

Cracking around the interface joint between masonry panels and their supporting reinforced concrete beams in buildings

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ABSTRACT: In the following paper, the matter of cracking around the interface between building masonry walls and concrete beams is discussed. It is well known the inconvenience of that cracking in buildings especially due to the possibility of rain penetration through the cracks and to negative aesthetic aspect. Here, a description is made of the wall-beam behaviour, with special consideration of the zone around the interface joint between masonry walls and their supporting beams when subjected to vertical load, mainly in terms of the cracking susceptibility of that zone for the particular case of solid lightweight concrete blocks (blocks of aerated autoclaved concrete and blocks of lightweight concrete with expanded clay aggregates).

1 INTRODUCTION

Cracking around the interface between building masonry walls and concrete beams is often a problem in buildings based on reinforced concrete frames with infilled masonry walls. It is well known the inconvenience of that cracking in buildings especially due to the possibility of rain penetration through the cracks and to negative aesthetic aspect.

Usually, in case of buildings based on reinforced concrete frames with infilled masonry walls, the interaction between beams and masonry walls is often neglected. This type of building is frequently associated with different construction materials (clay bricks, concrete blocks, etc.), components and workmanship, and where masonry is, generally, considered a non-structural element. In some types of construction systems, where masonry is accepted as a material with significant resistance, (CEN – Eurocode n°6), the composite behaviour of the wall-beam element can be considered, as, for example, in the case of reinforced concrete lintels in the openings, (Davies & Ahmed 1976, Stafford Smith & Pradolin 1978, Page 1979).

It must be stressed the considerable influence, in the construction overall behaviour, of the differences in the characteristics of masonry construction techniques and the constituent parts (units, mortar, workmanship, etc.). The most important effects to be studied require extensive testing, with the investigation of characteristic properties of the constituent elements.

Here, a description is made of the wall-beam behaviour, focusing on the zone around the interface joint

between masonry walls and their supporting beams, when the assemble is subjected to vertical load, mainly in terms of the cracking susceptibility of that zone. The analysis is referred to the particular case of solid lightweight concrete blocks – blocks of aerated autoclaved concrete and blocks of lightweight concrete with expanded clay aggregates.

So, mention is made of the principal results and conclusions of an experimental study that mainly concerned the determination of masonry blocks and mortar joints mechanical properties as well as the conduction of masonry wall-beam tests, (Miranda Dias 1997a, Miranda Dias 1997b). In these latter tests, the panel wall is supported by a reinforced concrete beam that spans between supports and a uniformly distributed vertical load, applied on the top of the wall, was produced using hydraulic jacks and a load spreader mounted in a reaction frame. The displacements of the wall and the beam were recorded with special regard to the deflections of the beam at mid span for the load corresponding to the initial cracking around the wall-beam interface and for the maximum vertical load reached.

2 MECHANICAL PROPERTIES OF MASONRY

The experimental determination of masonry properties involved the assessment of the behaviour of solid blocks of aerated autoclaved concrete (material X – dry density of 560kg/m³) and solid blocks of lightweight concrete with expanded clay aggregates

