

Seismic analysis should focus on statistically determined volumes of increased seismicity, rather than discrete, large magnitude seismic events. These volumes correlate to regions of the rock mass undergoing plastic deformation and releasing energy.

SEISMIC HAZARD AND FORECASTING

AT BECK ENGINEERING WE KNOW THAT TO SAFELY MINE IN A SEISMIC ENVIRONMENT REQUIRES CLEAR UNDERSTANDING OF THE CURRENT AND FUTURE SEISMIC HAZARD.

OUR UNIQUE APPROACH UTILISES PHYSICS BASED CALCULATIONS OF ENERGY RELEASE CALIBRATED TO THE MINE'S SEISMIC OBSERVATIONS.

THIS PHYSICS BASED APPROACH CAPTURES THE MECHANISM OF DEFORMATION AND SEISMICITY, ALLOWING YOU TO CLEARLY COMMUNICATE CURRENT AND FUTURE SEISMIC HAZARD TO ENGINEERS, MANAGERS, AND CREWS.

Mining induced seismicity is one of the major hazards associated with underground mining.

The re-distribution of stress around an excavation causes damage to the rock mass and on discontinuities.

Conventionally, stress is used as a predictor for seismicity; however this is a measure of stored energy, rather than the resulting energy release.

To capture the correct stress re-distribution mechanism and resulting plastic deformation advanced modelling techniques are required.

Beck Engineering has spent many years refining methods for quantifying and forecasting seismic hazard. This area remains one of our primary field of research, and continues to be a major focus.

We apply our proven methods, and continue to undertake research at some of the most challenging seismically active mining operations globally.

Speak to one of our engineers on incorporating our methods of seismic hazard analysis and seismic forecasting at your mine site.

Beck Engineering is an Australian-based engineering firm that specialises in mining and rock mechanics analysis for the global mining industry.

We apply realistic physics-based simulations to forecast the geotechnical performance of underground and open pit mines, across a broad range of mining methods, geotechnical conditions and commodities. Our experienced mining engineers work with our clients to integrate these performance forecasts into practical mine designs, schedules and operating plans.

BECK ENGINEERING SHARES A COMMON GOAL WITH OUR CLIENTS: TO DESIGN, PLAN AND OPERATE SAFE, PRODUCTIVE AND RELIABLE MINES.

SEISMIC HAZARD AND FORECASTING

OUR APPROACH

- Beck Engineering assesses seismicity as a system response resulting from a combination of:
 - Geology
 - Structure
 - Void, and
 - Deformation
- Beck Engineering's own rock mechanics LRx models quantify the peak instantaneous energy release rate, which is shown to be a reliable predictor for seismicity.
- Forecasting utilises all available information to generate a complete 3D interpretation of the mining environment and detailed extraction of material.
- Our simulations use non-linear, strain softening, dilatant material models for each geotechnical domain allowing the system to determine where the seismic hazard exists.

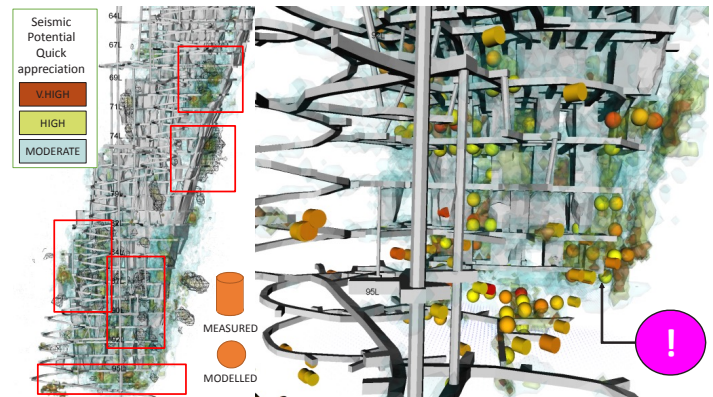
WHAT YOU GET

- A greater appreciation for the underlying seismic mechanisms.
- A powerful tool for visualising and communicating the current and future seismic hazard.
- A virtual laboratory to remove flawed design attributes mitigating seismic hazards
- Quick turnaround time between iterations
- Full three-dimensional results database available for site engineers to use for ongoing confirmation, analysis and refinement.
- Full transparency: We will teach you how to get the most out of your seismic observations and simulation results.
- A step approach for ways to improve future forecasts.

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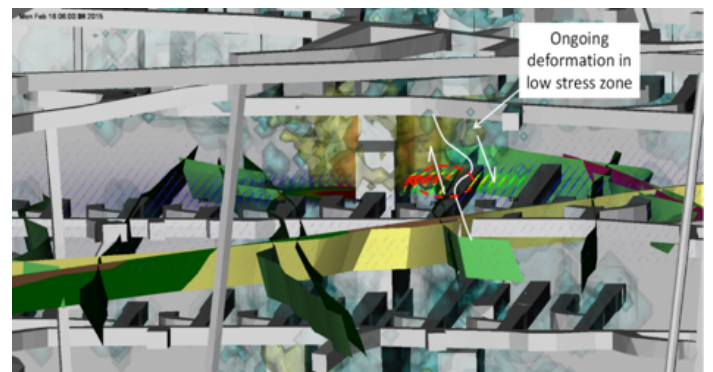
CASE STUDY 1

During the calibration process, seismic observations are statistically defined. These statistical volumes are then used to calibrate the numerical results for each material domain. The outcome is a statistically valid forecast for seismic hazard. This methodology has been used in seismically active mines globally, assisting in the redesign of a mining plans to lower the future seismic potential.



CASE STUDY 2

Forecasts of Seismic potential results can be combined with the deformation potential and the geological and structural models to assist in understanding the future mechanism for damage and indicate regions with a higher potential for problematic working conditions.



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