Cyclic Masonry Wall Verification Report

BSYIGMACAD v1.3.6 benchmark evidence package documenting comparison against extracted published reference cases.

Reference Case

JRC low-wall cyclic in-plane shear benchmark

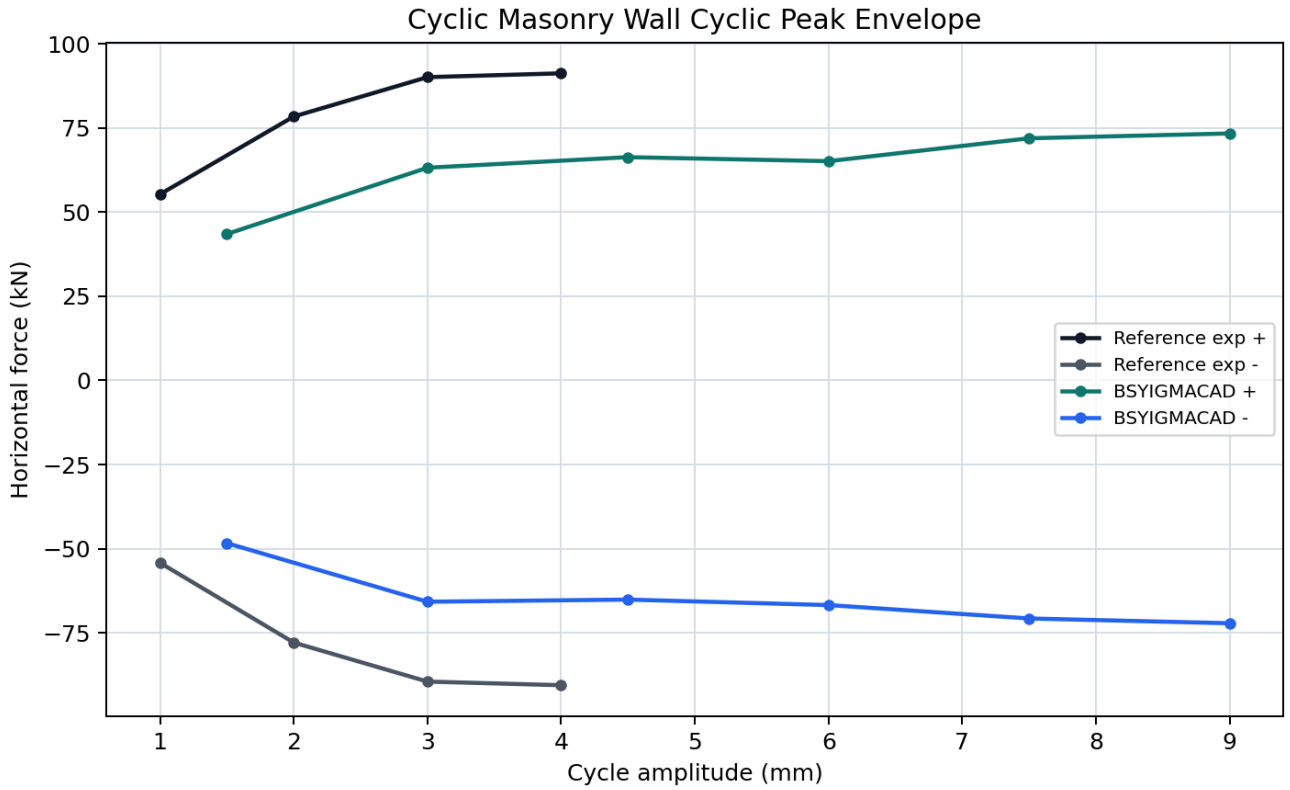
Oliveira, D. V. (2003). Experimental and Numerical Analysis of Blocky Masonry Structures Under Cyclic Loading. PhD thesis, Universidade do Minho.

Result Summary

Default cyclic wall output is compared against extracted low-wall cyclic peak and visual evidence.

Metric	Value	Unit
BSYIGMACAD positive peak	73.372	kN
BSYIGMACAD positive peak amplitude	9.000	mm
BSYIGMACAD negative peak	-72.168	kN
BSYIGMACAD negative peak amplitude	9.000	mm
Reference experimental positive peak	91.240	kN
Reference experimental negative peak	-90.580	kN
Positive peak error vs experimental	-19.58	%
Negative peak error vs experimental	-20.33	%

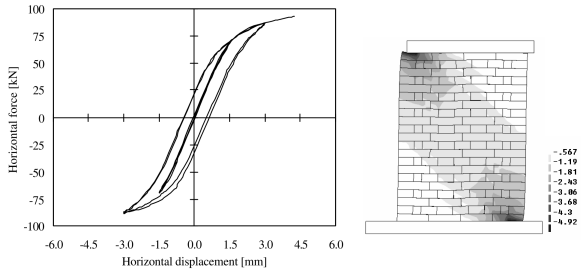
Curve Comparison



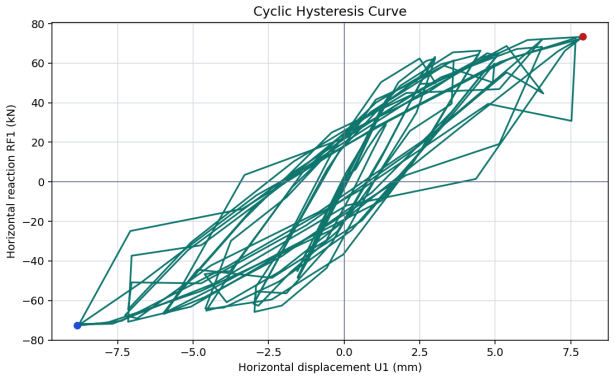
Visual Evidence

Reference excerpt

order to characterize its cyclic response. The numerical results are shown in Figure 6.21. It was observed that, for a displacement close to +4.1 mm, the steel beam started to slide along the top tier of bricks. Since this mechanism was not observed in the experiment, it was decided to stop the analysis.

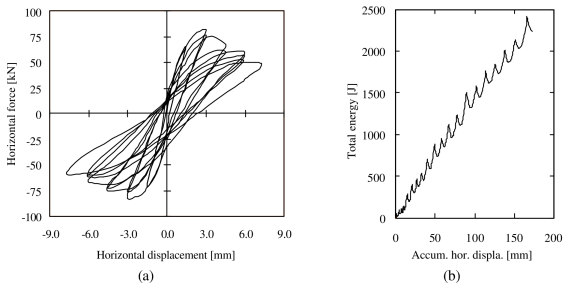


BSYIGMACAD output

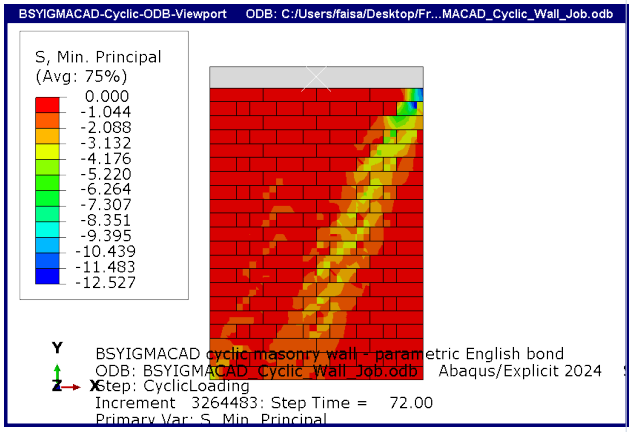


Reference excerpt

diagram and (b) total energy evolution.



BSYIGMACAD output



Reference excerpt

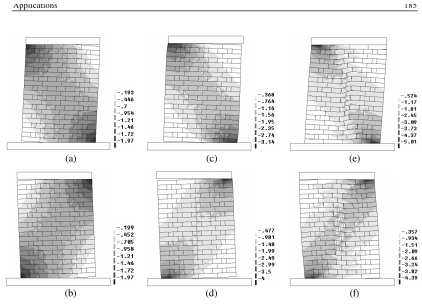
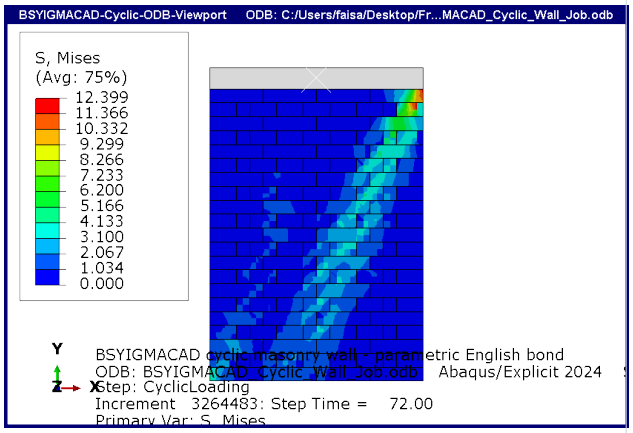


Figure 6.25 – Low wall: Principal compressive stresses [N/mm^2] depicted on the incremental deformed mesh for a horizontal displacement equal to [mm]: (a) +1.5; (b) –1.5; (c) +3.0; (d) –3.0; (e) +4.5; (f) –2.91 (failure initiation).

For cycles of small amplitude (±1.5 mm and ±3.0 mm), damage is essentially due to the opening-closing at the corners, as confirmed by analyzing the shape of the unloading branches of the load-displacement diagram and the deformed meshes from Figure 6.25. For higher displacements, the deformed pattern is characterized by the development of cracks in the head joints of the central region of the wall. The changes in the main inelastic mechanism are clearly visible from the shape of the unloading branch started at a displacement of +4.5 mm. Unloading and subsequent reloading causes damage in the same area, leading to the formation of a kind of vertical crack, only interrupted by the units, that are not allowed to crack. This kind of alignment of vertical cracks is

BSYIGMACAD output



BSYIGMACAD output