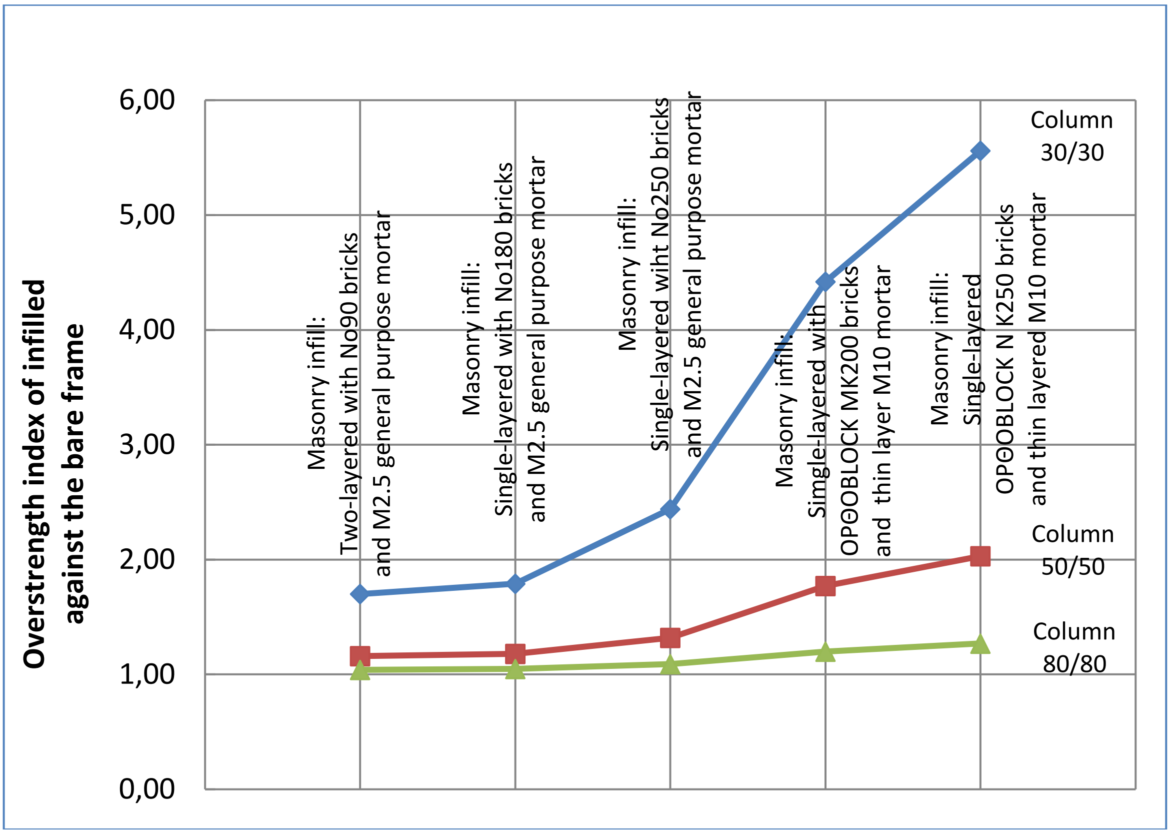

Figure 3: Overstrength of masonry infill systems

With respect to the relatively weak bare frames with 30/30 column cross section, the contribution of masonry infills is significant, increasing as the masonry infill becomes stronger. In low rise buildings, even weak walls offer overstrength in the order of 1.8 to 2.5. However, the overstrength offered by strong walls made of high strength vertical hole MK200 and ORTHOBLOCK NK250 bricks is many times larger and reaches 4.5 to 5.5.

With respect to the second group of frames with 50/50 column cross section, the contribution of masonry infills with conventional horizontal hole bricks was considerably reduced and is not noteworthy. On the contrary, frames with vertical hole ORTHOBLOCK MK200 and ORTHOBLOCK NK250 bricks continue to offer considerable overstrength, in the order of 2.0.

As regards the third group of frames, with 80/80 column cross section, the contribution of the masonry infills using conventional, horizontal hole bricks is practically zero, while frames using vertical hole MK200 and ORTHOBLOCK NK250 bricks continue to offer some overstrength.

In addition, an analytical simulation, using the process followed in this study was run, for comparison reasons, on a frame for which experimental data is available. Overstrength equal to 1.4 was resulted from the simulation, against a value of 2.0 of the experiment. **This means that the computer simulation is conservative and that a significant additional strength margin is available.**

It is thus obvious that strong walls, made of high strength bricks, such as the ORTHOBLOCK MK200 or, even better, the ORTHOBLOCK NK250 bricks of this study, in combination with thin layer ORTHOBLOCK mortar, which complements the ORTHOBLOCK building system by Northern Greek Ceramics (KEBE), should be preferred.