

Professional Development Courses

Training Courses

Prof Andre van As has developed several courses which includes a theoretical component accompanied by a practical, hands-on training component that is critical for site professionals. These courses focus primarily on underground geotechnical engineering, cave geomechanics and cave engineering, though the fundamental courses (e.g. Geotechnical Core Logging and Rock Mass Characterisation) can be applied to other mining methods.

1. Cave Mining Fundamentals

The objective of the course is to accelerate the learning of engineers and geoscience professionals, particularly those who have no underground and/or cave mining experience.

The 'Cave Mining Fundamentals' course content has been ideally developed for site 'class room' training but has been adapted to an online Learning Management System.

The course is subdivided into modules, starting with fundamental rock mass data collection and analysis and then building on these, each module building on learnings and data from preceding modules.

Cave Mining Fundamentals modules:

- Rock Mass Characterisation
- Caveability & Cave Propagation
- Cave Subsidence
- Cave Fragmentation
- Cave Flow & Drawpoint Spacing
- Undercut Methods & Design (includes Drill & Blast Design)
- Cave Ground Support Design
- Cave Management (Draw Control) and Operations
- Managing Caving Hazards

1.1 Rock Mass Characterisation

1.1.1 Objective & Outline

To provide a theoretical and practical understanding of:

- *What is Rock Mass Characterisation?*
- *Geotechnical Domaining*
- *Geological Data Collation (for Rock Mass Characterisation)*
- *Structural Data Collation (for Rock Mass Characterisation)*
- *Geotechnical Data Collation (for Rock Mass Characterisation).*
This includes general geotechnical core logging and exposure mapping training and guidelines, including describing the measurement of key core and down-hole geophysical logging parameters.
- *Rock Mass Strength*
- *Rock Mass Classification for Cave Mines*
- *Rock Mass Preconditioning*
- *Stress Measurements*

1.2 Caveability & Cave Propagation

1.2.1 Objective

To develop an understanding of the concepts and importance of caveability, cave propagation and caving rate and their impact on the successful operation of the cave.

Understand the limitations of the various caveability predictive tools and how to use them to assess the caveability of the rock mass.

1.2.2 Outline

- *What is caveability and why is it important?*
- *Types of caving*
- *Conceptual Model of Stress Caving - Cave Zone.*
- *Factors influencing caveability & cave propagatio.*
- *Methods of caveability analysis and prediction*
- *Cave propagation*
- *The need for cave induction.*
- *Case studies*
- *Glossary of caving terminology*

1.3 Cave Subsidence

1.3.1 Objective

To develop an understanding of the concepts and importance of cave subsidence.

Understand the limitations of the various subsidence assessment tools and understand how to go about assessing cave subsidence.

1.3.2 Outline

- *What is cave subsidence?*
- *Cave subsidence terminology*
- *Types of subsidence*
- *Cave subsidence deformation zones*
- *Impacts of cave subsidence*
- *Factors influencing cave subsidence*
- *Methods of Subsidence Analysis and Prediction*
- *Case studies*

1.4 Cave Fragmentation

1.4.1 Objective

To develop an understanding of the types of cave fragmentation and understand the methodology and application of how to go about predicting cave fragmentation over the life of the mine.

Learn how to translate predicted fragmentation distributions into practical numbers for cave design and cave operations.

1.4.2 Outline

- *What is Cave Fragmentation*
- *Definitions & Terminology*
- *Rock Mass Parameters Influencing Fragmentation*

- *Mine Design Parameters Influenced by Fragmentation*
- *In Situ Fragmentation*
- *Primary Fragmentation*
- *Secondary Fragmentation*
- *Methodologies for Cave Fragmentation Prediction*
- *Introduction to cave fragmentation software for predicting cave fragmentation*
- *Methodology for Predicting Oversize and Hang-ups*
- *Fragmentation Measurement Methods*

1.5 Cave Flow & Drawpoint Spacing

1.5.1 Objective

To develop an understanding of the main concepts of cave flow, isolated draw, interactive draw and why controlling the draw is important for managing dilution entry, cave propagation and also 'load-shedding' of vertical stresses loading the extraction level.

Learn how to derive drawpoint spacing from fragmentation profile predictions, using the Laubscher (1994) empirical method.

1.5.2 Outline

- *Fundamentals of cave material flow, definitions & terminology*
- *Isolated draw & interactive draw theory*
- *Methodology for deriving drawpoint spacing*
- *An introduction to predictive cave flow models*
- *Basic application of flow modelling and analysis of its results*
- *Cave flow monitoring*
- *Draw control*
- *Case study examples*

1.6 Undercut methods & Design (includes fundamentals of Drill & Blast design)

1.6.1 Objective

To develop an understanding of the importance of undercutting for cave initiation and cave management.

Learn how to design and sequence an undercut to minimise the effects of stress and structure.

1.6.2 Outline

- *What is undercutting and why is it important?*
- *Strategic undercutting considerations - types of undercutting methods & undercutting sequence*
- *Tactical undercutting considerations*
- *Operational undercutting considerations .*
- *Undercut monitoring*
- *Undercutting principles*
- *Fundamentals of drill and blast design – Describes the fundamental considerations around drill and blast design*
- *Case studies*

1.7 Ground Support Design

1.7.1 Objective

To develop an understanding of basic principles of ground support design in cave mines for varying geotechnical domains, stress regimes and longevity requirements of the excavation.

1.7.2 Outline

- A theoretical and practical understanding of ground support in Cave mines:
- *What is Ground Support Design and why is it required?*
- *Terminology.*
- *Defining Support Regimes*
- *Extraction Level Ground Support Design*
- *Undercut Level Ground Support Design*
- *Rehabilitation*
- *Supporting Major Excavations*

1.8 Cave Management (Draw Control)

1.8.1 Objective

To develop an understanding of the importance of cave monitoring for cave management. Of particular importance is cave draw control and the necessity to integrate production draw with all cave monitoring systems that measure the rock mass response to caving.

1.8.2 Outline

- To provide an understanding of Cave Management Principles
- *What is Cave Management*
- *Definitions & Terminology*
- *Undercut Management*
- *Cave Initiation, Cave Rampup & Cave Production*
- *Cave Propagation*
- *Draw Control*
- *Extraction Level Monitoring*
- *Cave Flow Monitoring* – Understanding the most commonly used monitoring tools to track / infer cave flow.
- *Trigger Action Response Plans*

1.9 Caving Hazards

1.9.1 Objective

To develop an understanding of the types of major hazards commonly associated with cave mining and understand the causes, effects and prevention/mitigation controls that must be implemented over the life of the mine.

1.9.2 Outline

- *Main Operational Hazards*
- *Terminology*
- *Airblast Hazard*
- *Mudrush Hazard*
- *Rockburst Hazard*