Vocational Education Program

5761

Ore Extraction

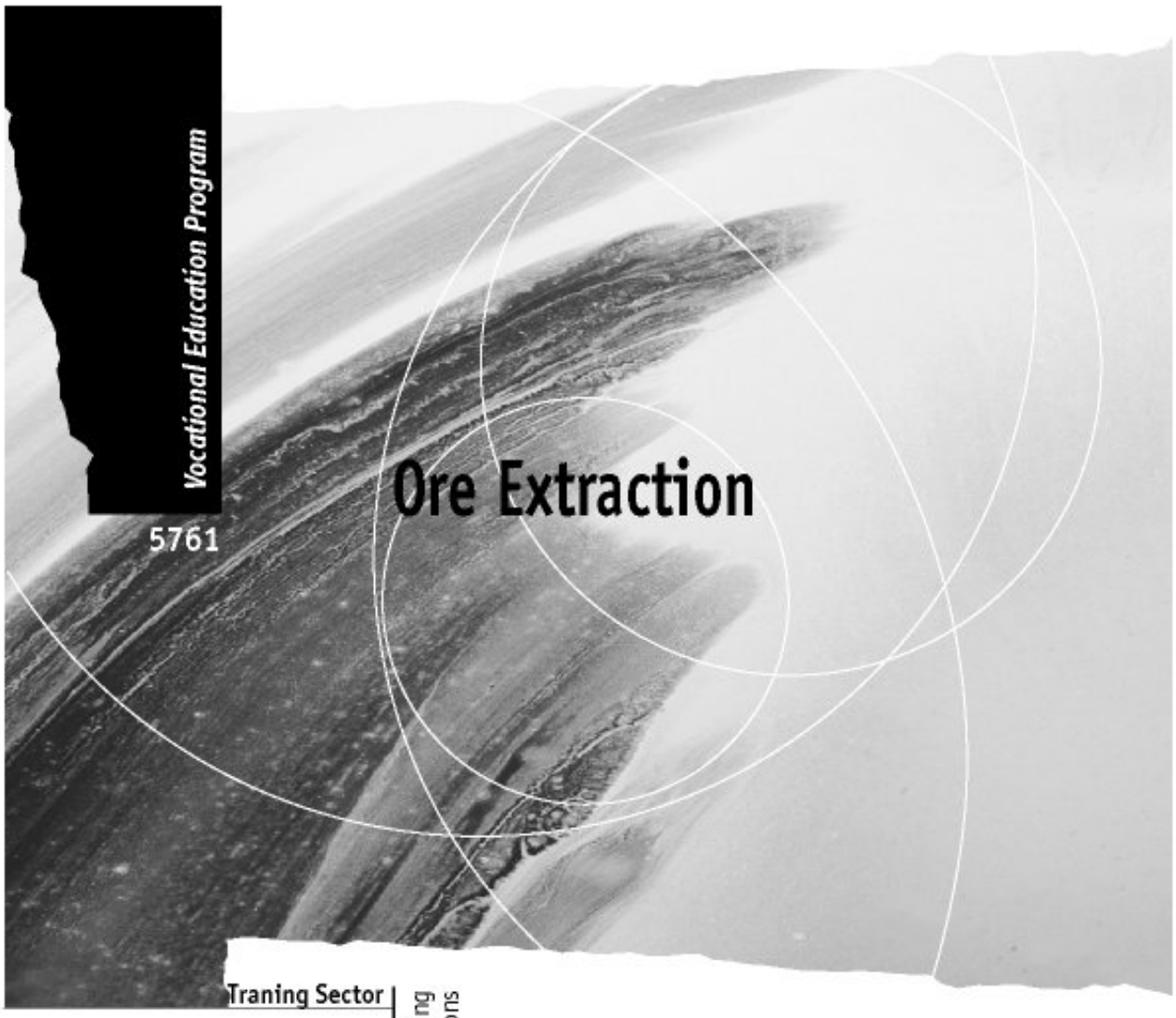
Training Sector

15

Mining and Site Operations

Reach for your Dreams

Québec



Vocational Education Program

5761

Ore Extraction

Traning Sector

15

Mining
and Site Operations

Formation professionnelle et technique
et formation continue

Direction générale des programmes
et du développement

MINING AND SITE OPERATIONS

ORE EXTRACTION

PROGRAM OF STUDY
5761

The *Ore Extraction* program
leads to the Diploma of Vocational Studies (DVS)
and prepares the student to work as a **MINER-BF.**

Direction générale des programmes
et du développement

ISBN 2-550-42922-2

Legal Deposit – Bibliothèque nationale du Québec, 2004

ACKNOWLEDGMENTS

The Ministère de l'Éducation wishes to thank the numerous contributors from the workplace and the field of education who helped develop and revise this program of study.

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INTRODUCTION

The *Ore Extraction* program is based on a framework for developing vocational education programs that calls for the participation of experts from the workplace and the field of education.

The program of study is developed in terms of competencies, expressed as objectives. These objectives are divided into modules. Various factors were kept in mind in developing the program: training needs, the job situation, purposes, goals, and strategies and means used to attain objectives.

The program of study lists the competencies that are the minimum requirements for a diploma for students in both the youth and adult sectors. It also provides the basis for organizing courses, planning teaching strategies, and designing instructional and evaluation materials.

The *Ore Extraction* program leads to the Diploma of Vocational Studies (DVS). To be admitted to the program, students must meet one of the following conditions:

- Persons holding a Secondary School Diploma or its recognized equivalent are not subject to any additional admission requirements.

OR

- Persons who are at least 16 years of age on September 30 of the school year in which their training is to begin must meet the following additional requirement: to have earned Secondary III credits in language of instruction, second language and mathematics, or to have been granted recognition of equivalent learning.

OR

- Persons who are at least 18 years of age must successfully complete the general development test.

N.B.: The requirement on the concurrency of general education courses and vocational training does not apply to this category.

The duration of the program is 930 hours, which includes 435 hours spent on the specific competencies required to practise the trade and 495 hours on general competencies. The program of study is divided into 23 modules, which vary in length from 15 to 60 hours (multiples of 15). The time allocated to the program is to be used not only for teaching but also for evaluation and remedial work.

The document contains two parts. Part I is of general interest and provides an overview of the training plan. It is broken down into five chapters: the first is a synoptic table of basic information about the modules; the second defines the program training goals; the third, the competencies to be developed; the fourth, the general objectives; and the fifth chapter explains the operational objectives. Part II is designed primarily for those directly involved in implementing the program. It contains a description of the operational objectives of each module.

GLOSSARY

Competency
A set of qualifications, skills, perceptions and attitudes that enable a person to correctly perform a work-related activity or task.

Credit
A unit used for expressing quantitatively the value of the modules in a program of study. One credit corresponds to 15 hours of training. Students must accumulate a set number of credits to graduate from a program.

General Objectives
Expression of the educational aims of a program in terms of competencies to be developed by the student. The general objectives are broken down into operational objectives.

Module of a Program
A component part of a program of study comprising a first-level operational objective and, if applicable, the related second-level operational objectives.

Operational Objectives
Statements of the educational aims of a program in practical terms. They serve as the basis for teaching, learning and evaluation.

Program Training Goals
Statements that describe the educational aims of a program. These goals are the general goals of vocational education adapted to a specific trade or occupation.

Part I

1. SYNOPTIC TABLE

Number of modules: 23
Duration in hours: 930
Credits: 62

Ore Extraction
Code: 5761
Type of certification: Diploma of Vocational Studies

CODE		TITLE OF THE MODULE	HOURS	CREDITS*
760 311	1	The Trade and the Training Process	15	1
760 323	2	Health and Safety	45	3
755 322	3	Basic Principles of Geology	30	2
755 332	4	Basic Principles of Explosives	30	2
760 334	5	Preventive Maintenance for Mining Vehicles	60	4
760 341	6	Truck and Scissor Lift	15	1
760 353	7	Hand-Held Drills	45	3
760 362	8	Scraper Hoist	30	2
760 372	9	Scooptram	30	2
760 383	10	Pneumatic Loaders	45	3
760 392	11	Drilling Patterns and Blasting Patterns	30	2
760 402	12	Scaffold Construction	30	2
760 413	13	Jumbo Drill	45	3
760 424	14	Long-Hole Drill	60	4
760 434	15	Back and Wall Scaling	60	4
760 444	16	Mucking Ore	60	4
760 452	17	Hauling Ore	30	2
760 464	18	Back and Wall Bolting	60	4
760 474	19	Stope Drilling	60	4
760 482	20	Preparation for Blasting a Development Heading	30	2
760 494	21	Drilling a Tunnel Round	60	4
760 502	22	Preparation for Blasting Rounds	30	2
760 522	23	Laying Railway Tracks	30	2

* 15 hours = 1 credit

2. PROGRAM TRAINING GOALS

The training goals of the *Ore Extraction* program are based on the general goals of vocational education and take into account the specific nature of the trade. These goals are:

To develop effectiveness in the practice of a trade.

- To teach students to perform ore extraction tasks and activities correctly and at an acceptable level of competence for entry into the job market.
- To prepare students to progress satisfactorily on the job by fostering:
  - the intellectual skills and techniques needed to make sound choices in performing tasks
  - a concern for effective communication with superiors and colleagues
  - respect for professional ethics
  - a sense of responsibility
  - the reinforcement of habits of neatness, cleanliness and precision in their work
  - a constant concern for occupational health and safety

To ensure integration into the work force.

- To familiarize students with the job market in general and the trade of mining in particular.
- To familiarize students with their rights and responsibilities as workers.

To foster personal and professional development.

- To help students develop autonomy, a sense of responsibility and a desire for success.
- To help students develop a concern for excellence and the basic attitudes that lead to professional success.
- To help students understand the principles underlying the techniques used.
- To help students acquire work methods and a sense of discipline.

To ensure job mobility.

- To help students develop positive attitudes toward technological change and new situations.
- To help students improve their ability to learn, find information and consult documentation.

3. COMPETENCIES

The competencies to be developed in *Ore Extraction* are shown in the grid of learning focuses on the following page. The grid lists general and specific competencies as well as the major steps in the work process.

General competencies involve work-related activities. They cover, for example, the technological or scientific principles that the students must understand to practise the trade or occupation. Specific competencies focus on tasks that are of direct use in the trade or occupation. The work process includes the most important steps in carrying out the tasks of the trade or occupation.

The grid of learning focuses shows the relationship between the general competencies on the horizontal axis and the specific competencies on the vertical axis. The symbol (Δ) indicates a correlation between a specific competency and a step in the work process. 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 formulation of objectives intended to develop specific competencies related to the trade or occupation.

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 of the grid shows the competencies directly related to the practice of a specific trade or occupation. These competencies are arranged in a relatively fixed order; therefore, the modules should be taught, insofar as possible, in the order represented on the grid. The modules including the general competencies on the horizontal axis should be taught in relation to those on the vertical axis. This means that some modules are prerequisite to others, while other modules are taught concurrently.

GRID OF LEARNING FOCUSES **Ore Extraction** SPECIFIC COMPETENCIES (directly related to the practice of the specific trade)		FIRST-LEVEL OPERATIONAL OBJECTIVES	DURATION (IN HOURS)	WORK PROCESS (major steps)							GENERAL COMPETENCIES (related to technology, subjects, personal development, etc.)													NUMBER OF OBJECTIVES	TOTAL DURATION (IN HOURS)
				Review the work to be performed	Plan the work	Check and maintain the equipment	Repair materials and equipment	Perform the work	Clear the work area	Report on the work performed	Apply basic principles of health and safety	Apply basic principles of geology	Apply basic principles of explosives	Perform preventive maintenance on and diagnose problems in mining vehicles	Operate a truck and a scissor lift	Operate hand-held drills	Operate a scraper hoist	Operate a scooptram	Operate pneumatic loaders	Draw up drilling patterns and blasting patterns	Construct scaffolds	Operate a jumbo drill	Operate a long-hole drill		
MODULE	**MODULES**										2	3	4	5	6	7	8	9	10	11	12	13	14		
	FIRST-LEVEL OPERATIONAL OBJECTIVES										B	B	B	B	B	B	B	B	B	B	B	B	B	14	
	DURATION (IN HOURS)										45	30	30	60	15	45	30	30	45	30	30	45	60		495
1	Determine their suitability for the trade and the training process	S	15	△	△	△	△	△	△	△	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍		
15	Scale a roof and walls	B	60	▲	▲	▲	▲	▲	▲	▲	●	●	❍	❍	●		❍		❍		❍				
16	Muck ore	B	60	▲	▲	▲	▲	▲	▲	▲	●	●	❍	❍	❍		●	●	●						
17	Haul ore	B	30	▲	▲	▲	△	▲	▲	▲	●	●	❍	❍	●	❍		❍							
18	Bolt a back and walls	B	60	▲	▲	▲	▲	▲	▲	▲	●	●	❍	❍	●	●	❍			❍	●	●			
19	Drill in a stope	B	60	▲	▲	▲	▲	▲	▲	▲	●	●	❍	❍	❍	●				●	●	❍	●		
20	Prepare to blast a development heading	B	30	▲	▲	▲	▲	▲	▲	▲	●	❍	●	❍						●	❍				
21	Drill a tunel round	B	60	▲	▲	▲	▲	▲	▲	▲	●	●	❍	❍		●			❍	●		●			
22	Prepare to blast rounds	B	30	▲	▲	▲	▲	▲	▲	▲	●	❍	●	❍						●					
23	Lay railway tracks	B	30	▲	▲	△	▲	▲	▲	▲	●			❍					●						
NUMBER OF OBJECTIVES		10																						23	
DURATION (IN HOURS)			435																						930

S: Situational objectives
B: Behavioural objectives

△ Correlation between a step and a specific competency
▲ Correlation to be taught and evaluated

❍ Correlation between a general and a specific competency
● Correlation to be taught and evaluated

4. GENERAL OBJECTIVES

The general objectives of the *Ore Extraction* program are presented below, along with the major statement of each corresponding first-level operational objective.

To develop in the students the competencies required to integrate harmoniously into the school and work environments.

- Determine their suitability for the trade and the training process.

To develop in the students the basic competencies required to understand the principles and concepts essential to practising the trade.

- Apply basic principles of geology.
- Apply basic principles of explosives.
- Draw up drilling patterns and blasting patterns.

To develop in the students the competencies required to perform the work safely and apply emergency response techniques in case of an accident.

- Apply basic principles of health and safety.

To develop in the students the competencies required to safely and effectively use the machinery.

- Operate hand-held drills.
- Operate a jumbo drill.
- Operate a long-hole drill.
- Operate a truck and a scissor lift.
- Operate a scraper hoist.
- Operate a scooptram.
- Operate pneumatic loaders.

To develop in the students the competencies required to prepare and organize the work area.

- Construct scaffolds.
- Scale a back and walls.
- Muck ore.
- Haul ore.
- Bolt a back and walls.
- Lay railway tracks.
- Perform preventive maintenance on and diagnose problems in mining vehicles.

To develop in the students the competencies required to perform drilling and blasting operations.

- Drill in a stope.
- Drill a tunnel round.
- Prepare to blast a development heading.
- Prepare to blast rounds.

5. FIRST- AND SECOND-LEVEL OPERATIONAL OBJECTIVES

5.1 DEFINITION

A first-level operational objective is defined for each competency to be developed in accordance with its description in Chapter 3. Competencies are organized into an integrated training program designed to prepare students to practise the trade or occupation. This systematic organization of competencies produces better overall results than training by isolated objectives. More specifically, it fosters a smooth progression from one objective to the next, saves teaching time by eliminating needless repetition and integrates and reinforces learning.

First-level operational objectives are the main, compulsory teaching/learning targets and they are specifically evaluated for certification. There are two kinds of operational objectives: behavioural and situational.

- **A behavioural objective** is a relatively closed objective that describes the actions and results expected of the student by the end of a learning step. Evaluation is based on expected results.

- **A situational objective** is a relatively open-ended objective that outlines the major phases of a learning situation. It allows for output and results to vary from one student to another. Evaluation is based on the student's participation in the activities of the learning context.

Second-level operational objectives are intermediate teaching/learning targets deemed prerequisite for attaining first-level objectives. They are grouped according to the specifications (see 5.2.1) or the phases (see 5.2.2) of the first-level objective.

The division of operational objectives into first- and second-level objectives is based on a clear distinction between the levels of learning:
- learning involving prerequisite knowledge
- learning involving competencies

Second-level operational objectives indicate prerequisite knowledge. They prepare the students to learn what is necessary to attain the first-level operational objectives, which collectively lead to the development of a competency. The objectives should always be adapted to meet the particular needs of the individual students or groups of students.

First-level operational objectives cover the learning that the students need to develop a competency:

- **The specifications or the phases of the objective** determine or guide specific learning, thereby allowing the competency to be developed step by step.

- **The objective as a whole** (i.e. the six components and in particular the last phase of a situational objective–see 5.2) determines or guides the overall learning and the integration and synthesis of this learning, allowing the competency to be developed fully.

To attain the objectives, the following learning activities may be prepared:

- specific learning activities for second-level objectives
- specific learning activities for the specifications or phases of first-level objectives
- general learning activities for first-level objectives

5.2 HOW TO READ FIRST-LEVEL OPERATIONAL OBJECTIVES

5.2.1 How to Read a Behavioural Objective

Behavioural objectives consist of six components. The first three provide an overview of the objective:

- The **expected behaviour** states a competency in terms of the general behaviour that the students are expected to have acquired by the end of the module.
- The **conditions for performance evaluation** define what the students can or must do during the evaluation designed to verify whether or not they have attained the objective. This means that the conditions for evaluation are the same wherever and whenever the program is taught.
- The **general performance criteria** define the requirements by which to judge whether or not the results obtained are generally satisfactory.

The last three components ensure that the objective is understood clearly and unequivocally:

- The **specifications of the expected behaviour** describe the essential elements of the competency in terms of specific behaviours.
- The **specific performance criteria** define the requirements for each of the specifications of behaviour. They ensure a more enlightened decision on the attainment of the objective.
- The **field of application** defines the limits of the objective, *if applicable*. It indicates cases where the objective applies to one or more task, occupation, field and so on.

5.2.2 How to Read a Situational Objective

Situational objectives consist of six components.

- The expected **outcome** states a competency as an aim to be pursued throughout the course.

- The **specifications** outline the essential aspects of the competency and ensure a better understanding of the expected outcome.

- The **learning context** provides an outline of the learning situation designed to help the students develop the required competency. It is normally divided into three phases of learning:

  - information
  - performance, practice or involvement
  - synthesis, integration and self-evaluation

- The **instructional guidelines** suggest ways and means of teaching the course to ensure that learning takes place and that the same conditions apply wherever and whenever the course is taught. These guidelines may include general principles or specific procedures.

- The participation **criteria** describe the requirements the students must fulfill, which are usually related to each phase of the learning context. 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 context.

- The **field of application** defines the limits of the objective, *if applicable*. It indicates cases where the objective applies to more than one task, occupation, field and so on.

6. HARMONIZATION

Ore Extraction 5761 was designed and developed as part of the effort to harmonize vocational programs of study. The goal of harmonization is to optimize the progress of students during the training process by making it easier to transfer from one program to another or one level of education to another, without having to repeat courses.

ORE EXTRACTION 5761	**EQUIVALENCE**[1]	**FORAGE AU DIAMANT** 5253
760 323 Health and Safety 45 hours	→	260543 Santé et sécurité 45 hours
760 353 Hand-Held Drills 45 hours	→	260572 Trous d'ancrage 30 hours
760 434 Back and Wall Scaling 60 hours	→	260551 Écaillage 15 hours
		FORAGE ET DYNAMITAGE 5092
755 322 Basic Principles of Geology 30 hours	↔	755 322 Basic Principles of Geology 30 hours
755 332 Basic Principles of Explosives 30 hours	↔	755 332 Basic Principles of Explosives 30 hours

→ The competency acquired in *Ore Extraction* may be recognized in the *Forage au diamant* program.

↔ The competency acquired in either *Ore Extraction* or *Forage et dynamitage* may be recognized in the other program.

Part II

MODULE 1: THE TRADE AND THE TRAINING PROCESS

Code: 760 311 **Duration: 15 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

EXPECTED OUTCOME

By participating in the required activities of the learning context according to the indicated criteria, the students will be able to
determine their suitability for the trade and the training process.

SPECIFICATIONS

During this module, the students will:

- Become familiar with the nature of the trade.
- Understand the training process.
- Confirm their career choice.

LEARNING CONTEXT

PHASE 1: Information on the Trade

- Learning about the job market in the field of ore extraction.
- Learning about the nature and requirements of the job through visits, meetings, written materials, etc.
- Presenting the information gathered and discussing as a group their views on the trade.

PHASE 2: Information on and Participation in the Training Process

- Discussing the skills, aptitudes and knowledge required to practise the trade.
- Becoming familiar with the training process.
- Discussing how the training program prepares students to practise the trade of mining.
- Sharing their initial reactions to the trade and the training process.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

PHASE 3: Evaluation and Confirmation of Career Choice

- Producing a report in which they:
  - state how their preferences, aptitudes and interests relate to ore extraction
  - evaluate their career choice by comparing the aspects and requirements of the trade with their personal preferences, aptitudes and interests

INSTRUCTIONAL GUIDELINES

The teacher should:

- Create a climate that favours the students' personal development and entry into the work force.
- 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.
- Provide students with the means to assess their career choice honestly and objectively.
- Organize visits to businesses representative of the work environment found in the field of ore extraction.
- Provide the students with pertinent reference materials: information on the trade, training programs, guides, etc.
- Organize meetings with specialists in the field.

PARTICIPATION CRITERIA

PHASE 1:

- Gather information on most of the topics to be covered.
- Express their views on the trade during a group discussion, relating these views to the information they have gathered.

PHASE 2:

- Give their opinions on some of the requirements they will have to meet in order to practise the trade.
- Carefully review the documents provided.
- Listen attentively to the explanations given.
- Express their views on the training program during a group discussion.
- Clearly express their reactions.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

PHASE 3:

- Produce a report in which they:
  - sum up their preferences and aptitudes
  - explain their career choice by clearly relating these preferences and aptitudes to the practice of the trade
  - explain why they chose to continue or abandon the training program

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before undertaking the activities in each of the phases:

1. Be receptive to information on the trade and the training process.
2. Share their perceptions of the trade with their classmates.

Before undertaking the activities of Phase 1 (Information on the Trade):

3. Locate information.
4. Decide how they will write down and present information.
5. Distinguish between job duties and the position itself.
6. Explain the meaning of "level of competence for entry into the job market."
7. List the main rules governing group discussions.

Before undertaking the activities of Phase 2 (Information on and Participation in the Training Process):

8. Distinguish among the skills, aptitudes and knowledge required to practise the trade of mining.
9. Describe the nature, purpose and content of a program of study.

Before undertaking the activities of Phase 3 (Evaluation and Confirmation of Career Choice):

10. Distinguish among preferences, aptitudes and interests.
11. Describe the main elements of a report confirming their career choice.

MODULE 2: HEALTH AND SAFETY

Code: 760 323 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
apply basic principles of health and safety
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with:
  - instructions
  - case studies, examples or learning situations
- Using:
  - equipment and accessories
  - technical documentation

GENERAL PERFORMANCE CRITERIA

- Appropriate use of equipment and materials
- Observance of occupational health and safety rules and regulations
- Accuracy of terminology

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Use personal protective equipment.	– Appropriate choice of equipment, based on: ▪ the type of work to be done ▪ prevailing environmental conditions – Thorough check of equipment – Appropriate assessment of the equipment's condition – Thorough drying and proper storage of equipment
B. Specify the safety measures applicable to the collective protection of workers.	– Accurate recognition of: ▪ the meaning of signal lights and signs ▪ the purpose of the locations used as refuge bays
C. Use fire extinguishers.	– Appropriate choice of extinguisher, based on the type of fire – Correct use of technique for using a fire extinguisher
D. Recognize the warning signs of a dangerous situation.	– Accurate perception of abnormal noises – Accurate recognition of: ▪ the origin of noxious gases ▪ situations requiring the release of warning gas
E. Explain the emergency procedure to follow in case of: • an evacuation • an accident	– Clear explanation of: ▪ the work area evacuation procedure ▪ the procedure to follow in case of an accident
F. Match various sections of health and safety legislation with the tasks performed by miners.	– Accurate matching of laws or regulations with the tasks

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to use personal protective equipment (A):

1. Be familiar with the purpose of specific pieces of commonly used protective equipment.
2. Recognize the risks of wearing damaged or poorly fitting equipment or clothing.
3. Explain the purpose of using employee tags on an in/out tag board.
4. Locate the places used for drying and storing equipment.

Before learning to specify the safety measures applicable to the collective protection of workers (B):

5. Recognize the safety components of a refuge bay.
6. Be familiar with the emergency response organizations.
7. Explain the importance of the safety work/inspection card and safety systems such as the five-point system.

Before learning to use fire extinguishers (C):

8. Name the main components of a fire extinguisher.

Before learning to explain the emergency procedure to follow in case of:
- **an evacuation**
- **an accident (E):**

9. Locate the emergency exit on a mine plan.
10. Be familiar with the criteria to consider when selecting a place of refuge.

MODULE 3: BASIC PRINCIPLES OF GEOLOGY

Code: 755 322 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
apply basic principles of geology
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with:
  - a questionnaire
  - rock or mineral samples
  - illustrations of geological structures, etc.
- Using:
  - geological maps
  - technical documentation

GENERAL PERFORMANCE CRITERIA

- Appropriate use of basic principles concerning the nature of rock and soil
- Accuracy of terminology

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Determine the primary characteristics and properties of rocks and minerals.	– Correct use of work techniques – Precise determination of major characteristics and properties such as: ▪ texture ▪ hardness ▪ weight ▪ volume ▪ structure, etc.
B. Classify different types of rocks and minerals.	– Accurate classification according to: ▪ origin ▪ mineralization
C. Explain the fragmentation process and the principles of rock and soil mechanics.	– Accurate explanation of the process and principles – Explanation taking into account characteristics of various types of rocks and soils
D. Explain the effects of drilling and blasting on the underground mining environment.	– Accurate explanation taking into account: ▪ geological and environmental characteristics ▪ modifications to the back and walls

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to determine the primary characteristics and properties of rocks and minerals (A):

1. Be familiar with the primary components in the earth's crust.
2. Identify the main geological and mining regions of Québec.
3. List the major geological formations and mineral resources in Québec.

Before learning to explain the fragmentation process and the principles of rock and soil mechanics (C):

4. Describe the structural characteristics of a geological formation.
5. Describe how the characteristics of various types of rocks affect the fragmentation process.

Before learning to explain the effects of drilling and blasting on the underground mining environment (D):

6. Be familiar with the major underground drilling and blasting operations and the resulting products.
7. Visually assess various rock formations.
8. Recognize modifications due to causes other than drilling and blasting operations.

MODULE 4: BASIC PRINCIPLES OF EXPLOSIVES

Code: 755 332 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
apply basic principles of explosives
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with:
  - a questionnaire
  - technical specifications from explosives manufacturers
- Using blasting techniques

GENERAL PERFORMANCE CRITERIA

- Relevant use of technical documentation and equipment
- Accuracy of terminology

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Distinguish among the main types of explosives.	– Accurate distinction according to: ▪ presentation ▪ use
B. Distinguish among the main types of blasting supplies.	– Accurate distinction between electrical and nonelectrical blasting supplies used for: ▪ priming ▪ connecting ▪ firing
C. Explain the criteria to consider in the selection of explosives.	– Accurate recognition of criteria to consider when selecting products – Taking into account: ▪ manufacturers' specifications ▪ characteristics and properties of explosives
D. Match various explosives with each step of a blasting operation.	– Accurate matching of explosives and blasting supplies with the steps of a blasting operation
E. Connect explosives to blasting supplies.	– Correct application of the connection method – Precision of connections
F. Be familiar with the principal laws and regulations governing explosives.	– Accurate recognition of principal laws and regulations

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to distinguish among the main types of explosives (A):

1. Be familiar with the various explosives manufacturers.
2. Recognize the meanings of the symbols for the chemical products most commonly used to make explosives.
3. Describe the purpose and characteristics of an explosives magazine.

Before learning to distinguish among the main types of blasting supplies (B):

4. Explain the purpose of the blasting supplies used in the initiation system of a blasting circuit.
5. Be familiar with the characteristics of the electrical and nonelectrical components of a blasting circuit.

Before learning to explain the criteria to consider in the selection of explosives (C):

6. Recognize the main chemical and physical properties of various types of explosives.

Before learning to connect explosives to blasting supplies (E):

7. Practise making various knots.
8. Use a galvanometer.

MODULE 5: PREVENTIVE MAINTENANCE FOR MINING VEHICLES

Code: 760 334 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
perform preventive maintenance on and diagnose problems in mining vehicles
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with:
  - instructions
  - minor mining vehicle problems, either real or simulated
- Using:
  - an inspection sheet
  - mining vehicles
  - manufacturers' technical manuals
  - tools, fuel, fluids and oils needed for maintenance
  - parts catalogues and manufacturers' maintenance manuals
  - class notes

GENERAL PERFORMANCE CRITERIA

- Compliance with occupational health and safety regulations
- Constant monitoring of potential for personal injury, environmental hazards and chances of equipment breakage
- Compliance with mining work rules and environmental standards regulating the disposal of used products and materials
- Correct use of tools and materials
- Correct use of work techniques

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Check the overall condition of mining vehicles.	– Thorough inspection of all parts (wheels, rims, tracks, etc.) and accessories – Accurate detection of any breakage or excessive wear and tear – Accurate assessment of the condition and working order of vehicle parts and accessories – Appropriate choice of parts and tools needed to make repairs – Repairs made according to manufacturers' specifications
B. Perform maintenance on the engine.	– Compliance with manufacturers' specifications with regard to: ▪ checking the oil level ▪ checking for leaks (fuel, fluids, antifreeze, oil, etc.) ▪ checking the condition of any belts
C. Perform maintenance on the fuel system.	– Compliance with manufacturers' specifications with regard to: ▪ checking the fuel level ▪ maintenance ▪ fill fuel tank ▪ purge any water ▪ detecting leaks
D. Perform maintenance on the exhaust system.	– Compliance with manufacturers' specifications with regard to: ▪ using a clogging indicator to check the air filter, muffler, exhaust assembly, turbocompressor and check valve ▪ checking the exhaust system for leaks ▪ maintenance, that is, cleaning or replacing the air filter

FIRST-LEVEL OPERATIONAL OBJECTIVE **BEHAVIOURAL OBJECTIVE**	
E. Perform maintenance on the cooling system.	– Compliance with manufacturers' specifications with regard to: ▪ checking the radiator, coolant levels, cooling fan, belts and hoses ▪ maintenance: ▪ adjust coolant level ▪ flush radiator – Impermeability of radiator hoses
F. Perform maintenance on the electrical system.	– Compliance with manufacturers' specifications with regard to: ▪ checking all dashboard lights and indicators, signal lights, lighting system and horn ▪ cleaning battery terminals ▪ replacing light bulbs
G. Perform maintenance on the hydraulic system.	– Compliance with manufacturers' specifications with regard to: ▪ checking the oil level, filters, connectors, hydraulic pipes, cylinders and valves ▪ maintenance: • adjust oil level • replace hydraulic system hoses – Impermeability of filters and pipes – Impermeability of connections
H. Perform maintenance on: • the transmission and brakes • the 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 warning lights – Compliance with manufacturers' specifications with regard to: ▪ checking for leaks ▪ inspecting snifting valves

FIRST-LEVEL OPERATIONAL OBJECTIVE **BEHAVIOURAL OBJECTIVE**	
I. 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
J. Write up the maintenance report.	– Thorough and accurate account of: ▪ any defects detected ▪ any parts to receive maintenance ▪ any components replaced – Accuracy of terminology

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to check the overall condition of mining vehicles (A):

1. Discuss the importance of a thorough inspection and careful maintenance.
2. List the main mining vehicle parts and accessories.
3. Be familiar with the main vehicle check points and most common problems.
4. List the clues indicating that a vehicle is not operating properly.
5. Be familiar with the rules regulating underground motor vehicles.
6. Use a systematic method to diagnose problems.
7. Explain the information on a material safety data sheet.
8. Understand the importance of properly handling and storing various lubricants.
9. Read the material safety data sheets for the products used (WHMIS).
10. Be familiar with the main characteristics of various types of lubricants (oil, grease) and filters.
11. Locate the lubricators for each vehicle.
12. Be familiar with the various types of autolubrication systems.

Before learning to perform maintenance on the engine (B):

13. Briefly explain how an engine operates.
14. Locate the main exterior engine components.
15. List the main principles of engine maintenance.
16. List the clues indicating that an engine is not operating properly.
17. Be familiar with engine servicing and check points.
18. Be aware of the hazards associated with the use of chemical products.

Before learning to perform maintenance on the fuel system (C):

19. Briefly explain how the main fuel system components operate.
20. Locate the main fuel system components on a vehicle.
21. Be familiar with fuel system maintenance and check points.
22. Be familiar with the main types of fuels and filters.

Before learning to perform maintenance on the exhaust system (D):

23. Briefly explain how the main exhaust system components operate.
24. Locate the main exhaust system components.
25. Be familiar with exhaust system maintenance and check points.
26. Be familiar with the clues indicating an exhaust system is not operating properly.
27. Describe the procedure to follow in the case of an overturned vehicle.
28. Be familiar with the various types of filters.
29. Be familiar with the harmful effects of exhaust and how they can be avoided.

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to perform maintenance on the cooling system (E):

30. Be familiar with the various engine cooling methods.
31. Be familiar with the various types of liquid coolants used in the mining industry.
32. Be familiar with cooling and climate control system maintenance and check points.
33. Be familiar with the various mixtures of coolant products needed for maintenance.

Before learning to perform maintenance on the electrical system (F):

34. Be familiar with the units of measure commonly used in electricity.
35. Describe the function of each main electrical system component.
36. Locate the main electrical system components on a vehicle.
37. Be familiar with the regular maintenance and check points for the charging system, starting system, lights and safety circuit.
38. Describe how to service a battery.
39. Describe how to boost an engine that will not start, depending on the voltage of the batteries.
40. Interpret the information provided by an ammeter and a voltmeter.

Before learning to perform maintenance on the hydraulic system (G):

41. Be familiar with the units of measure commonly used in hydraulics.
42. Briefly describe how the main hydraulic system components operate.
43. Locate the main hydraulic system components on a vehicle, as well as the maintenance and check points.
44. List the main principles of hydraulic system maintenance.
45. Be familiar with the capacities of various hydraulic systems.
46. Be familiar with the clues indicating a hydraulic system component has broken or worn down.

Before learning to perform maintenance on the transmission, brakes, the differential and planetary gear sets (H):

47. Briefly explain the function of each component in the transmission, brakes, the differential and planetary gear sets.
48. Be familiar with the maintenance and check points for the transmission, brakes, the differential and planetary gear sets.
49. Be familiar with the main grades and types of oil used to maintain the transmission, brakes, the differential and planetary gear sets.
50. Be familiar with the methods for bleeding the brakes.

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to inspect the fire protection systems (I):

51. Distinguish among the various types of fire protection systems.
52. Describe how the various types of fire protection systems generally operate.

Before learning to write up the maintenance report (J):

53. Know the information to include in a daily maintenance report.
54. Explain the importance of supplying accurate information about the true condition of vehicles.

MODULE 6: TRUCK AND SCISSOR LIFT

Code: 760 341 **Duration: 15 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
operate a truck and a scissor lift
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with:
  - a truck
  - a scissor lift
- Using:
  - personal protective equipment
  - tools and materials
- In a tunnel or in a ramp

GENERAL PERFORMANCE CRITERIA

- Compliance with occupational health and safety regulations and prescribed standards
- Compliance with manufacturers' specifications
- Correct use of work techniques
- Constant monitoring of the equipment's condition and working order

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Check and maintain the machinery.	– Thorough check of machinery, before and after starting the engine – Accurate reading of the information provided by signal lights and dials – Accurate detection of breakage and excessive wear and tear – Accurate assessment of machinery's condition and working order – Proper maintenance: relevance of any adjustments or repairs made – Correct use of tools – Correct use of the technique for starting the engine
B. Perform basic manoeuvres.	– Safe work area – Appropriate position in driver's seat – Coordination of manoeuvres: flow and sequence of movements – Machinery's capacity and limitations taken into account – Appropriate speed: ▪ along route followed ▪ around surrounding obstacles ▪ during manoeuvres performed – Manoeuvres performed safely when machinery driven on a slope

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
C. Drive through a tunnel or onto a ramp.	– Observance of signs, signals and the rules governing vehicular and pedestrian traffic – Appropriate use of: ▪ steering system ▪ speed range ▪ braking system ▪ controls for raising and lowering the scissor lift ▪ other controls – Manoeuvres performed safely while machinery is moving
D. Position the scissor lift.	– Accurate determination of lift position – Appropriate positioning of hydraulic jacks – Accuracy of manoeuvres – Appropriate height of platform
E. Park the machinery.	– Truck and scissor lift parked so that they are: ▪ stable ▪ out of the way of other work ▪ protected from falling or projected rocks ▪ unable to roll down a slope ▪ clean – Correct use of the technique for turning off the engine – Appropriate precautions taken when climbing into or out of the machinery

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to check and maintain the machinery (A):

1. Be familiar with the various methods of hauling ore in a mine.
2. Discuss the importance of thorough, regular checking and maintenance.
3. Match various fluids with the mechanical components requiring maintenance.

Before learning to drive through a tunnel or onto a ramp (C):

4. Be familiar with the health and safety regulations that apply to driving a truck and operating a scissor lift.

Before learning to park the machinery (E):

5. Discuss the importance of the proper storage and cleaning of machinery.

MODULE 7: HAND-HELD DRILLS

Code: 760 353 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
operate hand-held drills
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with a jackleg drill and a stoper drill
- Using:
  - personal protective equipment
  - tools and materials
- In a tunnel or stope

GENERAL PERFORMANCE CRITERIA

- Compliance with occupational health and safety regulations and prescribed standards
- Compliance with manufacturers' specifications
- Correct use of work techniques
- Correct use of tools
- Constant monitoring of the drills' condition and working order

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Check and maintain the drills and drilling accessories.	– Safe work area – Thorough check of drills and accessories – Accurate detection of breakage and excessive wear and tear – Accurate assessment of the machinery's condition and working order – Proper maintenance: relevance of any adjustments and repairs made – Neatness of work
B. Prepare the drills and drilling accessories.	– Strength of connections – Secure positioning of hoses – Drill bits properly fitted onto drill steels
C. Drill holes using: • a jackleg drill • a stoper drill	– Safe work area – Logical sequence of manoeuvres – Accuracy of manoeuvres: ▪ stability of drill ▪ adequate control of equipment – Drill holes: ▪ perpendicular to walls ▪ at pre-set depth
D. Put away the drills and accessories.	– Appropriate choice of storage location: ▪ out of the way of other work ▪ protected from falling or projected rocks – Full recovery of all bits – Cleanliness and organization of drills and accessories

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to check and maintain the drills and drilling accessories (A):

1. Explain the overall operation of a drill.
2. Discuss the importance of keeping equipment clean and in good working order.
3. Repair hoses.
4. Assess the condition of the cutting edges of various drill bits and drill steels.

Before learning to prepare the drills and drilling accessories (B):

5. Differentiate between air and water hoses.
6. Use hose clamp equipment.
7. Distinguish among various types of drill steels, based on their use.

Before learning to drill holes using:

- **a jackleg drill**
- **a stoper drill (C):**

8. Distinguish among a misfire hole, a bootleg and a cut-off hole.
9. Differentiate between normal and abnormal rock conditions.
10. Recognize various geological structures.
11. Be familiar with the effects of an overly violent thrust on the drill steel.

Before learning to put away the drills and drilling accessories (D):

12. Estimate the distances of projected rocks.
13. Discuss the importance of storing equipment and accessories in an organized manner.

MODULE 8: SCRAPER HOIST

Code: 760 362 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
operate a scraper hoist
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with a scraper hoist and its accessories
- Using:
  - personal protective equipment
  - tools and materials
- In a stope

GENERAL PERFORMANCE CRITERIA

- Compliance with occupational health and safety regulations and prescribed standards
- Correct use of work techniques
- Accurate, coordinated manoeuvres
- Correct use of tools
- Work positions appropriate to manoeuvres performed

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Check and maintain the hoist, its accessories and the drilling equipment.	– Thorough check of all equipment and accessories – Accurate detection of breakage and excessive wear and tear – Accurate assessment of equipment's condition and working order – Proper maintenance and relevance of any repairs made
B. Drill holes in order to set up the scraper hoist and its accessories.	– Proper preparation of drilling equipment – Accurate detection of misfire holes, bootlegs and cut-off holes – Appropriate choice of hole locations and drilling angle – Adequate stability and control of drill – Accuracy of the angle and depth of drill holes
C. Prepare the hoist and its accessories.	– Hose or cable: ▪ firmly attached ▪ positioned out of the way of manoeuvres – Proper installation of: ▪ safety devices ▪ anchors for pulleys ▪ pulleys ▪ steel cables – Impermeability of hose – Safety cover on ore chute
D. Perform basic manoeuvres.	– Cables properly rolled and unrolled – Absence of abrupt manoeuvres – Rubbing of cables against the walls and the muckpile reduced to an absolute minimum

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
E. Move the hoist to a new location.	– Appropriate position of anchors, pulleys and cables – Stability of anchors and shackles – Slow, controlled movement of hoist – Absence of abrupt manoeuvres
F. Put away the hoist, its accessories and the drilling equipment.	– Proper storage: ▪ out of the way of subsequent operations ▪ protected from falling rocks and water – Air hose completely emptied (if applicable) – Air hose or electrical cable completely rolled up (if necessary) – Cleanliness of machinery and accessories

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to check and maintain the hoist, its accessories and the drilling equipment (A):

1. Describe the operation of a scraper hoist.

Before learning to drill holes in order to set up the scraper hoist and its accessories (B):

2. Describe the technique for using anchor bolts.
3. Be familiar with the methods used to stabilize a hoist.
4. Use a cable cutter and cable puller.

Before learning to prepare the hoist and its accessories (C):

5. Practise making various knots.

Before learning to perform basic manoeuvres (D):

6. Specify the function of each control lever.

Before learning to move the hoist to a new location (E):

7. Describe the technique for reinforcing cables.

Before learning to put away the hoist, its accessories and the drilling equipment (F):

8. Discuss the importance of safely storing equipment.

MODULE 9: SCOOPTRAM

Code: 760 372 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
operate a scooptram
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with a scooptram
- Using:
  - tools and materials
  - personal protective equipment
- In a stope or tunnel

GENERAL PERFORMANCE CRITERIA

- Compliance with occupational health and safety regulations
- Compliance with manufacturers' specifications
- Correct use of driving techniques
- Constant monitoring of the machinery's condition and working order
- Control of the movement of the machine and the bucket

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Check and maintain the scooptram.	– Thorough check of machinery, before and after starting the engine – Accurate assessment of machinery's condition and working order – Proper maintenance: relevance of any adjustments and repairs made – Correct use of tools
B. Prepare the scooptram.	– Electrical cable securely connected and positioned out of the way of manoeuvres – Solidity of support
C. Perform basic manoeuvres.	– Safe work area – Appropriate position in driver's seat – Machinery's capacity and limitations taken into account – Coordination of manoeuvres: flow and sequence of movements – Constant attention to: ▪ unstable rocks ▪ the presence of explosives in the ore
D. Park the scooptram.	– Scooptram parked so that it is: ▪ stable ▪ out of the way of other work ▪ protected from falling or projected rocks ▪ unable to roll down a slope ▪ clean – Appropriate precautions taken when climbing into or out of the scooptram

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to check and maintain the scooptram (A):

1. Describe the overall operation of a scooptram.
2. Discuss the importance of thorough, regular checking and maintenance.
3. Recognize the various types of scooptrams.
4. Distinguish among the various fluids used in the maintenance of a scooptram.

Before learning to prepare the scooptram (B):

5. Name the main types of breakage that can affect the condition of the electrical cable.

Before learning to perform basic manoeuvres (C):

6. Be familiar with the function of each control lever.

Before learning to park the scooptram (D):

7. Discuss the importance of parking the scooptram in an appropriate location.

MODULE 10: PNEUMATIC LOADERS

Code: 760 383 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
operate pneumatic loaders
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with:
  - a track loader
  - an automatic loader
- Using:
  - tools and materials
  - personal protective equipment
- In a tunnel

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety regulations
- Compliance with manufacturers' specifications
- Constant monitoring of the machinery's condition and working order
- Control of the movement of the machine and the bucket

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Check and maintain the pneumatic loaders.	– Thorough check of machinery, before and after starting the engine – Accurate assessment of machinery's condition and working order – Careful maintenance and relevance of any repairs made – Correct use of tools
B. Prepare the loaders.	– Cables and drive mechanisms clear of any obstacles – Air hose firmly connected and positioned out of the way of manoeuvres – Solidity of step and safety device – Air hose fully inflated
C. Perform basic manoeuvres.	– Safe work area – Stability of person on platform – Machinery's capacity and limitations taken into account – Coordination of manoeuvres: flow and sequence of movements – Constant attention to: ▪ unstable rocks ▪ the presence of explosives in the ore
D. Put a track loader back onto the rails.	– Safe position within the work area – Work positions appropriate to manoeuvres performed – Correct use of tools
E. Move a track loader from one line to another.	– Safe position within the work area – Work positions appropriate to manoeuvres performed – Correct use of tools

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
F. Park the loaders.	– Air hose completely emptied – Air hose fully rolled up and securely attached – Loaders parked so that they are: ▪ stable ▪ out of the way of other work ▪ protected from falling or projected rocks – Cleanliness of machinery

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to check and maintain the pneumatic loaders (A):

1. Recognize the various types of pneumatic loaders.
2. Explain the overall operation of a pneumatic loader.

Before learning to perform basic manoeuvres (C):

3. Name the function of each control lever.
4. Describe the technique for servicing an automatic loader.
5. Describe the operation of a switch on a rail line.

Before learning to put a track loader back onto the rails (D):

6. Specify the functions of the tools used to put a loader back onto the rails.

Before learning to move a track loader from one line to another (E):

7. Be familiar with the situations that justify moving a loader to another line.

Before learning to park the loaders (F):

8. Recognize the importance of completely emptying the air hose.

MODULE 11: DRILLING PATTERNS AND BLASTING PATTERNS

Code: 760 392 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
draw up drilling patterns and blasting patterns
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with:
  - a questionnaire
  - drilling patterns
  - blasting patterns
- Using:
  - technical specifications for explosives
  - drawing materials

GENERAL PERFORMANCE CRITERIA

- Accurate recognition of the characteristics of the development heading
- Accurate recognition of how the drilling pattern data is related to the blasting pattern data
- Feasibility of drilling patterns and blasting patterns

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Read: • geological plans • mine plans	– Accurate recognition of the meaning of symbols, codes, initialisms and abbreviations – Location of work site pinpointed
B. Determine the type of development heading.	– Careful determination of the development heading, based on: ▪ the configuration of walls ▪ the development plan
C. Determine the parameters of a simple drilling pattern.	– Valid determination that takes into account: ▪ the interpretation of the plans ▪ the desired fragmentation ▪ the drilling equipment available – Proper design of pattern – Neatness and readability of pattern
D. Select the explosives.	– Careful selection, based on: ▪ drill hole depth and diameter ▪ the type of development heading – Taking into account the explosives' characteristics and properties
E. Draw up a simple blasting pattern.	– Taking into account the drilling pattern – Proper design of pattern – Neatness and readability of pattern
F. Determine the sequence for charging the holes.	– Taking into account the data provided in the drilling pattern and blasting pattern – Appropriate distribution of: ▪ detonators ▪ blasting accessories ▪ explosives

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to read:

- **geological plans**
- **mine plans (A):**

1. Explain how drawing up geological and mine plans fits into the various steps of a drilling operation.
2. Name the types of plans used in mining.
3. Use the conversion tables for SI and imperial units of measure.

Before learning to determine the type of development heading (B) and determine the parameters of a simple drilling pattern (C):

4. Calculate areas and volumes.
5. Draw diagrams of the drill holes.
6. Describe the relationships among the diameter of the drill holes, the sizes of the rock fragments and the height of the development heading.
7. Discuss how the spacing and loading of drill holes affects the walls and rock fragmentation.
8. Be familiar with the function of the cut in blasting a round.
9. Distinguish among the various types of cuts.

Before learning to select the explosives (D):

10. Describe how the type of explosive affects the size of the rock fragments.
11. Explain the importance of handling detonators with care.

Before learning to draw up a simple blasting pattern (E):

12. Review the steps in the rock fragmentation process.

MODULE 12: SCAFFOLD CONSTRUCTION

Code: 760 402 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
construct scaffolds
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with:
  - instructions
  - construction materials
- Using:
  - personal protective equipment
  - a hand-held drill and drilling accessories
  - various tools
- In a stope or tunnel developed for this purpose

GENERAL PERFORMANCE CRITERIA

- Compliance with occupational health and safety regulations and prescribed standards
- Correct use of work techniques
- Appropriate use of materials, tools and equipment
- Work positions appropriate to manoeuvres performed
- Attention to detail and accuracy so as to ensure worker safety

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Select a site for assembling: • a ladder scaffold	– Careful selection of the site, based on the configuration of the walls and the height of the muckpile – Precise determination of the location of ladders
• a hanging scaffold	– Precise determination of the height of the anchors and the length of the chains
B. Prepare the drill and drilling accessories.	– Thorough check and appropriate maintenance – Solidity and impermeability of connections – Drill bit properly fitted onto the drill steel
C. Prepare to construct: • a hanging scaffold	– Careful selection of the drill hole location and the drilling angle – Accuracy of manoeuvres: ▪ stability of drill ▪ adequate control of the drill – Drill holes bored at the pre-set depth and angle
• a ladder scaffold	– Appropriate clearing of the ground at the base of the ladders
D. Assemble: • a ladder scaffold	– Appropriate cut of wood pieces: ▪ ladders ▪ putlogs ▪ planks – Appropriate arrangement of planks – Putlogs at correct height and in a horizontal position – Solidity of planks and anchors – Solidity, stability and horizontality of scaffold

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
• a hanging scaffold	– Appropriate cut of putlogs and planks – Putlogs at correct height and in a horizontal position – Appropriate arrangement and solidity of planks – Solidity of anchors – Chains of an appropriate length – Solidity, stability and horizontality of scaffold
E. Secure the scaffolds and guardrails.	– Absence of lateral movements – Appropriate selection of location for guardrail – Solidity of guardrails
F. Disassemble the scaffolds.	– Logical disassembly sequence – Complete disassembly – Absence of protruding nails
G. Put away the materials, tools and equipment.	– Proper storage: ▪ out of the way of other work ▪ protected from breakage and falling rocks

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to prepare to construct:
- **a hanging scaffold**
- **a ladder scaffold (C):**

1. Discuss the importance of properly preparing the site for the assembly of a scaffold.
2. Describe the technique for handling heavy objects.
3. Detect the presence of explosives in the rock back and walls.

Before learning to assemble:
- **a ladder scaffold**
- **a hanging scaffold (D):**

4. Recognize the types of anchors and what they are used for.
5. Review the technique for using anchor bolts.

Before learning to secure the scaffolds and guardrails (E):

6. Specify the purpose of the guardrails.
7. Recognize the importance of stable scaffolds.

MODULE 13: JUMBO DRILL

Code: 760 413 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
operate a jumbo drill
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with:
  - instructions
  - a jumbo drill
- Using:
  - personal protective equipment
  - tools and materials
- In a tunnel

GENERAL PERFORMANCE CRITERIA

- Compliance with occupational health and safety regulations and prescribed standards
- Compliance with manufacturers' specifications
- Correct use of work techniques
- Constant monitoring of the jumbo drill's condition and working order
- Adequate control of the machinery's movements and the drill manoeuvres

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Check and maintain the machinery.	– Safe work area – Thorough check of machinery, before and after starting the engine – Accurate detection of breakage and excessive wear and tear – Accurate assessment of machinery's condition and working order – Proper maintenance: relevance of any adjustments and repairs made – Correct use of tools – Neatness of work – Correct use of the technique for starting the engine
B. Perform basic manoeuvres with the machinery.	– Safe work area – Appropriate position in driver's seat – Logical sequence of operations – Sensitivity of the hydraulic controls taken into account – Coordination of manoeuvres: flow and sequence of movements – Appropriate adjustment of engine speed and speed according to: ▪ surrounding obstacles ▪ manoeuvres to be performed – Manoeuvres performed safely when the jumbo is driven on a sloped site
C. Drive through a tunnel with a jumbo drill.	– Observance of signs, signals and the rules governing vehicular and pedestrian traffic – Appropriate use of: ▪ steering system ▪ speed range ▪ other controls – Safe and precise manoeuvres

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
D. Position the equipment.	– Work area clear and secure – Coordination of manoeuvres and accuracy of movements – Appropriate distance between the boom and the development heading – Correct positioning of hydraulic jacks – Safe and accurate manoeuvres – Correct use of the technique for turning off the engine
E. Prepare the equipment for drilling.	– Solidity of connections – Hoses and electrical wires in a safe position – Proper fitting of: ▪ the siphon ▪ the drill rod in the drill chuck ▪ the drill bit on the drill rod
F. Activate the jumbo drill's controls.	– Appropriate position in driver's seat – Sensitivity of the hydraulic controls taken into account – Coordination of manoeuvres and flow of movements – Safe manoeuvres near the back and walls – Boom positioned according to the angle of the development heading
G. Drill holes.	– Safe work area – Logical sequence of drilling operations – Accuracy of manoeuvres: ▪ stability of the boom ▪ adequate control of the drill – Drill holes drilled according to: ▪ pre-set drilling angle ▪ pre-set depth

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
H. Park the jumbo drill.	– Jumbo drill parked so that it is: ▪ stable ▪ out of the way of other work ▪ protected from falling and projected rocks ▪ clean – Correct use of the technique for turning off the engine – Appropriate precautions taken when climbing into or out of the machinery

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to check and maintain the machinery (A):

1. Recognize the types of jumbo drills and their accessories.
2. Explain the overall operation of a jumbo drill.
3. Match various fluids with the components requiring maintenance.

Before learning to position the equipment (D):

4. Explain the purpose of survey points for alignment.

Before learning to prepare the equipment for drilling (E):

5. Describe the operation of a siphon.

Before learning to drill holes (G):

6. Describe the effects of an overly violent thrust on the drill steel.

MODULE 14: LONG-HOLE DRILL

Code: 760 424 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
operate a long-hole drill
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with:
  - instructions
  - a long-hole drill and drilling accessories
- Using:
  - personal protective equipment
  - tools and materials
- In a stope, sublevel or tunnel

GENERAL PERFORMANCE CRITERIA

- Compliance with occupational health and safety regulations and prescribed standards
- Compliance with manufacturers' specifications
- Correct use of work techniques
- Constant monitoring of the long-hole drill's condition and working order
- Correct use of tools
- Adequate control over the machinery's movements and the drill manoeuvres

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Assemble various components of the drilling equipment.	– Safe work area – Appropriate organization of components – Logical assembly sequence – Appropriate location of drill on sliding carriage, based on drilling pattern – Solidity of assembly – Hoses connected to the correct drill components
B. Prepare the drill and accessories.	– Solidity of connections – Hoses in a safe position – Correct position of control levers – Appropriate choice of bit – Drill bit properly fitted onto the drill steel – Drill is operational and safe
C. Check and maintain the drill and its accessories.	– Thorough check of machinery – Accurate detection of breakage and excessive wear and tear – Accurate assessment of machinery's condition and working order – Proper maintenance: relevance of any adjustments and repairs made – Neatness of work
D. Position the long-hole drill.	– Appropriate preparation of ground – Operator located in a safe place – Appropriate use of control levers – Careful positioning of drill, based on: ▪ survey points for alignment ▪ configuration of walls – Correct position of: ▪ hydraulic jacks ▪ drill on crossbar – Sliding carriage arranged according to pre-set angle – Logical sequence of operations – Long-hole drill: ▪ stable ▪ positioned according to pre-set angles

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
E. Activate the drill controls.	– Appropriate position at the controls – Manoeuvres coordinated, flowing and accurate
F. Install the casing: drill a hole for the casing and secure the pipe.	– Appropriate position at the controls – Accuracy and precision of manoeuvres – Constant checking of the stability of the hydraulic jacks – Drill hole bored according to: ▪ pre-set angle ▪ pre-set depth – Logical sequence of operations – Appropriate choice of bit – Proper fitting of drill bit and drill rod – Appropriate positioning of pipe in drill hole collar – Gradual insertion of pipe in drill hole collar – Solidity of casing
G. Drill holes.	– Appropriate position at the controls – Accuracy and precision of manoeuvres – Constant checking of the stability of the hydraulic jacks and the drill's working order – Drill holes drilled according to: ▪ pre-set angles ▪ pre-set depth – Logical sequence of operations
H. Disassemble various components of the drilling equipment.	– Logical disassembly sequence – Hoses completely emptied and rolled up – Drill put away for later work – Cleanliness of equipment and accessories

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to assemble various components of the drilling equipment (A):

1. Explain the overall operation of a long-hole drill.
2. Explain the conditions for using a long-hole drill in a mine.

Before learning to prepare the drill and accessories (B):

3. Recognize the purpose of various types of drill bits.

Before learning to check and maintain the drill and its accessories (C):

4. Match various fluids with the components requiring maintenance.

Before learning to position the long-hole drill (D):

5. Review the purpose of survey points for alignment.
6. Use a magnetic clinometer.

Before learning to install the casing: drill a hole for the casing and secure the pipe (F):

7. Be familiar with the purpose of the casing.

MODULE 15: BACK AND WALL SCALING

Code: 760 434 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
scale a back and walls
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with instructions and technical data
- Using:
  - scaling bars of varying lengths
  - a water hose
  - a scissor lift
  - personal protective equipment
- Following a recent blasting operation

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety regulations
- Compliance with work techniques and prescribed standards
- Work positions appropriate to manoeuvres performed
- Methodical work and attention to detail

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Become familiar with the work to be performed.	– Appropriate recognition of: ▪ type of work to be done ▪ potential dangers and safety measures ▪ safety regulations and applicable standards
B. Plan the work.	– Brief evaluation of blasting results: ▪ rock fragmentation ▪ distribution of ore on the ground – Thorough examination of walls and back – Meticulous search for the presence of misfire holes, bootlegs and cut-off holes – Detailed definition of scaling sequence – Appropriate choice of scaling bars
C. Check and maintain the equipment and accessories used for the washing and scaling.	– Thorough check of equipment and accessories – Accurate detection of breakage and excessive wear and tear – Correct use of tools – Careful maintenance and relevance of any repairs made
D. Prepare the equipment and accessories.	– Solidity and impermeabilty of connections between the hose, joints and clamps
E. Perform the work: • set up the equipment and wash the rock (back and walls)	– Careful choice of location for equipment and hydraulic jacks – Precision of manoeuvres – Platform at 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

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
	– Maximum removal of dust – Thorough washing of misfire holes, bootlegs and cut-off holes
• check the condition of the back and walls after washing	– Thorough check of area to be scaled: ▪ detection of dangerous ground conditions ▪ precise determination of location of misfire holes, bootlegs and cut-off holes – Valid determination of steps to be taken to make work area safe – Exact determination of number of misfire holes, bootlegs and cut-off holes to be reloaded
• 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 ▪ presence of fissures in the rock ▪ sudden changes in the configuration of the back and walls – Relevance of decision to: ▪ continue work ▪ reload misfire holes, bootlegs and cut-off holes ▪ stop the work
• sound the rock	– Appropriate choice of escape route – Appropriate choice of starting point of the sounding and the route to follow, given work area characteristics – 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

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
• detach the loose rock fragments from the rock mass	– Taking into account: ▪ scaling limitations of the different types of rock ▪ physical abilities – Absence of rock fragments in work area
F. 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
G. Report on the work performed.	– Clear and precise communication 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

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to become familiar with the work to be performed (A):

1. Recognize the importance of fully understanding all instructions.

Before learning to plan the work (B):

2. Recognize the importance of rigorously planning for the work.
3. Distinguish between a failed blasting operation and a successful blasting operation.

Before learning to check and maintain the equipment and accessories used for washing and scaling (C):

4. List the primary causes of broken or worn-out washing and scaling equipment and accessories.
5. Recognize the various types of hoses and supply lines used in a mine.

Before learning to perform the work:
- **set up the equipment and wash the rock (back and walls)**
- **check the condition of the back and walls after washing**
- **determine whether it is appropriate to continue the scaling operation**
- **sound the rock**
- **detach loose rock fragments from the rock mass (E):**

6. Explain the operation of a mine's air and water supply system.
7. Explain the procedure to follow when a misfire or cut-off hole is found.
8. Be familiar with the effects of rock washing on certain geological structures.
9. Apply the leverage principle.

Before learning to report on the work performed (G):

10. Discuss the importance of effective communication among work crews.

MODULE 16: MUCKING ORE

Code: 760 444 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
muck ore
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with mucking equipment or machinery and accessories
- Using:
  - tools and equipment
  - personal protective equipment
- In a stope or tunnel
- Following the blasting and scaling of a specific work area

GENERAL PERFORMANCE CRITERIA

- Compliance with occupational health and safety regulations and prescribed standards
- Correct use of work techniques
- Work positions appropriate to manoeuvres performed
- Coordinated, precise manoeuvres
- Capacity and limitations of the equipment and machinery taken into account

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Become familiar with the work to be performed.	– Appropriate recognition of: ▪ type of work to be done ▪ potential dangers and safety measures ▪ applicable standards and safety regulations
B. Plan the work.	– Brief evaluation of blasting results – Precise determination of the mucking sequence, based on work area characteristics – Precise determination of location of misfire or cut-off holes – Appropriate choice of location for air hose and electrical cable – Compliance with prescribed standards and safety regulations
C. Check and maintain the mucking equipment, accessories and machinery.	– Thorough check of equipment, machinery and accessories – Accurate assessment of condition and working order – Thorough maintenance and relevance of any repairs made – Compliance with manufacturers' specifications – Controls of the idle scooptram – Controls and drive mechanisms of the idle pneumatic loader
D. Prepare the mucking equipment, accessories and machinery.	– Scraper hoist: ▪ appropriate choice of site for set-up ▪ correct positioning and solidity of anchors ▪ proper fitting of safety devices ▪ solidity and impermeability of connections between hoses, joint and clamps ▪ accessories firmly connected ▪ appropriate position of accessories

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
	– Scooptram: • electrical cable firmly connected and secured • spring support properly fitted onto electrical cable and fastener – Pneumatic loader: • air hose firmly attached • drive mechanisms free and clear
E. Perform the work.	– Constant assessment of blasting results – Constant attention to the condition of back and walls
• using a scraper hoist	– Logical sequence of mucking operations – Manoeuvres appropriate for the characteristics of area to be mucked – Appropriate position of person in work area – Mucking of a significant amount of material
• using a scooptram: - load the bucket	– Observance of signs, signals and the rules governing vehicular and pedestrian traffic – Proper preparation of work area: absence of rocks and obstacles – Appropriate choice of angle of attack for the bucket, given the configuration of the muck pile
- haul the load	– Load balanced in bucket while being hauled – Stability of loader – Speed appropriate for conditions of route taken – Moderate loss of material

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
- dump the material and return to the loading point	– Moderate loss of material – Proper recovery of lost material – Grading suitable for route taken
• using a pneumatic loader: - position the loader and load the bucket	– Appropriate position at the controls – Constant attention to position of air hose – Proper preparation of work area: ▪ absence of rocks and obstacles ▪ filling of holes – Appropriate choice of angle of attack for the bucket, given the configuration of the muck pile – Priority mucking of cleared material
- dump the material into the box and unload it	– Bucket contents properly checked before dumping – Moderate loss of material – Appropriate positioning of: ▪ operator at controls ▪ loader ▪ the box, before handling controls – Gradual opening of cylinder supply valve
- return to the loading point	– Grading suitable for route taken – Bucket at appropriate height – Proper recovery of lost material – Correct filling of holes
• using a pneumatic track loader	– Appropriate position at controls – Constant attention to position of air hose

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
- position the loader and load the bucket	– Proper preparation of work area: ▪ track properly cleared ▪ absence of rocks and obstacles – Appropriate choice of angle of attack for the bucket, given the configuration of the muck pile – Priority mucking of cleared material
- dump the material and return to the loading point	– Stability of loader – Load balanced in bucket – Bucket contents properly checked before dumping – Proper recovery of lost material
F. Clear the work area.	– Proper storage of equipment, accessories and machinery so that they are: ▪ out of the way of other work ▪ unable to roll down the incline ▪ protected from projected or falling rocks
G. Report on the work performed.	– Clear and precise communication 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

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to become familiar with the work to be performed (A):

1. Be familiar with the overall operation of a mine.

Before learning to check and maintain the mucking equipment, accessories and machinery (C):

2. Describe the drive mechanisms of mucking machinery.

Before learning to perform the work:

- **using a scraper hoist**
- **using a scooptram:**
  - **load the bucket**
  - **haul the load**
  - **dump the material and return to the loading point**
- **using a pneumatic loader:**
  - **position the loader and load the bucket**
  - **dump the material into the box and unload it**
  - **return to the loading point**
- **using a pneumatic track loader:**
  - **position the loader and load the bucket**
  - **dump the material and return to the loading point (E):**

3. Explain the technique for reinforcing a steel cable.
4. Recognize the importance of spraying the ore.

Before learning to report on the work performed (G):

5. Describe the mechanisms for controlling the amount of ore mucked.

MODULE 17: HAULING ORE

Code: 760 452 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
haul ore
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with:
  - instructions
  - a truck
- Using:
  - personal protective equipment
  - tools and equipment
- In a tunnel or on a ramp
- Following the blasting, washing and scaling of a specific work area

GENERAL PERFORMANCE CRITERIA

- Compliance with occupational health and safety regulations and prescribed standards
- Correct use of work techniques
- Work positions appropriate to manoeuvres performed
- Coordinated, precise manoeuvres
- Methodical work and attention to detail

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Become familiar with the work to be performed.	– Appropriate recognition of: ▪ type of work to be done ▪ potential dangers and safety measures ▪ applicable standards and safety regulations
B. Plan the work.	– Precise determination of: ▪ dumping point ▪ route to take ▪ sequence of transportation operations – Compliance with prescribed standards and safety regulations
C. Check and maintain the truck.	– Thorough and accurate examination of vehicle – Accurate assessment of condition and working order – Proper maintenance: relevance of any adjustments and repairs made – Compliance with manufacturers' specifications
D. Perform the work: • position the truck for loading	– Appropriate precautions during manoeuvres – Proper approach to loading point and correct positioning of truck
• advance to the dumping point	– Observance of signs, signals and the rules governing vehicular and pedestrian traffic – Appropriate use of controls: ▪ steering system ▪ speed range – Safe manoeuvres while truck is driven on an incline
• dump the material	– Proper approach to dumping point and correct positioning of truck – Without excessive loss of material

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
E. Clear the work area.	– Truck parked so that it is: ▪ out of the way of other work ▪ unable to roll down the incline ▪ protected from projected or falling rock – Cleanliness of equipment
F. Report on the work performed.	– Clear and precise communication of information on: ▪ the condition of the work area and equipment after the ore is hauled ▪ the presence of potential dangers along the route ▪ the equipment required by the next crew for subsequent work – Accurate terminology

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to plan the work (B):

1. Discuss the importance of underground signs and signals.
2. Explain the steps involved in hauling material from the stope to the processing plant.

Before learning to perform the work:

- **position the truck for loading**
- **advance to the dumping point**
- **dump the material (D):**

3. Recognize the consequences of overloading a truck.
4. Describe the technique used to park a truck on an incline.

MODULE 18: BACK AND WALL BOLTING

Code: 760 464 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
bolt a back and walls
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with:
  - instructions
  - a bolting plan
- Using:
  - tools and equipment
  - personal protective equipment
  - hand-held drills and drilling accessories
  - a scissor lift
- Following a blasting operation in a stope or tunnel
- Following the washing and scaling of the back and walls

GENERAL PERFORMANCE CRITERIA

- Compliance with occupational health and safety regulations and prescribed standards
- Correct use of work techniques
- Work positions appropriate to manoeuvres performed
- Coordinated, precise manoeuvres
- Methodical work and attention to detail
- Clear and precise communication among members of work crew

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Become familiar with the work to be performed.	– Appropriate recognition of: ▪ type of work to be done ▪ characteristics of bolting plan ▪ potential dangers and safety measures ▪ applicable standards and safety regulations
B. Plan the work.	– Appropriate choice of reinforcement method(s), based on the condition of the back and walls – Precise determination of the dimensions of the area to be bolted – Accurate assessment of the number of bolts needed, based on: ▪ the bolting plan ▪ the characteristics of the area to be bolted – Appropriate choice of equipment, accessories and types of scaffolds – Precise determination of bolting sequence – Compliance with prescribed standards and safety regulations
C. Check and maintain the drilling equipment and accessories.	– Compliance with manufacturers' specifications – Thorough check of equipment and accessories – Accurate detection of any breakage or excessive wear and tear – Accurate assessment of condition and working order – Careful maintenance and relevance of any repairs made
D. Prepare the bolting equipment and accessories.	– Solidity of connections – Proper fitting of metal plates and nuts onto bolts

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
E. Construct the scaffold or position the scissor lift.	– Proper choice of the location of the scaffold or scissor lift – Solidity, stability and horizontality of scaffold – Correct position of hydraulic jacks
F. Perform the work: • drill holes for the bolts	– Drill holes: ▪ perpendicular to wall ▪ at pre-set depth – Compliance with bolting plan – Coordination of manoeuvres – Scissor lift platform at appropriate height
• insert the bolts	– Logical sequence of operations – Bolts: ▪ attached firmly ▪ at recommended tension
G. Clear the work area.	– Appropriate choice of storage place – Complete recovery of all bits – Proper storage of equipment and accessories – Cleanliness of equipment
H. Report on the work performed.	– Clear and precise communication of pertinent information – Accuracy of terminology

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to plan the work (B):

1. Name the features of each reinforcement method.
2. Establish a relationship between a bolting plan and the condition of the back and walls.

Before learning to check and maintain the drilling equipment and accessories (C):

3. Review the causes of breakage and excessive wear and tear of drill bits and drill steels.

Before learning to prepare the bolting equipment and accessories (D):

4. Review the technique for handling heavy objects.

Before learning to perform the work:
- **drill holes for the bolts**
- **insert the bolts (F):**

5. Detect the presence of explosives in the back or walls.

Before learning to clear the work area (G):

6. Be familiar with the operations that must be carried out before the drilling equipment and accessories can be put away.

MODULE 19: STOPE DRILLING

Code: 760 474 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
drill in a stope
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with:
  - instructions
  - a drilling pattern
- Using:
  - personal protective equipment
  - hand-held drills and drilling accessories
  - tools and equipment
- In a stope or tunnel

GENERAL PERFORMANCE CRITERIA

- Compliance with occupational health and safety regulations and prescribed standards
- Correct use of work techniques
- Work positions appropriate to manoeuvres performed
- Methodical work and attention to detail
- Ability to work independently
- Clear and precise communication among members of work crew

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Become familiar with the work to be performed.	– Appropriate recognition of: ▪ type of work to be done ▪ potential dangers and safety measures ▪ applicable standards and safety regulations
B. Plan the work.	– Appropriate choice of the type of development heading – Accurate assessment of the characteristics of the development heading – Precise determination of the drilling sequence – Precise determination of the number of holes to be drilled – Appropriate choice of drill steels
C. Check and maintain the drilling equipment and accessories.	– Compliance with manufacturers' specifications – Thorough check of equipment and accessories – Accurate assessment of condition and working order – Thorough maintenance and relevance of any repairs made – Cleanliness of equipment
D. Prepare the drills and drilling accessories.	– Impermeability of hoses and accessories – Solidity of connections between hoses, clamps and joints – Correct use of tools – Drill bit fitted properly onto the drill steel
E. Construct the scaffold.	– Appropriate choice of the type and location of scaffold – Solidity, stability and horizontality of scaffold

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
F. Perform the work:	– Constant monitoring of the state of the work area – Appropriate scaling of loose rock fragments
• mark all misfire holes, cut-off holes and bootlegs	– Accurate marking
• shoot lines and mark up the drilling pattern	– Precise determination of the height and direction of the development heading – Accurate definition of the drilling pattern, based on: ▪ the type of development heading to be drilled ▪ the drills used ▪ the rock conditions – Accurate marking of the dimensions from the drilling pattern – Visibility of drilling pattern
• connect the equipment	– Appropriate position of equipment – Stability of drill – Solidity of connections – Impermeability of hoses and connections
• drill holes	– Logical sequence of operations – Compliance with drilling pattern – Manoeuvres coordinated and precise
G. Clear the work area.	– Appropriate choice of storage place – Complete recovery of all bits – Proper storage of equipment and accessories – Cleanliness of equipment and accessories
H. Report on the work performed.	– Clear and precise communication of relevant information – Accuracy of terminology

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to plan the work (B):

1. Briefly describe the various mining techniques.
2. Distinguish among various drilling patterns.
3. Locate a stope on a plan.

Before learning to perform the work:

- **mark all misfire holes, cut-off holes and bootlegs**
- **shoot lines and mark up the drilling pattern**
- **connect the equipment**
- **drill holes (F):**

4. Use various types of instruments for measuring length.

MODULE 20: PREPARATION FOR BLASTING A DEVELOPMENT HEADING

Code: 760 482 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
prepare to blast a development heading
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with:
  - instructions
  - technical data
- Using:
  - personal protective equipment
  - explosives
  - tools and a blasthole loader
- After drilling in a stope

GENERAL PERFORMANCE CRITERIA

- Compliance with occupational health and safety regulations and prescribed standards
- Correct use of work techniques
- Work positions appropriate to manoeuvres performed
- Methodical and precise work
- Clear and precise communication among members of work crew

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Become familiar with the work to be performed.	– Appropriate recognition of: ▪ type of work to be done ▪ potential dangers and safety measures ▪ applicable standards and safety regulations
B. Plan the work.	– Thorough inspection of the site – Precise determination of the sequence of operations – Appropriate choice of equipment and quantity of explosives – Compliance with manufacturers' specifications – Appropriate choice of location for the blasthole loader
C. Check and maintain the equipment.	– Thorough check of equipment – Thorough maintenance and relevance of any repairs made
D. Prepare the equipment.	– Firmly connected blasthole loader – Correct use of tools
E. Perform the work: • check the condition of the drill holes and clean them	– Constant monitoring of the state of the work area – Thorough cleaning of holes – Openings of holes completely clear – Checking of alignment of holes – Proper scaling of loose rock fragments
• load the holes	– Compliance with manufacturers' specifications – Proper loading of holes – Precise positioning of detonators
• connect the components of the blasting circuit	– Proper positioning of the blasting switch – Proper unrolling of: – detonating cord – electrical wires and cables

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
	– Proper connecting of: ▪ shock tubes to detonating cord ▪ electrical wires to electrical cable ▪ electric detonator to electrical wires ▪ electric detonator to detonating cord – Careful check of circuit continuity: ▪ through the lead wire ▪ through the electric detonator
• connect the blasting circuit	– Correct insertion of blasting switch into outlet
• ventilate the work area	– Proper installation of fan
F. Clear the work area.	– Complete recovery of excess or spilled explosives and detonators from the work area – Proper storage of: ▪ explosives and detonators in magazine ▪ equipment
G. Report on the work performed.	– Clear and precise communication of relevant information – Accuracy of terminology

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to plan the work (B):

1. Describe the power supply system of the blasting circuit.

Before learning to perform the work:

- **check the condition of the drill holes and clean them**
- **load the holes**
- **connect the components of the blasting circuit**
- **connect the blasting circuit**
- **ventilate the work area (E):**

2. Recognize the function of each drill hole in the development heading as it relates to the blasting operation.
3. Describe the relationship between the delay detonators and the drill holes.
4. Describe the technique for using a galvanometer.
5. Be familiar with the methods used to dispose of explosives spilled in a work area.

MODULE 21: DRILLING A TUNNEL ROUND

Code: 760 494 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
drill a tunnel round
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with:
  - instructions
  - a drilling pattern
- Using:
  - personal protective equipment
  - drilling equipment and accessories
  - tools and equipment
- In a tunnel
- Following the bolting of the back and walls

GENERAL PERFORMANCE CRITERIA

- Compliance with occupational health and safety regulations and prescribed standards
- Correct use of work techniques
- Work positions appropriate to manoeuvres performed
- Methodical and precise work
- Attention to detail
- Ability to work independently
- Clear and precise communication among members of work crew

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Become familiar with the work to be performed.	– Appropriate recognition of: ▪ type of work to be done ▪ potential dangers and safety measures ▪ applicable standards and safety regulations
B. Plan the work.	– Accurate assessment of the characteristics of the development heading – Appropriate choice of type of cut – Precise determination of the drilling sequence – Precise determination of the number of holes to be drilled – Appropriate choice of drill steels – Compliance with prescribed standards and safety regulations
C. Check and maintain the drilling equipment and accessories.	– Thorough check of equipment and accessories – Accurate detection of breakage and excessive wear and tear – Accurate assessment of condition and working order – Thorough maintenance and relevance of any repairs made
D. Prepare the drilling equipment and accessories.	– Solidity and impermeability of connections between hoses, joint and clamps – Appropriate position of siphon – Drill bit properly fitted onto the drill steel – Correct use of tools
E. Perform the work: • dig a ditch	– Constant attention to the back and walls during work – Appropriate scaling of rock fragments – Appropriate choice of position within the work area – Appropriate positioning of pipe – Logical sequence of operations – Conformity of ditch with prescribed standards

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
• set up the drilling platform, if necessary	– Appropriate location and horizontality of platform – Stability of platform and wheels – Accuracy of manoeuvres
• position the machinery	– Appropriate choice of location for machinery – Stability of jumbo drill
• mark the drill holes and the cut	– Accurate marking of: ▪ misfire holes ▪ cut-off holes ▪ bootlegs ▪ the cut
• shoot lines and mark up the drilling pattern	– Precise determination of: ▪ the position of the survey points in the development heading ▪ the direction of the development heading – Logical sequence of operations – Accurate marking of the dimensions from the drilling pattern – Precision of the grid – Appropriate choice of location for the cut – Visibility of drilling pattern
• drill holes using: - hand-held drills	– Compliance with drilling pattern – Adequate control of drill – Appropriate position of hands and feet – Coordinated and precise manoeuvres
- a jumbo drill	– Appropriate use of control levers – Coordinated and precise manoeuvres

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
F. Clear the work area.	– Appropriate choice of storage place – Complete recovery of all bits – Proper storage of equipment and accessories – Cleanliness of equipment and accessories
G. Report on the work performed.	– Clear and precise communication of relevant information – Accuracy of terminology

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to plan the work (B):

1. Match the different types of cuts with various geological structures.
2. Locate a tunnel on the mine plan.

Before learning to perform the work:

- **dig a ditch**
- **set up the drilling platform, if necessary**
- **position the machinery**
- **mark the drill holes and the cut**
- **shoot lines and mark up the drilling pattern**
- **drill holes using:**
  - **hand-held drills**
  - **a jumbo drill (E):**

3. Recognize how the leverage principle can be applied to drilling operations.

MODULE 22: PREPARATION FOR BLASTING ROUNDS

Code: 760 502 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
prepare to blast rounds
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with:
  - instructions
  - technical data
- Using:
  - a blasthole loader
  - explosives
  - tools
  - personal protective equipment
- In a stope, after drilling a round off

GENERAL PERFORMANCE CRITERIA

- Compliance with occupational health and safety regulations and prescribed standards
- Correct use of work techniques
- Work positions appropriate to manoeuvres performed
- Ability to work independently
- Methodical and precise work
- Clear and precise communication among members of work crew

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Become familiar with the work to be performed.	– Appropriate recognition of: ▪ type of work to be done ▪ potential dangers and safety measures ▪ applicable standards and safety regulations
B. Plan the work.	– Thorough inspection of the site – Precise determination of the sequence of operations – Appropriate choice of equipment and quantity of explosives – Compliance with manufacturers' specifications – Appropriate choice of location for the blasthole loader
C. Check and maintain the equipment.	– Thorough check of equipment – Thorough maintenance and relevance of any repairs made
D. Prepare the equipment.	– Blasthole loader securely connected – Correct use of tools
E. Perform the work: • check the condition of the drill holes and clean them	– Constant monitoring of the state of the work area – Thorough cleaning of holes – Openings of lifter holes completely clear – Checking of alignment of holes – Openings of holes completely clear – Appropriate scaling of rock fragments
• load the holes	– Compliance with manufacturers' specifications – Appropriate loading of holes – Precise positioning of detonators
• connect the components of the blasting circuit	– Appropriate positioning of the blasting switch – Proper unrolling of: • detonating cord • electrical wires and cables

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
	– Proper connecting of: ▪ shock tubes to detonating cord ▪ electrical wires to electrical cable ▪ electric detonator to electrical wires ▪ electric detonator to detonating cord – Careful check of circuit continuity: ▪ through the lead wire ▪ through the electric detonator
• connect the blasting circuit	– Correct insertion of blasting switch into outlet
• ventilate the work area	– Proper installation of fan
F. Clear the work area.	– Complete recovery of excess or spilled explosives and detonators from the work area – Proper storage of: ▪ explosives and detonators in magazine ▪ equipment
G. Report on the work performed.	– Clear and precise communication of relevant information – Accuracy of terminology

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

Before learning to plan the work (B):

1. Differentiate among the various types of cuts.

Before learning to perform the work:

- **check the condition of the drill holes and clean them**
- **load the holes**
- **connect the components of the blasting circuit**
- **connect the blasting circuit**
- **ventilate the work area (E):**

2. Recognize the function of each drill hole in the round.
3. Describe the relationship between the detonators and the drill holes.

MODULE 23: LAYING RAILWAY TRACKS

Code: 760 522 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
lay railway tracks
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working with:
  - instructions
  - technical data
- Using:
  - personal protective equipment
  - a pneumatic track loader
  - rails and ties
  - tools and equipment
- In a tunnel
- Following the washing, scaling and clearing of an area suitable for laying railway tracks

GENERAL PERFORMANCE CRITERIA

- Compliance with occupational health and safety regulations and prescribed standards
- Correct use of work techniques
- Work positions appropriate to manoeuvres performed
- Coordinated, precise manoeuvres
- Observance of time allotted to work
- Methodical work and attention to detail
- Clear and precise communication among members of work crew

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Become familiar with the work to be performed.	– Appropriate recognition of: ▪ type of work to be done ▪ potential dangers and safety measures ▪ applicable standards and safety regulations
B. Plan the work.	– Precise determination of: ▪ opportune time to begin laying the railway tracks ▪ the number and positioning of ties ▪ the positioning of the rails and the railway intersection (if necessary) – Appropriate choice of rail length – Compliance with prescribed standards and safety regulations
C. Prepare the tools and materials.	– Rails handled properly – Tools and materials properly organized – Materials hauled safely
D. Perform the work: • lay the rails and ties	– Correct use of tools – Logical sequence of operations – Appropriate levelling of ground – Horizontal ties – Rails properly positioned
• adjust and secure the rails	– Secure fastening of: ▪ nuts and bolts ▪ rails on ties ▪ side rails – Parallel layout of rails
• finish laying the railway tracks	– Railway at appropriate position and height

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
E. Clear the work area.	– Proper storage of tools and materials so that they are: ▪ out of the way of other work ▪ protected from falling or projected rocks
F. Report on the work performed.	– Clear and precise communication of relevant information – Accuracy of terminology

SECOND-LEVEL OPERATIONAL OBJECTIVES

IN ORDER TO ACHIEVE THE FIRST-LEVEL OBJECTIVE, THE STUDENTS SHOULD HAVE PREVIOUSLY ATTAINED SECOND-LEVEL OBJECTIVES, SUCH AS:

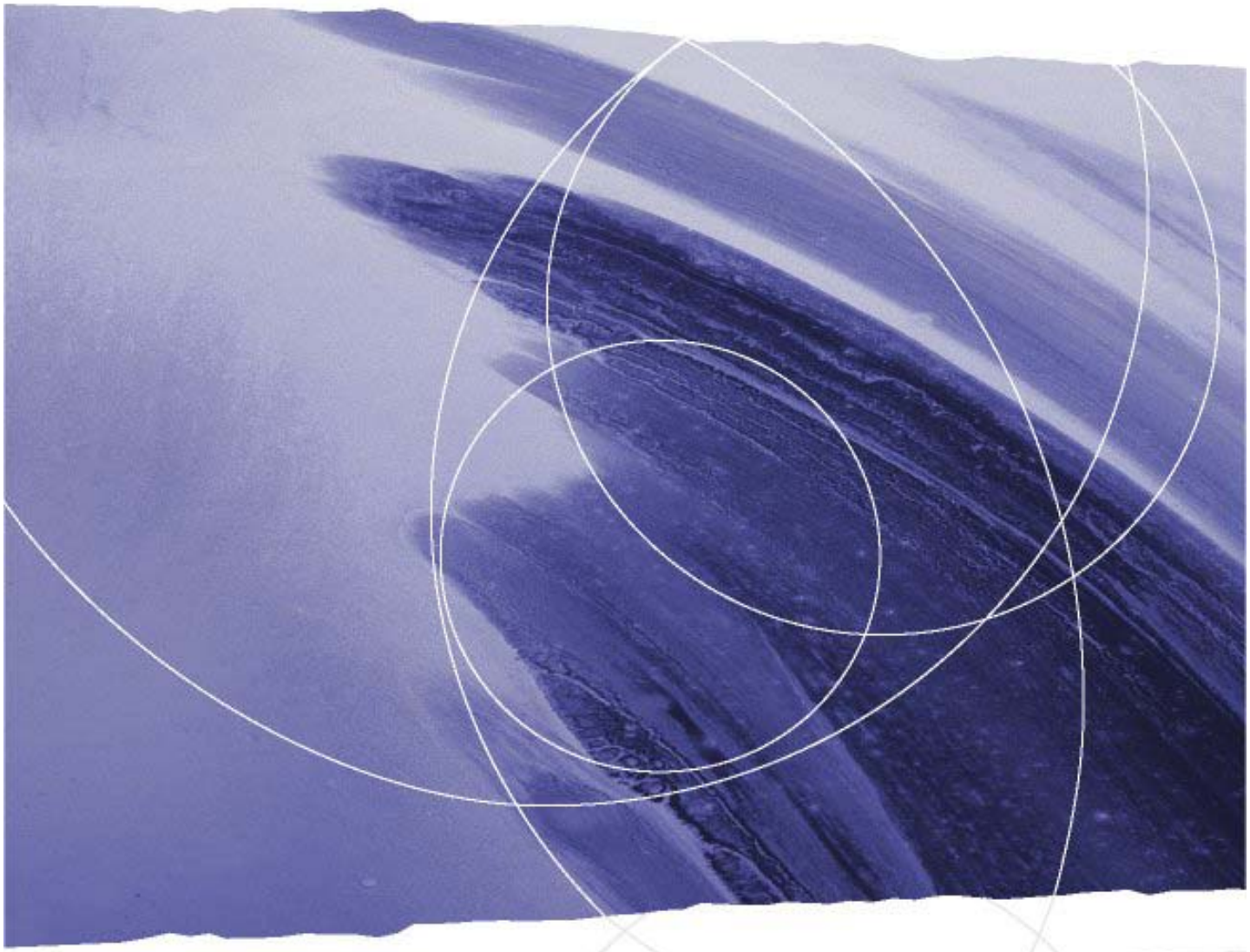
Before learning to prepare the tools and materials (C):

1. Distinguish among the various types of rails and accessories.
2. Review the steps of the technique for handling heavy objects.

Before learning to perform the work:

- **lay the ties and rails**
- **adjust and secure the rails**
- **finish laying the railway tracks (D):**

3. Recognize how the leverage principle applies to laying railway tracks.
4. Specify the widths that must be maintained between various types of rails.
5. Review the function of survey points in a tunnel for alignment.
6. Use chains when levelling the rails.



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