

0036 – Masonry Wall

Description

A masonry wall of the given dimensions is fixed and loaded according to the **Figure 1**. Neglecting its self-weight and assuming only small deformations, determine total deflection of the structure u and its minimum and maximum stress σ_x . Use linear as well as nonlinear calculations.

Material	Masonry	Modulus of Elasticity	E	28300.000	MPa
		Poisson's Ratio	ν	0.200	—
		Yield Stress - Tension	$\sigma_{x,limit} = \sigma_{y,limit}$	0.000	MPa
Geometry	Wall	Height	h	2.100	m
		Length	L	3.600	m
		Depth	d	0.150	m
	Boundary conditions	Horizontal support length	a	0.450	m
		Loaded length	b	0.600	m
Loading		Distributed	q	30.000	MN/m

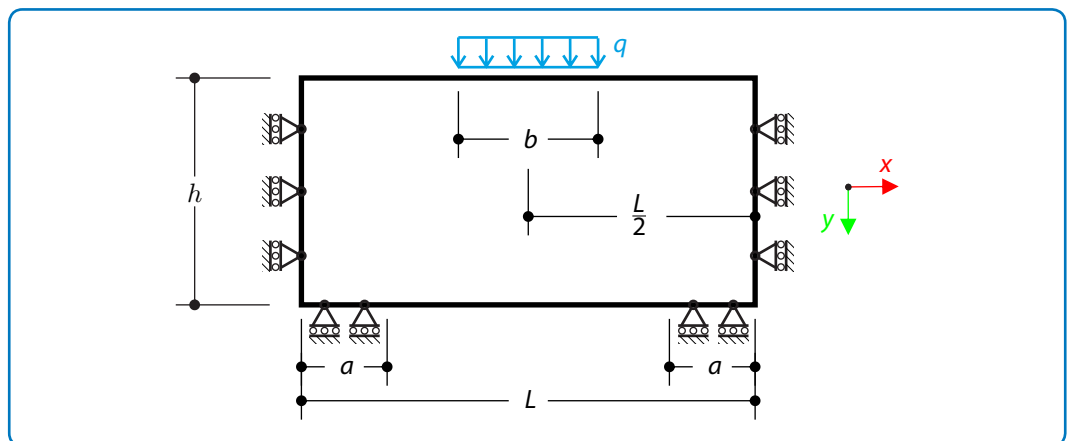


Figure 1: Problem sketch

Analytical Solution

Analytical solution is not available for this example.

Verification Example: 0036 – Masonry Wall

RFEM 5 Settings

- Modeled in RFEM 5.04.1142
- The element size is $l_{FE} = 0.01875$ m
- Geometrically linear analysis is considered
- The Mindlin plate theory is used
- Load was applied in 5 increments in nonlinear simulations.

Results

Structure File	Calculation	Material Model	Surface Stiffness Type
0036.01	Linear	Isotropic Masonry 2D	Standard
0036.02	Nonlinear	Isotropic Masonry 2D	Standard
0036.03	Nonlinear	Isotropic Linear Elastic	Without Tension
0036.04	Nonlinear	Isotropic Damage 2D/3D (Plate)	Standard

RFEM 5			
Linear Calculation	Nonlinear Calculation		
Isotropic Masonry 2D	Isotropic Masonry 2D	Without Tension	Isotropic Damage 2D/3D (Plate)
$ u $ [mm]	$ u $ [mm]	$ u $ [mm]	$ u $ [mm]
10.711	12.795	12.795	13.154

RFEM 5			
Linear Calculation	Nonlinear Calculation		
Isotropic Masonry 2D	Isotropic Masonry 2D	Without Tension	Isotropic Damage 2D/3D (Plate)
$\sigma_{x,min}$ [MPa]	$\sigma_{x,min}$ [MPa]	$\sigma_{x,min}$ [MPa]	$\sigma_{x,min}$ [MPa]
−191.053	−234.340	−234.340	−375.000

RFEM 5			
Linear Calculation	Nonlinear Calculation		
Isotropic Masonry 2D	Isotropic Masonry 2D	Without Tension	Isotropic Damage 2D/3D (Plate)
$\sigma_{x,max}$ [MPa]	$\sigma_{x,max}$ [MPa]	$\sigma_{x,max}$ [MPa]	$\sigma_{x,max}$ [MPa]
55.421	0.008	0.008	465.100