iRing

3-D Ring Planning

Designed and developed in collaboration with a major underground mining corporation, *iRing* is an exciting software package primarily used to plan ring layouts for underground blasting operations. This innovative application provides mine planners with intelligent tools to slice wireframe models, accurately and precisely plan blast patterns on-screen, load the holes with explosives and evaluate fragmentation and costs.

Using AutoCAD's® object model and graphics engine, *iRing* is a fully integrated Graphical User Interface (GUI). The revolutionary *iRing* Control Panel logically assists planner's through the ring planning process, ensuring that all hole layouts fall within design parameters.

All design tools, slicing, drilling and loading parameters are accessible at the click of a button. Database settings minimize input repetitions. Slice long sections and rings. Repair drifts. Use an existing, or create a new, reference line. Select design criteria from three standard drill cases. Drill 360 degrees. Ring layouts are automatically generated in accordance with specified parameters. Use online statistics to check designs. Create and test "what if" scenarios to optimize your drilling and blasting choices. Undo your calculations and start over. Simple. Quick. *iRing* Control Panel does it seamlessly - at the click of a mouse.

Plan multiple sills for a single ring quickly and easily. Add holes to a drawing or edit previously designed layouts. Design uphole and downhole drill and load patterns for difficult and unusual situations. Import gyroed hole data. View your layout in 3-D. Adjust hole positions, add offsets, and adjust explosive loads and timing to optimize layouts to minimized overbreak conditions.

Designed *for* planners *from a planners perspective*, *iRing* automates a time-consuming, manual process. Customizable, flexible, effective.

Intelligent

Intuitive. Efficient. Interactive.

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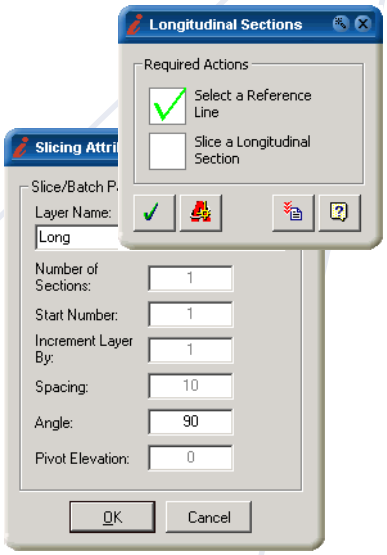
Intelligent Ring Planning Technology

Slicing

Slicing Features

Slicing Interface

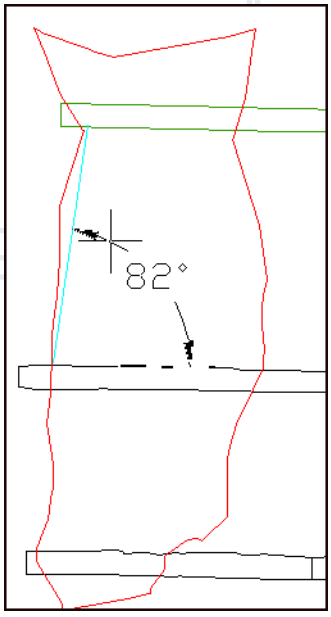
- Slice angled planes quickly and accurately
- Slices oriented in a specific “look” direction
- Undo steps without loss of information
- Customize to any mining operation
- Jump to Ring utility provides quick access to all profiles on a drawing
- Easy access to AutoCAD



Long Section Selections:

- Unique layer name identifier
- Reference line
- Slicing angle
- Quick access to AutoCAD

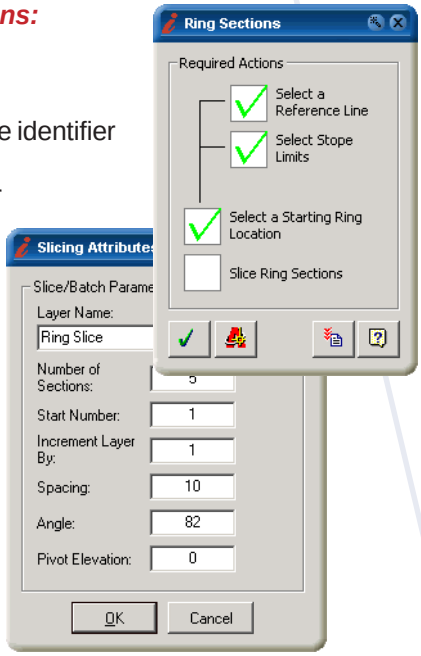
Slicing Results



This illustration of a long section slice through a wireframe shows the ore body outline in red with green/black stopes. A blue angled line has been added to assist in determining the lean angle for the ring slices.

Ring Slice Selections:

- Reference line
- Stope limits
- Unique layer name identifier
- Number of rings
- Ring start number
- Slicing angle
- Pivot elevation
- Ring spacing
- Ring parameters
- Quick access to AutoCAD



Quick.
Accurate.
Versatile.

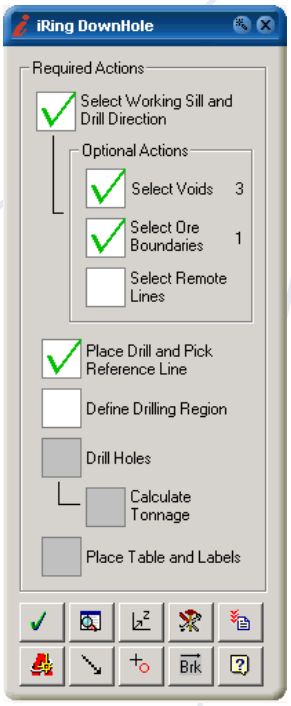
Drilling

Drilling Features

Drilling Interface

- Intuitive Control Panel interface provides a step-by-step progression through drill layout designs which improves a planner's stope design process
- Work on multiple sills concurrently
- Complete integration between iRing and AutoCAD
- Undo steps without loss of information
- Change options to optimize selections
- Compare statistics to optimize layouts
- Customize to any mining operation
- Detailed, customizable reports

Turn a time-consuming manual exercise into a 15-second focused process



Drilling Panel Selections:

- Working sill for drill placement
- Drilling direction
- Void spaces for hole termination
- Ore boundaries and offsets
- Reference line for dimensioning collars
- Drill set-up parameters
- Drill hole parameters
- Drill region boundary
- Custom tables and labels
- Statistics and profiles

iRing Calculations:

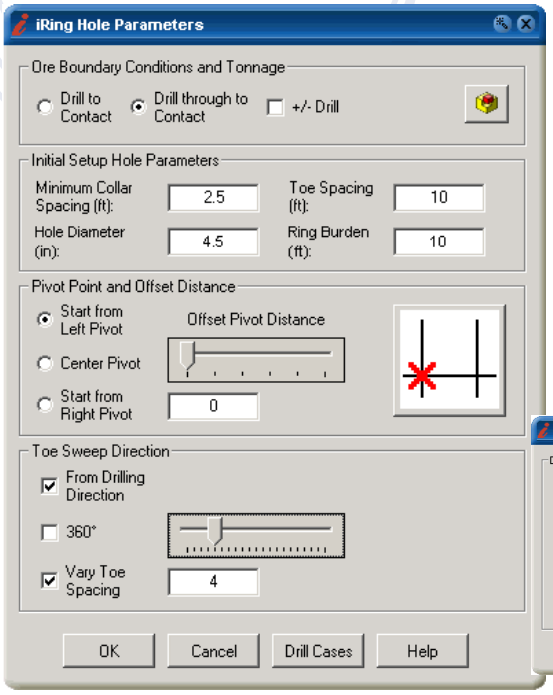
- Number of holes
- Number of drill setups
- Number of pivot points
- Drill factor
- Total tonnage and footage
- Cost per unit drilled

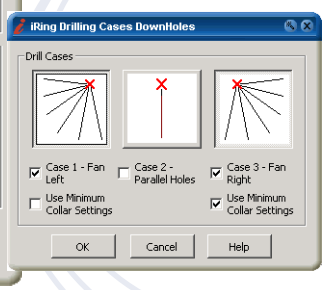
Customize Layouts

Optimize Selections

Unique Approach:

- Determine placement of the drill setup
- Select toe and collar spacing
- Vary toe spacing to accommodate difficult ore geometries
- Select minumum hole spacing and length
- Select boundary conditions
- Determine sweep direction
- Generate layouts and compare statistics
- Option to drill 360 degrees





Easy to Select Drill Cases:

- Three drill cases to choose from as a group or individually
- Minimum collar setting override
- Single or multiple pivot points

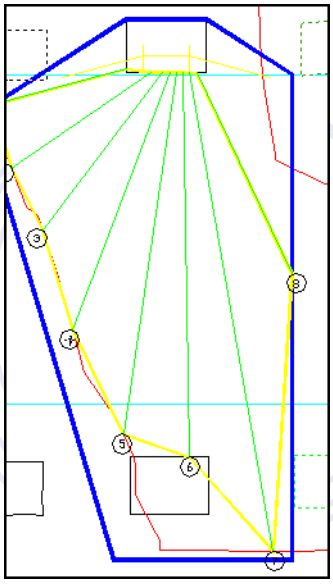
iRing

New Features Enhanced Capabilities

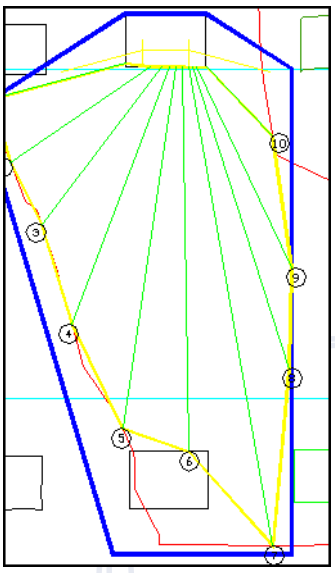
Add or Offset Holes

Your drill layout generates as planned, but past experience tells you that you need an extra hole to obtain satisfactory breakage statistics. *iRing* now provides you with the opportunity to add new holes and the capability of placing offset holes. All hole information is automatically stored in the registry database, and statistics are recalculated to reflect the change.

Go from this ...



... to this ...

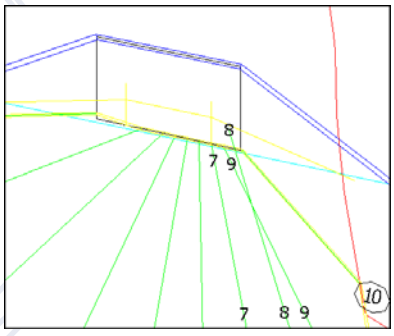


... in seconds

Numbered drill holes are contained within a blue drill boundary and yellow tonnage calculation boundary.

This illustration has had hole #10 added and hole # 8 added and offset.

This illustration shows an isometric view of the collar of hole # 8, offset by 3 feet.



Gyroed Holes

Purpose:

- True hole profile
- Determine exact spatial relationship of all holes

Benefit:

- Drill hole position accuracy = more precise breakage data
- Improved explosive loading accuracy
- Accurate inventory and cost analysis
- Document hole deviations on drill plan
- More accurate tonnage calculations
- Better representation of hole position
- Can factor in changing rock conditions = adjustments to type and quantity of explosives

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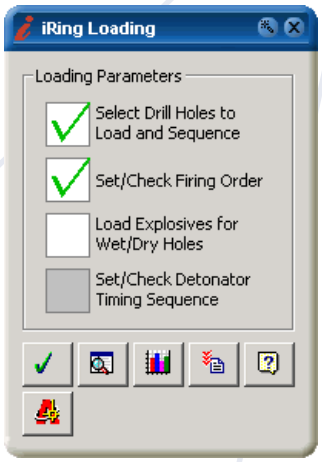
Loading

Loading Features

Loading Interface

- Explosives parameters set in Loading Preferences database; explosives, detonators, primers, cords, ore/rock type, seismic limits
- Change options to optimize loading sequences
- On-screen test to check hole firing order
- Automatic or manual loading selections
- Choice of mining method
- Powder factor continuously calculated
- Loading Panel logical progression through loading sequence
- Check vibration levels based on explosive weight/delay
- Detailed, customizable reports

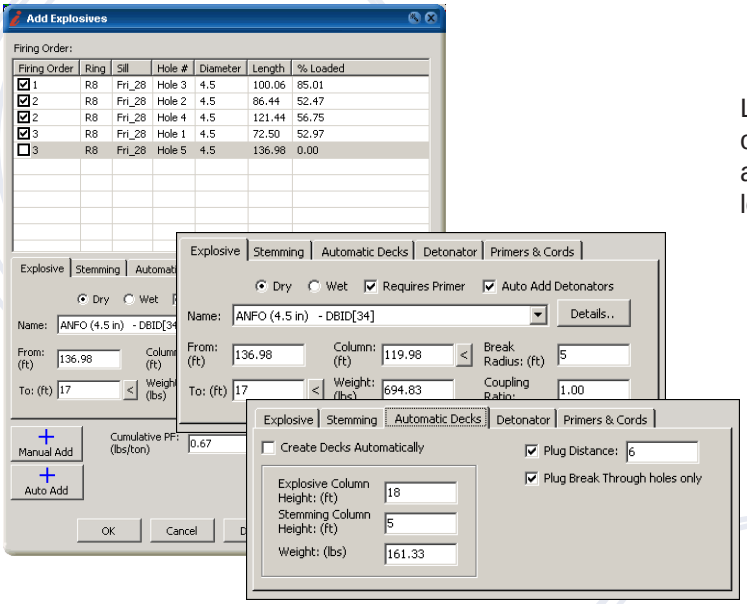


Loading Panel Selections:

- Rings, sills and holes to load
- Mining method
- Firing order of the holes
- Explosives, primers, cords and detonators for each hole
- Location of detonators
- Break radius for the section
- Timing of firing sequence
- Seismic parameters
- Automatic deck creation
- Priming interval
- Plug breakthrough holes

Load Explosives

Automatic or Manual



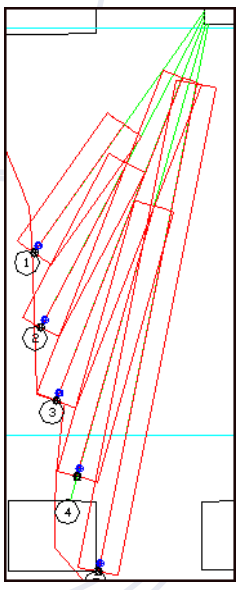
Automatically Calculated:

- Weight of specific explosives
- Percentage of hole loaded
- Coupling ratio
- Powder factors
- Amount of explosives and stemming for automatic loading
- Appropriate parameters for products selected

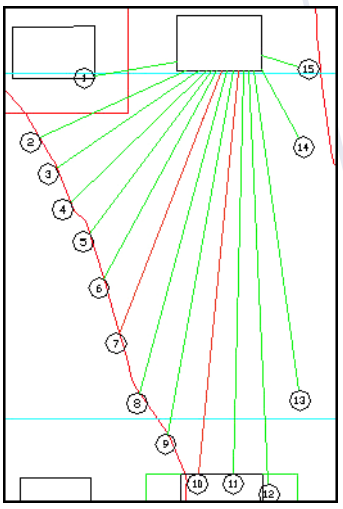
Real-Time Displays

Optimize Selections

Load holes automatically with explosives and detonators while on-screen display of powder factor and cumulative powder factor assist in optimizing the blast. This illustration demonstrates holes loaded automatically based on pre-selected criteria.



Select firing order of holes and run a check of firing sequence. This illustration demonstrates holes 7 and 10 firing concurrently.



Intelligent Ring Planning Technology

Fragmentation

Fragmentation Features

Fragmentation Interface

- Predicts the size distribution of ring analysis based on pattern drilling and explosives loading
- Fragmentation for every hole is calculated
- Adjust energy, accuracy and ore variances
- On-screen calculation of “what if” scenarios
- Test the effect or size distribution by increasing or decreasing ring burden and spacing

Capabilities

- Predict fragmentation based on explosives energy and distribution
- Provides a sensitivity analysis on the predicted fragmentation profile,using explosive energy, drilling accuracy, toe spacing and ring burden values
- Calibrate to fragmentation measurement

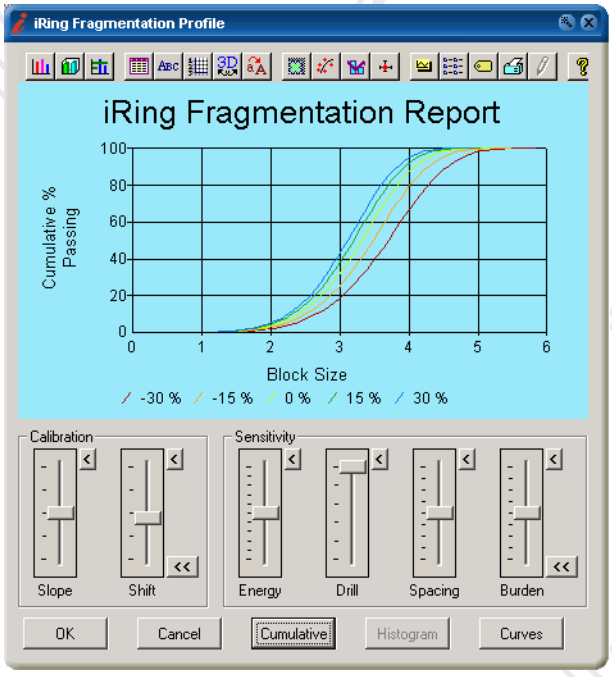
Getting Started

Adjustments

- Calibration and Sensitivity adjustments
- Increase or decrease explosive energy
- Drill accuracy
- Toe spacing
- Ring burden
- Margin of error calculations
- Reset one or all adjustment to default position

Unique Approach

- Evaluate blasting patterns associated with underground drill layout geometries
- Evaluate fragmentation profiles for all holes in a ring, or multiple rings, based on underground geometry
- Calibration of fragmentation model of measured values using on-screen slider controls
- Increase or decrease explosive energy values

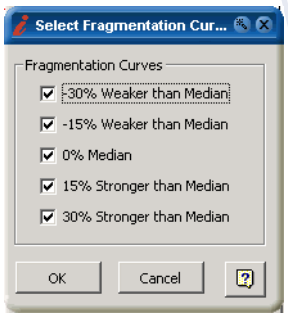


Real-Time Displays

Optimize Selections

- Adjust previously selected parameters for explosive energy, drill accuracy and ore variances and generate “what-if” scenarios to optimize ring designs.
- Minimize overbreak and reduce underbreak conditions resulting in more efficient ore recovery.
- Improve ore recovery by trying different drilling configurations.

Select which of the relative ore tensile strengths to display.



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