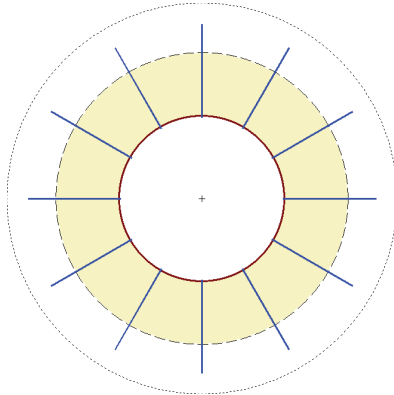# RocSupport
Support Estimation Using Ground Reaction Curves

Ground reaction and support reaction

What is RocSupport?

RocSupport is an easy-to-use software tool for estimating deformation in circular or near-circular excavations in weak rock and visualizing tunnel interaction with various support systems. Given the tunnel radius, in-situ stress conditions, and rock and support parameters, a ground reaction curve and a support reaction curve are calculated. The intersection of these curves determines a factor of safety for the support system.

RocSupport can be used as a tool for the preliminary design of tunnels and support systems. It can provide valuable information about various tunnel support options before detailed analysis is carried out with a finite element program such as RS2.

What's New in RocSupport

- Incorporation of Vrakas Method (2016) used for tunnels with large-strain non-linear General Hoek-Brown with dilation

Software Highlights

Ground Reaction Curve

- Based on the analytical solution for a circular tunnel in an elasto-plastic rock mass under a hydrostatic stress field
- Ground reaction and support reaction curves are calculated given the tunnel radius, in-situ stress conditions, rock parameters, and support parameters
- Intersection of these curves determines a factor of safety for the support system
- Define rock mass strength in terms of either Mohr-Coulomb or Hoek-Brown parameters

Support Options

- Simulate the application of rock bolts, steel sets, or shotcrete around tunnel circumference
- Within each support category, select from several pre-defined support types (e.g., 34 mm rock bolts, 203 mm flange I-section rib steel sets, 50 mm thick shotcrete) or create a custom version
- Easily combine different support types (e.g., rock bolts and shotcrete) to use properties of the combined support system to determine the overall support reaction curve

Plans & Pricing

Personal License: Locked to one computer.

- Lease: **USD $395/year**
  Leased annually. Includes Maintenance+.
- Perpetual: **USD $795**
  Purchased outright. Includes 12 months of Maintenance+.

Flexible License: Installed on any number of machines. The license file sits on the server.

- Lease: **USD $595/year**
  Leased annually. Includes Maintenance+.
- Perpetual: **USD $1,195**
  Purchased outright. Includes 12 months of Maintenance+.

Maintenance+

Maintenance+ is our enhanced maintenance and support services subscription, purchased annually at 20% of the license cost.

With Maintenance+ Continuous Software you get access to all feature releases, enhancements, and bug fixes throughout the year and as soon as they're available. You also have access to convenient License Services, the support of our experts, and exclusive learning offerings.

Find more details: rocscience.com/software/rocsupport

Contact us at software@rocscience.com

Analysis Options

- Duncan Fama solution for ground reaction curve
- Carranza-Torres solution
- Vrakas and Anagnostou solution
- Lee and Pietruszczak solution
- Barbosa solution
- Vrakas (2016) solution
- Plot long-term ground reaction curve (specify strength reduction factor)
- Deterministic (safety factor) or probabilistic (probability of failure) analysis

Probabilistic Analysis

- Monte Carlo or Latin Hypercube simulation
- Random or pseudo-random sampling
- Random variables—all tunnel and rock parameters can be defined as random variables
- Statistical distributions—normal, uniform, triangular, beta, exponential, lognormal, gamma
- Histogram, cumulative, and scatter plots
- User-defined plot variables
- Best-fit distribution and regression line
- Highlight support failure on histogram and scatter plots
- One-click export of charts to Excel

Rock Parameters

- Elastic properties: Young's Modulus, Poisson's Ratio
- Strength properties: Mohr-Coulomb or Generalized Hoek-Brown
- Equivalent Mohr-Coulomb parameters can be calculated from Hoek-Brown parameters (GSI, mi, intact UCS, D)
- Built-in charts and tables help estimate suitable values of GSI, mi, intact UCS, and D
- Peak and residual strength parameters for Generalized Hoek-Brown criterion

Support

- Pre-defined support types for rock bolts, steel sets, and shotcrete
- Combine multiple support types (e.g., rock bolts and shotcrete)
- Simple parametric analysis —add, change, or remove support with a few mouse clicks
- User-defined support
- Support installation—specify distance from face or tunnel convergence
- Interactive positioning of support
- Longitudinal deformation profile —built-in or user-defined function
- Custom support option for each of the three support types
- Steel set reinforcement database

Tunnel Parameters

- Tunnel radius
- In-situ stress

Viewing Options

- Ground reaction and support reaction views
- Tunnel section and plastic zone radius views
- Customize display options
- Export image files
- Info Viewer summary of analysis results