FLAC® VERSION 8.0

Explicit Continuum Modeling of Non-linear Material Behavior in 2D

ABOUT *FLAC*

FLAC is a numerical modeling code for advanced geotechnical analysis of soil, rock, and structural support in two dimensions. *FLAC* utilizes an explicit Lagrangian finite-volume formulation that can model complex behaviors not readily suited to FEM codes, such as problems that consist of several stages, large displacements and strains, non-linear material behavior, and unstable systems.

FEATURES

GENERAL

- Large-strain simulation of continua
- Explicit solution scheme
- Extensive solution controls and options
- Multi-physics modeling
- Histories of model properties
- Libraries of constitutive models
- Built-in scripting language (*FISH*)
- Multi-threaded solutions, no CPU locks
- Licenses: network, standard, and lease
- Standard license moves between computers
- Project management tools
- All operations available via the GUI, written command, and *FISH* scripting
- Optional automatic re-meshing

GRIDS and GEOMETRY

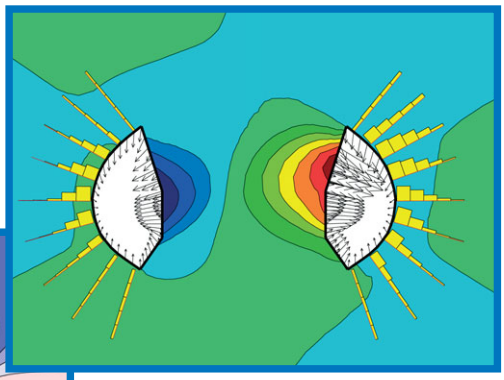
- Visual model geometry tools
- Virtual grid manipulation
- Library of pre-built geometries
- Import grid geometry from CAD data

MATERIALS and MODELS

- Seventeen built-in material models
  - Null (excavation)
  - Elastic, isotropic
  - Elastic, transversely isotropic
  - Drucker-Prager
  - Mohr-Coulomb
  - Ubiquitous-joint (UBJ)
  - Strain hardening/softening
  - UBJ, bilinear strain hardening/softening
  - Double yield
  - Hoek-Brown
  - Modified Hoek-Brown
  - Modified Cam-clay
  - Cap-yield soil
  - Simplified Cap-yield soil
  - UBJ, Elastic Anisotropic
  - Swelling
  - Plastic Hardening (PH)
- Null model for sequencing/excavation
- Built-in materials library
- Option to add user-defined models
- Statistical distribution of any property

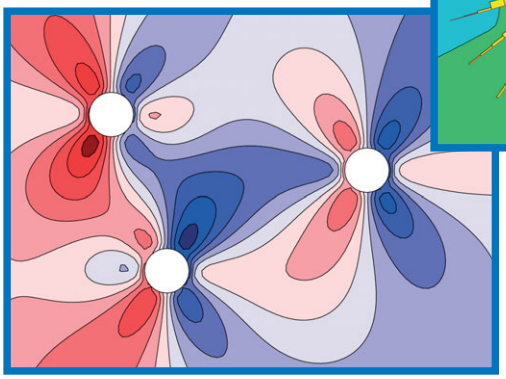
BOUNDARIES and CONDITIONS

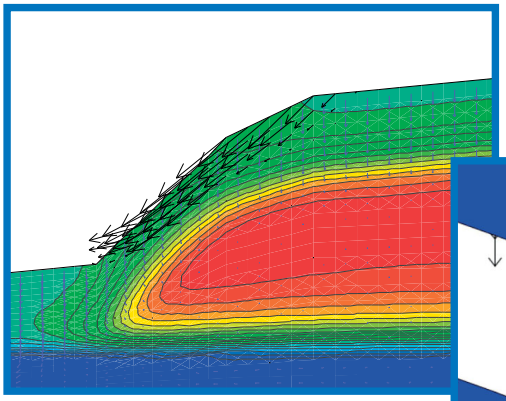
- Displacement and stress boundaries
- Artificial boundaries
- Structural support elements (beams, liners, cables, piles, rockbolts, strips, support members, and shells)



▲ *FLAC* model of a supported tunnel constructed in several stages. Horizontal ground displacement, displacement-vectors, and rock bolt loads are shown.

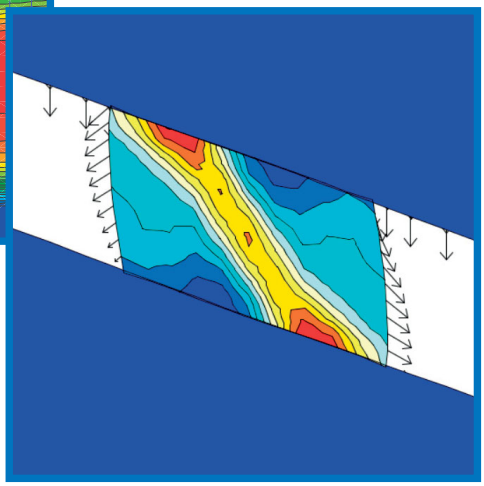
Multiple tunnels in a biaxial stress field with ▼ x-displacement contours shown.





▲ Velocity vectors, water flow, and soil saturation contours of a *FLAC* model are displayed for a slope subjected to a high-intensity, short-duration rainfall.

▼ *FLAC* model of pillars in an inclined underground stope. Displacement vectors and the maximum shear strain increment contours are shown.



ITASCA™
Consulting Group, Inc.
www.itascacg.com

ITASCA software sales, training and consulting for Sub-Saharan Africa by:

Groundwork Consulting (Pty) Ltd.
16 –18 Orange Street, Sunnyside, Johannesburg
PO Box 1166, Auckland Park 2006
Tel +27 (0) 11 482 8836/8 Fax +27 (0) 11 482 8839
sales@groundwork.co.za www.groundwork.co.za
GROUNDWORK

FEATURES (cont.)

- Water table to get effective stress
- Interfaces for faults, joints, and boundaries

SOLUTIONS and SEQUENCING

- Continuous or sequenced solutions
- Project tree and clone models make for easy parametric analyses
- Automatic Factor of Safety calculations, including water, structural support elements, and material properties
- Groundwater flow calculation
- Coupled calculations
- Multi-threaded mechanical calculations
- *FLAC/Slope* is included

POST PROCESSING

- Multiple graphical output formats
- Easily export results tables
- Extensive visual plotting facilities
- Export bitmap image series from any view to generate videos

NEW IN VERSION 8.0

- 64-bit version to build larger models
- Safety mapping using the built-in automatic Factor of Safety analysis
- Axisymmetrical shell structural elements to model shaft linings, pressure vessels, and circular plates
- Multi-threaded fluid flow for faster runs
- Boundary relaxation tool to simulate the 3D effect of an advancing tunnel
- Color ramps for improved contour plots
- New and updated constitutive models:
  - Swell model
  - Anisotropic ubiquitous elastic model
  - Cysoil (updated)
  - Ubiquitous viscoplastic creep model (with creep option)
- Seismic Wizard to pre-process signals for dynamic analyses
- Groundwater flow improvements
- New moment-thrust diagrams
- Export plot histories as CSV data
- User interface enhancements

AVAILABLE OPTIONS

DYNAMIC

- Permits two-dimensional, plane-strain, plane-stress, or axisymmetric, fully dynamic analysis
- Can be coupled to structural elements, groundwater flow, and optional thermal model
- Applications include earthquake engineering, seismology, and mine rockbursts

TWO-PHASE FLOW

- Allows modeling of the flow of two immiscible fluids through porous media
- Applies to problems, such as those encountered in reservoir simulation

CREEP

- Used to simulate materials that exhibit time-dependent material behavior
- Includes eight creep models: viscoelastic, power-law, WIPP, Burgers-creep viscoplastic, power-law viscoplastic, power-law viscoplastic with ubiquitous joints, WIPP-creep viscoplastic, and crushed-salt

THERMAL

- A conduction models allows simulation of transient heat conduction in materials and the development of thermally induced displacements and stresses
- An advection model takes into account the transport of heat by convection to simulate temperature-dependent fluid density and thermal advection in the fluid

USER-DEFINED C++ MODELS (UDM)

- Permits users to create their own *FLAC* constitutive model. The model must be written in C++ and compiled as a DLL file; it can be loaded as needed

A website for exchange of user-defined *FLAC* models for can be found at:

www.itascacg.com/udms

TRY THE DEMO

Itasca is pleased to offer free demo versions of all software for download. There is no restriction to the length of time you can use the demos, but some model size restrictions apply

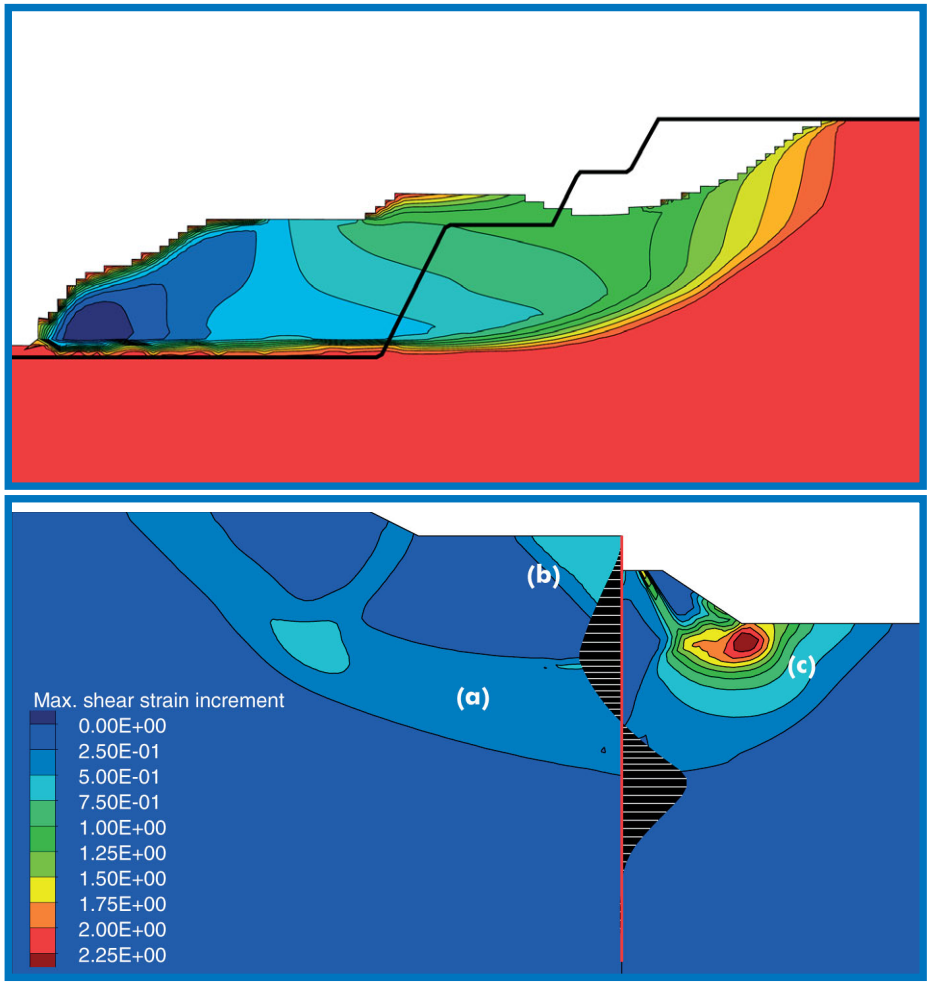
www.itascacg.com/demos

ORDER SOFTWARE

Itasca sales offices and agents vary geographically. To locate or contact the agent for your region, visit:

www.itascacg.com/sales

▼ Large-strain *FLAC* slope model (circular inset) using automatic rezoning logic to map existing stresses, velocities, and displacements onto a new, more regular grid. This allows the simulation to continue with numerical stability and estimate the extent of failure. Horizontal displacements are shown.



▲ *FLAC* is capable of modeling multiple physical failure mechanisms as they evolve naturally. In this example, a slope is reinforced with a sheet pile wall (SPW), shown in red. A factor of safety less than 1 is determined due to (a) global deep seated shear failure, (b) an active wedge behind the SPW, and (c) the bearing capacity of the lower-most slope toe. The bending moments of the SPW are also shown in black.

ITASCA™
Consulting Group, Inc.
www.itascacg.com

ITASCA software sales, training and consulting for Sub-Saharan Africa by:

Groundwork Consulting (Pty) Ltd.
16 –18 Orange Street, Sunnyside, Johannesburg
PO Box 1166, Auckland Park 2006
Tel +27 (0) 11 482 8836/8 Fax +27 (0) 11 482 8839
sales@groundwork.co.za www.groundwork.co.za
GROUNDWORK