

Masonry Building Plan

Micro Masonry Validation and DIANA Correlation Report

Gravity equilibrium, nonlinear pushover response, and modal frequencies compared with the MasonryHouse benchmark.

1. Benchmark model

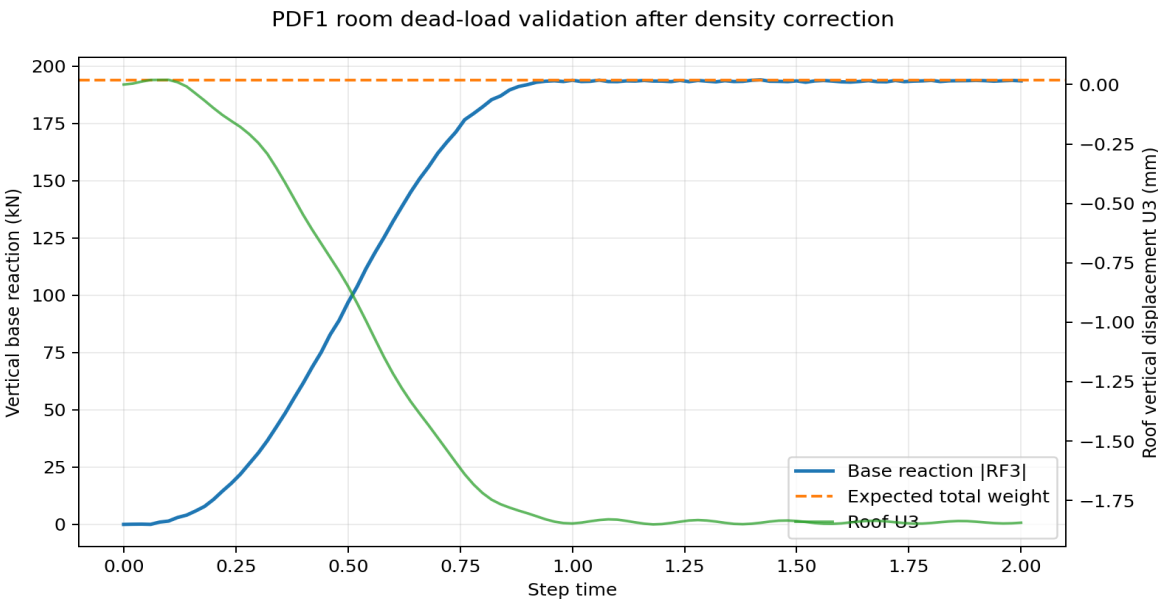
The benchmark is a 5200 x 3200 x 3000 mm single-storey masonry room with 100 mm walls and a 1000 x 2300 mm door opening. The Micro formulation uses explicit masonry units, cohesive/frictional mortar contact, a timber beam-and-deck roof, and a continuous ring foundation with fixed underside.

Analysis	Abaqus result	Reference	Difference
Gravity	193.539 kN	193.968 kN	-0.221%
Pushover peak shear	64.1 kN	55.8 kN	+14.8%
Pushover peak displacement	56 mm	67 mm	-16.5%
Modal mode 1	4.9716 Hz	6.0268 Hz	-17.51%

2. Gravity validation

The calculated total weight is compared with the summed vertical support reaction. The final reaction differs from the expected weight by 0.221%, confirming the gravity load path, mass conversion, supports, and reaction extraction.

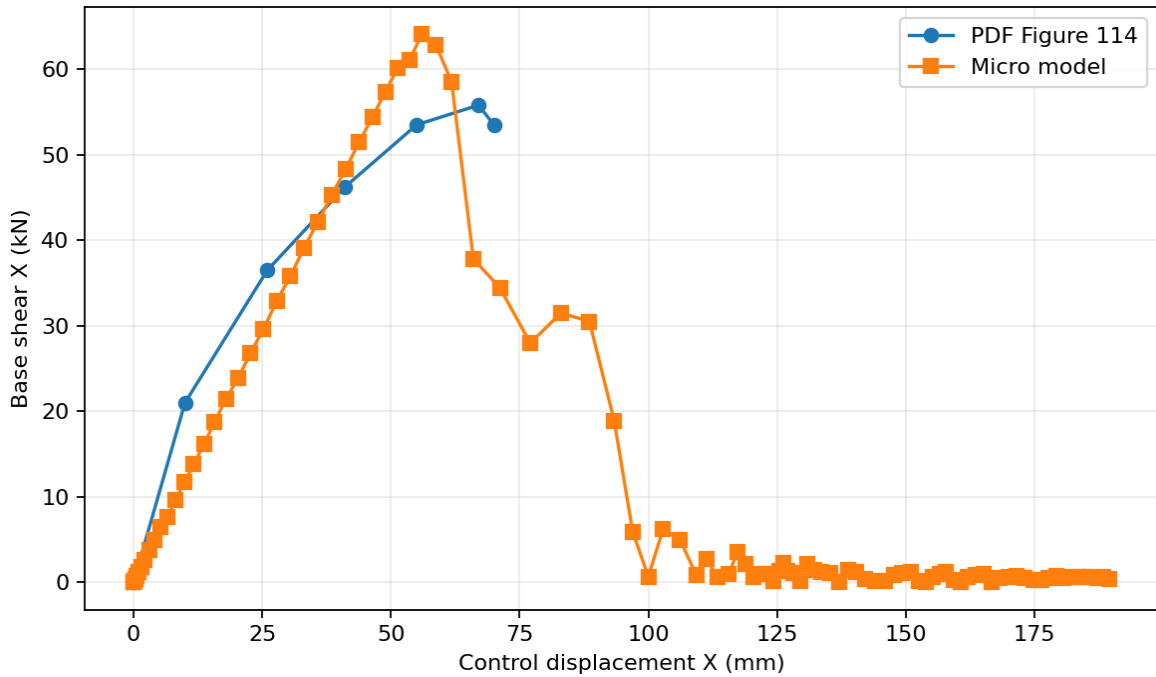
Metric	Value
Expected total weight	193.9679 kN
Final base reaction	193.5390 kN
Gravity equilibrium error	-0.221%
Peak base reaction	193.9744 kN
Final roof vertical displacement	-1.8439 mm



3. Pushover validation

The displacement-controlled Micro response is compared with the digitized DIANA Figure 114 curve. The calibrated model reproduces the overall rise, peak region, and post-peak degradation within the documented comparison range.

Metric	DIANA	Abaqus Micro	Difference
Peak base shear	55.8 kN	64.1 kN	+14.8%
Displacement at peak	67 mm	56 mm	-16.5%

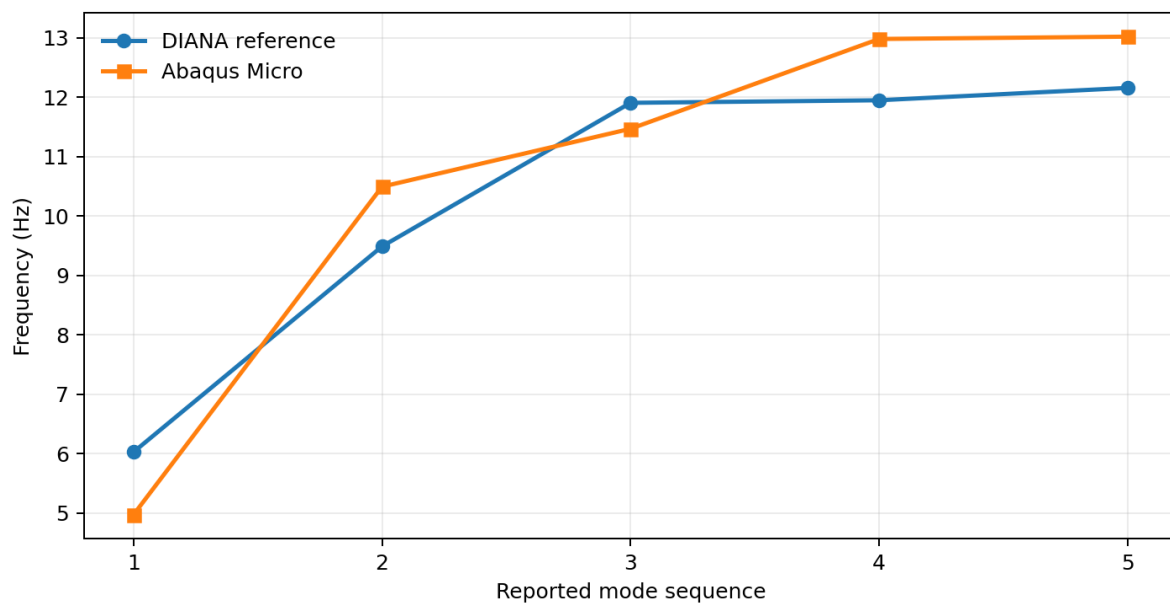


4. Modal validation

Each Abaqus frequency frame was read directly from the ODB and rendered as displacement magnitude on the deformed shape. The first five Abaqus modes are compared in sequence with the five DIANA reference frequencies. Signed error is $(\text{Abaqus} - \text{DIANA}) / \text{DIANA} \times 100\%$.

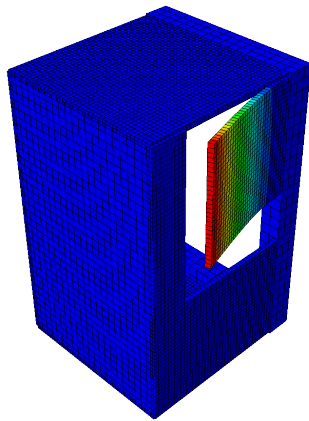
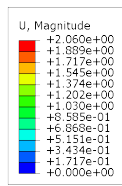
Frequency comparison

Mode	DIANA (Hz)	Abaqus (Hz)	Signed error	Absolute error
1	6.0268	4.9716	-17.51%	17.51%
2	9.4887	10.4940	+10.59%	10.59%
3	11.9060	11.4690	-3.67%	3.67%
4	11.9490	12.9810	+8.64%	8.64%
5	12.1570	13.0200	+7.10%	7.10%
Mean	—	—	—	9.50%

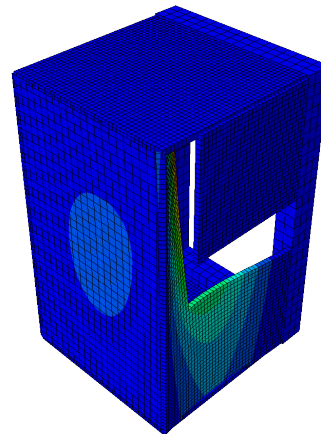
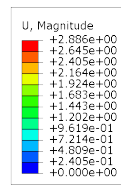


The first-mode Abaqus result is 4.9716 Hz versus 6.0268 Hz in DIANA (-17.51%). The mean absolute frequency difference over the five reported modes is 9.50%.

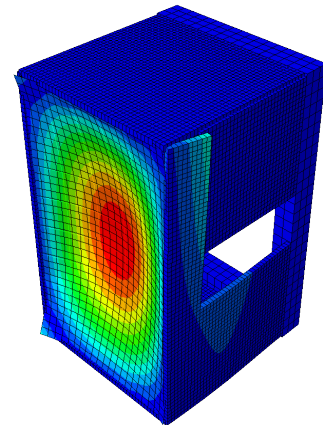
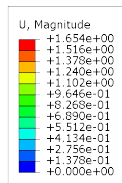
5. Abaqus displacement mode shapes



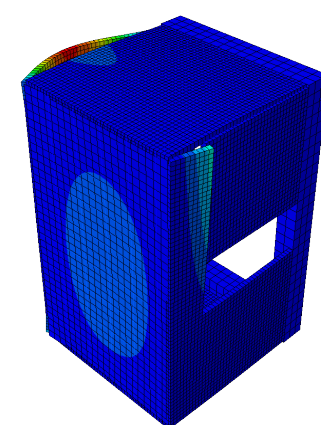
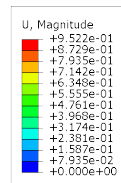
Mode 1 — 4.9716 Hz



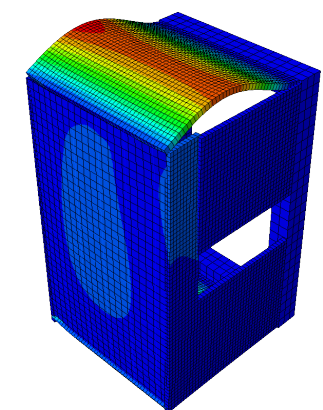
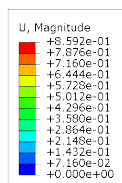
Mode 2 — 10.4940 Hz



Mode 3 — 11.4690 Hz



Mode 4 — 12.9810 Hz



Mode 5 — 13.0200 Hz