PAPER REF: 3946

INFLUENCE OF MASONRY INFILL WALLS OVER RESISTANT CAPACITY OF BUILDINGS

Lucía Sánchez[1(*)], Gracia Luis Ramón Álvarez[2]
[1]School of Engineering, University of Zaragoza, Zaragoza, Spain
[2]Department of Structure, INTEMAC, Madrid, Spain
[(*)]*Email:* 578006@unizar.es

ABSTRACT

This work analyzes the distribution of loads between infill masonry and frame.

Some of the failures in columns due to Lorca earthquake can not be explained if those columns were carrying the expected vertical load. Additionally, many building remain that should have collapsed (because of the damage in all the columns in a line). The reason behind such unexpected behaviour is the structural role of non-structural components and, in particular, building enclosures In order to study their effect, four different loads were studied: Gravitational loads, brick moisture expansion, concrete shrinkage and thermal loads. The finite elements models performed allowed to observe the strains due to each load and combination of them.

Keywords: infill masonry, facades, seismic resistance.

INTRODUCTION

A large number of buildings are constructed with masonry infill for architectural needs or aesthetic reasons. Infill panels, though considered non-structural, support loads not expected due to the interaction between infill and frame (Dávila.S,2011).

When stiffness and resistance of the masonry infill panels are comparable with the frame, it is not possible to consider like non-structural elements. These elements are stiffing many buildings effectively (Álvarez-Cabal.R, 2011)

Over these elements are acting many loads which modify the behavior of the frame. Brick moisture expansion cause the expansion of masonry infill, whose values are between 0,1 mm/m (De Isidro Gordejuela.F, 2003) and 2 mm/m (Pérez Arroyo.S, 2000). On the other hand Spanish standard provide a value for the load of reinforced concrete shrinkage, 0,25 mm/m. And thermal load is a variable load which depends on the external temperature.

RESULTS AND CONCLUSIONS

The results from the finite elements models are shown in Fig. 1, Fig. 2 and Fig.3. The results shown belong to minimum load values. As brick moisture expansion as concrete shrinkage and thermal loads produce tensile stress on the pillars.

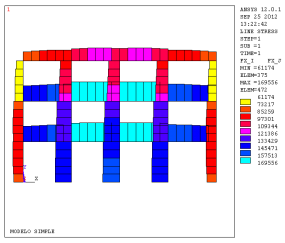

Fig.1 - Strain on the frame due to brick moisture expansion

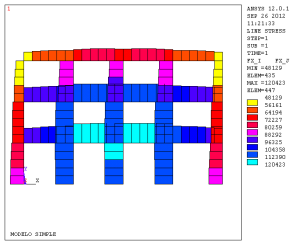

Fig.2 - Strain on the frame due to concrete shrinkage

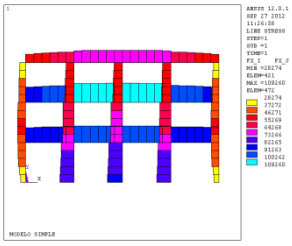

Fig.3 - Strain on the fram due to concrete shrinkage

As result of the rheological behavior of the materials, tensile stress on pillars due to these loads is greater than compression stress due to gravitational loads. The results are shown in Fig.4.

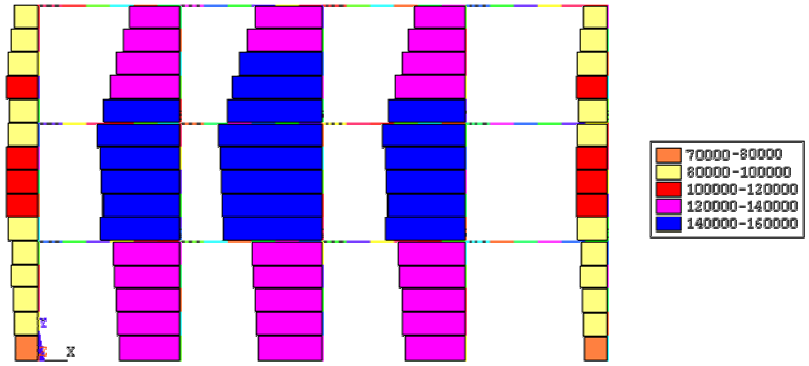

Fig. 4 - Resulting strains

These results are opposite of hypothesis on construction projects. Consequently, it causes many pathologies and much uncertainty about the static and seismic behavior of the buildings.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the funding by Instituto Técnico de Materiales (INTEMAC), Madrid, Spain.

REFERENCES

[1]-Álvarez-Cabal R, Dávila S, Diáz-Pavón, E., 2011, Comportamiento de los cerramientos y particiones durante el terremoto de Lorca. Zuncho, 30, p.29-43.

[2]-Dávila S, Hoogendoorn P, Álvarez-Cabal R., 2011 Actions on facades. Intemac quaterly, 83, 3rd quarter ’11.

[3]-De Isidro Gordejuela F., 2003, “Determinación de la expansión por humedad de los productos cerámicos empleados en elementos estructurales”.

[4]-Pérez Arroyo S., 2000 “La piel del armadillo”.