# Pressure only 2D members

P E **esas.44**

Analysis of 2D members capable of resisting only compression forces. It can be used e.g. for analysis of masonry walls and arches.

Highlights
Effective modelling of structures that do not transfer tension, e.g. masonry
Suitable for complex 3D-structures with shear walls and building cores
Deep insight in the structural behaviour of structures
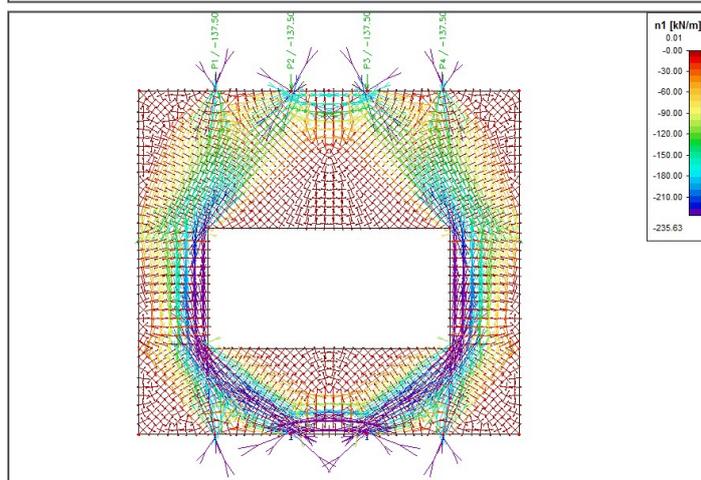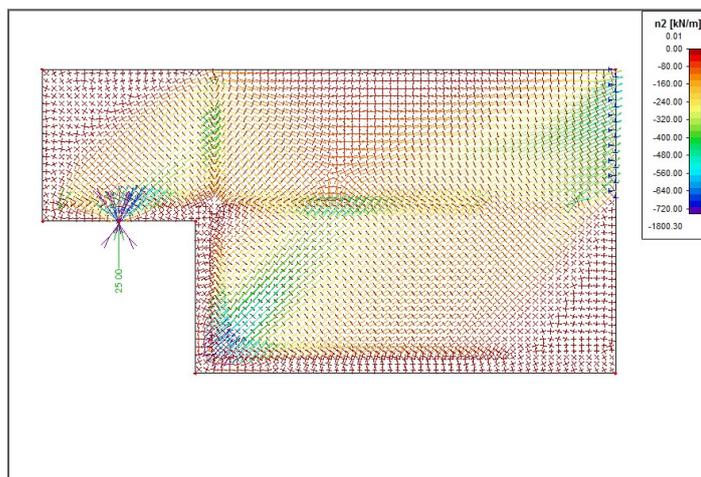
Pressure only finite elements

This model gives the user a very good insight in the behaviour of structures such as shear walls or building cores. It is possible to effectively model (reinforced) concrete or masonry structures in a 3D environment. Using a non-linear analysis the user is capable of reducing all tensile stresses in the concrete or masonry finite elements, thus resulting in a system of compression-only finite elements. The model is capable of displaying the internal arches/struts above openings and doors. Also lintels above openings can be easily modelled and considered in the calculation as hinged beams. Reinforcement in the concrete, capable of resisting the tensile forces, is modelled as an internal rib with the area and stiffness of the reinforcement grade. Using this so-called strut and-tie model the user gets a complete tool to design and check the reinforcement in walls.

A non-linear analysis is performed in order to calculate the pressure-only finite elements. Using a set of iteration steps the stiffness in the direction of the tension stresses is reduced, thus effectively reducing the tensile stresses in the structure. If the geometry of the structure is such, that a new state of equilibrium in ultimate limit state is found, i.e. by internal arches or reinforcement, the convergence criterion will be reached.

Using the function for displaying the trajectories of the principal forces or stresses the user is able to adequately review the behaviour of the structure. The internal struts and ties can be clearly seen. The internal forces on the reinforcement can be displayed as axial forces in the structure. Other results like reactions and deformations also help the user to get the proper insight into the behaviour of the structure.

This module helps the engineer in the design and checking of complex 3D-structures with shear walls and building cores. A practical example shows the difference between a linear elastic analysis (according to the service limit state) and a non-linear analysis using pressure only finite elements (according to the ultimate limit state).

The pressure only finite 2D-elements is a must have add-on for the engineer who calculates 3D-structures or 2D-walls in day-to-day practice. This module supplies an adequate insight into the structural behaviour of the structure. Using this module the user can effectively model masonry or reinforced concrete structures. Practical applications can be masonry walls with openings, concrete walls with openings, special concrete details like tooth-supports of beams.

Required modules

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