

Vocational Training Program

5753

Diamond Drilling

Training Sector

15

Mining
and Site Operations

Reach for
your **Dreams**

Québec 



Vocational Training Program

5753

Diamond Drilling

Training Sector

15

Mining
and Site Operations

Formation professionnelle et technique
et formation continue

Direction générale des programmes
et du développement

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MINING AND SITE OPERATIONS

DIAMOND DRILLING

PROGRAM OF STUDY 5753

The *Diamond Drilling* program leads to the Diploma of Vocational Studies (DVS) and prepares the student to work as a **Diamond Drill Operator**.

Direction générale des programmes
et du développement

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INTRODUCTION

The *Diamond Drilling* program is based on a framework for developing vocational training 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 *Diamond Drilling* program leads to the Diploma of Vocational Studies. To be admitted to the program, students must meet one of the following conditions:

- For students holding a Secondary School Diploma or a recognized equivalent, no additional conditions are required.
OR
- For students who are at least 16 years of age on September 30 of the school year in which they begin the program, the following condition applies: they must have obtained Secondary III credits in language of instruction, second language and mathematics, or the recognized equivalents.
OR
- For students who are at least 18 years of age, successful completion of the General Development Test is prescribed as a functional prerequisite.

NOTE: The condition regarding concurrence does not apply to this category.

The duration of the program is 600 hours, which includes 495 hours spent on the specific competencies required to practise the trade and 105 hours on general competencies. The program of study is divided into 11 modules, which vary in length from 15 to 120 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 six 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; the fifth chapter explains the operational objectives; and the sixth illustrates the program's harmonization with other programs of study. 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 training adapted to a specific trade or occupation.

Part I

1 SYNOPTIC TABLE

Number of modules: 11
Duration in hours: 600
Credits: 40

Diamond Drilling
Code: 5753

CODE	MODULE	HOURS	CREDITS*
760 531	1 The Trade and the Training Process	15	1
760 543	2 Health and Safety	45	3
760 551	3 Scaling	15	1
760 564	4 Relocating a Site	60	4
760 572	5 Anchor Holes	30	2
760 583	6 Installing Drills	45	3
760 593	7 Water Supply	45	3
760 606	8 Overburden Drilling	90	6
760 618	9 Surface Rock Drilling	120	8
760 628	10 Underground Rock Drilling	120	8
760 631	11 Geotechnical Drilling	15	1

* 15 hours = 1 credit

2 TRAINING GOALS

The training goals of the *Diamond Drilling* program are based on the general goals of vocational training 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 the tasks and activities of diamond drilling correctly, at an acceptable level of competence for entry into the job market.
- To prepare students to progress satisfactorily on the job by fostering:
 - the ability to make decisions and solve problems
 - a constant concern for occupational health and safety
 - a constant concern for the environment
 - a sense of responsibility and professional ethics
 - the ability to communicate effectively with customers, superiors and colleagues, and in particular with one's assistant
 - the ability to perform under pressure

To ensure integration into the work force.

- To familiarize students with the job market in the specific trade of diamond drill operator.
- To familiarize students with new technologies and contemporary applications in the field of diamond drilling.
- To familiarize students with their rights and responsibilities as workers.

To foster personal and professional development.

- To help students understand the principles underlying the techniques and technologies used.
- To help students develop the autonomy to find information on new technologies and learn new work methods.
- To help students develop the ability to perform more complex tasks.
- To help students adopt the attitudes essential to a successful career.

To ensure job mobility.

- To help students develop a positive attitude toward technological change and new situations.
- To help students improve their ability to learn and find information.
- To familiarize students with foreign job opportunities.

3 COMPETENCIES

The competencies to be developed in the *Diamond Drilling* program 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 (▲) 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

GRID OF LEARNING FOCUSES				WORK PROCESS (major steps)							GENERAL COMPETENCIES (related to technology, subjects, personal development, etc.)				TOTALS	
		OPERATIONAL OBJECTIVES	DURATION (in hours)	Ensure the safety of the work area	Prepare the materials and equipment	Perform the work	Identify problems and provide solutions	Maintain materials and equipment	Supervise the work of the assistant operator	Write up a report	Determine their suitability for the trade and the training process	Apply basic principles of health and safety on drill sites	Scale the back and walls of an excavation	Prepare the anchor holes for a diamond drill in an excavation	NUMBER OF OBJECTIVES	DURATION (in hours)
MODULES	MODULES										1	2	3	5		
	OPERATIONAL OBJECTIVES										S	B	B	B	4	
	DURATION (in hours)										15	45	15	30		105
4	Relocate to a new drill site	B	60	▲	△	▲	△	▲	▲	▲	●	●	●			
6	Install various types of diamond drills	B	45	▲	△	▲	△	△	▲	▲	●	●	○	●		
7	Ensure a constant water supply	B	45	△	△	▲	△	▲	▲	▲	●	●				
8	Perform overburden drilling operations	B	90	△	▲	▲	▲	△	▲	▲	●	●				
9	Perform surface rock drilling operations	B	120	△	▲	▲	▲	▲	▲	▲	●	●				
10	Perform underground rock drilling operations	B	120	▲	▲	▲	▲	▲	▲	▲	●	●	●			
11	Compare geotechnical drilling to diamond drilling	S	15	△	▲	▲	△	△	△	△	●	○				
NUMBER OF OBJECTIVES		7													11	
DURATION (in hours)			495													600

S : Situational objective
B : Behavioural objective

△ 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 *Diamond Drilling* program are presented below, along with the major statement of each corresponding operational objective.

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

- Determine their suitability for the trade and the training process.
- Compare geotechnical drilling to diamond drilling.

To develop in the students the competencies required to safely perform the work.

- Apply basic principles of health and safety on drill sites.
- Scale the back and walls of an excavation.

To develop in the students the competencies required to prepare drilling operations.

- Relocate to a new drill site.
- Prepare the anchor holes for a diamond drill in an excavation.
- Install various types of diamond drills.
- Ensure a constant water supply.

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

- Perform overburden drilling operations.
- Perform surface rock drilling operations.
- Perform underground rock drilling operations.

5 OPERATIONAL OBJECTIVES

5.1 DEFINITION

An operational objective is defined for each competency to be developed. 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 material.

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.

Note: Programs of study accompanied by analysis and planning tables do not include second-level operational objectives.

5.2 HOW TO READ 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, *where necessary*. It indicates cases where the objective applies to more than one task, occupation or field.

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, *where necessary*. It indicates cases where the objective applies to more than one task, occupation or field.

6 HARMONIZATION

The *Diamond Drilling* program (5753) was designed and developed as part of the effort to harmonize vocational programs of study. The goal of harmonization is to optimize the efforts of students during the training process by making it easier to transfer from one program to another or one level of instruction to another, without having to repeat courses.

ORE EXTRACTION	EQUIVALENT ¹	DIAMOND DRILLING
760 323 Health and Safety 45 hours	—————▶	760 543 Health and Safety 45 hours
760 353 Hand-Held Drills 45 hours	—————▶	760 572 Anchor Holes 30 hours
760 434 Back and Wall Scaling 60 hours	—————▶	760 551 Scaling 15 hours

¹

—————▶ The competency acquired in *Ore Extraction* may be recognized in the *Diamond Drilling* program.

Part II

MODULE 1: THE TRADE AND THE TRAINING PROCESS

Code: 760 531

Duration: 15 hours

SITUATIONAL OBJECTIVE

EXPECTED OUTCOME

By participating in the required activities of the learning context according to the indicated guidelines and 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 and the Training Process

- Learning about the job market: sectors of activity and job prospects, working conditions, remuneration, etc.
- Learning about the nature and requirements of the trade of diamond drill operator: types of tasks, workplace, standards and regulations, ethics, physical skills, aptitudes and qualities required, etc.
- Learning about basic principles of geology: most common soils and rocks, geological structures, possible content of core samples, etc.
- Learning about the school setting: rules, student services, schedule, etc.
- Learning about the training process: program of study, evaluation methods, certification of studies, participation required, etc.

PHASE 2: Participation in the Training Process

- Visiting education centres.
- Attending seminars.
- Sharing their views on the trade and their initial reactions to the program of study.
- Meeting with specialists in the field.
- Visiting work sites or businesses.

SITUATIONAL OBJECTIVE (cont.)

PHASE 3: Evaluation and Confirmation of Career Choice

Producing an oral presentation in which they:

- specify their preferences, aptitudes and expectations with respect to the trade
- justify their career choice by comparing these personal preferences with various aspects of the trade of diamond drill operator

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 arrive at an accurate perception of the trade.
- Help students clearly understand the relevance of the training program with respect to the work performed by diamond drill operators.
- Organize visits to businesses and work sites representative of the field.
- Organize meetings with specialists in the field.
- Organize meetings with geologists.
- Provide the students with pertinent reference materials: information on the trade, regulations, program of study, etc.
- Provide students with the means to assess their career choice honestly and objectively.

PARTICIPATION CRITERIA

- PHASE 1:**
- Gather pertinent information on most of the topics to be covered.
 - Listen attentively to the explanations given.
 - Carefully review the documents available.

- PHASE 2:**
- Participate in the various activities organized.
 - Discuss ideas with teachers and nonteaching professionals, their classmates and specialists in the field.

- PHASE 3:**
- Produce an oral presentation in which they:
- sum up their preferences, aptitudes and expectations with regard to the trade
 - summarize the various aspects of the trade of diamond drill operator
 - justify their decision to continue or withdraw from the training program by clearly relating these preferences, aptitudes and expectations to the practice of the trade

MODULE 2: HEALTH AND SAFETY

Code: 760 543

Duration: 45 hours

BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

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

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Working with:
 - case studies and learning situations
 - instructions
- Using:
 - products, materials and equipment
 - a Workplace Hazardous Materials Information System (WHMIS) manual
 - personal protective equipment

GENERAL PERFORMANCE CRITERIA

- Compliance with laws and regulations
- Constant concern for personal safety and that of others
- Constant concern for personal health and that of others
- Appropriate use of materials and equipment

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

A. Recognize dangerous situations.

SPECIFIC PERFORMANCE CRITERIA

- Accurate recognition of warning signs
- Accurate recognition of job hazards
- Pertinent links between job hazards and preventive measures

BEHAVIOURAL OBJECTIVE (cont.)	
SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
B. Use personal protective equipment.	<ul style="list-style-type: none"> — Appropriate choice of equipment — Appropriate assessment of the equipment's condition — Proper wearing and adjustment of equipment — Proper maintenance of equipment
C. Use hazardous products.	<ul style="list-style-type: none"> — Accurate interpretation of WHMIS symbols — Accurate recognition of safety measures associated with symbols
D. Implement safe work practices.	<ul style="list-style-type: none"> — Correct personalized signalling of one's presence in the mine — Accurate interpretation of signal lights and signs — Accurate understanding of the function of safety stations — Proper following of the work area evacuation procedure — Proper following of the procedure prescribed for accidents
E. Extinguish a fire.	<ul style="list-style-type: none"> — Appropriate choice of equipment — Correct use of equipment — Thorough check of equipment — Proper storage of equipment
F. Provide first aid.	<ul style="list-style-type: none"> — Compliance with health and safety rules — Accurate recognition of individual's needs — Appropriate intervention techniques and measures — Calm, coolheaded response — Accurate assessment of one's abilities and limitations — Request for relevant assistance

MODULE 3: SCALING

Code: 760 551

Duration: 15 hours

BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

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

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Working with instructions
- Using:
 - scaling bars of varying lengths
 - materials
 - a water hose
 - personal protective equipment
- At an actual work site

GENERAL PERFORMANCE CRITERIA

- Compliance with health and safety regulations
- Compliance with prescribed laws and standards
- Work positions appropriate to manoeuvres performed
- Proper application of work techniques
- Methodical work and attention to detail
- Constant concern for personal safety and that of others

BEHAVIOURAL OBJECTIVE (cont.)	
SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Evaluate the work to be performed.	<ul style="list-style-type: none"> — Thorough examination of walls and back — Accurate recognition of: <ul style="list-style-type: none"> • potential hazards • preventive measures • safety regulations and applicable standards — Detailed definition of scaling sequence
B. Prepare the washing and scaling equipment and accessories.	<ul style="list-style-type: none"> — Strength and impermeability of connections between the hose, joints and clamps — Appropriate choice of scaling bars
C. Wash the back and walls.	<ul style="list-style-type: none"> — Secure, functional positioning of operator — Secure, functional positioning of water hose — Sufficient removal of dust — Accurate detection of dangerous situations — Relevance of decision to continue or stop washing
D. Sound the back and walls.	<ul style="list-style-type: none"> — Appropriate choice of escape route — Appropriate choice of starting point of the sounding and the route to follow — Progression within area to be scaled from good to bad ground — Regular visual inspection of work area — Constant attention to: <ul style="list-style-type: none"> • noises produced by the rock • signs of changes in the geological structure
E. Detach the loose rock fragments from the rock mass.	<ul style="list-style-type: none"> — Accurate assessment of scaling limitations of the rock — Accurate assessment of one's physical abilities — Complete absence of loose rock fragments

BEHAVIOURAL OBJECTIVE <i>(cont.)</i>	
SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
F. Maintain the equipment and accessories.	<ul style="list-style-type: none"> — Thorough inspection of all components — Accurate detection of breakage and excessive wear and tear — Appropriate repairs — Careful cleaning and storage — Regular inventory of materials — Relevant orders of materials and replacement parts

MODULE 4: RELOCATING A SITE

Code: 760 564

Duration: 60 hours

BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **relocate to a new drill site** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Working with:
 - instructions
 - previously positioned grade stakes
- Using:
 - heavy equipment
 - a hydraulic diamond drill on the surface and a pneumatic diamond drill underground
 - tools, materials and equipment
 - personal protective equipment
- At an actual work site

GENERAL PERFORMANCE CRITERIA

- Compliance with health and safety regulations
- Compliance with environmental standards
- Conformity of work with instructions received
- Careful choice of tools, materials and equipment
- Appropriate use of tools, materials and equipment
- Constant attention to the drill
- Proper use and care of equipment and constant concern for its reliability
- Methodical work and attention to detail

BEHAVIOURAL OBJECTIVE (cont.)	
SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Close a drill site.	<ul style="list-style-type: none"> — Gentle removal of casing, if necessary — Proper aggradation of drill holes, if necessary — Thorough storage of all drilling equipment, materials and products — Cleanliness of site
B. Create access to a new drill site:	
• build an aboveground access road	<ul style="list-style-type: none"> — Precise location of site — Restricted road width — Careful stacking of split wood — Solidity of culverts — Sufficient thickness of ice, if necessary
• ensure the safety of an underground access road	<ul style="list-style-type: none"> — Thorough inspection of road — Appropriate washing and scaling, if necessary — Thorough removal of muck, if necessary
C. Transport drilling materials and equipment.	<ul style="list-style-type: none"> — Safe and secure loading of equipment — Appropriate choice of heavy machinery for surface terrain — Skillful control of heavy machinery on the surface: <ul style="list-style-type: none"> • proper alignment of machinery and equipment to be towed • soft start • accurate interpretation of dashboard lights and indicators • speed and acceleration appropriate for terrain

BEHAVIOURAL OBJECTIVE *(cont.)*

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

D. Prepare a drill site:

- on the surface

- Accurate assessment of site
- Appropriate levelling of terrain or sufficient thickness of ice, if necessary
- Proper deck area

- underground

- Thorough inspection of site safety
- Appropriate washing and scaling, if necessary
- Thorough removal of muck, if necessary
- Careful inspection of the ventilation
- Careful inspection of the water supply and, if applicable, the supply of air and electricity
- Appropriate levelling of the bottom of the excavation
- Sufficient resistance, appropriate levelling and absolute safety of floor

E. Position the drill.

- Precise location of survey markers, ribbons and marks
- Accurate interpretation of instructions

F. Maintain the equipment used for the site relocation.

- Frequent inspections and cleaning
- Accurate detection of problems
- Appropriate minor repairs and adjustments
- Regular addition of fluids
- Regular lubrication of parts
- Regular inventory of materials and products
- Relevant orders of materials, products and replacement parts
- Secure, functional storage of equipment

BEHAVIOURAL OBJECTIVE <i>(cont.)</i>	
SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
G. Supervise the work of the assistant operator.	<ul style="list-style-type: none"> — Constant concern for the assistant's safety — Constant attention to the treatment of materials and equipment — Careful inspection of the work performed — Responsible, friendly attitude
H. Write up a report.	<ul style="list-style-type: none"> — Clear, pertinent verbal communication — Complete, accurate written information

MODULE 5: ANCHOR HOLES

Code: 760 572

Duration: 30 hours

BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **prepare the anchor holes for a diamond drill in an excavation** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- With a jackleg drill and a stoper drill
- Working with instructions
- Using:
 - tools and materials
 - personal protective equipment
- At an actual work site

GENERAL PERFORMANCE CRITERIA

- Compliance with health and safety regulations
- Compliance with prescribed standards
- Conformity of work with instructions received
- Safe, appropriate handling of drills
- Appropriate use of tools, materials and drills
- Constant concern for drill reliability
- Methodical work and attention to detail

SPECIFICATIONS OF EXPECTED BEHAVIOUR

A. Ensure the safety of the work area.

SPECIFIC PERFORMANCE CRITERIA

- Thorough inspection of area
- Appropriate washing and scaling, if necessary
- Thorough removal of muck, if necessary

BEHAVIOURAL OBJECTIVE *(cont.)*

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

- | | |
|---|---|
| B. Prepare the equipment. | <ul style="list-style-type: none"> — Strength of connections — Secure positioning of hoses — Proper inspection of air and water supply — Appropriate choice of drill bits — Drill bits properly fitted onto drill steels |
| C. Drill utility holes in walls and back. | <ul style="list-style-type: none"> — Appropriate choice of drill — Logical sequence of manoeuvres — Constant stability of drill — Proper control of equipment — Drill holes perpendicular to walls — Drill holes at pre-set dimensions |
| D. Insert eye bolts. | <ul style="list-style-type: none"> — Appropriate choice of bolts — Proper sinking — Secure installation |
| E. Maintain the materials and equipment used to drill anchor holes. | <ul style="list-style-type: none"> — Thorough inspection of all components — Frequent cleaning of drills and accessories — Regular lubrication of drills — Full recovery of all bits — Accurate detection of breakage and excessive wear and tear — Appropriate repairs — Regular inventory of materials and products — Relevant orders of materials, products and replacement parts — Secure, functional storage of equipment |

MODULE 6: INSTALLING DRILLS

Code: 760 583

Duration: 45 hours

BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **install various types of diamond drills** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working in pairs
- With:
 - a hydraulic drill, on the surface
 - a pneumatic drill with mobile cart, a pneumatic extension-leg drill and an electric drill, underground
- Working with:
 - instructions
 - pre-set grade stakes
- Using:
 - tools, materials and equipment
 - personal protective equipment
- At an actual work site

GENERAL PERFORMANCE CRITERIA

- Compliance with health and safety regulations
- Compliance with environmental protection standards
- Conformity of work with instructions received
- Proper choice of tools, materials and equipment
- Appropriate use of tools, materials and equipment
- Proper use and care of equipment
- Methodical work and attention to detail

BEHAVIOURAL OBJECTIVE (cont.)	
SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Level the drill.	<ul style="list-style-type: none"> — Proper use of levelling techniques for various types of drills: <ul style="list-style-type: none"> • careful handling of system for extending legs of hydraulic drill • proper blocking of sled for the pneumatic drill with mobile cart • appropriate vertical adjustment of the leg and secure bolting of pneumatic drill to the extension leg • proper blocking of the electric drill and its sled or floor
B. Reassemble and unfold the drill.	<ul style="list-style-type: none"> — Solid assembly, if necessary — Careful inspection of drill and hydraulic system fluids — Accurate detection and repair of problems — Careful starting of drill, if necessary — Careful extension of the mast, if necessary — Constant attention to the equipment
C. Adjust the direction and inclination of the mast.	<ul style="list-style-type: none"> — Accurate interpretation of instructions — Proper adjustment of the mast for the hydraulic drills, pneumatic with mobile cart drills and electric drills: <ul style="list-style-type: none"> • proper alignment with survey markers, ribbons and wall marks • correct angle of inclination — Proper adjustment of the pneumatic extension-leg drill: <ul style="list-style-type: none"> • proper alignment of drill with wall marks • correct angle of inclination of pivoting head

BEHAVIOURAL OBJECTIVE (cont.)	
SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
D. Anchor the drill, underground.	<ul style="list-style-type: none"> — Precise maintenance of drill direction and inclination — Anchor positioning in line with drilling direction and orientation — Solid anchoring
E. Prepare the area.	<ul style="list-style-type: none"> — Accurate assessment of need to construct platform or deck — Secure, functional location of platform, deck or sled for rods — Sufficient resistance, appropriate levelling and absolute safety of platform or deck — Organized, secure and functional layout of materials
F. Connect water hoses and air and power lines, if applicable.	<ul style="list-style-type: none"> — Careful inspection of equipment and materials — Sealed connections between hoses and tubing — Proper installation of protective sheaths — Proper connection with electric power supply panel, if necessary
G. Disassemble the drill or prepare it for relocation.	<ul style="list-style-type: none"> — Proper method — Secure storage
H. Supervise the work of the assistant operator.	<ul style="list-style-type: none"> — Constant concern for the assistant's safety — Careful attention to the treatment of materials and equipment — Careful inspection of the work performed — Responsible, friendly attitude
I. Write up a report.	<ul style="list-style-type: none"> — Clear, pertinent verbal communication — Complete, accurate written information

MODULE 7: WATER SUPPLY

Code: 760 593

Duration: 45 hours

BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **ensure a constant water supply** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Working with instructions
- Using:
 - tools, materials and equipment
 - personal protective equipment
- At an actual work site

GENERAL PERFORMANCE CRITERIA

- Compliance with health and safety regulations
- Compliance with environmental protection standards
- Conformity of work with instructions received
- Proper choice of tools, materials and equipment
- Appropriate use of tools, materials and equipment
- Proper use and care of equipment and constant concern for its reliability
- Methodical work and attention to detail

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

A. Select a water body.

SPECIFIC PERFORMANCE CRITERIA

- Accurate assessment of supply source
- Functionality of the location

BEHAVIOURAL OBJECTIVE (cont.)	
SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
B. Install the water pump.	<ul style="list-style-type: none"> — Appropriate choice of location — Careful inspection of oils — Appropriate protection against freezing, if necessary — Appropriate height of the suction — Proper starting
C. Install the water heater, if necessary.	<ul style="list-style-type: none"> — Secure, functional location — Safe handling of propane gas tanks — Careful inspection of supply hose seals
D. Install hoses.	<ul style="list-style-type: none"> — Proper unrolling of hoses — Careful inspection of hose seals and connections — Careful verification of absence of ice inside hoses, if necessary — Appropriate protection against freezing, if necessary
E. Maintain the equipment used to ensure a steady water supply.	<ul style="list-style-type: none"> — Frequent inspections and cleaning — Accurate detection of excessive wear and tear — Accurate detection of problems — Appropriate minor repairs and adjustments — Regular addition of fluids — Regular lubrication of parts — Proper changing of propane gas tanks — Regular inventory of materials and products — Relevant orders of materials, products and replacement parts

BEHAVIOURAL OBJECTIVE <i>(cont.)</i>	
SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
F. Supervise the work of the assistant operator.	<ul style="list-style-type: none"> — Constant concern for the assistant's safety — Careful attention to the treatment of materials and equipment — Careful inspection of the work performed — Responsible, friendly attitude
G. Write up a report.	<ul style="list-style-type: none"> — Clear, pertinent verbal communication — Complete, accurate written information

MODULE 8: OVERBURDEN DRILLING

Code: 760 606

Duration: 90 hours

BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **perform overburden drilling operations** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working in pairs
- With a hydraulic drill or simulator
- Working with instructions
- Using:
 - tools, materials and equipment
 - personal protective equipment
- At an actual or simulated work site

GENERAL PERFORMANCE CRITERIA

- Compliance with health and safety regulations
- Compliance with environmental protection standards
- Conformity of work with instructions received
- Proper choice of tools, materials and equipment
- Appropriate use of tools, materials and equipment
- Appropriate problem solving
- Proper use and care of equipment and constant concern for its reliability
- Methodical work and attention to detail

BEHAVIOURAL OBJECTIVE (cont.)

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

A. Prepare the equipment.

- Appropriate diameter of the casing and casing shoe
- Proper installation of casing shoe
- Jaws suitable for the casing
- Appropriate selection of additives
- Proper preparation of additives

B. Follow the standard method of overburden drilling.

- Careful starting of drill
- Constant verification of flow of water to shoe
- Proper adjustment of water flow, if necessary
- Constant verification of drill's oil and water pressure
- Appropriate use of additives
- Sufficient penetration rate and rotation speed
- Maintenance of casing direction
- Meticulous administration of inclination tests
- Proper sinking of last casing

C. Use a specific drilling technique, if necessary.

- Accurate assessment of the relevance of the operation
- Appropriate choice of technique to use
- Proper use of the coring shoe technique:
 - appropriate diameter of the casing and coring shoe
 - proper installation of coring shoe
 - jaws changed properly
 - sufficient penetration rate and rotation speed
 - appropriate use of additives
- Proper use of twin-rod drilling technique:
 - appropriate diameter of drill rods
 - proper installation of core bit and accessories
 - proper installation of rod/casing adapter
 - jaws changed properly
 - sufficient penetration rate and rotation speed
 - appropriate use of additives

BEHAVIOURAL OBJECTIVE (cont.)

**SPECIFICATIONS OF THE EXPECTED
BEHAVIOUR**

SPECIFIC PERFORMANCE CRITERIA

- | | |
|--|--|
| D. Supervise the work of the assistant operator. | <ul style="list-style-type: none">— Constant concern for the assistant's safety— Constant attention to the treatment of materials and equipment— Careful inspection of the work performed— Responsible, friendly attitude |
| E. Write up a report. | <ul style="list-style-type: none">— Clear, pertinent verbal communication— Complete, accurate written information |

MODULE 9: SURFACE ROCK DRILLING

Code: 760 618

Duration: 120 hours

BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **perform surface rock drilling operations** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working in pairs
- With a hydraulic drill or simulator
- Working with instructions
- Using:
 - tools, materials and equipment
 - personal protective equipment
- At an actual or simulated work site

GENERAL PERFORMANCE CRITERIA

- Compliance with health and safety regulations
- Compliance with environmental protection standards
- Respect for confidentiality
- Conformity of work with instructions received
- Proper choice of tools, materials and equipment
- Appropriate use of tools, materials and equipment
- Accurate recognition of the drill's capacity
- Appropriate problem solving
- Proper use and care of equipment and constant concern for its reliability
- Methodical work and attention to detail

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

A. Go through the overburden.

SPECIFIC PERFORMANCE CRITERIA

— Follow the procedure used for this manoeuvre

BEHAVIOURAL OBJECTIVE *(cont.)*

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

- | | |
|---|---|
| B. Prepare the materials and equipment needed for drilling. | <ul style="list-style-type: none"> — Jaws suitable for rod diameters — Proper insertion of jaws into the drill chuck — Proper installation of core bit, core barrel and accessories — Rods skilfully lowered — Proper installation of shell — Careful starting of water pump |
| C. Operate the drill. | <ul style="list-style-type: none"> — Careful starting of drill — Constant verification of flow of water — Proper adjustment of water flow, if necessary — Constant verification and accurate interpretation of gauge — Regular, proper grinding of diamond bit — Careful handling of controls — Appropriate use of additives — Sufficient penetration rate and rotation speed |
| D. Remove a core. | <ul style="list-style-type: none"> — Appropriate method for replacing the inner tube — Appropriate method for adding a drill rod — Careful extraction and storage of core — Cleanliness of core and storage case — Accurate identification of storage case |
| E. Perform complementary operations. | <ul style="list-style-type: none"> — Proper retrieval of rods — Meticulous administration of inclination tests — Careful installation of materials specifically for orientation tests — Appropriate assistance for installing wedges to maintain or change the direction |

BEHAVIOURAL OBJECTIVE (cont.)	
SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
F. Maintain the materials and equipment used for drilling.	<ul style="list-style-type: none"> — Regular inspection of materials and equipment — Accurate detection of excessive wear and tear — Accurate detection of problems — Appropriate minor repairs and adjustments — Regular addition of fluids — Appropriate lubrication of parts — Regular inventory of materials and products — Relevant orders of materials, products and replacement parts
G. Supervise the work of the assistant operator.	<ul style="list-style-type: none"> — Constant concern for the assistant's safety — Constant attention to the treatment of materials and equipment — Careful inspection of the work performed — Responsible, friendly attitude
H. Write up a report.	<ul style="list-style-type: none"> — Clear, pertinent verbal communication — Complete, accurate written information

MODULE 10: UNDERGROUND ROCK DRILLING

Code: 760 628

Duration: 120 hours

BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must **perform underground rock drilling operations** in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working in pairs
- With a pneumatic drill with a mobile cart or an electric drill or simulator
- Working with instructions
- Using:
 - tools, materials and equipment
 - personal protective equipment
- At an actual or simulated work site

GENERAL PERFORMANCE CRITERIA

- Compliance with health and safety regulations
- Compliance with environmental protection standards
- Respect for confidentiality
- Conformity of work with instructions received
- Proper choice of tools, materials and equipment
- Appropriate use of tools, materials and equipment
- Accurate recognition of the drill's capacity
- Appropriate problem solving
- Proper use and care of equipment and constant concern for its reliability
- Methodical work and attention to detail

BEHAVIOURAL OBJECTIVE *(cont.)*

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

- | | |
|---|---|
| A. Ensure the safety of the work area. | <ul style="list-style-type: none"> — Thorough inspection of site safety — Appropriate washing and scaling, if necessary — Thorough removal of muck, if necessary |
| B. Prepare the materials and equipment needed for drilling. | <ul style="list-style-type: none"> — Appropriate lengths of initial rods — Jaws suitable for rod diameters — Proper insertion of jaws into the drill chuck — Proper installation of initial core bit, initial core barrel and accessories — Proper installation of water swivel — Careful starting of water pump |
| C. Begin drilling the hole: <ul style="list-style-type: none"> • horizontal drilling • drilling aimed upwards • drilling aimed downwards | <ul style="list-style-type: none"> — Careful starting of drill — Proper verification of the inclination and direction of drill hole after five or six centimetres of penetration into the rock — Compliance with the regular drill sequence |
| D. Replace the materials. | <ul style="list-style-type: none"> — Proper retrieval of initial rods — Appropriate changes to the core bit and barrel — Proper opening of the drill's pivoting head — Appropriate lengths of new rods — Proper closing of pivoting head |
| E. Operate the drill: <ul style="list-style-type: none"> • horizontal drilling • drilling aimed upwards • drilling aimed downwards | <ul style="list-style-type: none"> — Constant verification of water flow — Proper adjustment of water flow, if necessary — Constant verification and accurate interpretation of gauge — Regular, proper grinding of diamond bit — Careful handling of controls — Appropriate use of additives — Sufficient penetration rate and rotation speed |

BEHAVIOURAL OBJECTIVE *(cont.)*

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

SPECIFIC PERFORMANCE CRITERIA

- | | |
|--|--|
| F. Remove a core. | <ul style="list-style-type: none"> — Appropriate method for replacing the inner tube — Appropriate method for adding a drill rod — Careful extraction and storage of core — Cleanliness of core and core box — Accurate identification of core box |
| G. Perform complementary operations. | <ul style="list-style-type: none"> — Proper retrieval of rods — Meticulous administration of inclination tests — Careful installation of materials specifically for orientation tests — Appropriate assistance for installing wedges to maintain or change the direction |
| H. Maintain the materials and equipment used for drilling. | <ul style="list-style-type: none"> — Regular inspection of materials and equipment — Accurate detection of excessive wear and tear — Accurate detection of problems — Appropriate minor repairs and adjustments — Appropriate lubrication of drill — Regular inventory of materials and products — Relevant orders of materials, products and replacement parts |
| I. Supervise the work of the assistant operator. | <ul style="list-style-type: none"> — Constant concern for the assistant's safety — Constant attention to the treatment of materials and equipment — Careful inspection of the work performed — Responsible, friendly attitude |
| J. Write up a report. | <ul style="list-style-type: none"> — Clear, pertinent verbal communication — Complete, accurate written information |

MODULE 11: GEOTECHNICAL DRILLING

Code: 760 631

Duration: 15 hours

SITUATIONAL OBJECTIVE

EXPECTED OUTCOME

By participating in the required activities of the learning context according to the indicated guidelines and criteria, the students will be able to
compare geotechnical drilling to diamond drilling

Specifications

During this module, the students will:

- Learn to recognize situations that require geotechnical drilling.
- Associate specific geotechnical drilling techniques with particular situations.
- Compare certain geotechnical drilling techniques to those used for diamond rock and overburden drilling.

LEARNING CONTEXT

PHASE 1: Information on Geotechnical Drilling

- Learning about situations that require geotechnical drilling: soil sampling, rock permeability studies, etc.
- Learning about the current needs and future prospects of geotechnical drilling in Québec, Canada and elsewhere.
- Learning about the various drilling techniques used to meet geotechnical needs: reversed circulation, split-spoon sampling, etc.
- Learning about Québec companies that provide geotechnical drilling services: company names, drill sites, types of drilling, etc.
- Learning about how to use certain geotechnical drilling techniques: equipment required, how to install the equipment, using the technique, etc.

PHASE 2: Participation

- Sharing their knowledge of the topic.
- Viewing films about geotechnical drilling.
- Meeting with specialists in the field.
- As part of a group, preparing an oral presentation comparing a specific geotechnical drilling technique to one or more diamond drilling techniques.

SITUATIONAL OBJECTIVE (cont.)

PHASE 3: Review and Evaluation

Working in groups, the students will prepare an oral presentation comparing a specific geotechnical drilling technique to one or more diamond drilling techniques.

This comparison must cover the following points:

- situations and geographic locations where these techniques are used
- Québec companies that use these techniques, if applicable
- equipment required
- how to install the equipment
- how to use the technique
- specific points to monitor and criteria to respect
- advantages and drawbacks, when compared to the work performed by diamond drill operators

INSTRUCTIONAL GUIDELINES

The teacher should:

- Create a climate that encourages the students' interest in the topic.
- Help students arrive at an accurate perception of geotechnical drilling.
- Provide the students with pertinent reference materials.
- Present films.
- Organize meetings with specialists in the field.
- Motivate students to participate in the proposed activities.
- Assist students with their oral presentation by providing necessary materials, if applicable.

PARTICIPATION CRITERIA

- PHASE 1:**
- Gather pertinent information on most of the topics to be covered.
 - Carefully review the documents provided.

- PHASE 2:**
- Listen attentively to the explanations given.
 - Share ideas with teachers, classmates and specialists in the field.
 - As part of a group, help prepare an oral presentation comparing a specific geotechnical drilling technique to one or more diamond drilling techniques.

- PHASE 3:**
- As part of a group, help present an oral presentation comparing a specific geotechnical drilling technique to one or more diamond drilling techniques.

