Vocational Training Program

5774

Machine Operations, Mineral and Metal Processing

Training Sector

15

Mining and Site Operations

Reach for your Dreams

Québec

Vocational Training Program

5774

Machine Operations, Mineral and Metal Processing

Training Sector

15

Mining and Site Operations

Formation professionnelle et technique
et formation continue

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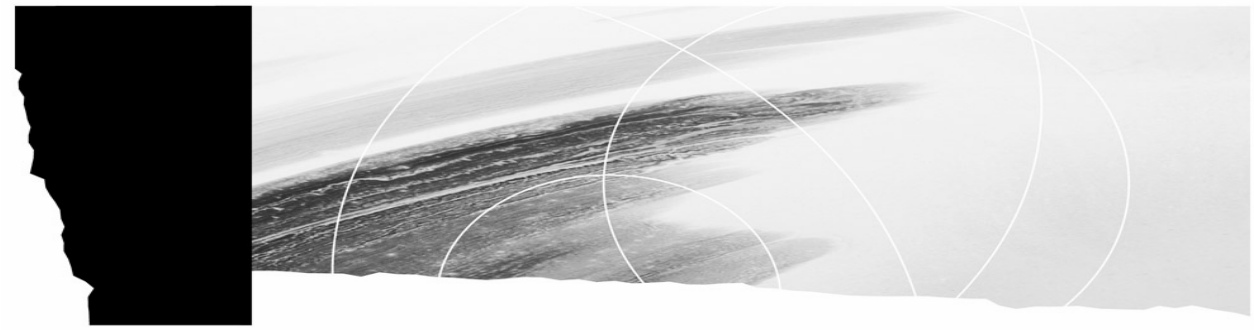


5774	**Machine Operations, Mineral and Metal Processing**

Year of approval: 2004

Certification:	Diploma of Vocational Studies
Number of credits:	60
Number of modules:	17
Total duration:	900 hours

To be admitted to the *Machine Operations, Mineral and Metal Processing* 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 the Secondary III credits in language of instruction, second language and mathematics in the programs of study established by the Minister, or to have been granted recognition of equivalent learning.

OR

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

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

Introduction to the Program

The vocational training curriculum, from which this program of study derives, is the responsibility of both the Ministère de l'Éducation, which develops programs and their teaching guides, and the educational institutions, which implement the programs and the evaluation process. Programs of study include compulsory objectives.

Programs of study provide teachers with a frame of reference for planning teaching activities. They define the scope of teaching strategies by identifying the broad educational orientations to be favoured and the objectives to be attained. By successfully completing a program, students acquire not only the entry-level competencies required by the workplace in order to practise a trade or occupation, but also learning that provides students with a certain degree of versatility.

The duration of the program is 900 hours, which includes 630 hours spent on the specific competencies required to practise the trade and 270 hours on general, work-related competencies. The program of study is divided into 17 modules, which vary in length from 15 to 135 hours. The total hours allocated to the program include time devoted to evaluation for certification purposes and to remedial work.

Title of Module	Code	Module	Hours	Credits
Trade and Training Process	778411	1	15	1
Occupational Health and Safety	778421	2	15	1
Applied Physics and Mathematics	778434	3	60	4
Ore Processing Methods	778444	4	60	4
Preparing Control Tests	778453	5	45	3
Machine Maintenance	778462	6	30	2
Size Reduction Operations	778479	7	135	9
Preparing Reagents	778482	8	30	2
Gravity Concentration Methods	778492	9	30	2
Computer-Based Control Systems	778503	10	45	3
Flotation Concentration	778516	11	90	6
Filtering Concentrates	778522	12	30	2
Filling	778532	13	30	2
Chemical Concentration Methods	778547	14	105	7
Agglomeration	778553	15	45	3
Wastewater Treatment	778562	16	30	2
Entering the Work Force	778577	17	105	7

Glossary

Program

A vocational training program is a coherent set of competencies to be acquired. It is formulated in terms of objectives and divided up into modules for administrative purposes. It describes the learning expected of students in accordance with a given performance level. Published as an official pedagogical document, the program leads to the recognition of training qualifying students to practise a trade or occupation.

A vocational training program includes compulsory objectives and content. Although the educational institutions are responsible for learning and evaluation activities, the program presents information regarding the certification of studies.

Program Goals

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

Educational Aims

Educational aims are broad orientations to be favoured during training in order to help students acquire intellectual or motor skills, work habits or attitudes. Educational aims usually address important aspects of personal and vocational development that have not been explicitly included in the program goals or competencies. They help guide educational institutions in implementing the program.

Competency

A competency is the ability to act successfully and evolve in order to adequately perform work-related tasks or activities, based on an organized body of knowledge and skills from a variety of fields, perceptions, attitudes, etc.

Objectives

Objectives refer to the operational aspect of a competency to be acquired. They are expressed in terms of specific requirements and serve as the practical basis for teaching, learning and evaluation. Objectives are either behavioural or situational.

1. Behavioural Objective

A behavioural objective is a relatively closed objective that describes the actions and results expected of the student. Behavioural objectives consist of the following components:

- The *statement of the competency,* which is the result of the job analysis, the general goals of the program and other determinants.
- The *elements of the competency,* which correspond to essential details that are necessary in order to understand the competency and are expressed in terms of specific behaviours. They refer to the major steps involved in performing a task or the main components of the competency.
- The *achievement context,* which corresponds to the situation in which the competency is exercised at entry-level on the job market. The achievement context does not specify the context for learning or evaluation.

- The performance criteria, which define the requirements by which to judge the attainment of the competency. They may refer to each element of the competency, to several elements or to the competency as a whole. Those associated with a specific element correspond to the requirements for performing a task or activity; those associated with several elements indicate the expected level of performance or the overall quality of a product or service.

Evaluation is based on expected results.

2. Situational Objective

A situational objective is a relatively open-ended objective that outlines the major phases of a learning situation in which a student is placed. It allows for output and results to vary from one student to another. Situational objectives consist of the following five components:

- The *statement of the competency,* which is the result of the job analysis, the general goals of the program and other determinants.

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

- The *learning context,* which provides a broad outline of the learning situation designed to help the students develop the required competency. It is normally divided into three phases of learning:
  – information
  – participation
  – synthesis

- The *instructional guidelines,* which provide guidelines and means to ensure that learning takes place and that the context in which it occurs is always the same. These guidelines may include general principles or specific procedures.

- The *participation criteria,* which describe requirements the students must fulfill when participating in the learning activities. They focus on how the students take part in the activities rather than on the results obtained. Participation criteria are normally provided for each phase of the learning context.

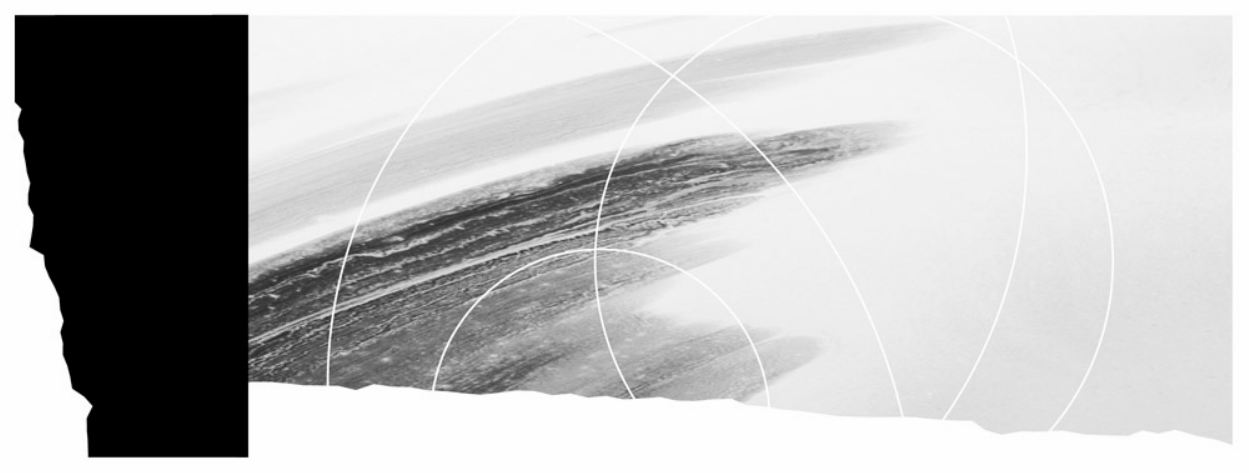
Evaluation is based on the student's participation in the activities suggested in the learning context.

Module

A module is a component of a program of study comprising a prescriptive objective.

Credit

A credit is 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 obtain a diploma or attestation.



Part I

Program Goals

Educational Aims

Program Competencies and Grid of Competencies

Harmonization

Program Goals

The *Machine Operations, Mineral and Metal Processing* program prepares students to practise the trade of Mineral and Metal Processing Machine Operator.

Mineral and Metal Processing Machine Operators work in aboveground mineral ore and metal processing plants located at mine sites. In some cases, these people work underground, performing primary processing operations on mineral ores and metals.

Mineral and Metal Processing Machine Operators operate (start, prepare, assemble, adjust, maintain and stop) machines that grind, separate, filter, mix, dissolve soluble products, roll, refine and treat ore. They monitor valves, meters, computer printouts and video screens to ensure that everything is working properly. They perform minor machine maintenance procedures and clean up work areas. Finally, they take appropriate measures when it comes to health, safety and environmental protection.

The program goals of the *Machine Operations, Mineral and Metal Processing* program are based on the general goals of vocational training. These goals are:

- To help students develop effectiveness in the practice of a trade or occupation

  – to teach students to perform roles, functions, tasks and activities associated with the trade or occupation upon entry into the job market

  – to prepare students to progress satisfactorily on the job (which implies having the technical and technological knowledge and skills in such areas as communication, problem solving, decision making, ethics, health and safety)

- To help students integrate into the work force

  to familiarize students with:
  – the job market in general and the context surrounding the trade or occupation they have chosen
  – their rights and responsibilities as workers
  – various work-related organizations
  – the trade or occupation by having them actively participate in a work environment

- To foster students' personal development and acquisition of occupational knowledge, skills, perceptions and attitudes

  to help students:
  – develop their autonomy and ability to learn, and acquire effective work methods
  – understand the principles underlying the techniques and the technology used in the trade or occupation
  – develop self-expression, creativity, initiative and entrepreneurial spirit
  – adopt the attitudes required to successfully practise the trade or occupation, and instill in them a sense of responsibility and a concern for excellence
  – develop the ability to self-evaluate their work performance

- To promote job mobility

  to help students:
  – develop positive attitudes toward change
  – improve their ability to learn and find information
  – prepare for a pro-active job search
  – develop their machine operation skills in various types of ore processing circuits

Educational Aims

The aim of the *Machine Operations, Mineral and Metal Processing* program is to help students develop attitudes and behaviours that are deemed essential to the practice of the trade or occupation:

- to develop an awareness of the consequences of work quality
- to develop a sense of responsibility and versatility
- to develop a concern for occupational health and safety
- to develop a concern for the environment

Program Competencies and Grid of Competencies

List of Competencies

- To determine their suitability for the trade and the training process.
- To interpret information relating to the handling and transport of hazardous materials.
- To perform mathematical calculations applied to physics.
- To interpret information relating to ore processing methods.
- To prepare control tests.
- To perform preventive maintenance on a machine and a piece of equipment.
- To operate machines and equipment used for size reduction operations.
- To operate machines and equipment used to prepare reagents.
- To operate machines and equipment used to produce ore concentrates using mechanical methods.
- To monitor the parameters of a computer-based ore processing circuit.
- To operate machines and equipment used to produce ore concentrates by flotation.
- To operate machines and equipment used to filter concentrates.
- To operate machines and equipment used for hydraulic backfill and paste backfill.
- To operate machines and equipment used to produce ore concentrates using chemical methods.
- To operate machines and equipment used for the agglomeration of concentrates.
- To operate machines and equipment used to treat wastewater.
- To enter the work force.

Grid of Competencies

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

The general competencies appear on the horizontal axis and the specific competencies, on the vertical axis. The symbol (△) indicates a correlation between a 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 related to specific competencies.

The logic used in constructing the grid influences the course sequence. Generally speaking, this sequence follows a logical progression in terms of the complexity of the learning involved and the development of the students' autonomy. The vertical axis presents the specific competencies in the order in which they should be acquired. The modules 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 COMPETENCIES

MACHINE OPERATIONS, MINERAL AND METAL PROCESSING				**GENERAL COMPETENCIES**							**WORK PROCESS**							
SPECIFIC COMPETENCIES	**Competency number**	**Type of objective**	**Duration (in hours)**	Determine their suitability for the trade and the training process	Interpret information relating to the handling and transport of hazardous materials	Perform mathematical calculations applied to physics	Interpret information relating to ore processing methods	Prepare control tests	Perform preventive maintenance on a machine and a piece of equipment	Monitor the parameters of a computer-based ore processing circuit	Read production instructions and share information with the relief shift	Verify machine and equipment operations offline	Start and stop machines and equipment	Verify machine and equipment operations online	Check whether production instructions are being followed	Take and prepare samples	Make any necessary repairs during production	Write up shift reports
Competency number				1	2	3	4	5	6	10								
Type of objective				S	B	B	B	B	B	B								
Duration (in hours)				15	15	60	60	45	30	45								
Operate machines and equipment used for size reduction operations	7	B	135	○	●	●	●	●	●	○	▲	▲	▲	▲	▲	▲	▲	▲
Operate machines and equipment used to prepare reagents	8	B	30	○	●	●	●	●	●	○	▲	▲	▲	▲	△	△	△	▲
Operate machines and equipment used to produce ore concentrates using mechanical methods	9	B	30	○	●	●	●	●	●	○	▲	▲	▲	▲	▲	▲	▲	▲
Operate machines and equipment used to produce ore concentrates by flotation	11	B	90	○	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲
Operate machines and equipment used to filter concentrates	12	B	30	○	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲
Operate machines and equipment used for hydraulic backfill and paste backfill	13	B	30	○	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲
Operate machines and equipment used to produce ore concentrates using chemical methods	14	B	105	○	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲
Operate machines and equipment used for the agglomeration of concentrates	15	B	45	○	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲
Operate machines and equipment used to treat wastewater	16	B	30	○	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲
Enter the work force	17	S	105	○	●	●	●	●	●	○	▲	▲	▲	▲	▲	▲	▲	▲

Harmonization

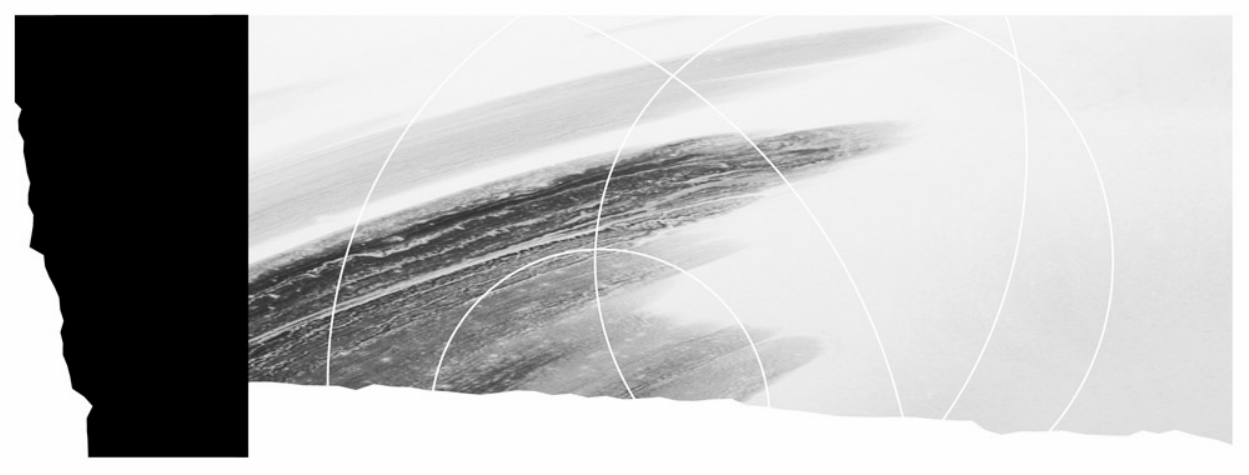
The Ministère de l'Éducation harmonizes its vocational and technical programs by establishing similarities and continuity between secondary- and college-level programs within a particular sector or between sectors in order to avoid overlap in program offerings, to recognize prior learning and to optimize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

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

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

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

The *Machine Operations, Mineral and Metal Processing* program does not share any competencies with other programs at this time.



Part II

Objectives

Trade and Training Process	Code:	778411

Module 1 Duration 15 hours

Situational Objective

Statement of the Competency

To determine their suitability for the trade and the training process.

Elements of the Competency

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

Learning Context

Information Phase

- Learning about the job market in the mineral and metal processing industry, in particular, job requirements, employment prospects and remuneration.
- Learning about the nature and requirements of the job: work schedules, main tasks, working conditions, main performance criteria, etc.
- Presenting the information gathered during a group discussion and sharing their perceptions of the trade.
- Learning about mineral and metal processing.

Participation Phase

- Discussing the skills, aptitudes, habits and knowledge necessary to practise the trade.
- Learning about the training experience: program of study, the training process, evaluation methods and certification of studies.
- Discussing the program of study and its relation to the operations to be performed in an ore processing plant.
- Sharing their initial reactions to the program of study and the training process.

Synthesis Phase

- Producing a report in which they specify their preferences, aptitudes and interests with respect to mineral and metal processing machine operations.
- Justifying their career choice by comparing various aspects and requirements of the trade with their personal preferences, aptitudes and interests.

Instructional Guidelines

- 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.
- Provide students with the means to assess their career choice honestly and objectively.
- Organize visits to businesses representative of the field.
- Provide students with reference materials: information on the trade, program of study, the certification of studies process, general information on the mining industry and ore processing activities, etc.
- Organize a discussion group with students and specialists in the field.
- Provide students with guidelines and a sample of the report required in Phase 3.

Participation Criteria

Information Phase

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

Participation Phase

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

Synthesis Phase

- Produce a report in which they:
  - sum up their preferences, interests, aptitudes and personal qualities
  - explain their career choice by clearly relating these preferences, interests and personal qualities to the practice of the trade
  - explain why they choose to continue or withdraw from the training program

Occupational Health and Safety	Code:	778421

Module 2 Duration 15 hours

Behavioural Objective

Statement of the Competency

To interpret information relating to the handling and transport of hazardous materials.

Achievement Context

- Working alone
- Working with instructions and technical sheets
- Using personal protective equipment; technical documentation; and hazardous products that are packaged and labelled

Elements of the Competency	Performance Criteria
1. Interpret the information contained in the WHMIS.	• Accurate recognition of types of information listed on sheets • Accurate recognition of risks associated with handling hazardous materials • Accurate interpretation of symbols, codes and abbreviations on sheets
2. Interpret the information relating to the transport of hazardous materials.	• Accurate interpretation of symbols, codes and abbreviations on labels • Accurate recognition of risks associated with transporting hazardous materials
	For the competency as a whole: • Appropriate use of terminology • Accurate interpretation of information on the safe handling and transport of hazardous materials

Applied Physics and Mathematics	Code: 778434

Module 3 Duration 60 hours

Behavioural Objective

Statement of the Competency

To perform mathematical calculations applied to physics.

Achievement Context

- Working alone
- Working with a questionnaire; instructions; procedures; examples; learning contexts; and ore samples
- Using a calculator; charts; technical data; and ore processing flow sheets

Elements of the Competency	**Performance Criteria**
1. Calculate: – weight and volume – density – the percentage of solids – dilution	• Use of appropriate formulas • Accuracy of calculations • Neatness and clarity of presentation
2. Calculate materials balances.	• Selection of appropriate formulas • Accuracy of calculations • Accurate determination of the quantity of inputs and outputs
3. Calculate metallurgical balances.	• Selection of appropriate formulas • Accuracy of calculations • Precise determination of the quantity of inputs and outputs
4. Determine the density of a mineral.	• Selection of appropriate formula • Compliance with the method for determining density • Accuracy of calculations
5. Present data in the form of a chart.	• Appropriate choice of chart • Accuracy of chart
	For the competency as a whole: • Use of appropriate terminology • Selection of appropriate formulas • Methodical work and attention to detail • Compliance with occupational health and safety regulations

Ore Processing Methods	Code: 778444

Module 4 Duration 60 hours

Behavioural Objective

Statement of the Competency

To interpret information relating to ore processing methods.

Achievement Context

- Working alone
- Working with a questionnaire; flow sheets and instrumentation diagrams; chemical products; and samples of rocks, minerals and concentrates
- Using technical documentation; plans; and drawings

Elements of the Competency	Performance Criteria
1. Identify the major types of minerals and concentrates.	• Accurate recognition of minerals and concentrates
2. Distinguish the principal ore processing methods.	• Correct association between principal minerals and corresponding processing methods • Accurate determination of processing circuits for each method • Accurate listing of the steps involved in each processing method
3. Associate machines and equipment with the various steps of ore processing.	• Correct association between machines and equipment and corresponding processing steps
4. Interpret the flow sheets and instrumentation diagram of an ore processing circuit.	• Accurate determination of: – the path of the ore, water, reagents, compressed air and forced air – inputs and outputs
5. Interpret the chemical reactions associated with ore processing methods.	• Accurate interpretation of the chemical reactions involved in mineral and metal processing • Clear explanation of the interaction between solutions and minerals

For the competency as a whole:

- Taking into account the characteristics of the various minerals and mineral concentrates
- Accurate interpretation of symbols, codes and abbreviations
- Appropriate use of terminology
- Appropriate organization of work area
- Appropriate use of materials, instruments and reagents
- Compliance with occupational health and safety regulations
- Compliance with environmental standards

Preparing Control Tests	Code: 778453

Module 5 Duration 45 hours

Behavioural Objective

Statement of the Competency

To prepare control tests.

Achievement Context

- Working alone
- Working with instructions; ore samples; test procedures; and learning contexts
- Using personal protective equipment; materials; instruments; and reagents

Elements of the Competency	**Performance Criteria**
1. Prepare the work area and materials.	• Correct association between types of test and corresponding samples required • Appropriate organization of the work area • Appropriate preparation of materials
2. Take test samples.	• Selection of appropriate instruments • Use of appropriate sampling method
3. Prepare the samples for testing.	• Selection of appropriate materials • Use of appropriate preparation method
4. Record the test results.	• Pertinence and accuracy of data recorded • Accurate recognition of differences between expected results and observed results • Clarity of data
5. Clean the work area and store all materials.	• Order and cleanliness of work area • Appropriate cleaning of work area and materials • Appropriate storage of materials
	For the competency as a whole: • Appropriate use of terminology • Methodical work • Compliance with occupational health and safety regulations • Compliance with environmental standards

Machine Maintenance	Code: 778462

Module 6 Duration 30 hours

Behavioural Objective

Statement of the Competency	**Achievement Context**
To perform preventive maintenance on a machine and a piece of equipment.	• Working alone • Working with assemblies; appropriate industrial equipment and machines; instructions; diagrams or illustrations; and technical data • Using the tools necessary; personal protective equipment; and pertinent documentation (manufacturer's manual, diagram, sketch, etc.)

Elements of the Competency	**Performance Criteria**
1. Interpret the functional block diagrams of a machine or piece of equipment.	• Accurate identification of all components and parts • Correct interpretation of manufacturer's specifications
2. Check the operation of a machine or piece of equipment.	• Accurate reading of physical parameters (pressure, flow, temperature, etc.) • Accurate detection of a potential operational problem • Compliance with techniques for inspecting the machine or piece of equipment • Accurate interpretation of functional parameters: – working order – necessary maintenance – necessary repairs
3. Lubricate a machine or piece of equipment.	• Compliance with the lubrication procedure • Compliance with instructions provided in the manufacturer's maintenance manual • Correct use of lubricants
4. Adjust or replace a gland seal on a pump.	• Compliance with the method for adjusting and replacing a gland seal
5. Inspect and replace a pipe or hose.	• Thorough inspection of a pipe or hose • Compliance with methods for replacing a pipe or hose

For the competency as a whole:

- Compliance with preventive maintenance methods
- Accurate detection of operational problems
- Appropriate use of tools
- Use of appropriate work methods
- Compliance with occupational health and safety regulations
- Compliance with environmental standards

Size Reduction Operations	Code: 778479

Module 7 Duration 135 hours

Behavioural Objective

Statement of the Competency

To operate machines and equipment used for size reduction operations.

Achievement Context

- Working alone
- On machines and equipment used for grinding, crushing and sizing
- With operating instructions for ore processing and production machines
- Using operational data for ore processing and production machines; measuring instruments; tools; personal protective equipment; a communications system; technical documentation including flow sheets; and rocks, water, minerals and reagents

Field of application

- Grinding and crushing circuits

Elements of the Competency	Performance Criteria
1. Interpret the information contained in production reports.	• Identification of pertinent data • Accurate interpretation of information gathered
2. Start or stop machines, equipment and circuits.	• Proper inspection of machines before starting them • Compliance with procedure for starting and stopping machines, equipment and circuits
3. Conduct a tour of inspection.	• Compliance with the inspection schedule • Thorough inspection of functional parameters of machines and equipment • Accurate interpretation of functional parameters of circuits • Accurate detection of operational problems
4. Adjust the crushing chamber opening of a: – jaw crusher – cone crusher – gyratory crusher	• Proper inspection of the chamber opening • Compliance with the procedure for adjusting the chamber opening
5. Inspect and replace the screen cloth.	• Proper inspection of the cloth's condition • Appropriate choice of replacement parts • Compliance with the replacement procedure

6. Conduct control tests.	• Compliance with the sampling and testing schedule • Compliance with the sampling method • Proper preparation of samples • Compliance with the testing method relating to: – the percentage of solids – particle size – humidity – ore density • Accurate interpretation of results • Soundness of the decision relating to whether it is necessary to repeat a test
7. Monitor production.	• Proper supervision of the functional parameters of machines and circuits • Compliance with the scheduling of steel addition • Compliance with the method for checking and adjusting the chamber openings of crushers • Appropriate choice of maintenance operations and repairs to be done
8. Clean the work area and store all materials and equipment.	• Appropriate use of washing materials • Appropriate cleaning of work area and equipment • Appropriate storage of materials and equipment
9. Write up a production report.	• Pertinence of data gathered • Comprehensive inclusion of all data • Accuracy of data • Neatness of report
	For the competency as a whole: • Compliance with instructions relating to production and machine operations • Compliance with methods relating to circuit and machine operations • Appropriate solutions to operational problems affecting circuits and machines • Use of appropriate work methods • Appropriate use of machines, equipment and materials • Appropriate communication with other specialists • Continuous monitoring of equipment and machine operations • Compliance with occupational health and safety regulations • Compliance with environmental standards

Preparing Reagents	Code: 778482

Module 8 Duration 30 hours

Behavioural Objective

Statement of the Competency

To operate machines and equipment used to prepare reagents.

Achievement Context

- Working alone
- On machines and equipment used to prepare reagents
- With operating instructions for ore processing and production machines
- Using operational data for ore processing and production machines; measuring instruments; tools; personal protective equipment; a communications system; technical documentation, including flow sheets; and liquid or solid reagents

Elements of the Competency	**Performance Criteria**
1. Interpret the information contained in production reports.	• Identification of data • Accurate interpretation of information gathered
2. Start or stop machines, equipment and circuits.	• Proper inspection of machines before starting them • Compliance with the procedure for starting and stopping machines, equipment and circuits
3. Conduct a tour of inspection.	• Compliance with the inspection schedule • Thorough inspection of functional parameters of machines and equipment • Accurate interpretation of functional parameters of circuits • Accurate detection of operational problems
4. Conduct control tests.	• Compliance with the sampling and testing schedule • Compliance with the sampling method • Proper preparation of samples • Compliance with the testing method relating to: – particle size – humidity – the concentration of the solution • Accurate interpretation of results • Soundness of the decision relating to whether it is necessary to repeat a test

5. Monitor production.	• Proper supervision of the functional parameters of machines and circuits • Monitoring of the reagent formulation as it is being prepared • Careful monitoring of reagents as they are transferred to distribution points • Appropriate choice of maintenance operations and repairs to be done
6. Clean the work area and store all materials and equipment.	• Appropriate use of washing materials • Appropriate cleaning of work area and equipment • Appropriate storage of materials and equipment
7. Write up a production report.	• Pertinence of data gathered • Comprehensive inclusion of all data • Accuracy of data • Neatness of report
	For the competency as a whole: • Compliance with instructions relating to production and machine operations • Compliance with methods relating to circuit and machine operations • Appropriate solutions to operational problems affecting circuits and machines • Use of appropriate work methods • Appropriate use of machines, equipment and materials • Appropriate communication with other specialists • Continuous monitoring of equipment and machine operations • Compliance with occupational health and safety regulations • Compliance with environmental standards

Gravity Concentration Methods	Code: 778492

Module 9 Duration 30 hours

Behavioural Objective

Statement of the Competency

To operate machines and equipment used to produce ore concentrates using mechanical methods.

Achievement Context

- Working alone
- On machines and equipment used for gravity concentration and sizing
- With operating instructions for ore processing and production machines
- Using operational data for ore processing and production machines; measuring instruments; tools; personal protective equipment; a communications system; technical documentation including flow sheets; and rocks, water, minerals and reagents

Field of application

- Particle sizing and gravity concentration circuits

Elements of the Competency	**Performance Criteria**
1. Interpret the information contained in production reports.	• Identification of pertinent data • Accurate interpretation of information gathered
2. Start or stop machines, equipment and circuits.	• Proper inspection of machines before starting them • Compliance with procedure for starting and stopping machines, equipment and circuits
3. Conduct a tour of inspection.	• Compliance with the inspection schedule • Thorough inspection of functional parameters of machines and equipment • Accurate interpretation of functional parameters of circuits • Accurate detection of operational problems
4. Conduct control tests.	• Compliance with the sampling and testing schedule • Compliance with the sampling method • Proper preparation of samples • Compliance with the testing method relating to: – particle size – the percentage of solids • Accurate interpretation of results • Soundness of the decision relating to whether it is necessary to repeat a test

5. Monitor production.	• Proper supervision of the functional parameters of machines and circuits • Appropriate choice of maintenance operations and repairs to be done
6. Clean the work area and store all materials and equipment.	• Appropriate use of washing materials • Appropriate cleaning of work area and equipment • Appropriate storage of materials and equipment
7. Write up a production report.	• Pertinence of data gathered • Comprehensive inclusion of all data • Accuracy of data • Neatness of report
	For the competency as a whole: • Compliance with instructions relating to production and machine operations • Compliance with methods relating to circuit and machine operations • Appropriate solutions to operational problems affecting circuits and machines • Use of appropriate work methods • Appropriate use of machines, equipment and materials • Appropriate communication with other specialists • Continuous monitoring of equipment and machine operations • Compliance with occupational health and safety regulations • Compliance with environmental standards

Computer-Based Control Systems	Code: 778503

Module 10 Duration 45 hours

Behavioural Objective

Statement of the Competency

To monitor the parameters of a computer-based ore processing circuit.

Achievement Context

- Working alone
- At a workstation
- With appropriate hardware; learning contexts; operating instructions for ore processing and production machines; and safety instructions
- Using operational data for ore processing and production machines; control software; technical documentation; appropriate machines and materials; flow sheets and instrumentation diagrams; personal protective equipment; a communications system; and rocks, water, minerals and reagents

Field of application

- Crushing, grinding and flotation circuits

Elements of the Competency	Performance Criteria
1. Experiment with all the features of the workstation.	• Recognition of computer system components and control software features • Appropriate use of computer hardware • Compliance with the method for inputting data and commands
2. Interpret the plan for the computer-based control system: – flow sheet – instrumentation diagram – control loop	• Proper use of the software's help function • Precise location of sensors and target computers • Accurate description of the role and operation of the control loop • Recognition of the variables measured and controlled by the instruments
3. Run the control software for the ore processing circuit.	• Compliance with the software's procedure call • Appropriate selection of functions and commands according to established parameters
4. Adjust the parameters of the machines used in the computer-based ore processing circuit and verify the circuit's operation.	• Proper adjustment of operational and safety set points • Appropriate use of the computer-based control system's functions • Accurate detection of operational problems • Appropriate choice of control mode: – automatic – manual • Proper use and care of machines and materials

For the competency as a whole:

- Compliance with instructions relating to production and machine operations
- Compliance with methods relating to circuit and machine operations
- Appropriate solutions to operational problems affecting circuits and machines
- Use of appropriate work methods
- Appropriate use of machines, equipment and materials
- Appropriate communication with other specialists
- Continuous monitoring of equipment and machine operations
- Compliance with occupational health and safety regulations
- Compliance with environmental standards

Flotation Concentration	Code: 778516

Module 11 Duration 90 hours

Behavioural Objective

Statement of the Competency

To operate machines and equipment used to produce ore concentrates by flotation.

Achievement Context

- Working alone
- On flotation cells
- With operating instructions for ore processing and production machines
- Using operational data for ore processing and production machines; measuring instruments; a computer-based control system for ore processing machines; tools; personal protective equipment; a communications system; technical documentation including flow sheets; and rocks, water, minerals and reagents

Elements of the Competency	**Performance Criteria**
1. Interpret the information contained in production reports.	• Identification of pertinent data • Accurate interpretation of information gathered
2. Start or stop machines, equipment and circuits.	• Proper inspection of machines before starting them • Compliance with procedures for starting and stopping machines, equipment and circuits
3. Conduct a tour of inspection.	• Compliance with the inspection schedule • Thorough inspection of functional parameters of machines and equipment • Accurate interpretation of functional parameters of circuits • Accurate detection of operational problems
4. Conduct control tests.	• Compliance with the sampling and testing schedule • Compliance with the sampling method • Proper preparation of samples • Compliance with the testing method relating to: – the percentage of solids – reagent capacity – the pH value – the froth level • Accurate interpretation of results • Soundness of the decision relating to whether it is necessary to repeat a test

5. Monitor production.	• Proper supervision of the functional parameters of machines and circuits • Appropriate choice of maintenance operations and repairs to be done
6. Clean the work area and store all materials and equipment.	• Appropriate use of washing equipment • Appropriate cleaning of work area and equipment • Appropriate storage of materials and equipment
7. Write up a production report.	• Pertinence of data gathered • Comprehensive inclusion of all data • Accuracy of data • Neatness of report
	For the competency as a whole: • Compliance with instructions relating to production and machine operations • Compliance with methods relating to circuit and machine operations • Appropriate solutions to operational problems affecting circuits and machines • Use of appropriate work methods • Appropriate use of machines, equipment and materials • Appropriate communication with other specialists • Continuous monitoring of equipment and machine operations • Compliance with occupational health and safety regulations • Compliance with environmental standards

Filtering Concentrates	Code: 778522

Module 12 Duration 30 hours

Behavioural Objective

Statement of the Competency

To operate machines and equipment used to filter concentrates.

Achievement Context

- Working alone
- On machines and equipment used for filtration
- With operating instructions for ore processing and production machines
- Using operational data for ore processing and production machines; measuring instruments; a computer-based control system for ore processing machines; tools; personal protective equipment; a communications system; technical documentation including circuit flow diagrams; and rocks, water, minerals and reagents

Elements of the Competency	Performance Criteria
1. Interpret the information contained in production reports.	• Identification of pertinent data • Accurate interpretation of information gathered
2. Start or stop machines, equipment and circuits.	• Proper inspection of machines before starting them • Compliance with the procedure for starting and stopping machines, equipment and circuits
3. Conduct a tour of inspection.	• Compliance with the inspection schedule • Thorough inspection of functional parameters of machines and equipment • Accurate interpretation of functional parameters of circuits • Accurate detection of operational problems
4. Conduct control tests.	• Compliance with the sampling and testing schedule • Compliance with the sampling method • Proper preparation of samples • Compliance with the testing method relating to: – the percentage of solids – humidity – the pH value – density • Accurate interpretation of results • Soundness of the decision relating to whether it is necessary to repeat a test

Filtering Concentrates	Code: 778522

5. Monitor production.	• Proper supervision of the functional parameters of machines and circuits • Appropriate choice of maintenance operations and repairs to be done
6. Inspect and replace a filter cloth.	• Proper inspection of the cloth's condition • Compliance with the replacement procedure
7. Clean the work area and store all materials and equipment.	• Appropriate use of washing materials • Appropriate cleaning of work area and equipment • Appropriate storage of materials and equipment
8. Write up a production report.	• Pertinence of data gathered • Comprehensive inclusion of all data • Accuracy of data • Neatness of report
	For the competency as a whole: • Compliance with instructions relating to production and machine operations • Compliance with methods relating to circuit and machine operations • Appropriate solutions to operational problems affecting circuits and machines • Use of appropriate work methods • Appropriate use of machines, equipment and materials • Appropriate communication with other specialists • Continuous monitoring of equipment and machine operations • Compliance with occupational health and safety regulations • Compliance with environmental standards

Filling	Code: 778532

Module 13 Duration 30 hours

Behavioural Objective

Statement of the Competency

To operate machines and equipment used for hydraulic backfill and paste backfill.

Achievement Context

- Working alone
- On machines and equipment used for filling and filtering
- With operating instructions for ore processing and production machines
- Using operational data for ore processing and production machines; measuring instruments; tools; personal protective equipment; a communications system; technical documentation including flow sheets; and rocks, water, minerals and reagents

Elements of the Competency	**Performance Criteria**
1. Interpret the information contained in production reports.	• Identification of pertinent data • Accurate interpretation of information gathered
2. Start or stop machines, equipment and circuits.	• Proper inspection of machines before starting them • Compliance with the procedure for starting and stopping machines, equipment and circuits
3. Conduct a tour of inspection.	• Compliance with the inspection schedule • Thorough inspection of functional parameters of machines and equipment • Accurate interpretation of functional parameters of circuits • Accurate detection of operational problems
4. Conduct control tests.	• Compliance with the sampling and testing schedule • Compliance with the sampling method • Proper preparation of samples • Compliance with the testing method relating to: – the percentage of solids – reagent capacity – the pH value – cyanide titration – subsidence • Accurate interpretation of results • Soundness of the decision relating to whether it is necessary to repeat a test

Filling	Code: 778532
5. Monitor production.	• Proper supervision of the functional parameters of machines and circuits • Appropriate choice of maintenance operations and repairs to be done
6. Clean the work area and store all materials and equipment.	• Appropriate use of washing materials • Appropriate cleaning of work area and equipment • Appropriate storage of materials and equipment
7. Write up a production report.	• Pertinence of data gathered • Comprehensive inclusion of all data • Accuracy of data • Neatness of report
	For the competency as a whole: • Compliance with instructions relating to production and machine operations • Compliance with methods relating to circuit and machine operations • Appropriate solutions to operational problems affecting circuits and machines • Use of appropriate work methods • Appropriate use of machines, equipment and materials • Appropriate communication with other specialists • Continuous monitoring of equipment and machine operations • Compliance with occupational health and safety regulations • Compliance with environmental standards

Chemical Concentration Methods	Code: 778547

Module 14 Duration 105 hours

Behavioural Objective

Statement of the Competency

To operate machines and equipment used to produce ore concentrates using chemical methods.

Achievement Context

- Working alone
- On machines and equipment used for chemical concentration methods and filtration
- With operating instructions for ore processing and production machines
- Using operational data for ore processing and production machines; measuring instruments; tools; personal protective equipment; a communications system; technical documentation including flow sheets; and rocks, water, minerals and reagents

Field of application

- Leaching, absorption, desorption, filtering and precipitating circuits for precious metals

Elements of the Competency	Performance Criteria
1. Interpret the information contained in production reports.	• Identification of pertinent data • Accurate interpretation of information gathered
2. Start or stop machines, equipment and circuits.	• Proper inspection of machines before starting them • Compliance with the procedure for starting and stopping machines, equipment and circuits
3. Conduct a tour of inspection.	• Compliance with the inspection schedule • Thorough inspection of functional parameters of machines and equipment • Accurate interpretation of functional parameters of circuits • Accurate detection of operational problems

4. Conduct control tests.	• Compliance with the sampling and testing schedule • Compliance with the sampling method • Proper preparation of samples • Compliance with the testing method relating to: – the percentage of solids – colorimetric determination – carbon concentration – reagent capacity – the pH value – cyanide titration • Accurate interpretation of results • Soundness of the decision relating to whether it is necessary to repeat a test
5. Monitor production.	• Proper supervision of the functional parameters of machines and circuits • Compliance with the carbon transfer method • Compliance with the carbon desorption method • Compliance with the method for preparing new carbon • Compliance with the method for using acid to clean the carbon and filter • Appropriate choice of maintenance operations and repairs to be done
6. Clean the work area and store all materials and equipment.	• Appropriate use of washing materials • Appropriate cleaning of work area and equipment • Appropriate storage of materials and equipment
7. Write up a production report.	• Pertinence of data gathered • Comprehensive inclusion of all data • Accuracy of data • Neatness of report

For the competency as a whole:

- Compliance with instructions relating to production and machine operations
- Compliance with methods relating to circuit and machine operations
- Appropriate solutions to operational problems affecting circuits and machines
- Use of appropriate work methods
- Appropriate use of machines, equipment and materials
- Appropriate communication with other specialists
- Continuous monitoring of equipment and machine operations
- Compliance with occupational health and safety regulations
- Compliance with environmental standards

Agglomeration	Code: 778553

Module 15 Duration 45 hours

Behavioural Objective

Statement of the Competency

To operate machines and equipment used for the agglomeration of concentrates.

Achievement Context

- Working alone
- On machines and equipment used for agglomeration and filtration
- With operating instructions for ore processing and production machines
- Using operational data for ore processing and production machines; measuring instruments; tools; personal protective equipment; a communications system; technical documentation including flow sheets; and rocks, water, minerals and reagents

Elements of the Competency	**Performance Criteria**
1. Interpret the information contained in production reports.	• Identification of pertinent data • Accurate interpretation of information gathered
2. Start or stop machines, equipment and circuits.	• Proper inspection of machines before starting them • Compliance with procedure for starting and stopping machines, equipment and circuits
3. Conduct a tour of inspection.	• Compliance with the inspection schedule • Thorough inspection of functional parameters of machines and equipment • Accurate interpretation of functional parameters of circuits • Accurate detection of operational problems
4. Conduct control tests.	• Compliance with the sampling and testing schedule • Compliance with the sampling method • Proper preparation of samples • Compliance with the testing method relating to: – the percentage of solids – particle size – humidity – waste • Accurate interpretation of results • Soundness of the decision relating to whether it is necessary to repeat a test

5. Monitor production.	• Proper supervision of the functional parameters of machines and circuits • Appropriate choice of maintenance operations and repairs to be done
6. Clean the work area and store all materials and equipment.	• Appropriate use of washing materials • Appropriate cleaning of work area and equipment • Appropriate storage of materials and equipment
7. Write up a production report.	• Pertinence of data gathered • Comprehensive inclusion of all data • Accuracy of data • Neatness of report
	For the competency as a whole: • Compliance with instructions relating to production and machine operations • Compliance with methods relating to circuit and machine operations • Appropriate solutions to operational problems affecting circuits and machines • Use of appropriate work methods • Appropriate use of machines, equipment and materials • Appropriate communication with other specialists • Continuous monitoring of equipment and machine operations • Compliance with occupational health and safety regulations • Compliance with environmental standards

Wastewater Treatment	Code: 778562

Module 16 Duration 30 hours

Behavioural Objective

Statement of the Competency	**Achievement Context**
To operate machines and equipment used to treat wastewater.	• Working alone • On machines and equipment used to treat wastewater • With operating instructions for ore processing and production machines • Using operational data for ore processing and production machines; measuring instruments; tools; personal protective equipment; a communications system; technical documentation including flow sheets; wastewater; and reagents Field of application • Neutralization circuits using lime, hydrogen peroxide, sulphur dioxide and polymers

Elements of the Competency	**Performance Criteria**
1. Interpret the information contained in production reports.	• Identification of pertinent data • Accurate interpretation of information gathered
2. Start or stop machines, equipment and circuits.	• Proper inspection of machines before starting them • Compliance with the procedure for starting and stopping machines, equipment and circuits
3. Conduct a tour of inspection.	• Compliance with the inspection schedule • Thorough inspection of functional parameters of machines and equipment • Accurate interpretation of functional parameters of circuits • Accurate detection of operational problems
4. Conduct control tests.	• Compliance with the sampling and testing schedule • Compliance with the sampling method • Proper preparation of samples • Compliance with the testing method relating to: – the pH value – reagent capacity – cyanide titration • Accurate interpretation of results • Soundness of the decision relating to whether it is necessary to repeat a test

5. Monitor production.	• Proper supervision of the functional parameters of machines and circuits • Appropriate choice of maintenance operations and repairs to be done
6. Clean the work area and store all materials and equipment.	• Appropriate use of washing materials • Appropriate cleaning of work area and equipment • Appropriate storage of materials and equipment
7. Write up a production report.	• Pertinence of data gathered • Comprehensive inclusion of all data • Accuracy of data • Neatness of report
	For the competency as a whole: • Compliance with instructions relating to production and machine operations • Compliance with methods relating to circuit and machine operations • Appropriate solutions to operational problems affecting circuits and machines • Use of appropriate work methods • Appropriate use of machines, equipment and materials • Appropriate communication with other specialists • Continuous monitoring of equipment and machine operations • Compliance with occupational health and safety regulations • Compliance with environmental standards

Entering the Work Force	Code:	778577

Module 17 Duration 105 hours

Situational Objective

Statement of the Competency

To enter the work force.

Elements of the Competency

- Look for a practicum position.
- Learn about the workplace by performing certain trade-related tasks.
- Pursue their personal and professional development in the workplace.

Learning Context

Information Phase

- Finding information about mineral and metal processing plants that offer practicums.
- Writing their résumé.
- Applying for a practicum position.

Participation Phase

- Learning about the plant's organization and operations.
- Learning about the practicum position and the tasks to be performed.
- Performing specific tasks in accordance with current health rules, safety measures and the manager's expectations.
- Sharing information and talking with plant personnel.
- Determining whether the manager is satisfied with their work.
- Keeping a logbook.

Synthesis Phase

- Producing a practicum report.
- In class, sharing their experience in the workplace with their classmates.
- Participating in the practicum evaluation.
- Producing a report in which they state their observations about the work environment and the tasks performed during the practicum.

Instructional Guidelines

- Provide students with the means to properly select their practicum position.
- Ensure the regular support and supervision of students.
- Ensure close cooperation between the school and the ore processing plants.
- Intervene in the event of difficulties or problems.
- Encourage students to critically appraise the practicum.
- Make sure that students are supervised by a responsible plant employee.
- Provide students with a sample practicum report.

Entering the Work Force	Code:	778577

Participation Criteria

Information Phase

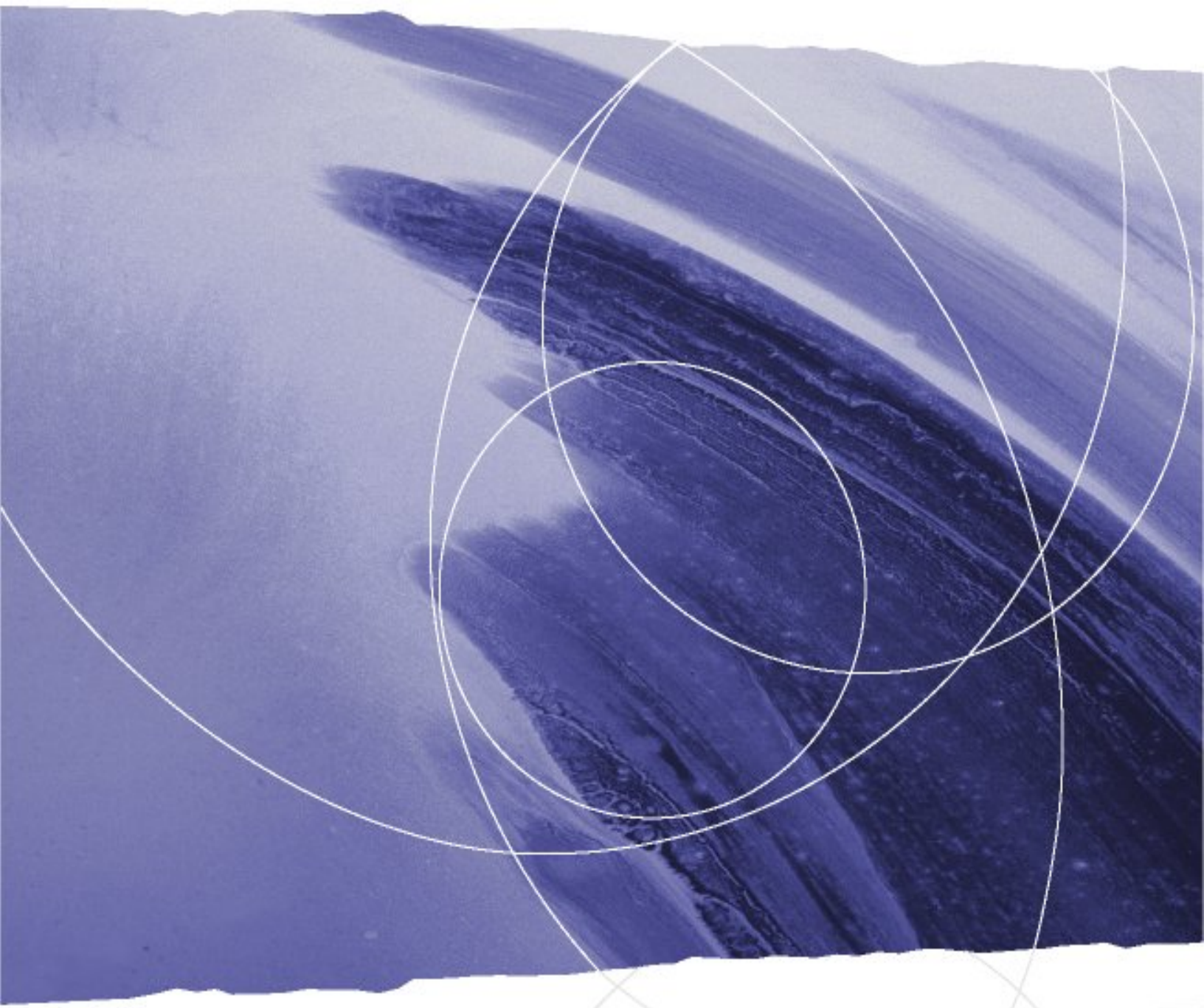
- Gather information about companies that offer practicums.
- Prepare for their interview and compose a well-written résumé.
- Be prepared to explain their choice and present their findings.

Participation Phase

- Perform assigned tasks in accordance with health and safety rules, as per the agreement with the plant and/or the practicum coordinator.
- Take an active, positive role in all meetings with the practicum coordinator.
- Write in their logbook daily.
- For the duration of the practicum, adopt the attitudes and behaviour expected of a mineral and metal processing machine operator.
- Talk with plant personnel.

Synthesis Phase

- Write and present their practicum report according to the instructions received.
- Indicate specific aspects of the workplace and the tasks performed that they noted during the practicum.
- Take an active role in evaluating their practicum.



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