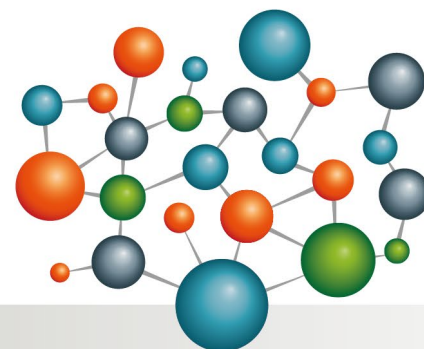


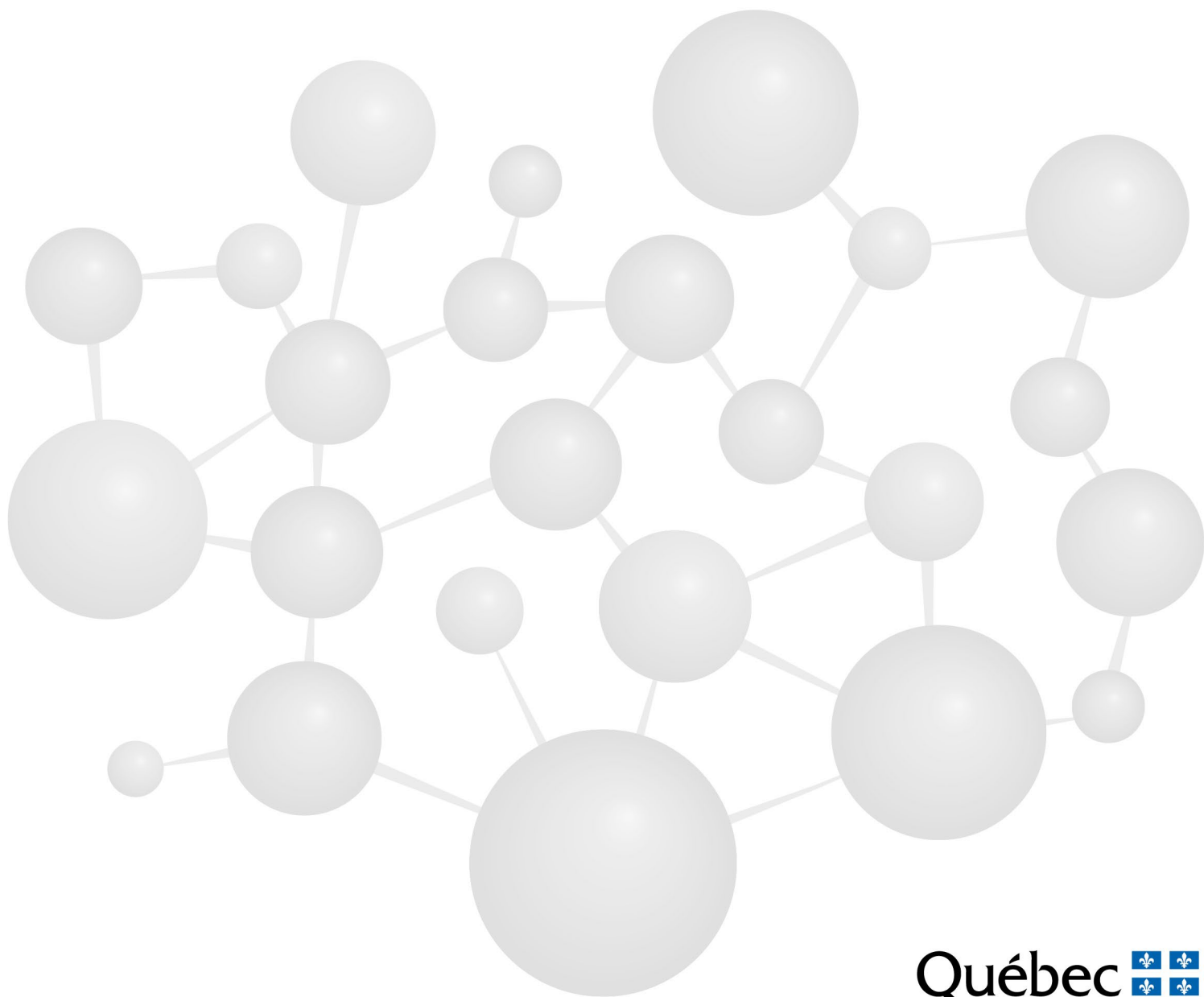
PROGRAM OF STUDY

ORE EXTRACTION (DVS 5868)

Training sector
MINING AND SITE OPERATIONS



MINISTÈRE DE L'ÉDUCATION



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Introduction to the Program

In vocational training, a program of study presents the competencies required to practise a given trade or occupation at entry level on the job market. The training provided allows students to acquire a degree of versatility that will be useful in their career and personal development.

A program is a coherent set of competencies to be developed. It outlines the knowledge and broad orientations to be favoured during training. The competencies correspond to the tasks of the trade or occupation or to activities related to work, vocational or personal life, depending on the case. Learning is acquired in a specific achievement context and targets the ability to act, succeed and evolve.

According to the Education Act,¹ every program “shall include compulsory objectives and contents and may include optional objectives and contents that shall be enriched or adapted according to the needs of students who receive the services.” For behavioural competencies, the compulsory components include the statement of the competency, the elements of the competency, the achievement context and the performance criteria; for situational competencies, they include the corresponding components.

For information purposes, programs also provide a grid of competencies, educational aims, a summary of competency-related knowledge and know-how, and guidelines. They also specify the suggested duration of each competency. All optional components of a program may be enriched or adapted according to the needs of the students, the environment and the workplace.

Program Components

Program Goals

Program goals consist of the expected outcome at the end of training as well as a general description of a given trade or occupation. They also include the four general goals of vocational training.

Educational Aims

Educational aims are broad orientations to be favoured during training in order to help students acquire intellectual or motor skills, work habits or attitudes. Educational aims usually address important aspects of career and personal development that have not been explicitly included in the program goals or competencies. They serve to orient appropriate teaching strategies to contextualize students' learning, in keeping with the dimensions underlying the practice of a trade or occupation. They help guide educational institutions in implementing the program.

Competency

A competency is the ability to act, succeed and evolve in order to adequately perform tasks or activities related to one's working or personal life, based on an organized body of knowledge and skills from a variety of fields, perceptions, attitudes, etc.

A competency in vocational training can be defined in terms of a behaviour or a situation, and includes specific practical guidelines and requirements for learning.

¹ *Education Act*, CQLR, c. I-13.3, s. 461

1. Behavioural Competency

A behavioural competency describes the actions and the results expected of the student. It consists of the following features:

- The statement of the competency is the result of the job analysis, the orientations and general goals of vocational training and other determinants.
- The elements of the competency correspond to essential details that are necessary in order to understand the competency and are expressed in terms of specific behaviours. They refer to the major steps involved in performing a task or to the main components of the competency.
- The achievement context corresponds to the situation in which the competency is exercised at entry level on the job market. The achievement context attempts to recreate an actual work situation but does not describe a learning or evaluation situation.
- The *performance criteria* define the requirements to be respected. They may refer to elements of the competency or to the competency as a whole. When associated with a specific element, performance criteria are used to judge whether a competency has been acquired. When associated with the competency as a whole, the criteria describe the requirements for performing a task or activity and provide information on the expected level of performance or the overall quality of a product or service.

2. Situational Competency

A situational competency describes the situation in which students are placed to acquire learning, and allows for actions and results to vary from one student to another. It consists of the following features:

- The *statement of the competency* is the result of the job analysis, the orientations and general goals of vocational training and other determinants.
- The *elements of the competency* outline the essential aspects of the competency and ensure a better understanding of the competency with respect to the expected outcome. The elements of the competency are fundamental to the implementation of the learning situation.
- The *learning context* provides a broad outline of the learning situation designed to help the students develop the required competency. It is normally divided into three key phases of learning: information, participation and synthesis.
- The *instructional guidelines* provide reference points and means for teachers to ensure that learning takes place and that the context in which it occurs is always the same. These guidelines may include general principles or specific procedures.
- The *participation criteria* describe requirements that the students must meet when participating in learning activities. They focus on how the students take part in the activities rather than on the results obtained. Participation criteria are normally provided for each phase of the learning situation.

Competency-Related Knowledge and Know-How

Competency-related knowledge and know-how, together with related guidelines, are provided for information purposes. Competency-related knowledge and know-how define the essential and meaningful learning that students must acquire in order to apply and continue to develop the competency. They are in keeping with the job market and are accompanied by guidelines that provide information about the field of application, level of complexity and learning content. They generally encompass learning associated with knowledge, skills, strategies, attitudes, perceptions, etc.

Duration

The total duration of the program is compulsory and must be observed. It consists of teaching time, which includes time for the evaluation of learning and for enrichment or remedial activities, depending on the students' needs. The duration indicated for a given competency refers to the amount of time needed to develop the competency.

The amount of teaching time corresponds to the amount of time allotted to training, which is established during program development as the average amount of time needed to acquire a competency and evaluate learning. This duration is helpful in organizing training.

Credit

A credit is a unit used for expressing the quantitative value of each competency. One credit corresponds to 15 hours of training.

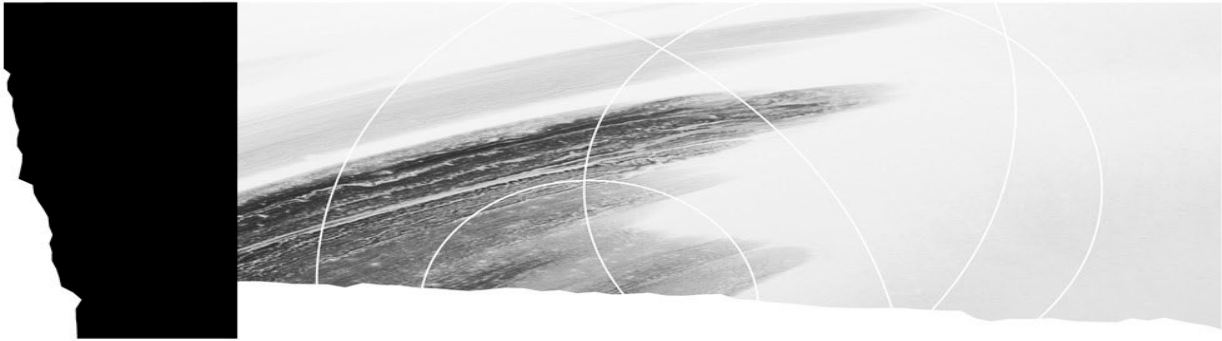
Aspects of Program Implementation

Program-Based Approach

The program-based approach is founded on a comprehensive view of a program of study and its components (e.g. goals, educational aims, competencies). It requires concerted action among all players involved, from the initial stages of program design and development, to program implementation and evaluation. It consists in ensuring that all of the actions and activities proposed are based on the same aims and take into account the same orientations. For students, the program-based approach makes training more meaningful as it presents learning as a coherent whole.

Competency-Based Approach

In vocational training, the competency-based approach is based on a teaching philosophy that is designed to help students mobilize their own individual sets of resources in order to act, succeed and evolve in different contexts, according to established performance levels with all the required knowledge and know-how (e.g. skills, strategies, attitudes, perceptions). The competency-based approach is carried out in situations that are relevant to the students' working life and personal life.



5368

ORE EXTRACTION

Year of approval: 2019

Certification:	Diploma of Vocational Studies
Number of credits:	62
Number of competencies:	16
Total duration:	930 hours

To be eligible for admission to the *Ore Extraction* program, candidates must meet one of the following requirements:

- Persons holding a Secondary School Diploma or its recognized equivalent.

OR

- Persons who are at least 16 years of age on September 30 of the school year in which they begin their training must meet the following condition: they must have obtained Secondary III credits in language of instruction, second language and mathematics in programs established by the Minister, or have been granted recognition of equivalent learning.

OR

- Persons who are at least 18 years of age upon entry into the program must have the following functional prerequisites: the successful completion of the general development test and ENG3070-3, or recognition of equivalent learning.

OR

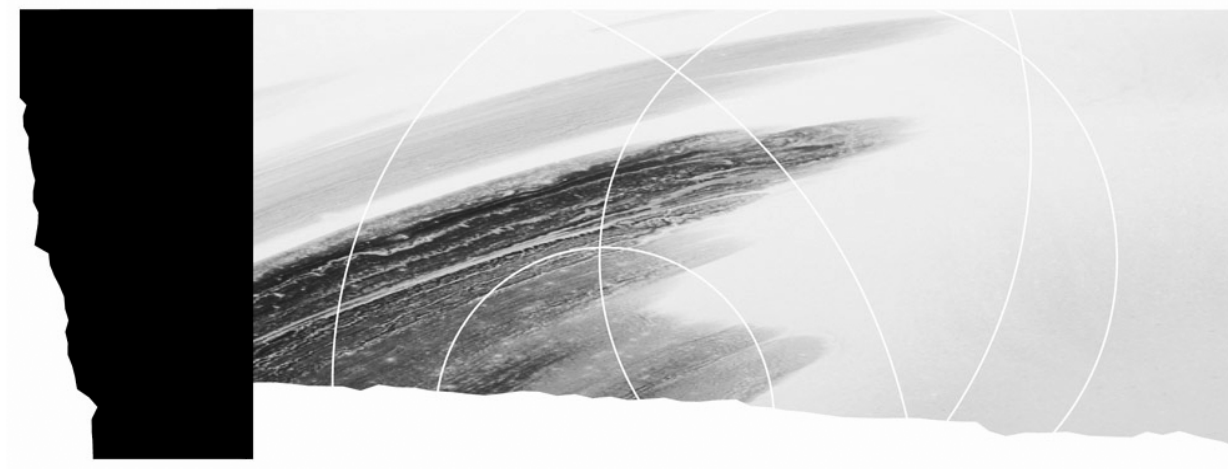
- Persons who have obtained Secondary III credits in language of instruction, second language and mathematics in programs established by the Minister are required to pursue, concurrently with their vocational training, Secondary Cycle Two general education courses in programs established by the Minister.

AS WELL AS THE FOLLOWING REQUIREMENT

- Persons must comply with the requirements of the *Act respecting explosives*.

The duration of the program is 930 hours, which includes 480 hours spent on the specific competencies required to practise the trade or occupation and 450 hours on general, work-related competencies. The program of study is divided into 16 competencies which vary in length from 15 to 120 hours. The total hours allocated to the program include time devoted to teaching, evaluation of learning and enrichment or remedial activities.

Competency	Code	Number	Hours	Credits
The Trade and the Training Process	260711	1	15	1
Health, Safety and Environmental Protection	260723	2	45	3
Drilling Techniques	260731	3	15	1
Explosives and Blasting Accessories	260743	4	45	3
Drilling and Blasting Plans	260753	5	45	3
Inspecting Mining Equipment	260764	6	60	4
Mobile Service Equipment Operations	260775	7	75	5
Scaling Backs and Walls	260784	8	60	4
Mucking Equipment Operations	260796	9	90	6
Drilling Operations	260804	10	60	4
Removing Blasted Rock	260815	11	75	5
Hauling Blasted Rock	260826	12	90	6
Support Work	260834	13	60	4
Installing Services	260842	14	30	2
Drilling Holes for Slash Blasting and Round Blasting Operations	260857	15	105	7
Preparing for Blasting Operations	260864	16	60	4



Part I

Program Goals

Educational Aims

Statements of the Competencies

Grid of Competencies

Harmonization

Program Goals

The *Ore Extraction* program prepares students to practise the trade of underground miner.

Underground miners extract ore in underground mines located primarily in four regions of Québec: Abitibi-Témiscamingue; Nord-du-Québec; Gaspésie—Îles-de-la-Madeleine; and Saguenay—Lac-Saint-Jean. Their work consists mainly in scaling backs and walls, installing and inspecting support systems, installing pipe systems and channels for services (air, water, ventilation, blasting line and communication systems) as the work progresses, performing various types of drilling and blasting operations, and removing blasted rock.

For the most part, underground miners work in a dark, humid, dusty and noisy environment with temperature variations and vibrations from the use of equipment. Some of their tasks may require working at a height. Some tasks can be carried out using remotely controlled equipment, and some involve confined spaces.

Underground miners work alone or in teams. Their schedule is often variable or atypical, based on the nature and scope of the work to be done, and they often work under direct or indirect supervision.

The stress experienced by underground miners is mostly related to time constraints, production standards, unforeseen events, hazardous working conditions, remoteness and isolation, confined spaces, the darkness and depth of deposits, work schedules and temperature variations.

The program goals of the *Ore Extraction* program are based on the general goals of vocational training. These goals are as follows:

- To help students develop effectiveness in the practice of a trade or occupation, that is:
 - to teach students to perform roles, functions, tasks and activities associated with the trade or occupation upon entry into the job market
 - to prepare students to progress satisfactorily on the job (which implies having the technical and technological knowledge and skills in such areas as communication, problem solving, decision making, ethics, health and safety)
- To help students integrate into the workforce, that is:
 - to familiarize students with the job market in general, and with the specific context of their chosen trade or occupation
 - to familiarize students with their rights and responsibilities as workers
- To foster students' personal development and acquisition of occupational knowledge, skills, perceptions and attitudes, that is:
 - to help students develop their autonomy and ability to learn, and acquire effective work methods
 - to help students understand the principles underlying the techniques and the technology used in the trade or occupation
 - to help students develop self-expression, creativity, initiative and entrepreneurial spirit
 - to help students adopt the attitudes required to successfully practise the trade or occupation, and instill in them a sense of responsibility and a concern for excellence.

- To promote job mobility, that is:
 - to help students develop positive attitudes toward change
 - to help students develop the means to manage their careers by familiarizing them with entrepreneurship

Educational Aims

The aim of the *Ore Extraction* program is to help students develop attitudes and behaviours that representatives from education and the field deem essential to the practice of the trade or occupation:

- Foster the strict application of occupational health and safety regulations
- Develop their ability to adapt to different situations and withstand stress
- Foster the development of a good sense of work organization and planning
- Develop precision in the performance of their tasks
- Help them acquire good work methods based on the characteristics of the terrain
- Help them acquire a sense of responsibility in their practice of the trade
- Develop their ability to pay attention to signs of danger
- Help them acquire the habit of using the communication methods and systems used in underground mines

Statements of the Competencies

List of Competencies

- Determine their suitability for the trade and the training process
- Prevent occupational health and safety and environmental protection risks
- Search for information about drilling techniques
- Search for information about explosives and blasting accessories
- Draw up drilling plans and blasting plans
- Inspect mining equipment
- Perform mobile service equipment operations
- Scale a back and walls
- Perform mucking equipment operations
- Perform drilling operations
- Remove blasted rock
- Haul blasted rock
- Install ground support
- Install services
- Drill holes for slash blasting and round blasting operations
- Prepare for blasting operations

Grid of Competencies

The grid of competencies shows the relationship between general competencies, which correspond to work-related activities, and specific competencies, which are required to practise the particular trade or occupation, as well as the major steps in the work process.

The general competencies appear on the horizontal axis and the specific competencies, on the vertical axis. The symbol (○) indicates a correlation between a general and a specific competency. Shaded symbols indicate that these relationships have been taken into account in the acquisition of specific competencies. The logic used in constructing the grid influences the course sequence. Generally speaking, this sequence follows a logical progression in terms of the complexity of the learning involved and the development of the students' autonomy. The vertical axis presents the specific competencies in the order in which they should be acquired and serves as a point of departure for determining how all of the competencies will be taught.

GRID OF COMPETENCIES													
SPECIFIC COMPETENCIES	Competency number	Type of competency	Duration (in hours)	GENERAL COMPETENCIES									
				Determine their suitability for the trade and the training process	Prevent occupational health and safety and environmental protection risks	Search for information about drilling techniques	Search for information about explosives and blasting accessories	Draw up drilling plans and blasting plans	Inspect mining equipment	Perform mobile service equipment operations	Perform mucking equipment operations	Perform drilling operations	TOTAL
Competency number				1	2	3	4	5	6	7	9	10	
Type of competency				S	C	C	C	C	C	C	C	C	
Duration (in hours)				15	45	15	45	45	60	75	90	60	450
Scale a back and walls	8	C	60	○	●		○			●			
Remove blasted rock	11	C	75	○	●		●		●		●		
Haul blasted rock	12	C	90	○	●				●	○	○		
Install ground support	13	C	60	○	●	●	○	○		○		●	
Install services	14	C	30	○	●		○		○	●		●	
Drill holes for slash blasting and round blasting operations	15	C	105	○	●	●	○	●	○	●		●	
Prepare for blasting operations	16	C	60	○	●		●	●	○	●	○		
Duration of training			480										930

Links between the general competencies and the specific competencies

- : Existence of a link
- : Application of a link

Harmonization

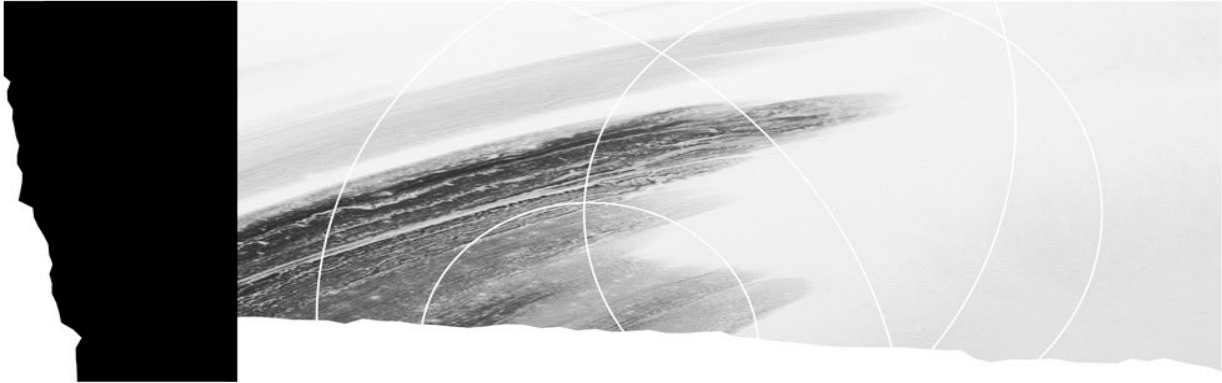
The Ministère de l'Éducation harmonizes its vocational and technical programs by establishing similarities and continuity between secondary- and college-level programs within a particular sector or between sectors in order to avoid overlap in program offerings, to recognize prior learning and to optimize the students' progress.

Harmonization establishes consistency between training programs and is especially important in ensuring that the tasks of a trade or occupation are clearly identified and described. Harmonization makes it possible to identify tasks requiring competencies that are common to more than one program. Even if there are no common competencies, training programs are still harmonized.

Harmonization is said to be “inter-level” when it focuses on training programs at different levels, “intra-level” when it focuses on programs within the same educational level, and “inter-sector” when carried out between programs in various sectors.

An important aspect of harmonization is that it allows the common features of competencies to be identified and updated as needed. Common competencies are those that are shared by more than one program; once acquired in one program, they can be recognized as having been acquired in another. Competencies with exactly the same statement and elements are said to be identical. Common competencies that are not identical but have enough similarities to be of equal value are said to be equivalent.

Harmonization of the *Ore Extraction* program has resulted in identifying competencies that are shared with other programs. Detailed information on the harmonization of this program and its results is presented in the document entitled *Tableaux d'harmonisation*.



Part II

Program Competencies
Glossary

Competency 1 Duration 15 hours Credit 1

Situational Competency

Statement of the Competency

Determine their suitability for the trade and the training process.

Elements of the Competency

- Be familiar with the nature of the trade.
- Understand the program of study and the training process.
- Confirm their career choice.

Learning Context

Information Phase

- Learning about the job market in ore extraction: work environments (types of companies), job prospects, remuneration, opportunities for career advancement and transfer, selection of applications
- Learning about the nature and requirements of the job (tasks, working conditions, evaluation criteria, permits and certificates, workers' rights and responsibilities, life underground, descending in a mine cage or a tunnel) during visits and interviews, by studying documentation, etc.
- Learning about the evolution of the practice of the trade

Participation Phase

- Listing the skills, aptitudes, attitudes and knowledge required to practise the trade
- Discussing the information collected and their views on the trade
- Drawing a parallel between the program of study and the work situation
- Presenting the information gathered and their views on the trade and the training process
- Searching for ways of improving their chances for success in the training process

Synthesis Phase

- Writing a report listing their skills, aptitudes, attitudes, knowledge, preferences and interests with respect to the practice of the trade
- Comparing their report with the requirements of the trade and the training process
- Confirming their career choice

Instructional Guidelines

The teacher should:

- Create a climate that favours the students' personal development and entry into the workforce.
- Encourage all students to engage in discussions and express their opinions.
- Motivate students to participate in the proposed activities.

- Help students to arrive at an accurate perception of the trade by providing the appropriate documents and organizing visits to companies and meetings with underground miners.
- Provide the necessary support and supervision for students' self-evaluation.
- Provide a model report and help students draft theirs.

Participation Criteria**Information Phase**

- Gather information on most of the topics to be covered.
- Gather relevant information about the job market in ore extraction.

Participation Phase

- Carefully review the documents provided.
- Participate actively in the proposed activities.
- Clearly express their views on the program of study.

Synthesis Phase

- Write a report listing their skills, aptitudes, attitudes, knowledge, preferences and interests with respect to the trade.
- Justify their career choice.

Suggestions for Competency-Related Knowledge and Know-How

The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each phase of the learning context, along with their attendant guidelines.

For the competency as a whole:

- Characteristics of the trade
- Job requirements
- Program competencies
- Vocabulary specific to underground mining

Information Phase

- Relevant sources of information (e.g. job analysis reports)
- Note-taking method

Participation Phase

- Views on the trade and the training process
- Advantages and disadvantages of the trade and of working underground

Synthesis Phase

- Main elements of a report confirming their career choice

Competency 2 Duration 45 hours Credits 3

Behavioural Competency

Statement of the Competency

Prevent occupational health and safety and environmental protection risks.

Achievement Context

- In an underground mine
- Given:
 - instructions
 - occupational health and safety regulations specific to mining
- Using:
 - personal protective equipment
 - collective protective devices and measures

Elements of the Competency**Performance Criteria**

1. Take the necessary precautions to protect their health and safety and that of others.
 - Recognition of dangerous situations in the work environment
 - Determination of appropriate controls related to:
 - the organization of the work area
 - work methods
 - the use of tools and equipment
 - the maintenance and storage of tools and equipment and the tidiness of the work area
 - the use of personal protective equipment
 - the use of collective protective devices and measures
 - Determination of the appropriate measures to take to prevent fire
2. Take the necessary precautions to preserve the quality of the environment.
 - Recognition of high-risk situations
 - Determination of appropriate controls related to:
 - the use of toxic and hazardous products
 - the organization of the work area
 - the use of tools and equipment
 - the storage, disposal and recycling of hazardous materials
 - the preservation of air quality
3. Take action in the case of an accident or emergency.
 - Observance of their limitations
 - Accurate determination of an effective method for communicating with emergency services
 - Accurate application of emergency procedure

For the competency as a whole:

- Observance of occupational health and safety and environmental protection laws and regulations
- Use of appropriate terminology

Suggestions for Competency-Related Knowledge and Know-How

The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

For the competency as a whole:

- Risks and prevention measures relating to mining and to working underground
 - Health, safety and environmental protection regulations relating to the tasks performed by underground miners
1. Take the necessary precautions to protect their health and safety and that of others.
 - Personal protective equipment:
 - function
 - choice based on the nature of the work to be done and the surrounding conditions
 - inspection of equipment
 - adjustments
 - storage
 - Collective protective devices and measures:
 - meaning of signs and signal lights
 - characteristics of refuge stations
 - communication techniques and devices used underground
 - underground vehicular traffic rules
 - Air quality:
 - ventilation of underground excavations and explosive magazines
 - methods of recognizing the source of harmful gases
 - evacuation of blasting gases
 - humidification of roads
 - spraying of blasted rock before removal
 - use of gas detectors
 - Use of gas alarms
 - Safety devices for air and hydraulic lines
 - Equipment maintenance
 - Scaling and ground support
 - Fire extinguishing systems: types of extinguishers, components and methods of use
 - Transportation and handling of explosives and blasting accessories
 - Location of bootlegs and explosives
 2. Take the necessary precautions to preserve the quality of the environment.
 - Presence of gas and dust in the ambient air
 - Basic principles for avoiding reducing air quality
 - Use, storage and disposal of greases, oils and solvents

3. Take action in the case of an accident or emergency.
 - Location of the first aid kit and fire extinguishing equipment
 - Importance of refuge stations and evacuation procedures
 - Control of ventilation systems
 - Procedure to follow in the case of an accident or emergency

Competency 3 Duration 15 hours Credit 1

Behavioural Competency

Statement of the Competency

Search for information about drilling techniques.

Achievement Context

- Given:
 - instructions
 - underground mine plans
 - work to be done in an underground mine
- Using:
 - technical documentation about drilling operations
 - a computer system and peripherals
 - drilling equipment manufacturers' data sheets

Elements of the Competency**Performance Criteria**

- | | |
|---|---|
| 1. Select the appropriate reference materials. | <ul style="list-style-type: none"> • Accurate determination of: <ul style="list-style-type: none"> – the purpose of the search – the type of information sought – search limitations • Determination of relevant sources of information based on the type of mining and the work to be done in the mine |
| 2. Search for information. | <ul style="list-style-type: none"> • Appropriate use of search techniques • Appropriate sorting of information collected • Observance of procedures for saving and transferring data |
| 3. Find the general and specific characteristics of the different drilling techniques and equipment in the documentation. | <ul style="list-style-type: none"> • Accurate description of the different drilling techniques and equipment • Accurate connections made between the techniques and equipment on the one hand, and the work to be done in the mine on the other |

For the competency as a whole:

- Appropriate application of search method
- Methodical documentation of key information

- Appropriate use of English and French terminology
- Accurate distinction between the different types of equipment based on their use in underground mines

Suggestions for Competency-Related Knowledge and Know-How

The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

For the competency as a whole:

- English and French terminology relating to drilling techniques and equipment (see the glossary at the end of this document or any other relevant source of information)
1. Select the appropriate reference materials.
 - Browsing of research sites
 - Equipment manufacturers' data sheets
 2. Search for information.
 - Information about the different types of drills and their use
 - Types of equipment based on the work to be done in the mine
 - Use of equipment based on the type of excavation (shaft, drift, raise, stope)
 3. Find the general and specific characteristics of the different drilling techniques and equipment in the documentation.
 - Specific characteristics of drilling machines
 - Comparison between the different types of drills
 - Characteristics of cable bolts

Competency 4 Duration 45 hours Credits 3

Behavioural Competency

Statement of the Competency

Search for information about explosives and blasting accessories.

Achievement Context

- Given:
 - instructions
 - regulations respecting explosives
- Using explosives and blasting accessory manufacturers' data sheets

Elements of the Competency**Performance Criteria**

- | | |
|---|--|
| 1. Classify the main types of explosives. | <ul style="list-style-type: none"> • Accurate classification of explosives based on: <ul style="list-style-type: none"> – visual presentation – use • Accurate classification of explosives based on their characteristics and properties |
| 2. Distinguish between the main types of blasting accessories. | <ul style="list-style-type: none"> • Accurate distinction between electric, non-electric and electronic blasting accessories used for: <ul style="list-style-type: none"> – priming – connecting – firing |
| 3. Match explosives and blasting accessories with each step of a blasting operation. | <ul style="list-style-type: none"> • Accurate matching of electric, non-electric and electronic blasting accessories with each step in a blasting operation • Accurate determination of the criteria for choosing explosives |
| 4. Be familiar with the laws and regulations respecting explosives applicable to the various steps of a blasting operation. | <ul style="list-style-type: none"> • Accurate identification of the laws and regulations respecting explosives in effect in Québec |

For the competency as a whole:

- Accurate connections made
- Accurate terminology used
- Compliance with current regulations
- Compliance with occupational health and safety regulations

Suggestions for Competency-Related Knowledge and Know-How

The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

For the competency as a whole:

- Terminology associated with explosives and blasting accessories
1. Classify the main types of explosives.
 - Explosives manufacturers
 - Main types of presentation of explosives
 - Main types of preparation of explosives
 - Chemical reaction associated with the detonation of an explosive
 - Information contained in the explosives manufacturers' data sheets
 2. Distinguish between the main types of blasting accessories.
 - Function of blasting accessories in an initiation system for firing
 - Characteristics of initiation systems for electric, non-electric and electronic firing
 - Blasting accessory manufacturers' data sheets
 3. Match explosives and blasting accessories with each step of a blasting operation.
 - Impact of new techniques on the composition and use of explosives
 - Equivalent explosives made by different manufacturers
 - Reactions of certain products to detonation depending on depth
 4. Be familiar with the laws and regulations respecting explosives applicable to the various steps of a blasting operation.
 - Relevance of regulations respecting explosives
 - Environmental standards applicable to drilling and blasting operations
 - Manuals and reference documents relating to regulations respecting explosives
 - Updates to regulations respecting explosives

Competency 5 Hours 45 hours Credits 3

Behavioural Competency

Statement of the Competency

Draw up drilling plans and blasting plans.

Achievement Context

- Given:
 - instructions
 - drawings and specifications
 - information about the characteristics of the work site
- Using explosives data sheets

Elements of the Competency**Performance Criteria**

- | | |
|---|--|
| 1. Learn about the characteristics of the site. | <ul style="list-style-type: none"> • Accurate interpretation of drawings and specifications • Appropriate identification of the characteristics of the rock at the site |
| 2. Determine the type of slash. | <ul style="list-style-type: none"> • Appropriate choice of type of slash based on: <ul style="list-style-type: none"> – the configuration of walls – the development plan |
| 3. Determine the parameters of a drilling plan. | <ul style="list-style-type: none"> • Accurate determination of parameters based on: <ul style="list-style-type: none"> – drawings and specifications – the desired fragmentation – the drilling equipment available • Proper design of plan • Neatness and legibility of plan |
| 4. Select the explosives. | <ul style="list-style-type: none"> • Careful selection, based on: <ul style="list-style-type: none"> – the diameter and depth of the drill holes – the type of slash • Taking in to account the explosives' characteristics and properties |
| 5. Draw up a blasting plan. | <ul style="list-style-type: none"> • Taking into account the drilling plan • Proper design of plan • Neatness and legibility of plan |
| 6. Determine the sequence for loading holes. | <ul style="list-style-type: none"> • Taking into account the data provided in the drilling and blasting plans • Appropriate distribution of: <ul style="list-style-type: none"> – detonators – blasting accessories – explosives |

For the competency as a whole:

- Accurate recognition of the connections between the data in the drilling plan and the data in the blasting plan
- Precise measurements and calculations
- Feasibility of the drilling and blasting plans
- Systematic compliance with current regulations

Suggestions for Competency-Related Knowledge and Know-How

The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

For the competency as a whole:

- Connections between the drilling plan, the blasting plan and the characteristics of the site
1. Learn about the characteristics of the site.
 - Main information contained in mining drawings and specifications
 - Basic knowledge of geology
 - Impact of the composition and structure of the rocks on the work done by underground miners
 2. Determine the type of slash.
 - Calculation of areas and volumes
 - Relationship between the diameter of the drill holes, the size of the rock fragments and the height of the slash
 3. Determine the parameters of a drilling plan.
 - Drill hole diagrams
 - Influence of the spacing and loading of the drill holes on the walls and rock fragmentation
 - Function of the cut in round blasting
 4. Select the explosives.
 - Factors that influence the choice of explosives
 - Limits for using explosives
 - Impact of the choice of explosives
 - Functions of the different types of detonators
 5. Draw up a blasting plan.
 - Characteristics and functions of the different types of blasting plans
 - Steps in the rock fragmentation process
 - Criteria for choosing a blasting plan

6. Determine the sequence of operations for loading holes.
 - Health and safety regulations associated with loading drill holes
 - Steps to take before loading drill holes
 - Characteristics and functions of the different loading sequences

Competency 6 Duration 60 hours Credits 4

Behavioural Competency

Statement of the Competency

Inspect mining equipment.

Achievement Context

- Given:
 - instructions
 - mining equipment failures
- Using:
 - an inspection sheet
 - mining equipment
 - manufacturers' technical manuals
 - tools, fuel, fluids and lubricants needed to make the adjustments

Elements of the Competency**Performance Criteria**

- | | |
|---|---|
| 1. Inspect the overall condition of mining equipment. | <ul style="list-style-type: none">• Thorough inspection of all parts (wheels, rims, tracks, etc.) and accessories• Accurate detection of any breakage and excessive wear and tear• Accurate assessment of the condition and working order of equipment parts and accessories |
| 2. Inspect the engine. | <ul style="list-style-type: none">• Compliance with manufacturers' specifications with regard to:<ul style="list-style-type: none">– checking and adjusting the oil level– checking for leaks (fuel, fluids, antifreeze, oil, etc.)– checking the condition of the belts |
| 3. Inspect the fuel system. | <ul style="list-style-type: none">• Compliance with manufacturers' specifications with regard to:<ul style="list-style-type: none">– checking the fuel level– filling the fuel tank– purging any water– detecting leaks |
| 4. Inspect the air intake and exhaust systems. | <ul style="list-style-type: none">• Compliance with manufacturers' specifications with regard to:<ul style="list-style-type: none">– using a clogging indicator to check the air filter, muffler, exhaust assembly, turbocompressor and check valve– checking the air intake and exhaust systems for leaks |

5. Inspect the cooling system.
 - Compliance with manufacturers' specifications with regard to:
 - checking the radiator, coolant levels, cooling fan, belts and hoses
 - adjusting the coolant level
 - clean radiator
 - Leaktightness of radiator hoses
6. Inspect the electrical system.
 - Compliance with manufacturers' specifications with regard to:
 - checking all dashboard lights and indicators, signal lights, lighting system and horn
 - cleaning the poles and the battery
7. Inspect the hydraulic system.
 - Compliance with manufacturers' specifications with regard to:
 - checking the oil level, filters, connectors, hydraulic pipes, cylinders and valves
 - adjusting the oil level
 - Leaktightness of filters and hoses
 - Leaktightness and solidity of connectors
8. Inspect the transmission, brakes, differential and planetary gear sets.
 - Compliance with manufacturers' specifications with regard to:
 - checking and adjusting oil levels
 - verifying that the parking and service brakes are working properly
 - checking the warning lights
 - checking for leaks
 - inspecting breathers
9. Inspect the fire protection systems.
 - Compliance with manufacturers' specifications with regard to:
 - checking the extinguisher's pressure indicator, seal and overall condition
 - checking all alarm lights and bells
 - Leaktightness of pipes
10. Fill out the inspection sheet.
 - Thorough and accurate account of:
 - any parts to receive maintenance
 - any defects detected
 - Accuracy of terminology

For the competency as a whole:

- Compliance with occupational health and safety regulations
- Constant monitoring of potential for personal injury, environmental hazards and chances of equipment breakage
- Compliance with inspection techniques in a mine and environmental standards regarding the disposal of used products and materials
- Correct use of tools and materials
- Observance of work techniques

Suggestions for Competency-Related Knowledge and Know-How

The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

For the competency as a whole:

- Types of mining equipment and their characteristics
 - Rules regulating underground motor vehicles
 - Importance of a thorough inspection
 - Information to record on an inspection sheet
 - Information about inspections in the manufacturers' technical manuals
1. Inspect the mining equipment.
 - Most common equipment problems
 - General inspection points on mining equipment
 - Signs of equipment not operating properly
 - Location of grease fittings on the equipment
 - Methods of handling and storing the different types of lubricants
 - Importance of checking fluid levels when equipment is level
 2. Inspect the engine.
 - General operation of an engine
 - Signs of engine not operating properly
 - Hazards associated with the use of chemicals
 - Adjustment of fluids
 3. Verify the fuel system.
 - Functions and characteristics of the main fuel system components
 - Fuel system checkpoints
 4. Inspect the air intake and exhaust systems.
 - Functions and characteristics of the main components of the air intake and exhaust systems
 - Air intake and exhaust system checkpoints
 - Signs of systems not operating properly
 - Exhaust fumes: harmful effects and how to avoid them

5. Inspect the cooling system.
 - Cooling and climate control system checkpoints
 - Adjustment of fluids
6. Inspect the electrical system.
 - Main electrical system components on equipment
 - Regular checkpoints for the charging system, starting system, lights and safety circuit
 - Boosting
 - Reading dashboard indicators and lights
7. Inspect the hydraulic system.
 - Main hydraulic system components on equipment
 - Signs indicating a hydraulic system component has broken or worn down
 - Topping off fluids
8. Inspect the transmission, braking system, differential and planetary gear sets.
 - Transmission, brake system, differential and planetary gear sets checkpoints
 - Breakage and abnormalities
 - Topping off fluids
9. Inspect the fire protection systems.
 - Types of fire protection systems
 - Operating principles of the different fire protection systems
 - Types of extinguishers (automatic, semiautomatic, manual)
10. Fill out the inspection sheet.
 - Information to include on an inspection sheet
 - Importance of supplying accurate information about the true condition of the equipment

Competency 7 Duration 75 hours Credits 5

Behavioural Competency

Statement of the Competency

Perform mobile service equipment operations.

Achievement Context

- Given:
 - mobile service equipment such as a service truck
- Using:
 - a work card
 - an equipment inspection sheet
 - personal protective equipment
 - service level plans
 - work procedures
 - rigging procedures

Elements of the Competency**Performance Criteria**

1. Inspect the equipment.

- Appropriate use of equipment inspection sheet
- Complete inspection of vehicle before and after starting the engine
- Accurate detection of leaks, breakage and signs of excessive wear and tear
- Proper performance of brake tests

2. Execute basic manoeuvres.

- Appropriate position of driver's seat
- Flow and sequence of movements
- Vehicle's capacity and limitations taken into account
- Appropriate speed:
 - along route followed
 - around surrounding obstacles
 - during manoeuvres performed

3. Drive the vehicle in the mine.

- Observance of signs, signals and the rules governing vehicular and pedestrian traffic
- Appropriate use of:
 - steering system
 - speed range
 - braking system
 - other controls

4. Set up a mobile service equipment.
 - Accurate determination of mobile equipment position
 - Appropriate positioning of hydraulic jacks
 - Accuracy of manoeuvres
 - Appropriate height of equipment
5. Position the equipment.
 - Appropriate positioning of vehicle to load and unload cargo
 - Observance of procedures for positioning the vehicle
 - Cleanliness of equipment
 - Clear and accurate end-of-shift report

For the competency as a whole:

- Compliance with occupational health and safety regulations
- Compliance with standards
- Compliance with the manufacturer's specifications
- Observance of work techniques
- Appropriate use of equipment
- Constant monitoring of the equipment's condition and working order

Suggestions for Competency-Related Knowledge and Know-How

The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

For the competency as a whole:

- Rules respecting vehicular and pedestrian traffic
1. Inspect the equipment.
 - Types of service equipment used
 - Importance of properly inspecting the equipment before and after starting the engine
 - Connections between different fluids and the mechanical components of a mobile lift
 - Health and safety factors related to driving a service vehicle
 - Cleanliness of equipment
 2. Execute basic manoeuvres.
 - Verification of brakes (operation, emergency, positioning)
 - Rigging procedures
 3. Drive the vehicle in the mine.
 - Traffic and positioning signs

4. Set up a mobile service equipment.
 - Positioning of hydraulic jacks
 - Characteristics of a safe location for the equipment
5. Position the equipment.
 - Use of wheel chocks and flashing lights
 - Procedures for shutting down equipment
 - End-of-shift report

Competency 8

Duration 60 hours

Credits 4

Behavioural Competency

Statement of the Competency

Scale a back and walls.

Achievement Context

- Given instructions and technical data
- Using:
 - scaling bars of varying lengths
 - a water hose
 - a mobile lift, if applicable
 - personal protective equipment
- Following a recent blasting operation

Elements of the Competency**Performance Criteria**

1. Become familiar with the work to be done.

- Thorough verification of the information provided by the previous crew
- Appropriate recognition of:
 - type of work to be done
 - potential dangers and safety measures
 - safety regulations and applicable standards

2. Plan the work.

- Brief evaluation of blasting results:
 - rock fragmentation
 - distribution of rubble on the ground
- Thorough examination of walls and back
- Meticulous search for the presence of missed holes, bootlegs and cut holes
- Detailed definition of scaling sequence
- Appropriate choice of scaling bars

3. Check the equipment and accessories used for scaling.

- Thorough check of equipment and accessories
- Correct use of tools
- Careful maintenance
- Solidity and leaktightness of connections between hose, joints and clamps

4. Set up the equipment.
 - Careful choice of location of the necessary equipment
 - Precision of manoeuvres
 - Platform at the appropriate height
 - Hose of an appropriate length positioned out of the way of the work
 - Safe and functional position of person within area to be washed
 - Progression within area to be scaled from good to bad ground
 - Maximal removal of dust
5. Check the condition of the back and walls after washing.
 - Thorough cleaning of missed holes, bootlegs and cut holes
 - Accurate detection of dangerous ground
 - Accurate location and inventory of missed holes, bootlegs and cut holes
 - Exact determination of steps to be taken to make work area safe
6. Determine whether it is appropriate to continue the scaling operation.
 - Accurate assessment of the overall state of the work area, based on:
 - noises produced by rock movement
 - the presence of fissures in the rock
 - sudden changes in configuration of the back and walls
 - Systematic application of a decision-making process to determine whether to continue or stop an operation
7. Sound the rock.
 - Appropriate choice of escape route
 - Appropriate choice of starting point of the sounding and the route to follow, given the characteristics of the work area
 - Progression through work area
 - Regular visual inspection of work area
 - Constant attention to:
 - noises produced by the rock
 - signs of changes in the geological structure
8. Dislodge unstable rocks.
 - Taking into account:
 - scaling limitations of the different types of rock
 - physical abilities

9. Clear the work area.
 - Proper storage of equipment and accessories so that they are:
 - out of the way of other work
 - protected from projected and falling rock
10. Report on the work performed.
 - Clear and precise communication on the work card of information on the:
 - condition of the work area and equipment after the scaling
 - presence of potential dangers in the scaled area
 - equipment required by the next crew for subsequent work
 - Accurate terminology

For the competency as a whole:

- Compliance with occupational health and safety regulations
- Observance of environmental standards
- Observance of work techniques and standards
- Work postures appropriate to manoeuvre performed
- Methodical work
- Attention to detail

Suggestions for Competency-Related Knowledge and Know-How

The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

For the competency as a whole:

- Scaling principles
 - Importance of scaling
1. Become familiar with the work to be done.
 - Importance of fully understanding instructions
 2. Plan the work.
 - Importance of carefully planning the work
 - Distinctions between a failed blasting operation and a successful blasting operation
 3. Inspect the scaling equipment and accessories.
 - Primary causes of broken or worn-out washing and scaling equipment and accessories
 - Types of hoses and supply lines used in a mine
 4. Install the equipment.
 - Types of scaffolding: prefabricated, scissor and tubular
 - Types of joints and clamps
 - Qualities of a good connection

5. Check the condition of the back and walls after washing.
 - Operation of a mine's air and water supply system
 - Procedure to follow when a missed or cut hole is found
 - Effects of rock washing on certain geological structures
6. Determine whether it is appropriate to continue the scaling operation.
 - Main criteria for evaluating whether to continue the scaling operation
7. Sound the rock.
 - Basic scaling principles
8. Dislodge unstable rocks.
 - Application of a certain amount of force based on leverage principle
 - Types of rocks and scaling procedures
9. Clear the work area.
 - Criteria for storing accessories and equipment
10. Report on the work done.
 - Importance of effective communication, using work cards, among work crews

Behavioural Competency

Statement of the Competency

Perform mucking equipment operations.

Achievement Context

- Given:
 - mucking equipment: conventional scoop, pneumatic loader and slusher scraper
 - tools and equipment
 - personal protective equipment
- At various underground sites

Elements of the Competency**Performance Criteria**

1. Inspect the mucking equipment.

- Thorough inspection of equipment before and after starting the engine
- Proper performance of brake tests, if applicable
- Accurate assessment of the condition and working order of the equipment
- Appropriate use of tools

2. Prepare the equipment.

- Hose or cable:
 - solidly connected
 - positioned out of the way of manoeuvres
- Solidity of safety devices and accessories

3. Execute basic manoeuvres.

- Safe work area
- Appropriate position of person on the equipment
- Observance of the capacity and limitations of the equipment
- Coordination of manoeuvres: flow and sequence of movements
- Constant attention paid to unstable rock and the presence of explosives in the blasted rock

4. Park the equipment.

- Stability of equipment
- Equipment positioned out of the way of other work and protected from projected and falling rock
- Compliance with equipment shutdown procedure
- Cleanliness of equipment

For the competency as a whole:

- Compliance with occupational health and safety regulations
- Compliance with the manufacturer's specifications
- Constant concern for the working condition of the equipment
- Work positions appropriate to manoeuvres performed
- Observance of directions for operating each type of mucking equipment

Suggestions for Competency-Related Knowledge and Know-How

The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

For the competency as a whole:

- Mucking operations performed using different types of equipment
1. Inspect the mucking equipment.
 - Characteristics of the different types of mucking equipment
 - Operation of each type of equipment
 2. Prepare the equipment.
 - Review of safety regulations
 - Safety devices and accessories for each type of equipment
 - Techniques for installing a slusher scraper
 - Air hose retaining device
 3. Execute basic manoeuvres.
 - Functions of control levers
 - Ground conditions and access roads
 - Driving a scoop tram with a loaded bucket
 4. Park the equipment.
 - Procedure for shutting down the equipment
 - Use of wheel chocks
 - Turning off main switch

Competency 10

Duration 60 hours

Credits 4

Behavioural Competency

Statement of the Competency

Perform drilling operations.

Achievement Context

- Given:
 - appropriate drilling equipment: jack leg, stopper and manipulator arm
 - personal protective equipment
 - tools and equipment
- In a drift or stope

Elements of the Competency**Performance Criteria**

1. Inspect drilling equipment and accessories.

- Safe work area
- Thorough inspection of drills and accessories
- Accurate assessment of the condition and working order of the drills and accessories
- Neatness of work

2. Prepare the drills and drilling accessories.

- Secure connections
- Secure positioning of hoses
- Drill bits properly fitted onto drill steels
- Drill steels properly inserted into drills

3. Drill holes.

- Safe work area
- Logical sequence of manoeuvres
- Stability of drill
- Adequate control of drills
- Drill holes:
 - at the specified angle and direction
 - at pre-set depth

4. Put away drills and accessories.

- Appropriate choice of storage locations
 - out of the way of other work
 - protected from projected and falling rock
- Full recovery of all bits and drill steels
- Organization and cleanliness of drills and drilling accessories

For the competency as a whole:

- Compliance with occupational health and safety regulations
- Compliance with standards
- Compliance with the manufacturers' specifications
- Observance of work techniques
- Appropriate use of equipment
- Constant concern for the condition and working order of the drills

Suggestions for Competency-Related Knowledge and Know-How

The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

For the competency as a whole:

- Types of hand-held drills
 - Characteristics and operation of a jackleg drill, a hand-held drill, a manipulator arm, etc.
1. Inspect drilling equipment and accessories.
 - Overall operation of a drill
 - Importance of keeping drills clean and in good working order
 - Repair of hoses using hose clamp equipment
 - Condition of the cutting edges of various drill bits and drill steels
 2. Prepare the drills and drilling accessories.
 - Water and air hoses
 - Types of drill steels, based on their use
 3. Drill holes.
 - Missed holes, bootlegs and cut holes
 - Importance of taking the condition of the rock into account
 - Effects of an overly violent thrust on the drill steel
 - Use of a retaining device on the machine's supply hose
 4. Put away drills and accessories.
 - Estimate of distances of projected rocks
 - Importance of storing equipment and accessories in an organized manner

Competency 11 Duration 75 hours Credits 5

Behavioural Competency

Statement of the Competency

Remove blasted rock.

Achievement Context

- Given instructions
- Using:
 - mucking equipment such as a conventional scoop, pneumatic loaders and slusher scraper
 - accessories
 - tools
 - personal protective equipment
- In a stope or drift

Elements of the Competency**Performance Criteria**

- | | |
|---|--|
| 1. Become familiar with the work to be done. | <ul style="list-style-type: none">• Appropriate recognition of:<ul style="list-style-type: none">– the type of work to be done– the potential dangers and safety measures– the applicable standards and safety regulations |
| 2. Plan the work. | <ul style="list-style-type: none">• Brief evaluation of blasting results• Precise determination of the mucking sequence, based on the characteristics of the work area• Precise determination of location of missed and cut holes• Appropriate air hose or electrical cable |
| 3. Inspect the mucking equipment and accessories. | <ul style="list-style-type: none">• Thorough inspection of equipment and accessories• Accurate assessment of condition and working order of the equipment and accessories• Compliance with manufacturers' specifications• Clear controls |
| 4. Prepare the mucking equipment. | <ul style="list-style-type: none">• Proper fitting of safety devices• Solidity and leaktightness of connections• Appropriate position of accessories |

5. Remove the rock.
 - Proper preparation of work area
 - Logical sequence of mucking operations
 - Manoeuvres appropriate for the characteristics of the area to be mucked
 - Appropriate position of person in work area
 - Mucking of a significant amount of material
 - Stability of equipment
 - Speed appropriate for conditions of route taken
 - Moderate loss of materials
 - Proper recovery of lost materials
6. Clear the work area.
 - Proper storage of tools, accessories and equipment
 - out of the way of other work
 - protected from projected or falling rocks
7. Report on the work performed.
 - Clear and precise communication on the work card of information on:
 - the condition of the work area and equipment following mucking
 - the presence of potential dangers in the mucking area
 - the equipment required by the next crew for subsequent work
 - Accurate terminology

For the competency as a whole:

- Compliance with occupational health and safety regulations
- Observance of environmental standards
- Observance of work techniques and standards
- Work positions appropriate to manoeuvres performed
- Coordinated, precise manoeuvres
- Capacity and limitations of the equipment taken into account
- Constant attention to the condition of the back and walls
- Proper spraying of rubble depending on the mucking equipment

Suggestions for Competency-Related Knowledge and Know-How

The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

For the competency as a whole:

- Sampling procedure
 - Removal of blasted rock
 - Removal of ore
1. Become familiar with the work to be done.
 - Overall operation of an underground mine
 2. Plan the work.
 - Importance of spraying muck
 3. Inspect the mucking equipment and accessories.
 - Drive mechanisms of mucking equipment
 4. Prepare the mucking equipment.
 - Importance of washing and scaling the back and walls in the work area
 5. Remove the rock.
 - Rock removal using a slusher scraper
 - Safe installation of a slusher scraper
 - Inspection of air supply on slusher scraper
 - Inspection of the cover and ventilation at the dumping point
 - Position of air hose
 - Rock removal using a conventional scoop
 - Importance of thoroughly inspecting the scoop before and after starting the engine
 - Application of signalling procedures in the work area and at the dumping point
 - Application of safety procedures when pedestrians are present
 - Importance of proper ventilation during the work
 - Rock removal using an automatic loader
 - Procedure for installing the supply hose
 - Rock removal using a muck machine
 - Inspection of working order of wagons
 - Importance of working order of wagons
 - Importance of the position of the hose during manoeuvres

Competency 12 Duration 90 hours Credits 6

Behavioural Competency

Statement of the Competency

Haul blasted rock.

Achievement Context

- Given instructions and technical data
- Using:
 - transportation equipment such as a truck, locomotive and wagons, etc.
 - the necessary tools and equipment such as tracks and ties
 - personal protective equipment

Elements of the Competency**Performance Criteria**

- | | |
|--|---|
| 1. Become familiar with the work to be done. | <ul style="list-style-type: none"> • Appropriate recognition of: <ul style="list-style-type: none"> – the type of work to be done – the potential dangers and safety measures – the applicable standards and safety regulations |
| 2. Plan the work. | <ul style="list-style-type: none"> • Precise determination of: <ul style="list-style-type: none"> – the spacing between the ties and between the tracks in the case of a railway – the dumping point – the route to take – the sequence of transportation operations • Compliance with prescribed standards and safety regulations |
| 3. Inspect the transportation equipment. | <ul style="list-style-type: none"> • Thorough and accurate examination of the equipment • Accurate assessment of condition and working order of the equipment • Compliance with the manufacturer's specifications • Proper performance of brake tests depending on the type of equipment |
| 4. Haul material. | <ul style="list-style-type: none"> • Appropriate precautions taken during manoeuvres • Proper approach to loading point and correct positioning • Observance of signs, signals and the rules governing vehicular and pedestrian traffic |

- Appropriate use of equipment operating systems
 - Safe manoeuvres while driving
 - Proper approach to dumping point and correct positioning
 - Proper performance of brake tests depending on the type of equipment
 - Minimal loss of material
5. Clear the work area.
- Equipment parked so that it is:
 - out of the way of other work
 - unable to roll down the incline
 - protected from projected or falling rock
 - Proper installation of wheel blocking devices
 - Main switch properly turned off
 - Cleanliness of equipment
6. Report on the work performed.
- Clear and precise communication on the work card of information on:
 - the condition of the work area and equipment after blasted rock is hauled
 - the presence of potential dangers along the route
 - the equipment required by the next crew for subsequent work
 - the location of the equipment

For the competency as a whole:

- Compliance with occupational health and safety regulations
- Observance of environmental standards
- Observance of work techniques and standards
- Work positions appropriate to manoeuvres performed
- Coordinated, precise manoeuvres
- Methodical work
- Attention to detail

Suggestions for Competency-Related Knowledge and Know-How

The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

For the competency as a whole:

- Manoeuvres executed at different loading sites, on the route and at the dumping point
- 1. Become familiar with the work to be done.
 - Importance of respecting signs and signals
 - Steps in hauling rock from the stope to the dumping points
- 2. Plan the work.
 - Verification of road conditions
 - Priorities to be applied when vehicles and pedestrians are present
 - Techniques for laying railway tracks
- 4. Haul material.
 - Consequences of overloading a truck
 - Signalling procedure at the loading and dumping point
 - Safe manoeuvres on varied terrain: slopes, curves, switches, frogs and intersections
- 5. Clear the work area.
 - Technique for parking a truck on a slope
 - Installation of wheel chocks
 - Procedure for turning off the main switch

Competency 13 Duration 60 hours Credits 4

Behavioural Competency

Statement of the Competency

Install ground support.

Achievement Context

- Given:
 - instructions
 - drawings and specifications
- Using:
 - the necessary equipment and tools
 - hand-held drills
 - drilling accessories
 - lifting equipment
 - personal protective equipment
- Following:
 - blasting in a stope or drift
 - scaling the back and walls
 - checking for explosives

Elements of the Competency**Performance Criteria**

- | | |
|--|---|
| 1. Become familiar with the work to be done. | <ul style="list-style-type: none">• Accurate interpretation of drawings and specifications• Appropriate recognition of the type of work to be done• Proper prevention of potential dangers |
| 2. Plan the work. | <ul style="list-style-type: none">• Appropriate choice of reinforcement methods• Accurate determination of work area• Accurate assessment of number and type of bolts needed• Appropriate choice of equipment and accessories• Precise determination of bolting sequence |
| 3. Inspect the drilling equipment and their accessories. | <ul style="list-style-type: none">• Compliance with the manufacturer's specifications• Thorough inspection of equipment and accessories• Accurate detection of any breakage and excessive wear and tear• Accurate assessment of the condition and working order of the equipment and accessories |
| 4. Prepare the bolting equipment and accessories. | <ul style="list-style-type: none">• Secure connections• Proper fitting of metal plates and nuts onto bolts |

- | | |
|---|--|
| 5. Install equipment to work at a height. | <ul style="list-style-type: none"> • Proper choice of the location of the equipment • Stability and solidity of the equipment used to work at a height |
| 6. Perform the work. | <ul style="list-style-type: none"> • Holes perpendicular to the rock • Precise depth of drilled holes • Compliance with drawings and specifications • Coordination of manoeuvres • Appropriate height of lifting equipment • Logical sequence of operations • Bolts solidly attached in the designated position |
| 7. Clear the work area. | <ul style="list-style-type: none"> • Appropriate choice of storage location • Recovery of all bits and drill steels • Proper storage of equipment and accessories • Cleanliness of equipment |
| 8. Report on the work done. | <ul style="list-style-type: none"> • Clear and accurate communication of relevant information on the work card • Accurate terminology |

For the competency as a whole:

- Compliance with occupational health and safety regulations
- Observance of environmental standards
- Compliance with company policies
- Observance of work techniques and standards
- Appropriate work positions depending on the manoeuvres performed
- Coordinated, precise manoeuvres
- Attention to detail
- Methodical work
- Clear and precise communication among members of the work crew

Suggestions for Competency-Related Knowledge and Know-How

The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

For the competency as a whole:

- Importance of scaling before doing any other operations

1. Become familiar with the work to be done.
 - Characteristics of the different types of supports (screen, bolts, sprayed concrete, etc.)
 - Relationship between a bolting plan and the condition of the back and walls
2. Plan the work.
 - Types of bolts
 - Importance of bolting sequence
3. Inspect the drilling equipment and their accessories.
 - Causes of excessive wear and tear and breakage of drill bits and drill steels
4. Prepare the bolting equipment and accessories.
 - Fitting of plates and nuts onto bolts
 - Purpose and method of installing screening
5. Install equipment to work at a height.
 - Application of techniques for lifting heavy objects
 - Types of scaffolding: prefabricated, scissor and tubular
6. Perform the work.
 - Detection of any explosives
7. Clear the work area.
 - Operations prior to storing the drilling equipment and accessories

Competency 14 Duration 30 hours Credits 2

Behavioural Competency

Statement of the Competency

Install services.

Achievement Context

- Given:
 - instructions
 - drawings and specifications
- Using:
 - the necessary equipment and tools
 - hand drills
 - personal protective equipment
- For the installation of services: ventilation or drainage pipes and air or water hoses

Elements of the Competency**Performance Criteria**

- | | |
|---|---|
| 1. Become familiar with the work to be done. | <ul style="list-style-type: none"> • Accurate determination of the types of pipes or cables to be installed • Accurate identification of installation sites on the drawings and specifications • Accurate identification of installation methods |
| 2. Perform inspections. | <ul style="list-style-type: none"> • Complete inspection of: <ul style="list-style-type: none"> – the installation sites – working order of installation equipment • Accurate identification of anchor points on the back for installing the services |
| 3. Determine the equipment needed for the installation. | <ul style="list-style-type: none"> • Accurate estimate of length of pipes or cables to be installed • Accurate calculations • Appropriate list of the necessary tools, equipment and accessories |
| 4. Install the lines or pipes. | <ul style="list-style-type: none"> • Accurate application of installation methods based on the drawings and specifications • Observance of service lockout procedures • Observance of installation sequence • Accurate application of techniques for purging pipes • Appropriate verification of working order of services |

5. Store the equipment.

- Cleanliness of equipment
- Accurate application of storage procedure based on company policy

For the competency as a whole:

- Compliance with occupational health and safety regulations
- Observance of environmental standards
- Compliance with company policies
- Observance of work techniques and standards
- Constant concern for the condition and working order of the equipment
- Constant concern for surrounding conditions

Suggestions for Competency-Related Knowledge and Know-How

The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

For the competency as a whole:

- Importance of scaling before doing any other operations
1. Become familiar with the work to be done.
 - Types of pipes and cables to use to install services
 - Dangers associated with the installation of services
 2. Perform inspections.
 - Importance of locating anchor points for the installation of services
 - Types of scaffolding: prefabricated, scissor, tubular, etc.
 3. Determine the equipment needed for the installation.
 - Necessary tools and equipment
 4. Install the lines or pipes.
 - Steps in the installation of services
 - Service lockout procedures
 5. Store the equipment.
 - Quality of storage

Competency 15 Duration 105 hours Credits 7

Behavioural Competency

Statement of the Competency

Drill holes for slash blasting and round blasting operations.

Achievement Context

- Given:
 - instructions
 - drawings and specifications
 - technical data
 - a drilling plan
- Using:
 - personal protective equipment
 - the necessary equipment and tools
 - drilling machines and accessories

Elements of the Competency**Performance Criteria**

- | | |
|---|---|
| 1. Become familiar with the work to be done. | <ul style="list-style-type: none"> • Appropriate recognition of: <ul style="list-style-type: none"> – the type of work to be done – the potential dangers and safety measures – the applicable standards and safety regulation |
| 2. Plan the work. | <ul style="list-style-type: none"> • Accurate assessment of the characteristics of the holes for slash blasting and round blasting • Precise determination of the drilling sequence • Precise determination of the number of holes to be drilled • Appropriate choice of drill steels |
| 3. Inspect the drilling equipment and accessories. | <ul style="list-style-type: none"> • Compliance with manufacturer's specifications • Thorough inspection of equipment and accessories • Accurate assessment of the condition and working order of the equipment • Cleanliness of equipment |
| 4. Prepare the drills and drilling accessories. | <ul style="list-style-type: none"> • Leaktightness of hoses and accessories • Secure connections between hoses, clamps and joints • Drill bit fitted properly onto the drill steel |
| 5. Locate and mark missed holes, cut holes, lifters and bootlegs. | <ul style="list-style-type: none"> • Precise and thorough location and marking of holes • Appropriate identification of cut, if applicable |

6. Shoot lines and mark up the drilling plan.
 - Precise determination of the direction of the holes for the slash blasting and round blasting
 - Accurate definition of the drilling plan, based on:
 - the type of holes to drill for the slash blasting and round blasting
 - the drills used
 - the rock conditions
 - Accurate marking of the dimensions from the drilling plan
 - Precision of the square
 - Visibility of drilling plan
7. Connect the drill.
 - Appropriate position of drill
 - Stability of drill
 - Solidity of connections
 - Leaktightness of hoses and connectors
8. Drill holes.
 - Logical sequence of operations
 - Compliance with drilling plan
 - Coordinated and precise manoeuvres
 - Parallel holes drilled
9. Clear the work area.
 - Appropriate choice of storage location
 - Recovery of all bits
 - Proper storage of equipment and accessories
 - Cleanliness of equipment and accessories
10. Report on the work done.
 - Clear and precise communication of relevant information on the work card
 - Accurate terminology

For the competency as a whole:

- Compliance with occupational health and safety regulations
- Observance of environmental standards
- Observance of work techniques and standards
- Work positions appropriate to manoeuvres performed
- Methodical work
- Attention to detail
- Autonomy
- Clear and precise communication between members of the work crew
- Constant monitoring of the state of the work area
- Proper scaling of unstable rocks

Suggestions for Competency-Related Knowledge and Know-How

The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

For the competency as a whole:

- Type of slash
 - Characteristics of a mine drift
1. Become familiar with the work to be done.
 - Characteristics of the different types of slashes
 2. Plan the work.
 - Characteristics and functions of the different types of drill steels
 - Identification of a drift on the mine plan
 - Types of cuts and characteristics of blasting (fragmentation, addition of holes, etc.)
 3. Inspect the drilling equipment and accessories.
 - Maintenance procedure
 - Characteristics of hydraulic jacks
 4. Prepare drills and drilling accessories.
 - Supply line retaining device
 - Characteristics and directions for using a pump
 5. Locate and mark missed holes, cut holes, lifters and bootlegs.
 - Using instruments for measuring length
 - Characteristics and functions of tools
 - Qualities of proper marking
 6. Shoot lines and mark the drilling plan.
 - Square
 9. Clear the work area.
 - Importance of recovering the bits

Competency 16 Duration 60 hours Credits 4

Behavioural Competency

Statement of the Competency

Prepare for blasting operations.

Achievement Context

- Given:
 - instructions
 - drawings and specifications
 - technical data
- Using:
 - explosives
 - a charger
 - blasting accessories
 - tools
 - personal protective equipment
- For slash blasting and round blasting

Elements of the Competency

Performance Criteria

- | | |
|--|--|
| 1. Become familiar with the work to be done. | <ul style="list-style-type: none">• Appropriate recognition of:<ul style="list-style-type: none">– the type of work to be done– the potential dangers and safety measures– the applicable standards and safety regulations |
| 2. Plan the work. | <ul style="list-style-type: none">• Thorough inspection of the site• Precise determination of the sequence of operations based on the drawings and specifications or company procedures• Appropriate choice of accessories and quantity of explosives• Compliance with explosives manufacturer's standards• Appropriate choice of location of the blasthole loader |
| 3. Inspect the equipment. | <ul style="list-style-type: none">• Thorough inspection of equipment• Appropriate inspection of mobile lift, if applicable |
| 4. Prepare the equipment. | <ul style="list-style-type: none">• Firmly connected blasthole loader• Correct use of tools• Transportation of explosives in compliance with regulations• Appropriate verification of working order of fan and pipes |

5. Verify the condition of the drill holes and clean them.
 - Constant monitoring of the state of the work area
 - Thorough cleaning of holes
 - Thorough clearing of lifters
 - Accurate verification of alignment of holes
 - Thorough clearing of the openings of holes
 - Proper scaling of unstable rock
6. Load the holes.
 - Compliance with manufacturer's specifications
 - Proper loading of holes
 - Precise positioning of detonators and priming
7. Connect the components of the blasting circuit.
 - Proper positioning of blasting box
 - Appropriate unrolling of:
 - detonating cord
 - blasting line
 - Proper connecting of:
 - shock tubes to detonating cord
 - detonator to detonating cord
 - other components of the circuit
 - Careful verification of circuit continuity:
 - through the blasting line
 - through the detonator
 - Proper connection to blasting box
8. Ventilate the work area.
 - Proper verification of the fan
9. Clear the work area.
 - Complete recovery of excess explosives and detonators
 - Proper storage of:
 - explosives and detonators in magazine
 - equipment
 - Proper parking of the equipment
10. Report on the work done.
 - Documentation of relevant data in a log
 - Clear and precise communication of relevant information on the work card
 - Accurate terminology

For the competency as a whole:

- Compliance with occupational health and safety regulations
- Observance of environmental standards
- Observance of work techniques and standards
- Work positions appropriate to manoeuvres performed
- Autonomy
- Methodical and precise work
- Clear and precise communication among members of the work crew

Suggestions for Competency-Related Knowledge and Know-How

The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

For the competency as a whole:

- Functions of the different types of blasting
 - Limits of the trade
1. Become familiar with the work to be done.
 - Blasting specifications
 - Slash blasting and round blasting
 2. Plan the work.
 - Blasting in compliance with the characteristics of the rock
 - Types of explosives and estimate of necessary quantities
 - Main accessories used
 3. Inspect the equipment.
 - Accessory inspection procedure
 4. Prepare the equipment.
 - Connection techniques
 5. Verify the condition of the drill holes and clean them.
 - Lifters
 - Method of loading holes
 7. Connect the components of the blasting circuit.
 - Verification of circuit continuity
 - Electric cables and wires
 - Programmable blasting system

9. Clear the work area.

- Connection techniques
- Methods of recovering and storing explosives and blasting accessories

10. Report on the work done.

- Log and data to enter

Glossary

BIT:	Drilling tool, screwed or inserted in the end of the string, with the leading edge cut into blades, spikes or serrations. It is affixed to the end of a drill steel or rotary drill bit.
BLASTING CORD:	Cord made up of a core of explosive powder wrapped in a textile or plastic sheath used to fire non-electric (nonel) detonators.
BLASTING PLAN:	Plan illustrating the blasting sequence of loaded holes.
BOOTLEG:	Part at the bottom of a hole that was not broken off by the detonation.
BREAST/SLASH:	Advancement of a mine at which work is progressing.
CUT:	The first holes blasted to create an opening for round blasting.
CUT HOLE:	Hole that did not completely detonate (was never initiated).
DRIFT:	Tunnel providing access to an underground orebody for mining or the transportation of rubble.
DRILL STEEL:	Metal rod affixed to a hammer drill used to break apart rock through the percussive action of a bit.
DRILLING PLAN:	Specific arrangement of holes to be drilled to prepare for blasting.
EYEBOLT:	Bolt with a welded or twisted (pigtail) eye and an expansion shell at least 24 in. long and more than $\frac{3}{4}$ in. in diameter that can resist 18 kN (4046.6 lb) of pullout force certified by an engineer if used as an anchor point.
JACK LEG:	Rotary tool mounted on an articulated pneumatic leg used to dig horizontal mine holes.
LIFTER:	Floor hole blasted last to define the floor area of a drift.
MISSED HOLE:	Hole or part of a hole containing explosives that did not completely detonate after blasting.
MOBILE SERVICE EQUIPMENT:	Any vehicle used to transport people, perishables or explosives.
MUCK MACHINE:	Pneumatic scoop on iron wheels with one traction motor for the four wheels for use on the levels. Some are remote controlled.
RAISE:	Vertical opening between two levels used to allow a person through (with a ladder), provide ventilation or access ore. It can be manual (with or without wood) or mechanized (Alimak).
ROUND BLASTING:	Blasting of a drift (tunnel) opening 8 to 16 ft. (2.44 to 4.88 m) deep. The number of holes blasted depends on the size (L x H) of the desired opening.

SCALING:	Process (work method) used to secure the work area against unstable rock. It is done using a special bar and must respect certain principles.
SCOOP:	Equipment designed to haul loads of rock to an unloading site. Capacities vary between $\frac{1}{2}$ and 20 cu. yds. Scoops are usually equipped with a diesel engine, but some are electric.
SELF-PROPELLED PNEUMATIC SCOOP:	Scoop on wheels with two Cavo traction motors (one for the two left wheels and the other for the two right wheels). The scoop, which may or may not have a dump body, can be controlled manually or by remote control in small openings (2.7 m x 2.4 m) in sublevels and stope and drift drawing points.
SHAFT:	Hole, usually vertical, with constant sections, dug into the ground and the rock to access the orebody and extract the ore.
SHOCK TUBE:	Thin plastic tube whose inner wall is coated with a fine explosive powder that is extremely sensitive to shocks (HMX) and that is connected to a blasting cord.
SLUSHER SCRAPER:	Equipment used to scrape rubble using a compressed air or electric motor with a shovel pulled by steel cables.
SQUARE:	System of regularly spaced perpendicular straight lines overlaid on the face to specify the position of the points where holes will be drilled.
STOPE:	Excavation used to remove ore from a rock mass.
STOPPER:	Rotary tool used to dig vertical mine holes.

