

The evolution of Rocscience

Since 1987, the Rock Engineering Group at the University of Toronto has developed and distributed geomechanics software, fulfilling a need for more reliable, easy-to-use 2D and 3D analysis and design tools in the mining and civil engineering industries.

Our first suite of programs evolved from work by various graduate students over the years under the leaderships of Dr. Evert Hoek and Dr. John Curran. The development of these initial programs was supported in part by the Canadian Mining Industry along with the

provincial and federal governments. These early versions were then widely distributed as shareware in Canada and internationally.

Since 1994, further research and development has transformed these early programs into the commercial versions available today. Together with new ideas and expertise, eleven high quality software programs are being sold. Each program includes a detailed manual or on-line help file, technical support and is very competitively priced. More than 2000 customers in over 75 countries are now using our software.

Rocscience Inc.

Rocscience Inc. was formed in May 1996 to handle the increased distribution and administration of the software. As a spin-off company from the University of Toronto, we will continue the evolution of ideas and technology, creating new software products in the field of geomechanics while maintaining the benefits of our close connection to the research environment.

Our strength comes from the strong geomechanics background of our staff and their excellent programming skills. We have created a common interface for all the programs, resulting in easy-to-use software for the practising engineer in the field as well as the demanding technical analysts employed by major consulting companies.

Rocscience Inc. offers expert technical support and can respond quickly to customer concerns. We value the suggestions and comments from our customers — this valuable input helps us update and improve our programs.

The future

We are encouraged by the wide range of correspondence from users around the world, indicating to us that

the programs are being successfully applied to many types of projects by engineering companies both large and small.

Look inside
for a preview
of our new
Windows 95/NT
programs!

While Rocscience Inc. continues to support its existing DOS based software, our focus now is to rewrite our existing programs in Windows 95/NT and to create new Windows programs in areas such as stress and deformation analysis, ground water flow and contaminant transport.

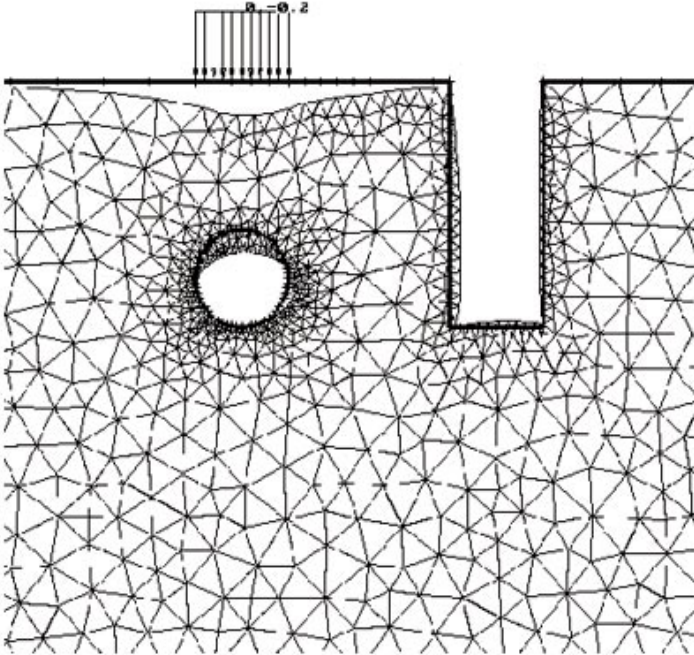
It is an accomplishment for the University of Toronto, in cooperation with industry and government, to have laid the groundwork for this software development. Rocscience Inc. will build on this foundation and continue to produce quality products.

IN THIS ISSUE

New Software Releases	2
Work in Progress.....	2
Phase², Examine^{3D}, Swedge, RocFall	4
FAQs	5
Web Site	5
Ordering Information	6



New Software Releases



Phase² (3.0)

- ❑ axisymmetric modeling
- ❑ joint elements
- ❑ new support options: rock and cable bolt models and beam elements for modeling shotcrete liners
- ❑ quadrilateral finite elements
- ❑ radial meshing
- ❑ new boundary condition options: springs and infinite elements
- ❑ extensive new data interpretation capabilities
- ❑ all new compute engine
- ❑ improved editing capabilities
- ❑ redesigned user interface

Phase², the long-awaited replacement for Phases, is a completely new 2D elasto-plastic finite element program for calculating stresses and displacements around excavations.

Three years in the making, the time and experience gained during this process ensures that **Phase²** is one of the most powerful, flexible and easy-to-use programs of its kind on the market.

Phase² can be used to solve a wide range of mining and civil engineering problems. Its mesh generation facilities are state-of-the-art. Modeling capabilities include progressive failure (staging), rock-support interaction, large strain, nonlinear rock mass and joint behavior.

Phase² comes with complete documentation, including reference, tutorial and verification manuals.

Examine^{3D} (4.0) for Windows 95/NT

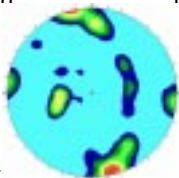
- ❑ a new geometry building facility called blending
- ❑ energy release computation
- ❑ rendering and animation enhancements
- ❑ Win 32 based program

Examine^{3D} is our 3D boundary element program for underground excavations in rock. Version 4.0 of **Examine^{3D}** for Windows 95/NT is now officially released. It allows multiple **Examine^{3D}** sessions running simultaneously in their own window.

Although developed mainly for stress analysis, the data visualization tools of **Examine^{3D}** have been applied to a wide range of three-dimensional mining and civil

WORK IN PROGRESS

Dips – A new option will allow the user to automatically identify joint sets at the click of a button. Work is nearly complete on a “Fuzzy Cluster Algorithm for the Automatic Identification of Joint Sets”. Look for details on our web site, www.rocscience.com, in the coming months.



Slide – Several additions are underway for the next version of **Slide**, including the ability to analyze non-circular failure surfaces, anisotropic materials, new failure criteria options, and additional limit equilibrium solution techniques.

Conversion from DOS to Windows – After developing programs in DOS for over 10 years, the transition to object oriented, 32 bit Windows-based programming is not an overnight task. We are developing a logical and consistent framework and converting all our programs to the Windows 95/NT format. Our goal is to create Windows programs which have 100% of the functionality, ease of use, and consistency between programs as our suite of DOS software, along with all the advantages offered by the Windows 95/NT environment.

DOS programs will continue to be maintained along with full technical support, bug fixes, and minor version updates.

engineering data. For example, *Examine^{3D}* allows the user to visualize microseismic datasets such as seismic velocity, source parameters, and event density.

Swedge which calculates the stability of wedges formed in rock slopes, now includes statistical analysis of failure probability.

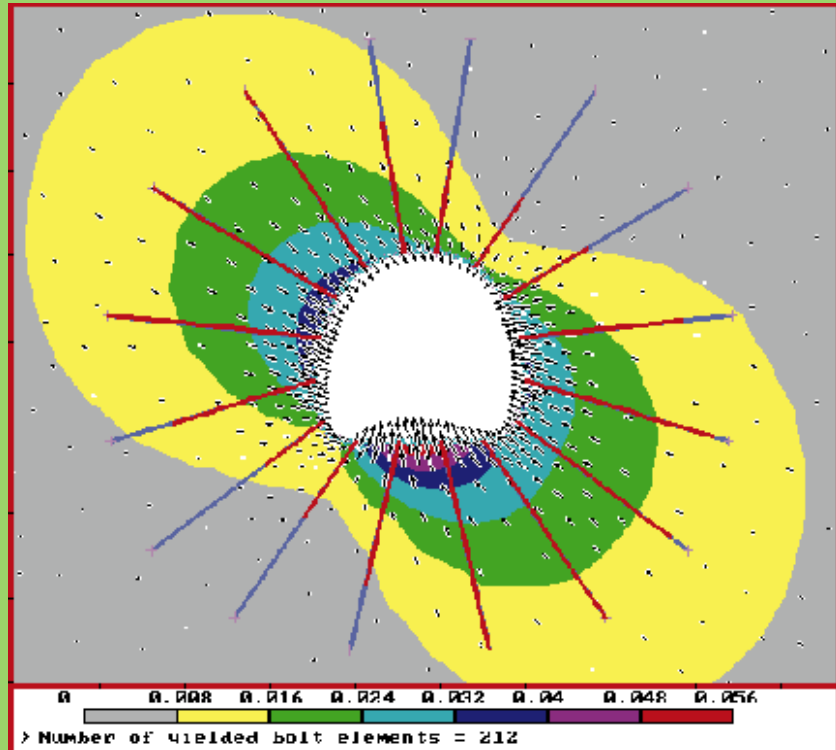
In addition to the deterministic calculation of safety factors, statistical input data can now be entered to account for uncertainty in joint orientation and strength values. The probability of failure is obtained from the safety factor distribution.

Swedge (2.0)

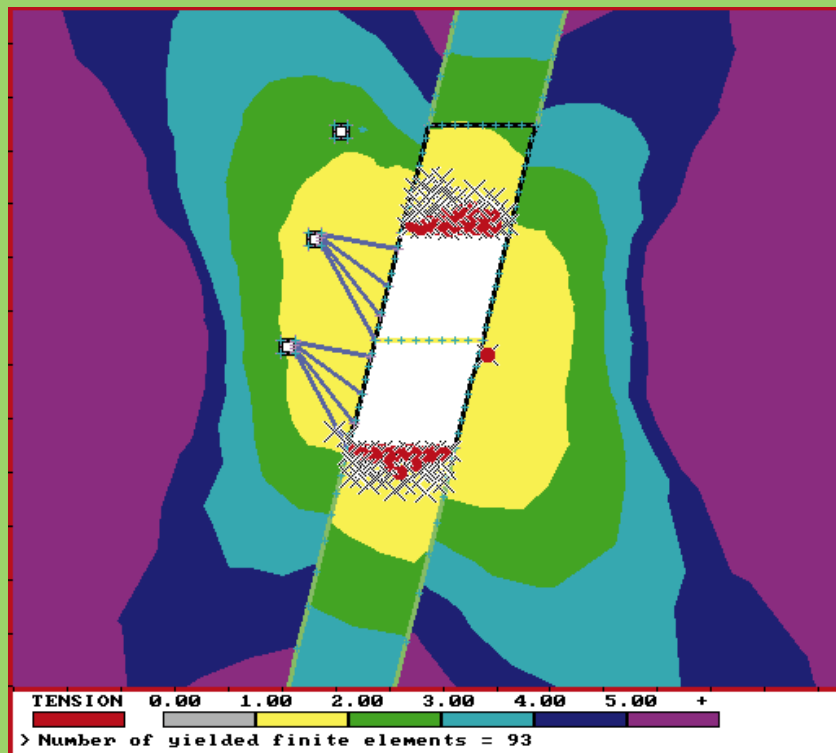
- statistical data input
- Monte Carlo or Latin Hypercube sampling techniques
- view result histograms

RocFall is a statistical analysis program designed to assist with a risk assessment of falling rocks on steep slopes. Energy, velocity and “bounce height” envelopes for the entire slope are determined by the program as is the location of rock endpoints.

RocFall is a Win 32 based application for Windows 95 and Windows NT 4.0.

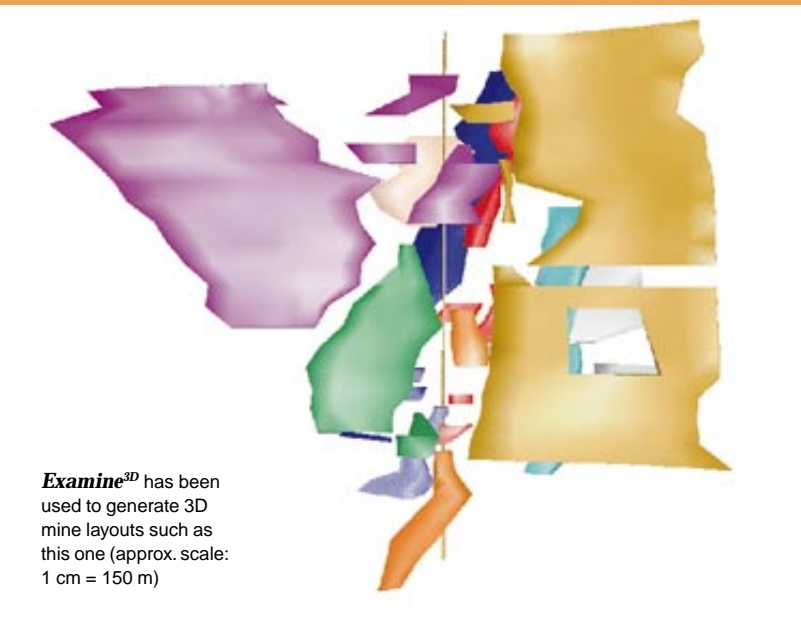
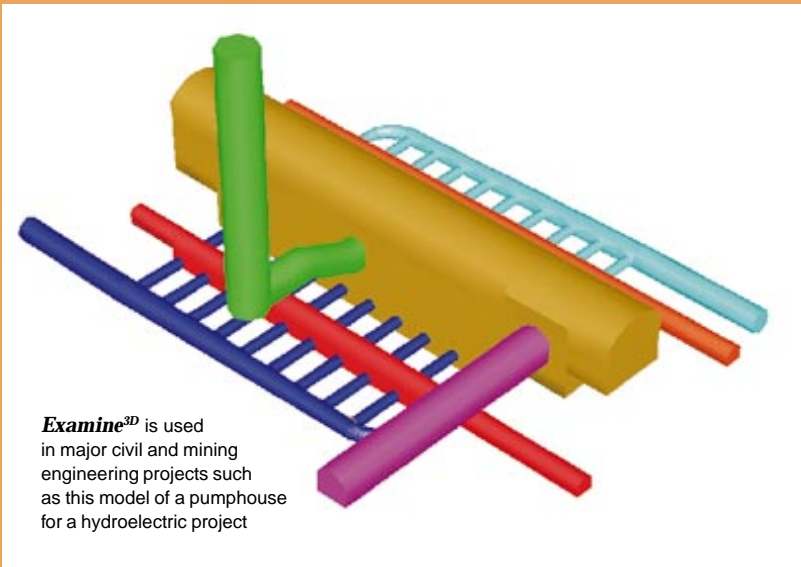


Displacement contours and trajectories around shotcrete-lined tunnel in very weak rock. Bolt yielding is highlighted in red.

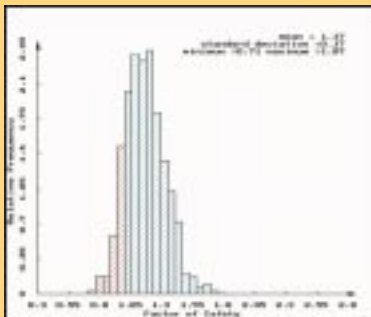


Staged excavation of longhole stope with strength factor contours and yielded points displayed. Cablebolting installed from access drifts.

EXAMINE^{3D}

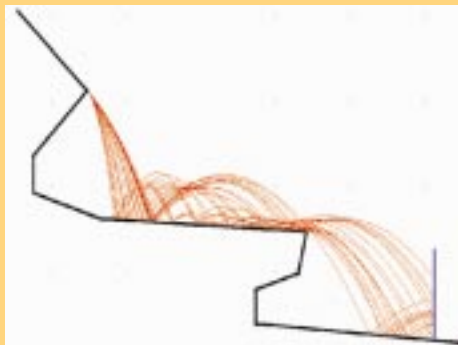


SWEDGE



Safety factor distribution, probabilistic analysis
Sample size = 500, probability of failure (p.f.) = 0.14

ROCFALL



Rockfall simulation on slope with barrier

F A Qs

Q. What kind of printer support is offered?

A. All programs have a built-in Print Configuration option which allows screen captures to be saved as PCX files, which can be imported into word processing or drawing programs. Screen captures can also be output directly to several common printer models. Image cropping is a built-in option.

Q. What is the difference between *Phase²* and *Phases*?

A. *Phases* is a hybrid finite element-boundary element program, which is no longer available. *Phase²* is strictly a finite element program, and has an all new compute engine, a greatly improved user interface and many new modeling and data interpretation features — see the “New Software Releases” section for details.

Q. What is the difference between *Phase²* and *Examine^{2D}*?

A. *Examine^{2D}* is an elastic 2D fictitious stress-displacement discontinuity program and is an excellent tool for quick analysis of excavations in a jointed rock mass. Program output, including stresses and displacements, joint slip and strength factor, can be used as a guide for the necessity of a full plasticity analysis using a program such as *Phase²*. *Phase²* is a comprehensive 2D elasto-plastic finite element program which can be used to solve

complex problems involving rock mass yielding and excavation support design.

Q. Why do we use software locks?

A. The use of software locks (“hardlock”, “dongle”) provides for low cost hardware-based copy protection and allows us to offer our suite of engineering analysis software at low cost with a high level of support. We recognize that there is a small inconvenience when transferring locks between systems, but firmly believe that end users would prefer to have us continue to distribute the software at low cost.

Q. Can current DOS users upgrade to the new Windows versions?

A. Yes, upgrade pricing will be available for registered users, based on the purchase price of the original program.

Q. How does the free internet update service work on our website?

A. Registered users who have purchased the latest program versions can download minor updates from our website. For example, if you originally purchased *Dips* v. 4.00, you can download version 4.03 free of charge. A list of bug fixes and improvements for each version is maintained on our web site. If you have an earlier version of the program, then you will have to upgrade to the latest version before you can take advantage of this service. Contact us about upgrades.

Q. Will the year 2000 date change affect the software?

A. None of our code uses the current date in any of the functions, therefore all the programs are “Year 2000 Compliant”.

WEB SITE

www.rocscience.com

- the latest program information
- demo versions to download
- free internet update service for registered program users

rocscience

AVAILABLE PROGRAMS

- Examine^{3D}** 3D stress analysis and data visualization for underground excavations
- Examine^{2D}** 2D boundary element analysis of stresses and displacements around underground excavations in jointed rock
- Examine^{TAB}** 3D displacement discontinuity analysis of excavations in tabular orebodies
- Dips** Plotting, analysis and presentation of structural data using spherical projection techniques
- RocFall** Risk analysis of falling rocks on steep slopes
- RocData** Determination of Mohr–Coulomb and Hoek–Brown strength parameters from laboratory strength data
- Unwedge** Analysis of the geometry, stability and support (bolts and shotcrete) of underground wedges
- Swedge** Probabilistic analysis of the geometry, stability and support of surface wedges in rock slopes
- Slide** 2D slope stability analysis; includes multiple materials, ground water, external/seismic loading
- CPillar** Probabilistic analysis of crown pillar and roof stability
- Phase²** 2D finite element elasto-plastic analysis of rock structures in jointed rock; includes progressive failure, staging, multiple materials and support (rock bolts, cable bolts and shotcrete)

F A Qs

Q. Are demo versions of our programs available?

A. Yes, demo versions of most of our programs are available. They can be downloaded from our website.

Q. How does one order a program?

A. Go to our web site and click on **Ordering** to print out the appropriate Order Form. Send us the completed Order Form and Payment Options sheet by fax. If you do not have internet access, send us your fax number or mailing address and we will send you the information. All orders require prepayment. Your package will be prepared and sent by courier once we receive your payment and registration information.

MAILING LIST

Make sure we have your correct address for future newsletters and update information. Please send us any corrections.

Email:
software@rocscience.com

Phone:
1-416-698-8217

Fax:
1-416-698-0908

Mail:
Rocscience Inc.
31 Balsam Avenue
Toronto Ontario
Canada
M4E 3B5

rocscience

Geomechanics Software and Research

Dips
Phase²
CPillar
Unwedge
RocData
RocFall

Examine^{3D}
Examine^{2D}
Examine^{TAB}
Swedge
Slide

See us at the
CIM-Tradex '98
Booth #2508 for
our new Windows launch

www.rocscience.com