

## DIANA and ESPI: use the best of two worlds for masonry research

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### *Abstract*

This study focuses on the comparison of DIANA and ESPI when used for research into the role of brick-mortar interaction. When a masonry structure is loaded, brick and mortar interact and this interaction is considered of paramount importance with respect to the mechanical behaviour of masonry.

The mortar joint, as an interface between units, is formed during the brick laying process and positioning of the unit. This changes the properties of the mortar, especially near the contact layer with the unit, forming a weak spot.

DIANA was used for some numerical simulations of the brick-mortar interaction. Specimen's dimensions were as in the experiments. An interface layer of 1 mm thickness was modelled between mortar and top unit to simulate the contact layer and fissures were modelled as 15 mm deep openings.

ESPI, a dedicated laser speckle test equipment, was used for measuring the clay-brick-mortar interaction in detail. It showed that most of the deformation occurred in the brick-mortar interface, especially due to the shape of the bed joint.

Similarities between ESPI and DIANA are the way the results – i.e. node displacements – are presented. Both DIANA and ESPI produce a similar table with node coordinates and their displacements which can be used in spread sheet programs for further analyses. As DIANA and ESPI give comparable results, the advantage of DIANA - i.e. the calculation of stresses - can be utilized.

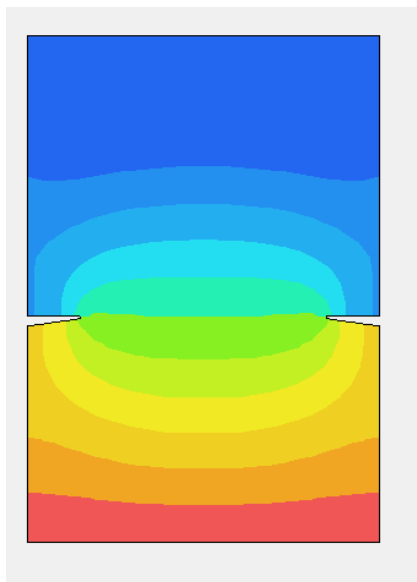


Figure 1 Deformation contours of a concentrically loaded specimen, DIANA results.

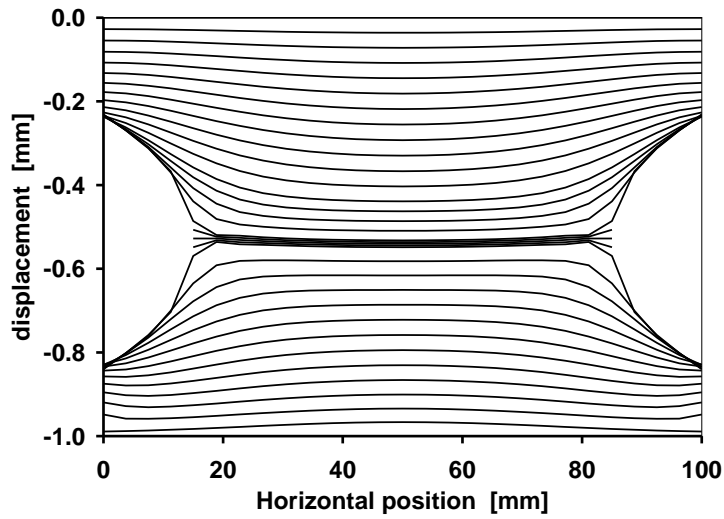


Figure 2 Vertical node displacements of a concentrically loaded specimen, DIANA results.

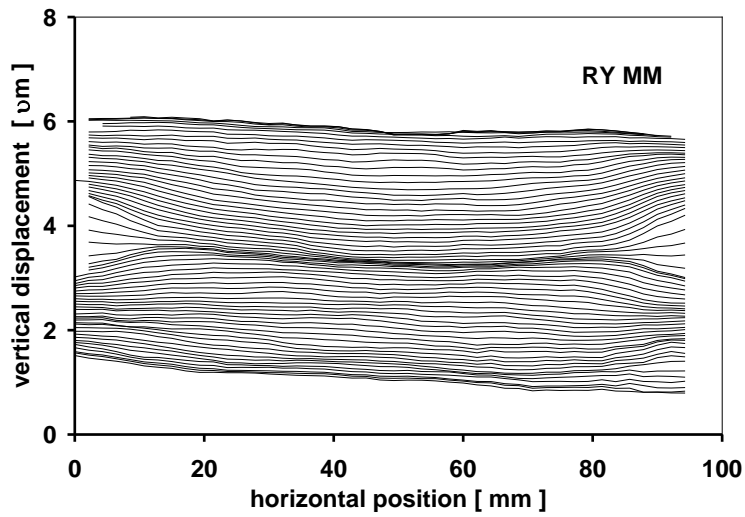


Figure 3 Vertical displacements versus horizontal position, ESPI results.