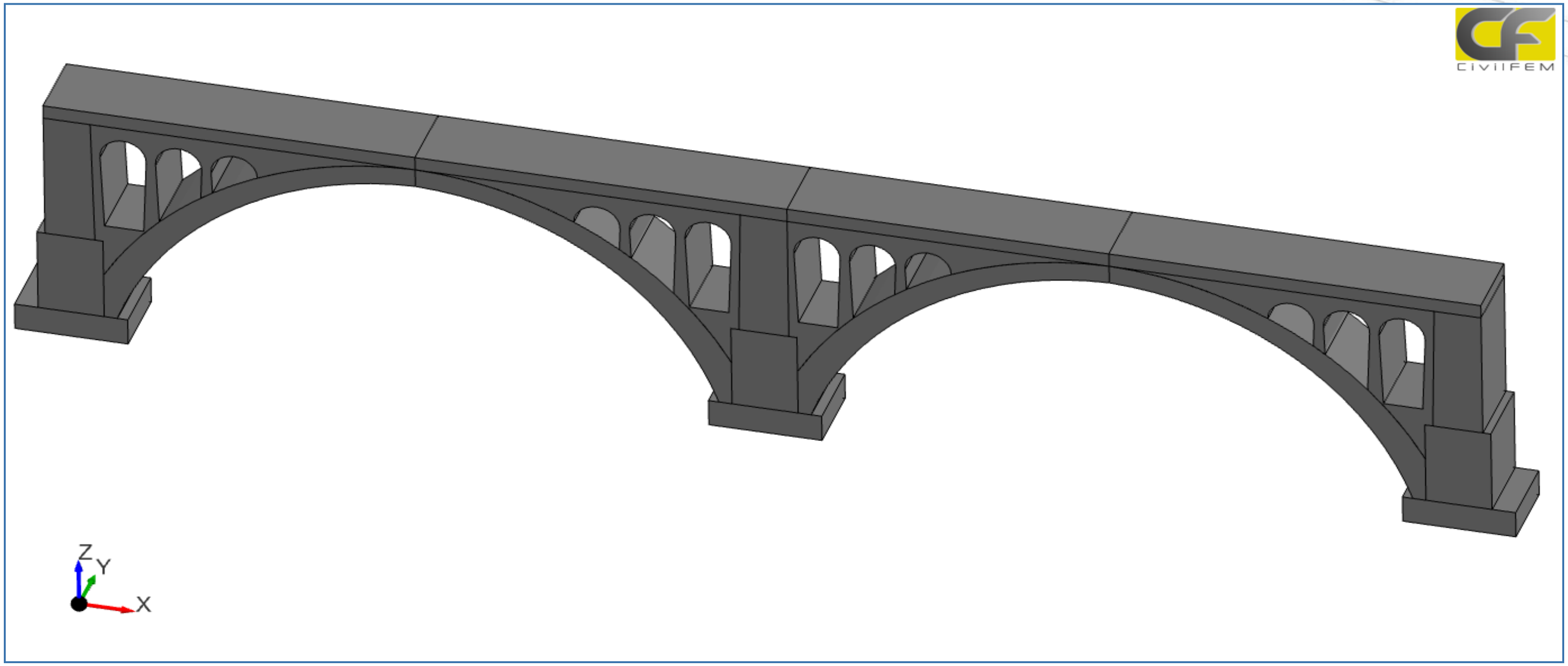
Non Linear Transient Analysis of a Masonry Bridge

CivilFEM Marc®

CivilFEM

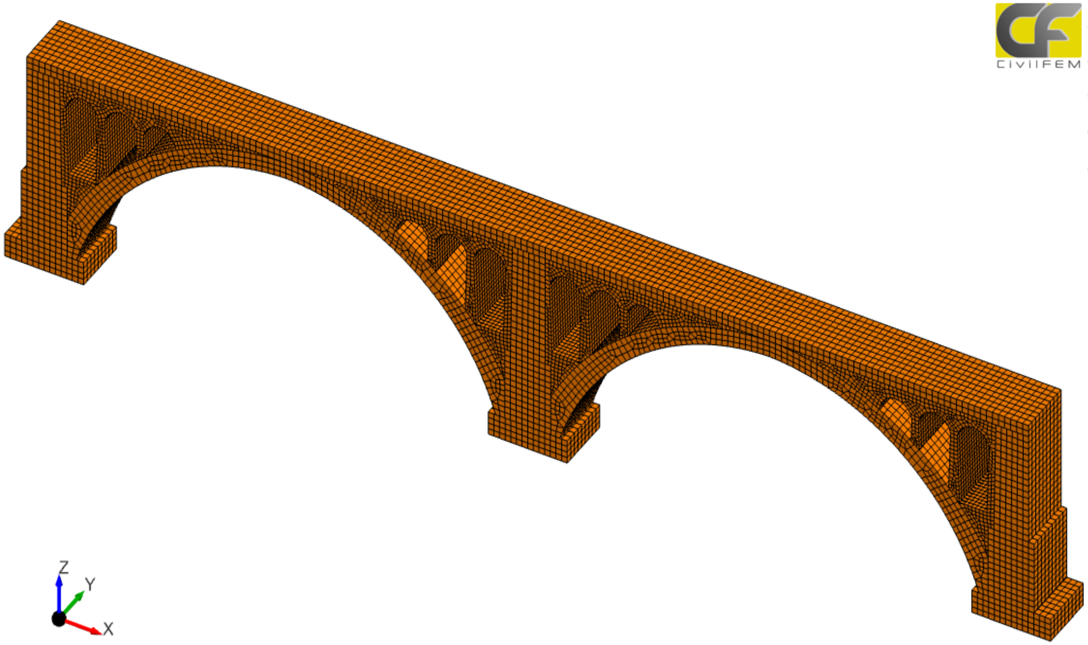
Masonry Bridge Description

We want to analyze the behavior of a masonry bridge under a seismic action, applying material nonlinearity.



With CivilFEM, the user can perform a transient dynamic time history analysis considering material nonlinearity .

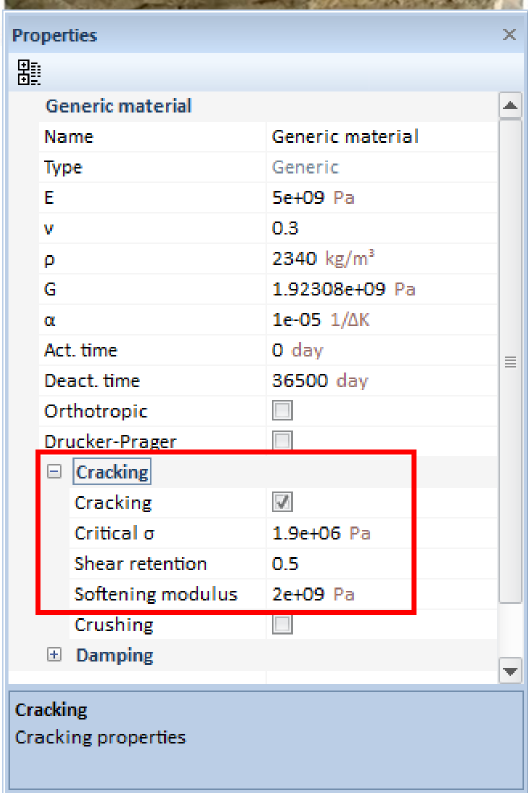
Masonry Bridge Description



The geometry is imported from a dxf file.

We select a generic material and define the parameters according to the masonry properties.

Masonry Bridge: Material



A material with cracking properties is selected.

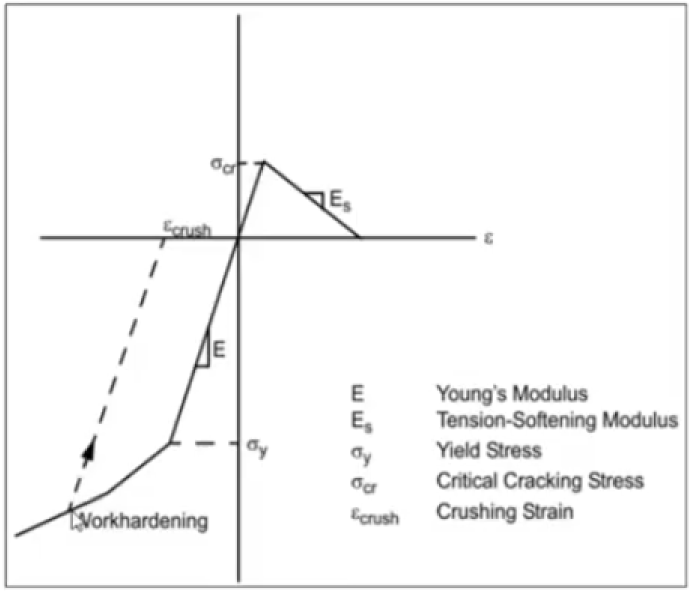
We consider a Generic Material with an Elasticity Modulus, **E = 5000 Mpa** and a maximum tension stress, **σ = 1.9 Mpa**

Shear Retention Factor is the reduction of the shear stiffness after cracking. We consider the default value of **0.5** (that is equivalent to a 50% reduction).

INGECIBER, S.A.

CivilFEM Marc®

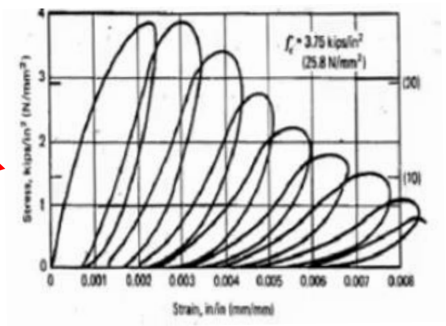
Masonry Bridge: Material



If tension softening is included, the stress in the direction of maximum stress does not go to zero immediately ; instead, the material softens until there is no stress along the crack.

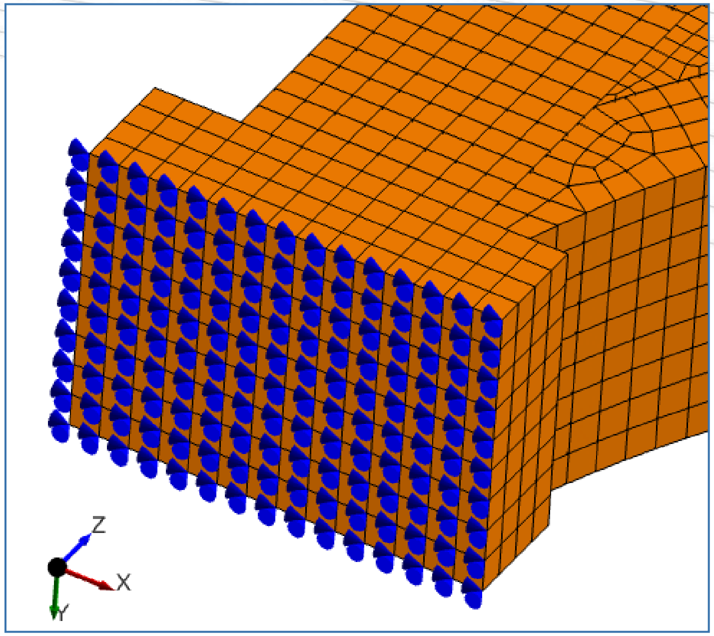
The softening behavior is characterized by a descending branch in the tensile stress-strain diagram, and it may be dependent on element size.

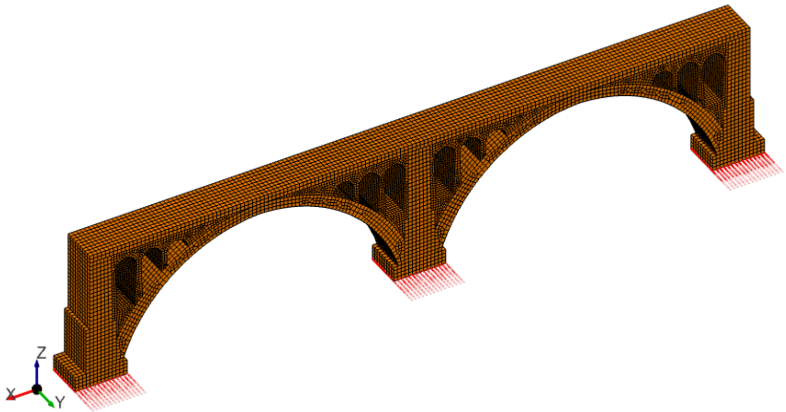
For cyclic loads similar to the loads in this analysis, we will have the behavior shown in the figure. Crack deformation will increase in successive cycles for the same load value.



Masonry Bridge: Boundary Conditions

The bridge is supported on rock, that can be simulated by restricting vertical displacement on the base surface of the piles. We also restrain the displacement on the X direction.





In order to simulate the ground motion induced by an earthquake, a time-dependent Y displacement has been entered into the bridge foundation as a boundary condition.

Masonry Bridge: Boundary Conditions

We have applied the displacement table at the base of the three foundation piles.

You can define several excitation functions by using time-dependent accelerations, velocities or displacements in different directions.

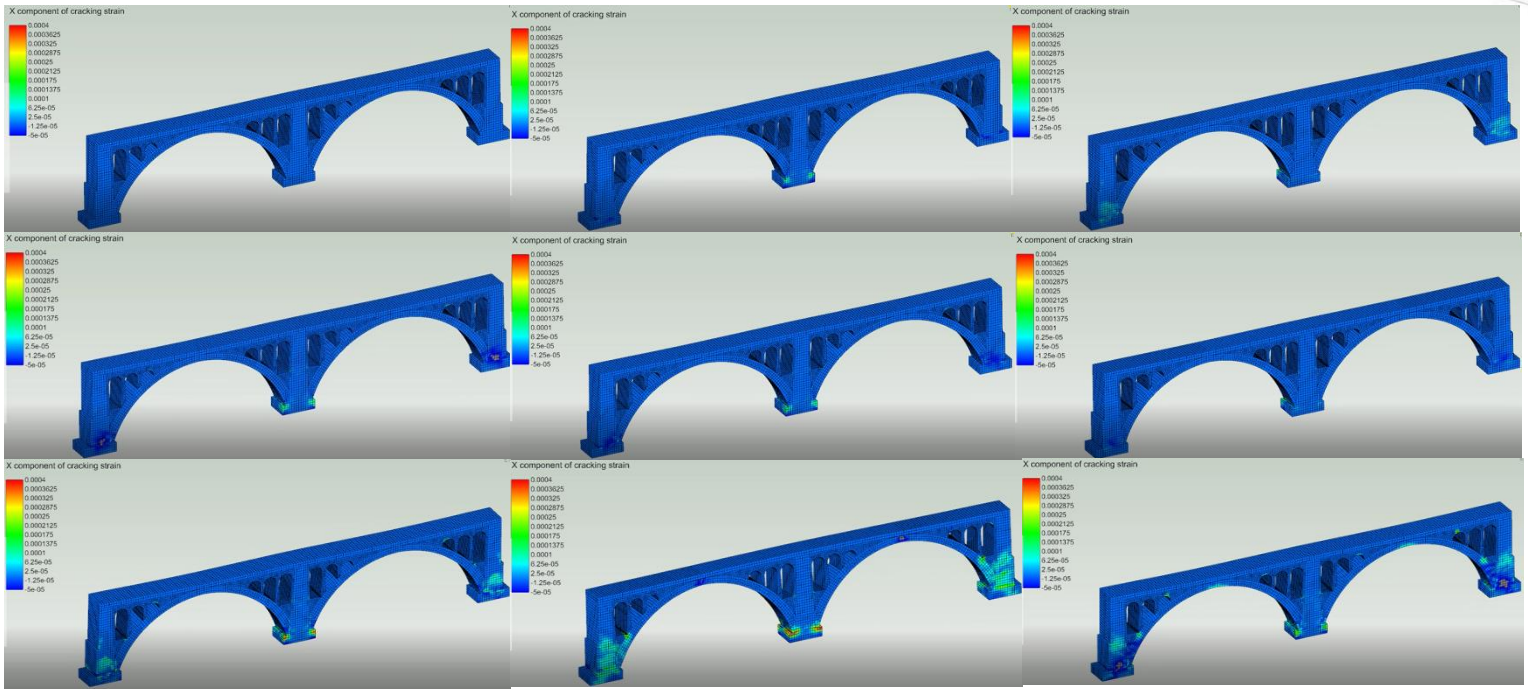
INGECIBER, S.A.

CivilFEM Marc

CivilFEM

Transient Analysis: earthquake motion

The user can plot the cracking strain and see how cracking appears and disappears in successive cycles over time.



INGECIBER, S.A.

CivilFEM Marc®

CivilFEM