

# Examine<sup>2D</sup> 7.0

2D stress analysis for underground excavations

**roccscience** software tools for rock and soil

*Examine<sup>2D</sup> is a 2-dimensional plane strain boundary element program for the elastic stress analysis of underground excavations. Examine<sup>2D</sup> is quick, interactive and easy to use, and is ideal for parametric analysis, preliminary design and as a teaching tool for numerical stress analysis.*

## Modeling

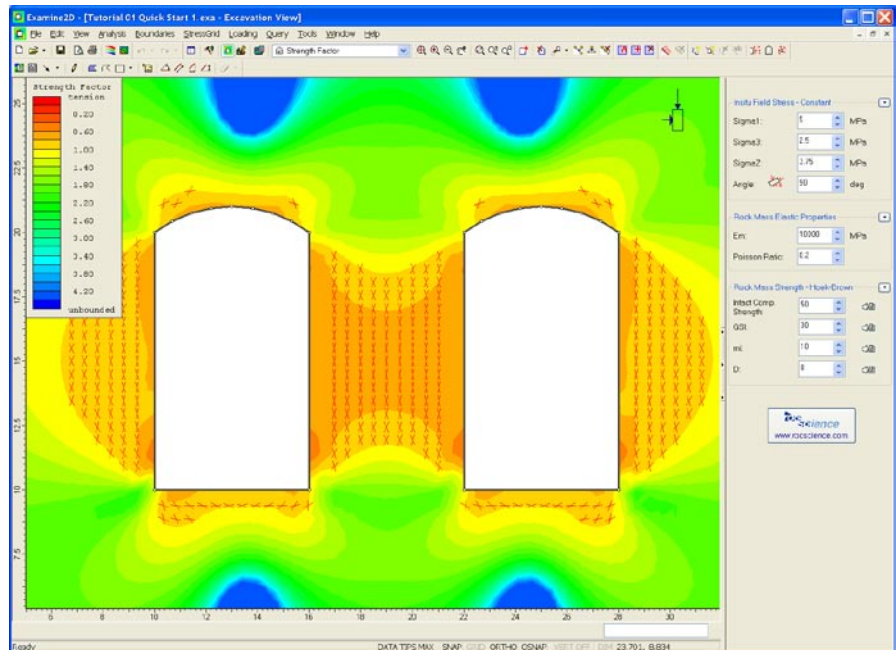
*Examine<sup>2D</sup> 7.0 was developed as an educational tool for both practicing engineers and students. The software makes it easy for the engineer to understand the basic principles of stress analysis and its application to the modeling of underground excavations. With state of the art interactive input and editing, you can create a model and view results with a few mouse clicks. Although Examine<sup>2D</sup> is primarily for the analysis of excavations in rock, it can also be used for soil applications.*

## Real Time Stress Analysis

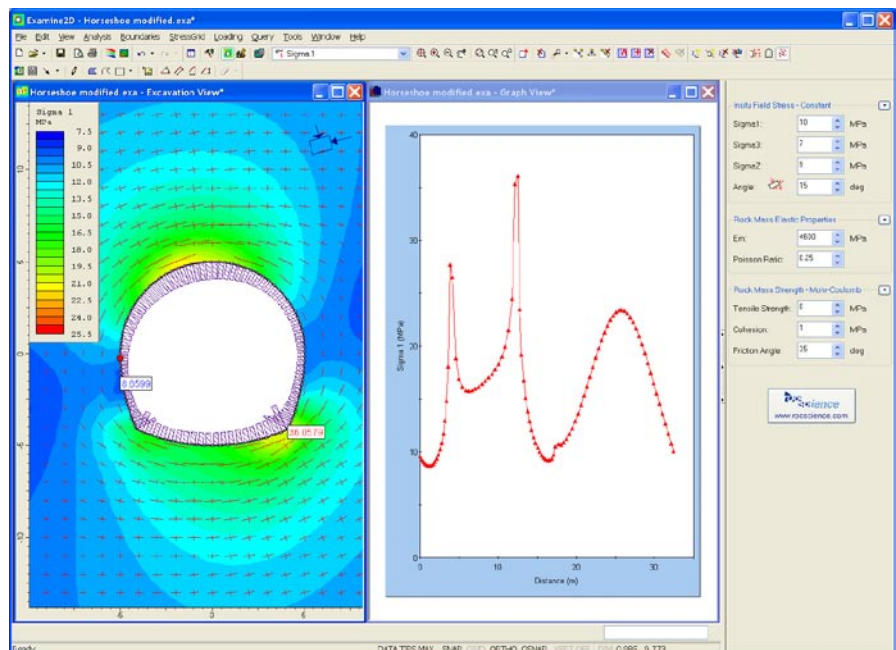
A unique feature of *Examine<sup>2D</sup>* is the real time stress analysis capability, which allows you to manipulate model parameters, and in real-time, visualize the effect on a stress analysis. In real-time, you can change the shape or position of an excavation, material properties and far field stresses, and the contours and graphs of stresses and displacements will be updated to show the influence of these changes.

## Data Interpretation

Contoured results include principal stress, displacements, and strength factor based on either Mohr-Coulomb or Generalized Hoek-Brown strength criteria. The Query option allows you to query the contour data at any location. The data can be displayed directly on the model, graphed, or exported to Excel. For further analysis, *Examine<sup>2D</sup>* models can be imported into the finite element program *Phase<sup>2</sup>*, which allows you to model multiple materials, staged excavation, plasticity and support.



Strength factor contours and failure trajectories around parallel caverns. Strength factor less than one indicates elastic overstress.



Principal stress contours and stress trajectories around horseshoe tunnel. Graph shows major principal stress on tunnel boundary.

### Modeling

- define excavation and ground surface boundaries
- interactive editing
- right click shortcuts
- easily define arcs and circles
- import / export in DXF format
- grid / vertex / object snapping
- interactive sidebar input
- automatic discretization
- undo / redo
- data tips

### Analysis

- single material
- homogeneous, linear elastic
- plane strain or complete plane strain
- constant, linear, quadratic elements
- choose matrix solver
- number of boundary elements
- metric or imperial units

### Elastic Properties

- isotropic
- transversely isotropic

### Strength Criteria

- Mohr-Coulomb
- Generalized Hoek-Brown (use mb, s, a or GSI, mi, D)
- estimate input parameters from built-in charts and tables

### Stress Grid

- automatic
- user-defined
- multiple stress grids
- modify grid spacing

### Far Field Stress

- constant
- gravitational (use elevation or ground surface boundary)
- aligned with excavation axis or 3-dimensional

### Loading

- apply uniform distributed load to boundaries
- model pressure, loading or equivalent support forces

### Real Time Stress Analysis

- automatic compute
- click and drag boundaries

- contours updated in real time as model boundaries or input parameters are edited

### Contour Data

- principal stress
- displacement
- strength factor
- strain
- stress trajectories
- deformation vectors
- deform boundaries
- failure trajectories

### Query

- query boundary
- query rock mass
- graph query or display data directly on model
- interactive graph sampler
- click on graph to highlight point on query

### Export

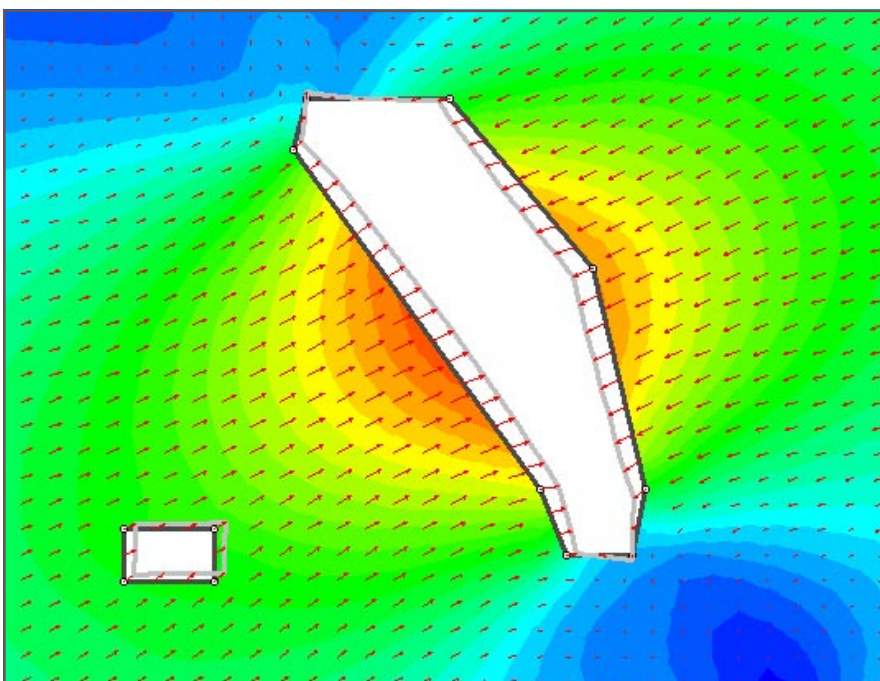
- one click export of data and charts to Excel
- copy to clipboard
- export image files
- Info Viewer analysis summary
- customize display options
- drawing, annotation and dimensioning toolkit
- save all drawing tools
- export to *Phase<sup>2</sup>*

### Price & Licensing

*Examine<sup>2D</sup> 7.0* is a free program. The software is an educational tool for both practicing engineers and students.

To download, go to the *Examine<sup>2D</sup>* Product page:

[www.rocscience.com/products/Examine2D.asp](http://www.rocscience.com/products/Examine2D.asp)



Displacement contours and deformation vectors around mining stope.