

Vocational Training Program

5784

# Northern Heavy Equipment Operations

Training Sector

15

Mining  
and Site Operations

**Reach** for  
your **Dreams**

Québec 



Vocational Training Program

5784

# Northern Heavy Equipment Operations

Training Sector

15

Mining  
and Site Operations

Formation professionnelle et technique  
et formation continue

Direction générale des programmes  
et du développement

# Development Team

## Coordination

*Lyne St-Pierre*  
Direction des programmes  
Ministère de l'Éducation

*Michel Cauchon*  
Coordinator of the Mining and Site Operations Sector  
Direction générale des programmes et du développement  
Ministère de l'Éducation

## Design and Development

*Jean-François Pouliot*  
Educational Consultant

## English Version\*

Direction de la production en langue anglaise  
Services à la communauté anglophone  
Ministère de l'Éducation

Technical Editing:

*Steven Wanamaker*  
Kativik School Board

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Educational Consultant

## Representatives Employed in Education

*Patrice Cloutier*  
Teacher  
Cree and Kativik School Boards

*Jacques Labelle*  
Teacher  
Cree and Kativik School Boards

*Paul Paquette*  
Teacher  
Cree and Kativik School Boards



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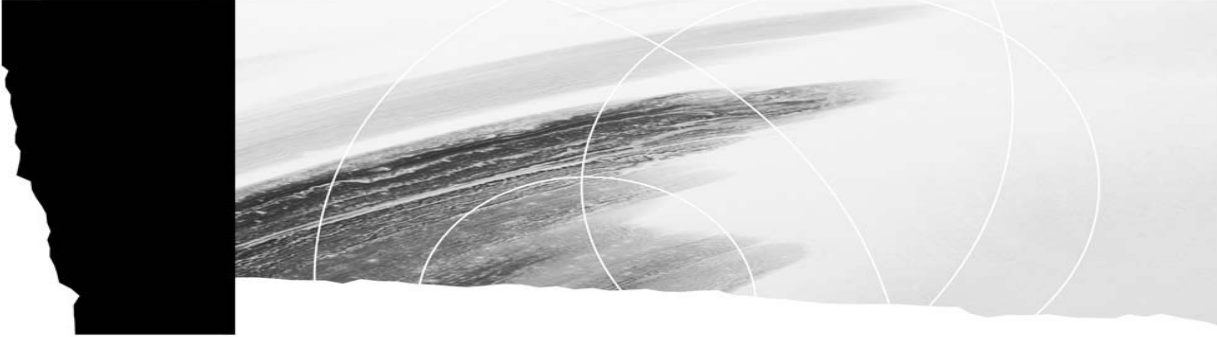
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5784

**Northern Heavy Equipment Operations**

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Year of approval: 2003

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<b>Certification:</b>	Diploma of Vocational Studies (DVS)
<b>Number of credits:</b>	60
<b>Number of modules:</b>	18
<b>Total duration:</b>	900 hours

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To be admitted to the *Northern Heavy Equipment Operations* 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 and suggestions for competency-related knowledge, skills and attitudes.

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 18 modules, which vary in length from 15 to 105 hours. The total hours allocated to the program include time devoted to evaluation for certification purposes and to remedial work.

<b>Title of Module</b>	<b>Code</b>	<b>Module</b>	<b>Hours</b>	<b>Credits</b>
The trade and the training process	727 231	1	15	1
Health and safety	755 002	2	30	2
Basic principles of infrastructure construction	727 242	3	30	2
Northern heavy equipment maintenance	727 253	4	45	3
Construction industry organizations	755 001	5	15	1
Introduction to the hydraulic shovel	727 273	6	45	3
Preparing a site with a hydraulic shovel	727 284	7	60	4
Excavating with a hydraulic shovel	727 294	8	60	4
Introduction to the bulldozer	727 303	9	45	3
Preparing a site and backfilling with a bulldozer	727 313	10	45	3
Excavating with a bulldozer	727 323	11	45	3
Grading with a bulldozer	727 343	12	45	3
Excavating and loading with a backhoe loader	727 355	13	75	5
Introduction to the grader	727 363	14	45	3
Shaping ditches, embankments and roads with a grader	727 376	15	90	6
Maintaining roads with a grader	727 383	16	45	3
Grading with a grader	727 394	17	60	4
Off-road dump truck	727 407	18	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 suggestions for competency-related knowledge, skills, attitudes and perceptions that must be enriched or adapted according to the needs of students, and information regarding the certification of studies.<sup>1</sup>

## 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.

Objectives also provide indicators for learning, related knowledge, skills, attitudes and perceptions, and associated guidelines. These indicators are grouped according to elements of the competency (in the case of behavioural objectives), and according to phases of the learning context (in the case of situational objectives).

### 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.

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<sup>1</sup> Specifications regarding certification complement the program of study, but are presented in another document. Evaluation criteria are prescriptive.

- 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 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.

### Competency-Related Knowledge, Skills, Attitudes and Perceptions<sup>2</sup>

Competency-related knowledge, skills, attitudes and perceptions define the essential and important learning that the student must acquire in order to apply and continue to develop the competency. They correspond to activities in the job market and are accompanied by guidelines that provide information on the field of application, the level of complexity or content related to training. The knowledge, skills, attitudes and perceptions and the related guidelines are not prescriptive.

### Module

A module is a component of a program of study comprising a prescriptive objective and suggestions for competency-related knowledge, skills, attitudes and perceptions.

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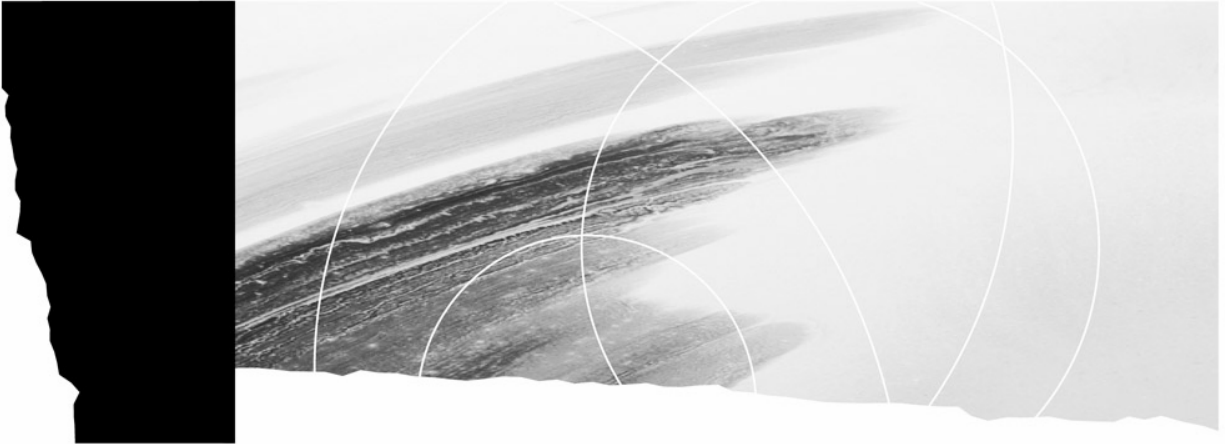
<sup>2</sup> This section does not apply to the *Northern Heavy Equipment Operations*' program.

**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 *Northern Heavy Equipment Operations* program prepares students to practise the occupation of Operator, Northern Heavy Equipment

Heavy equipment operators operate heavy equipment used in the construction and maintenance of roads, bridges, airports, gas and oil pipelines, tunnels, buildings and other structures; in surface mining and quarrying activities; and in material handling work.

The program goals of the *Northern Heavy Equipment Operations* 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, that is:
  - to teach students to perform roles, functions, tasks and activities associated with the trade or occupation upon entry into the job market
  - to prepare students to progress satisfactorily on the job (which implies having the technical and technological knowledge and skills in such areas as communication, problem solving, decision making, ethics, health and safety)
- To help students integrate into the work force, that is:
  - to familiarize students with the job market in general and the context surrounding the trade or occupation they have chosen
  - to familiarize students with their rights and responsibilities as workers
- To foster students' personal development and acquisition of occupational knowledge, skills, perceptions and attitudes, that is:
  - to help students develop their autonomy and ability to learn, and acquire effective work methods
  - to help students understand the principles underlying the techniques and the technology used in the trade or occupation
  - to help students adopt the attitudes required to successfully practise the trade or occupation, and instill in them a sense of responsibility and a concern for excellence
- To promote job mobility, that is:
  - to help students develop positive attitudes toward change
  - to help students develop the means to manage their careers by familiarizing them with entrepreneurship

# Educational Aims

The aim of the *Northern Heavy Equipment Operations* 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 effect of work quality
- to develop a sense of responsibility and versatility
- to develop a concern for occupational health and safety regulations
- to develop a concern for environmental standards



# Program Competencies and Grid of Competencies

## List of Competencies

- Determine their suitability for the trade and the training process.
- Apply rules of health and safety on construction sites.
- Apply basic principles of infrastructure construction.
- Perform maintenance on Northern heavy equipment.
- Understand their role vis-à-vis construction industry organizations.
- Operate a hydraulic shovel.
- Perform site preparation operations using a hydraulic shovel.
- Perform excavation operations using a hydraulic shovel.
- Operate a bulldozer.
- Perform site preparation and backfilling operations using a bulldozer.
- Perform excavation operations using a bulldozer.
- Perform grading operations using a bulldozer.
- Perform excavation and loading operations using a backhoe loader.
- Operate a grader.
- Shape ditches, embankments and roads using a grader.
- Perform road maintenance operations using a grader.
- Perform grading operations using a grader.
- Operate an off-road dump truck.

## 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 ( $\Delta$ ) indicates a correlation between a specific competency and a step in the work process. The symbol ( $\circ$ ) 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

<b>NORTHERN HEAVY EQUIPMENT OPERATIONS</b>				GENERAL COMPETENCIES										WORK PROCESS		
				Competency number	Objective	Duration (in hours)	Determine their suitability for the trade and the training process	Apply rules of health and safety on construction sites	Apply basic principles of infrastructure construction	Perform maintenance on Northern heavy equipment	Understand their role vis-à-vis construction industry organizations	Operate a hydraulic shovel	Operate a bulldozer	Operate a grader	Prepare the work	Perform the work
<b>Competency number</b>				1	2	3	4	5	6	9	14					
<b>Objective</b>				S	S	B	B	S	B	B	B					
<b>Duration (in hours)</b>				15	30	30	45	15	45	45	45					
Perform site preparation operations using a hydraulic shovel	7	B	60	○	●	●	●	○	●			▲	▲			
Perform excavation operations using a hydraulic shovel	8	B	60	○	●	●	●	○	●			▲	▲	▲		
Perform site preparation and backfilling operations using a bulldozer	10	B	45	○	●	●	●	○		●		▲	▲	▲		
Perform excavation operations using a bulldozer	11	B	45	○	●	●	●	○		●		▲	▲	▲		
Perform grading operations using a bulldozer	12	B	45	○	●	●	●	○		●		▲	▲	▲		
Perform excavation and loading operations using a backhoe loader	13	B	75	○	●	●	●	○				▲	▲	▲		
Shape ditches, embankments and roads using a grader	15	B	90	○	●	●	●	○			●	▲	▲	▲		
Perform road maintenance operations using a grader	16	B	45	○	●	●	●	○			●	▲	▲	▲		
Perform grading operations using a grader	17	B	60	○	●	●	●	○			●	▲	▲	▲		
Operate an off-road dump truck	18	B	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, recognize prior learning and facilitate the students' progress.

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

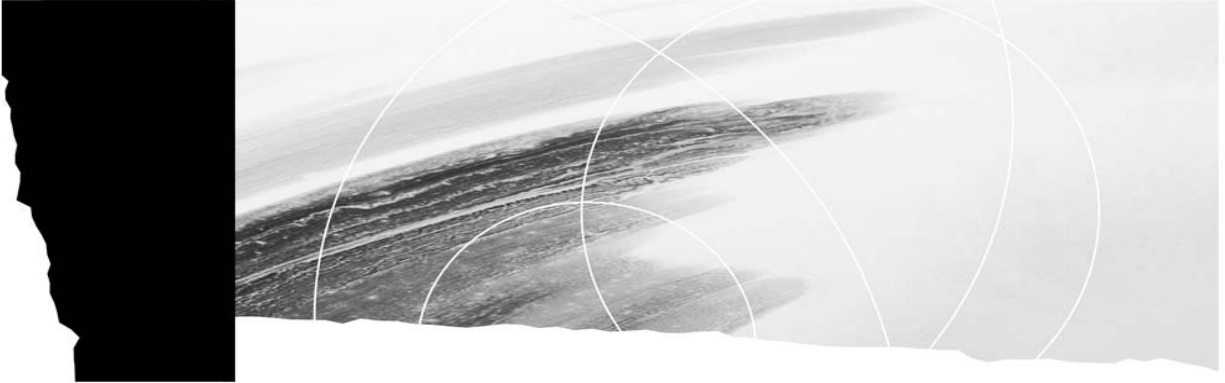
Harmonization is said to be “inter-level” when it focuses on training programs at different levels, “intra-level” when it focuses on programs within the same educational level, and “inter-sector” when carried out between programs in various sectors.

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

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







## **Part II**

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Objectives



Module 1                      Duration: 15 hours

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## ***Situational Objective***

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### **Statement of the Competency**

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.

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### **Learning Context**

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#### **Information phase**

- Learning about the job market in the field of Northern heavy equipment operations: workplaces (types of companies), job prospects, remuneration, etc.
- Learning about the nature and requirements of the job (tasks, working conditions, driver's licence, etc.).
- Presenting the information gathered and discussing their views on the trade.

#### **Participation phase**

- Discussing the skills, aptitudes and knowledge required to practise the trade.
- Becoming familiar with the training program: program of study, training process, evaluation methods and certification of studies.
- Sharing their initial reactions to the trade and the training process.

#### **Synthesis phase**

- Evaluating their career choice by comparing the aspects and requirements of the trade with their personal preferences, aptitudes and interests.
- Producing a report in which they present the results of this evaluation.

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### **Instructional Guidelines**

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- 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 sites representative of the most common workplaces.
- Provide the students with pertinent reference materials: information on the trade, training programs, guides, etc.
- Organize a meeting with specialists in the field.

**Participation Criteria**

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**Information phase**

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

**Participation phase**

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

**Synthesis phase**

- Produce a report in which they:
  - sum up their preferences, interests and aptitudes
  - explain their career choice by clearly relating these preferences, interests and aptitudes to the practice of the trade

Module 2                      Duration: 30 hours

## ***Situational Objective***

---

### **Statement of the Competency**

Apply rules of health and safety on construction sites.

### **Elements of the Competency**

- Become familiar with the laws and regulations that apply to health and safety on construction sites.
- Become familiar with the roles and responsibilities of construction workers with regard to health and safety.
- Become familiar with the risks inherent in certain jobs and the applicable preventive measures.
- Become familiar with the risks inherent in construction sites and the applicable preventive measures.
- Become familiar with the risks associated with the use of certain products and the applicable preventive measures.
- Become familiar with the measures to take in the event of an emergency.

### **Learning Context**

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#### **Information phase**

- Finding out the objective of the training unit and the teaching guide.

#### **Participation phase**

- Gathering information on the topic to be covered.
- Forming an opinion and expressing it on the topic.
- Asking questions.
- Identifying the primary concepts and basic principles underlying safe behaviour.
- Evaluating their support for these principles.

#### **Synthesis phase**

- Reviewing the important concepts and elements of the training unit.
- Answering a questionnaire.
- Checking their answers and discussing them, as needed.

### **Instructional Guidelines**

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- Ensure students have access to a suitable classroom and adequate materials.
- Present the content in a dynamic fashion.
- Favour group discussions.
- Make good use of teaching materials (charts, transparencies, films, videos, information cards, etc.).

## Participation Criteria

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### Information phase

- Participate in at least 18 of the 20 training units. Units 1 and 2 are mandatory for everyone.

### Participation phase

- Listen attentively.
- Ask questions and offer pertinent answers.

### Synthesis phase

- Apply themselves when answering the questionnaire.
- Discuss the topic being covered.
- Correct all exercises.

Module 3 Duration: 30 hours

***Behavioural objective***

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**Statement of the Competency**

Apply basic principles of infrastructure construction.

**Achievement Context**

- Working alone
- Working with:
  - verbal or written instructions
  - soil and aggregate samples
  - site plans
  - grade stakes
- Using:
  - infrastructure construction standards
  - surveying systems

**Elements of the Competency**

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- 1 Differentiate among the different types of soil.
- 2 Interpret plans.
- 3 Estimate the time and materials required to do the work.
- 4 Interpret the information marked on grade stakes.

**Performance Criteria**

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- Proper identification of types of soil
- Recognition of different grain sizes
- Recognition of various types of plans (elevations, cross-sections, etc.)
- Accurate interpretation of grade lines, symbols, labels and elevations
- Appropriate application of mathematical formulas
- Accuracy of calculations
- Precise location of grade stakes
- Accurate interpretation of information:
  - centre line
  - point of elevation, etc.

*For the overall competency*

- Accuracy of terminology employed





Module 4 Duration: 45 hours

***Behavioural objective*****Statement of the Competency**

Perform maintenance on Northern heavy equipment.

**Achievement Context**

- Working alone
- With a hydraulic shovel, bulldozer, backhoe loader, grader or truck
- Using:
  - inspection sheets
  - maintenance programs
  - hand tools
  - replacement parts
  - fluids and lubricants

**Elements of the Competency****Performance Criteria**

1 Perform a visual inspection of the equipment.

- Thorough inspection of all systems:
  - fuel system
  - exhaust system
  - cooling system
  - hydraulic system
- Thorough inspection of attachments
- Detection of any breakage or wear and tear
- Accurate assessment of the condition of equipment systems and attachments

2 Replace teeth, blades, wedges or tires on:

- a hydraulic shovel
- a bulldozer
- a backhoe loader
- a grader
- a truck

- Appropriate selection of parts
- All parts firmly and securely connected
- Correct use of tools

3 Perform preventive maintenance on vehicle systems.

- Accurate interpretation of inspection sheet
- Correct application of maintenance program

4 Detect any problems or defects affecting operations.

- Clear description of any defects
- Accuracy of diagnosis

*For the overall competency*

- Compliance with environmental standards
- Compliance with occupational health and safety regulations



Module 5                      Duration: 15 hours

## ***Situational Objective***

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### **Statement of the Competency**

Understand their role vis-à-vis construction industry organizations.

### **Elements of the Competency**

- Become familiar with the laws and regulations governing labour relations in the construction industry.
- Learn the primary roles and responsibilities of union and employer associations and organizations.

### **Learning Context**

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#### **Information phase**

- Finding out the objective of the training unit in the teaching guide.

#### **Participation phase**

- Gathering information on the topic to be covered.
- Expressing their opinions on the topic and asking questions.

#### **Synthesis phase**

- Reviewing the important elements of the training unit.
- Individually answering a questionnaire.
- Correcting their answers as a group.

### **Instructional Guidelines**

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- Ensure students have access to a suitable classroom and adequate materials.
- Present the content in a dynamic fashion.
- Favour group discussions.
- Make use of charts and pertinent illustrations.

### **Participation Criteria**

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- Participate in seven of the nine training units.
- Listen attentively.
- Discuss the topics being covered.
- Ask questions and offer pertinent answers.
- Apply themselves when doing the exercises.
- Correct all exercises.



Module 6 Duration: 45 hours

## ***Behavioural objective***

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### **Statement of the Competency**

Operate a hydraulic shovel.

### **Achievement Context**

- Working alone
- Working with verbal instructions
- With a hydraulic shovel and lowbed semi-trailer
- With a rock breaker, ripper and other attachments
- On relatively flat terrain with loose debris and objects to be moved (tree trunks, rocks, etc.)

### **Elements of the Competency**

### **Performance Criteria**

- |  |  |
|--|--|
| 1 Unload the hydraulic shovel from the lowbed. | <ul style="list-style-type: none"> <li>• Proper preparation of hydraulic shovel</li> <li>• Correct technique for unfastening chains and cables</li> <li>• Precautions taken during manoeuvres</li> <li>• Absence of any breakage to lowbed</li> </ul>                            |
| 2 Install attachments.                         | <ul style="list-style-type: none"> <li>• Attachments firmly and securely fastened</li> <li>• Solidity of connections and impermeability of hoses</li> <li>• Correct installation method</li> </ul>   |
| 3 Drive and then park the hydraulic shovel.    | <ul style="list-style-type: none"> <li>• Careful selection of proper speed</li> <li>• Precision of route taken</li> <li>• Hydraulic shovel positioned in the proper location</li> <li>• Stability of hydraulic shovel</li> </ul>   |
| 4 Excavate earth and stockpile materials.      | <ul style="list-style-type: none"> <li>• Bucket filled to optimum capacity</li> <li>• Rocks held properly and securely</li> <li>• Maintenance of optimum distance between the bucket and hydraulic shovel</li> <li>• Materials dumped in accordance with requirements</li> </ul> |
| 5 Remove the hydraulic shovel from the mud.    | <ul style="list-style-type: none"> <li>• Accurate analysis of situation</li> <li>• Hydraulic shovel manoeuvred safely and with precision</li> <li>• Correct use of boom and bucket</li> </ul>  |

6 Load the hydraulic shovel onto the lowbed.

- Cleanliness of hydraulic shovel
- Precautions taken during manoeuvres
- Removal of attachments
- Correct technique for turning off the engine
- Hydraulic shovel fastened firmly and securely to lowbed
- Thorough sealing of top of exhaust pipe
- Absence of any breakage to lowbed

*For the overall competency*

- Correct interpretation of dashboard lights and indicators
- Accurate determination of manoeuvres to be performed
- Proper choice of engine speed
- Correct use of controls
- Coordination and precision of manoeuvres
- Hydraulic shovel's capacity taken into account
- Demonstration of caution
- Compliance with occupational health and safety regulations

Module 7 Duration: 60 hours

## ***Behavioural objective***

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### **Statement of the Competency**

Perform site preparation operations using a hydraulic shovel.

### **Achievement Context**

- Working alone
- Working with verbal instructions and a work plan
- With a hydraulic shovel and attachments

### **Elements of the Competency**

### **Performance Criteria**

- |  |   |
|--|---|
| 1 Prepare the work.                        | <ul style="list-style-type: none"> <li>• Thorough visual inspection of hydraulic shovel</li> <li>• Accurate interpretation of instructions and work plan</li> </ul>   |
| 2 Remove all stumps and rocks.             | <ul style="list-style-type: none"> <li>• Proper determination of the dimensions of the excavation for filling and the dimensions of the site for stockpiling</li> <li>• Correct use of ripper</li> </ul>  |
| 3 Construct a service road.                | <ul style="list-style-type: none"> <li>• Accurate analysis of site conditions</li> <li>• Precise location of service road</li> <li>• Practicality and accessibility of service road</li> <li>• Suitable driving surface</li> </ul>                      |
| 4 Drain the site.                          | <ul style="list-style-type: none"> <li>• Accurate assessment of slopes on site</li> <li>• Precise location of areas to be drained</li> <li>• Appropriate selection of drainage method</li> <li>• Effectiveness of drainage</li> </ul>                   |
| 5 Break up the materials.                  | <ul style="list-style-type: none"> <li>• Accuracy of angle of attack</li> <li>• Proper breaking up of materials</li> <li>• Correct use of rock breaker</li> </ul>   |
| 6 Finish up at the end of the work period. | <ul style="list-style-type: none"> <li>• Proper parking of hydraulic shovel</li> <li>• Correct technique for turning off the engine</li> <li>• Proper checking and maintenance of hydraulic shovel</li> <li>• Proper completion of daily log</li> </ul> |

*For the overall competency*

- Proper operation of hydraulic shovel
- Proper installation of attachments
- Appropriate selection of materials
- Optimum use of materials
- Pertinence and efficiency of work techniques used
- Hydraulic shovel's capacity taken into account
- Compliance with construction standards
- Compliance with environmental standards
- Compliance with occupational health and safety regulations



Module 8 Duration: 60 hours

***Behavioural objective*****Statement of the Competency**

Perform excavation operations using a hydraulic shovel.

**Achievement Context**

- Working alone
- Working with verbal instructions, survey data and excavation plans
- With a hydraulic shovel and attachments
- With a culvert
- Using a surveying system
- With the help of an unskilled worker or control operator

**Elements of the Competency****Performance Criteria**

- |   |   |
|---|---|
| 1 Prepare the work.   | <ul style="list-style-type: none"> <li>• Thorough visual inspection of hydraulic shovel</li> <li>• Accurate interpretation of instructions, survey data and excavation plans</li> </ul>   |
| 2 Excavate trenches with vertical and sloped walls.   | <ul style="list-style-type: none"> <li>• Precise determination of width of trench opening</li> <li>• Uniformity of trench bottom</li> <li>• Correct depth and slope of trench</li> <li>• Proper alignment of walls</li> <li>• Materials stockpiled for removal or use as fill</li> </ul>  |
| 3 Backfill a trench.  | <ul style="list-style-type: none"> <li>• Appropriate selection of fill material</li> <li>• Filling and compaction done in successive layers</li> </ul>  |
| 4 Dig ditches.  | <ul style="list-style-type: none"> <li>• Precise determination of width of ditch opening</li> <li>• Uniformity of ditch bottom</li> <li>• Correct depth and slope of ditch</li> <li>• Proper alignment of slopes</li> <li>• Materials stockpiled for removal or use as fill</li> </ul>  |
| 5 Clean ditches.  | <ul style="list-style-type: none"> <li>• Proper location of dump site</li> <li>• Uniform alignment of slopes</li> <li>• Proper cleaning and grading</li> </ul>  |
| 6 Dig a single-level regular basement or an irregular basement and make a service entrance. | <ul style="list-style-type: none"> <li>• Width, gradient and depth of service entrance in compliance with requirements</li> <li>• Basement depth in compliance with requirements</li> <li>• Uniformity of basement floor</li> <li>• Precision of slopes and walls</li> <li>• Materials stockpiled for removal or use in making the access ramp</li> </ul> |

- 7 Construct access ramps.
- Materials spread along the width, length and gradient of ramps
  - Appropriate levelling of surface
  - Ramps properly aligned with the street and the excavation
  - Proper compaction of earth
- 8 Install a culvert.
- Digging until ditch bottom or required elevation level is reached
  - Safe and correct handling of objects
  - Culvert placed along centre line of ditch
  - Filling and compaction done in successive layers
- 9 Finish up at the end of the work period.
- Proper parking of hydraulic shovel
  - Correct technique for turning off the engine
  - Proper checking and maintenance of hydraulic shovel
  - Proper completion of daily log
- For the overall competency*
- Excavations in compliance with plans
  - Proper installation of attachments
  - Proper operation of hydraulic shovel
  - Appropriate selection of materials
  - Optimum use of materials
  - Pertinence and efficiency of work techniques used
  - Hydraulic shovel's capacity taken into account
  - Compliance with construction standards
  - Correct use of survey data
  - Compliance with environmental standards
  - Compliance with occupational health and safety regulations

Module 9 Duration: 45 hours

## ***Behavioural objective***

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### **Statement of the Competency**

Operate a bulldozer.

### **Achievement Context**

- Working alone
- Working with verbal instructions
- With a bulldozer equipped with winch and a lowbed semi-trailer
- On relatively flat terrain with loose debris and objects to be moved (tree trunks, rocks, etc.)

### **Elements of the Competency**

### **Performance Criteria**

- |   |  |
|---|--|
| 1 Unload the bulldozer from the lowbed. | <ul style="list-style-type: none"> <li>• Proper preparation of bulldozer</li> <li>• Correct technique for unfastening chains and cables</li> <li>• Precautions taken during manoeuvres</li> <li>• Absence of any breakage to lowbed</li> </ul>   |
| 2 Drive the bulldozer.                  | <ul style="list-style-type: none"> <li>• Careful selection of proper speed</li> <li>• Precision of route taken</li> </ul>  |
| 3 Push objects.                         | <ul style="list-style-type: none"> <li>• Objects placed in the proper location</li> <li>• Correct use of blade</li> </ul>  |
| 4 Level and compact materials.          | <ul style="list-style-type: none"> <li>• Appropriate blade height</li> <li>• Uniform distribution of materials</li> <li>• Correct use of blade when machinery is moving forward or backward</li> <li>• Correct technique for crosscutting tracks</li> <li>• Acceptable bearing capacity</li> </ul> |
| 5 Remove the bulldozer from the mud.    | <ul style="list-style-type: none"> <li>• Accurate analysis of situation</li> <li>• Cable attached to an appropriate anchor point</li> <li>• Warning to people located in or near the danger zone</li> <li>• Proper winding of cable</li> </ul>   |

6 Load the bulldozer onto the lowbed.

- Cleanliness of bulldozer
- Precautions taken during manoeuvres
- Removal of attachments
- Correct technique for turning off the engine
- Bulldozer fastened firmly and securely to lowbed
- Thorough sealing of top of exhaust pipe
- Absence of any breakage to lowbed

*For the overall competency*

- Correct interpretation of dashboard lights and indicators
- Accurate determination of manoeuvres to be performed
- Proper choice of engine speed
- Correct use of controls
- Coordination and precision of manoeuvres
- Bulldozer's capacity taken into account
- Demonstration of caution
- Compliance with occupational health and safety regulations

Module 10 Duration: 45 hours

### ***Behavioural objective***

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#### **Statement of the Competency**

Perform site preparation and backfilling operations using a bulldozer.

#### **Achievement Context**

- Working alone
- Working with verbal instructions and a work plan
- With a bulldozer

#### **Elements of the Competency**

#### **Performance Criteria**

1 Prepare the work.

- Thorough visual inspection of bulldozer
- Accurate interpretation of instructions and work plan

2 Remove all stumps and rocks.

- Proper determination of the dimensions of the excavation for filling and the dimensions of the site for stockpiling
- Correct use of ripper

3 Backfill trenches and ditches.

- Correct backfilling method

4 Backfill approach ramps.

- Correct method for spreading fill
- Evenness and stability of approach ramps

5 Reinforce foundations.

- Correct levelling and compaction of fill
- Absence of any breakage to foundations

6 Finish up at the end of the work period.

- Proper parking of bulldozer
- Correct technique for turning off the engine
- Proper checking and maintenance of bulldozer
- Proper completion of daily log

*For the overall competency*

- Proper operation of bulldozer
- Appropriate selection of materials
- Optimum use of materials
- Pertinence and efficiency of work techniques used
- Bulldozer's capacity taken into account
- Compliance with construction standards
- Compliance with environmental standards
- Compliance with occupational health and safety regulations



Module 11 Duration: 45 hours

## ***Behavioural objective***

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### **Statement of the Competency**

Perform excavation operations using a bulldozer.

### **Achievement Context**

- Working alone
- Working with verbal instructions, survey data and excavation plans
- With a bulldozer

### **Elements of the Competency**

### **Performance Criteria**

1 Prepare the work.

- Thorough visual inspection of bulldozer
- Accurate interpretation of instructions, survey data and excavation plans

2 Dig various types of basements:

- regular
- irregularly shaped
- with more than one level
- with more than one floor height

- Width, gradient and depth in compliance with requirements
- Uniformity of basement floor
- Precision of slopes and walls

3 Dig excavations with various different slopes.

- Width, gradient and depth of excavations in compliance with requirements
- Proper alignment of slopes
- Precision of slopes

4 Finish up at the end of the work period.

- Proper parking of bulldozer
- Correct technique for turning off the engine
- Proper checking and maintenance of bulldozer
- Proper completion of daily log

#### *For the overall competency*

- Excavations in compliance with plans
- Proper operation of bulldozer
- Appropriate selection of materials
- Optimum use of materials
- Pertinence and efficiency of work techniques used
- Bulldozer's capacity taken into account
- Compliance with construction standards
- Correct use of survey data
- Compliance with environmental standards
- Compliance with occupational health and safety regulations





Module 12 Duration: 45 hours

### ***Behavioural objective***

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#### **Statement of the Competency**

Perform grading operations using a bulldozer.

#### **Achievement Context**

- Working alone
- Working with verbal instructions and survey data
- With a bulldozer and surveying system
- With the help of a control operator

#### **Elements of the Competency**

#### **Performance Criteria**

- |  |   |
|--|---|
| 1 Prepare the work.                                    | <ul style="list-style-type: none"> <li>• Thorough visual inspection of bulldozer</li> <li>• Accurate interpretation of instructions and survey data</li> </ul>  |
| 2 Spread the materials.                                | <ul style="list-style-type: none"> <li>• Precise determination of where work should begin and direction bulldozer should head, depending on the area to be cut or filled</li> <li>• Appropriate blade height and angle</li> <li>• Uniform distribution of materials</li> <li>• Mastery of technique for blending passes</li> <li>• Uniformity of driving surface</li> <li>• Absence of excess material on roadside</li> </ul> |
| 3 Compact the materials.                               | <ul style="list-style-type: none"> <li>• Elevation levels taken into account</li> <li>• Correct technique for crosscutting tracks</li> <li>• Compaction of entire surface</li> </ul>  |
| 4 Level the surface with a specific point of drainage. | <ul style="list-style-type: none"> <li>• Accurate assessment of slopes on site</li> <li>• Precise location of drainage point and area</li> <li>• Proper shaping of basin around drainage point</li> <li>• Proper levelling of entire surface</li> <li>• Correct use of drainage slopes</li> </ul>   |
| 5 Finish up at the end of the work period.             | <ul style="list-style-type: none"> <li>• Proper parking of bulldozer</li> <li>• Correct technique for turning off the engine</li> <li>• Proper checking and maintenance of bulldozer</li> <li>• Proper completion of daily log</li> </ul>   |

*For the overall competency*

- Spreading and levelling in compliance with survey data
- Proper operation of the bulldozer
- Appropriate selection of materials
- Optimum use of materials
- Pertinence and efficiency of work techniques used
- Bulldozer's capacity taken into account
- Compliance with construction standards
- Compliance with environmental standards
- Compliance with occupational health and safety regulations

Module 13 Duration: 75 hours

***Behavioural objective*****Statement of the Competency**

Perform excavation and loading operations using a backhoe loader.

**Achievement Context**

- Working with verbal instructions, survey data and excavation plans
- With a backhoe loader, cables and slings
- With sewer pipes and manholes

**Elements of the Competency****Performance Criteria**

- |   |   |
|---|---|
| <p>1 Prepare the work.</p> <p>2 Drive the backhoe loader.</p> <p>3 Dig trenches with sloped walls:</p> <ul style="list-style-type: none"> <li>– with transverse drainage systems</li> <li>– with multiple levels</li> </ul> <p>4 Dig junction points for the ditches and trenches.</p> <p>5 Lay sewer pipes and manholes in a trench.</p> <p>6 Load trucks:</p> <ul style="list-style-type: none"> <li>– using the front bucket</li> <li>– using the rear bucket</li> </ul> | <ul style="list-style-type: none"> <li>• Thorough visual inspection of backhoe loader</li> <li>• Accurate interpretation of instructions, survey data and excavation plans</li> </ul> <ul style="list-style-type: none"> <li>• Careful selection of proper speed</li> <li>• Precision of route taken</li> </ul> <ul style="list-style-type: none"> <li>• Precise determination of width of trench openings</li> <li>• Uniformity of trench bottoms</li> <li>• Correct depth and slope of trenches</li> <li>• Proper alignment and slope of walls</li> <li>• Materials stockpiled for removal or use as fill</li> <li>• Correct work technique</li> </ul> <ul style="list-style-type: none"> <li>• Junction points in compliance with plans and instructions</li> <li>• Materials stockpiled for removal or use as fill</li> </ul> <ul style="list-style-type: none"> <li>• Secure and proper handling of sewer pipes and manholes</li> <li>• Correct placement of sewer pipes and manholes</li> <li>• Sewer pipes properly buried</li> </ul> <ul style="list-style-type: none"> <li>• Proper placement of backhoe loader</li> <li>• Optimum filling of front bucket</li> <li>• Rear bucket holding maximum, balanced load</li> <li>• Absence of any breakage to trucks</li> </ul> |
|---|---|

*For the overall competency*

- Excavations in compliance with plans
- Proper operation of backhoe loader
- Appropriate selection of materials
- Optimum use of materials
- Pertinence and efficiency of work techniques used
- Backhoe loader's capacity taken into account
- Compliance with construction standards
- Correct use of survey data
- Compliance with environmental standards
- Compliance with occupational health and safety regulations

Module 14 Duration: 45 hours

***Behavioural objective***

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**Statement of the Competency**

Operate a grader.

**Achievement Context**

- Working alone
- Working with verbal instructions
- With a grader

**Elements of the Competency****Performance Criteria**

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1 Drive the grader along a section of road.

- Careful selection of proper speed
- Precision of route taken
- Compliance with *Highway Safety Code*

2 Perform backfilling operations.

- Correct filling of holes

3 Form a windrow.

- Appropriate blade height
- Uniform distribution of materials
- Correct work technique

4 Compact materials.

- Correct technique for crosscutting tracks
- Acceptable bearing capacity

5 Remove the grader from the mud.

- Accurate analysis of situation
- Grader manoeuvred safely and with precision
- Correct removal methods

*For the overall competency*

- Correct interpretation of dashboard lights and indicators
- Accurate determination of manoeuvres to be performed
- Proper choice of engine speed
- Correct use of controls
- Correct use of blade
- Coordination and precision of manoeuvres
- Grader's capacity taken into account
- Demonstration of caution
- Compliance with occupational health and safety regulations



Module 15 Duration: 90 hours

## ***Behavioural objective***

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### **Statement of the Competency**

Shape ditches, embankments and roads using a grader.

### **Achievement Context**

- Working with verbal instructions and survey data
- With a bulldozer and surveying system
- With the help of a control operator

### **Elements of the Competency**

### **Performance Criteria**

- |   |  |
|---|--|
| <p>1 Prepare the work.</p>  | <ul style="list-style-type: none"> <li>• Thorough visual inspection of grader</li> <li>• Accurate interpretation of instructions and survey data</li> </ul>  |
| <p>2 Dig various ditches:</p> <ul style="list-style-type: none"> <li>– with steep slopes and gentle slopes</li> <li>– straight and curved V-ditches</li> </ul>        | <ul style="list-style-type: none"> <li>• Proper differentiation of soil types</li> <li>• Water content of soil taken into account</li> <li>• Ditch slopes in compliance with requirements</li> <li>• Uniformity and alignment of walls</li> <li>• Proper compaction of slopes</li> </ul>   |
| <p>3 Construct embankments.</p>   | <ul style="list-style-type: none"> <li>• Gradient of slopes appropriate for materials used</li> <li>• Precise elevation levels</li> <li>• Correct method for spreading materials</li> </ul>  |
| <p>4 Form the following types of road sections:</p> <ul style="list-style-type: none"> <li>– straight road</li> <li>– curved road</li> <li>– intersections</li> </ul> | <ul style="list-style-type: none"> <li>• Consistency in contours of subfoundation and foundation</li> <li>• Precision of spreading and compaction</li> <li>• Appropriate thickness of layers</li> <li>• Uniform distribution of materials</li> <li>• Compliance with characteristics of infrastructure profile</li> <li>• Correct use of elevation points</li> </ul> |
| <p>5 Finish up at the end of the work period.</p>   | <ul style="list-style-type: none"> <li>• Proper parking of grader</li> <li>• Correct technique for turning off the engine</li> <li>• Proper checking and maintenance of grader</li> <li>• Proper completion of daily log</li> </ul>  |

*For the overall competency*

- Spreading and levelling in compliance with survey data
- Pertinence and efficiency of work techniques used
- Proper operation of grader
- Appropriate selection of materials
- Optimum use of materials
- Correct levelling technique
- Grader's capacity taken into account
- Compliance with construction standards
- Compliance with environmental standards
- Compliance with occupational health and safety regulations



Module 16 Duration: 45 hours

### ***Behavioural objective***

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#### **Statement of the Competency**

Perform road maintenance operations using a grader.

#### **Achievement Context**

- Working with verbal instructions
- With a grader

#### **Elements of the Competency**

#### **Performance Criteria**

- |  |  |
|--|--|
| 1 Prepare the work.                        | <ul style="list-style-type: none"> <li>• Thorough visual inspection of grader</li> <li>• Accurate interpretation of instructions</li> </ul>  |
| 2 Repair a section of road.                | <ul style="list-style-type: none"> <li>• Precise demarcation of affected area</li> <li>• Recovery of all reusable materials</li> <li>• Proper stockpiling of undesirable materials</li> <li>• Proper reconstruction of road section</li> <li>• Smooth, level surface</li> </ul>  |
| 3 Repair a surface.                        | <ul style="list-style-type: none"> <li>• Correct use of scarifier</li> <li>• Water content of soil taken into account</li> <li>• Forced compaction of materials</li> </ul>   |
| 4 Repair a road shoulder.                  | <ul style="list-style-type: none"> <li>• Correct work technique</li> <li>• Grader parallel to centre line of road</li> <li>• Shoulder properly aligned with various points along the road</li> <li>• Repairs in conformity with road grade and shoulder width</li> <li>• Care taken with regard to private driveways and property</li> </ul> |
| 5 Resurface the top layer.                 | <ul style="list-style-type: none"> <li>• Smoothness of the surface</li> </ul>  |
| 6 Finish up at the end of the work period. | <ul style="list-style-type: none"> <li>• Proper parking of grader</li> <li>• Correct technique for turning off the engine</li> <li>• Proper checking and maintenance of grader</li> <li>• Proper completion of daily log</li> </ul>  |

*For the overall competency*

- Pertinence and efficiency of work techniques used
- Appropriate blade height and angle
- Proper operation of grader
- Uniform distribution of materials
- Formation and transportation of windrow
- Optimum use of materials
- Absence of excess materials
- Grader's capacity taken into account
- Compliance with construction standards
- Compliance with environmental standards
- Compliance with occupational health and safety regulations

Module 17 Duration: 60 hours

### ***Behavioural objective***

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#### **Statement of the Competency**

Perform grading operations using a grader.

#### **Achievement Context**

- Working with verbal instructions and survey data
- With a grader and surveying system
- With the help of a control operator

#### **Elements of the Competency**

#### **Performance Criteria**

- |  |  |
|--|--|
| 1 Prepare the work.  | <ul style="list-style-type: none"> <li>• Thorough visual inspection of grader</li> <li>• Accurate interpretation of instructions and survey data</li> </ul>  |
| 2 Spread the surface materials.  | <ul style="list-style-type: none"> <li>• Accuracy of elevation level</li> <li>• Appropriate blade height and angle</li> <li>• Uniform distribution of materials</li> <li>• Correct spreading technique</li> </ul>  |
| 3 Level the land near a wall or building.  | <ul style="list-style-type: none"> <li>• Absence of any damage</li> <li>• Work in compliance with requirements</li> </ul>  |
| 4 Perform levelling operations with: <ul style="list-style-type: none"> <li>– one drainage point</li> <li>– several drainage points</li> </ul> | <ul style="list-style-type: none"> <li>• Accurate assessment of slopes on site</li> <li>• Precise location of drainage point or points and drainage area</li> <li>• Proper shaping of basin around drainage point</li> <li>• Proper levelling of entire surface</li> <li>• Correct use of drainage slopes</li> </ul> |
| 5 Finish up at the end of the work period.   | <ul style="list-style-type: none"> <li>• Proper parking of grader</li> <li>• Correct technique for turning off the engine</li> <li>• Proper checking and maintenance of grader</li> <li>• Proper completion of daily log</li> </ul>  |

*For the overall competency*

- Spreading and levelling in compliance with survey data
- Pertinence and efficiency of work techniques used
- Proper operation of grader
- Appropriate selection of materials
- Optimum use of materials
- Correct levelling technique
- Grader's capacity taken into account
- Compliance with construction standards
- Compliance with environmental standards
- Compliance with occupational health and safety regulations

Module 18 Duration: 105 hours

## ***Behavioural objective***

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### **Statement of the Competency**

Operate an off-road dump truck.

### **Achievement Context**

- Working with verbal instructions
- With a manual or automatic-transmission dump truck

### **Elements of the Competency**

### **Performance Criteria**

- |  |  |
|--|--|
| 1 Prepare the work.                        | <ul style="list-style-type: none"> <li>• Thorough visual inspection of truck</li> <li>• Accurate interpretation of instructions</li> <li>• Correct determination of route to take</li> <li>• Use of daily inspection procedures</li> <li>• Correct technique for starting the engine</li> </ul>  |
| 2 Position the vehicle to receive a load.  | <ul style="list-style-type: none"> <li>• Accurate interpretation of signals</li> <li>• Proper checking of area behind truck</li> <li>• Correct techniques for backing up and stopping</li> </ul>   |
| 3 Transport the load.                      | <ul style="list-style-type: none"> <li>• Proper changing of gears</li> <li>• Correct techniques for making turns</li> <li>• Appropriate reactions to unforeseen circumstances</li> <li>• Good driving conduct</li> </ul>   |
| 4 Unload the contents of the dump body.    | <ul style="list-style-type: none"> <li>• Proper verification of dumping area</li> <li>• Proper positioning of truck</li> <li>• Proper dumping of load in either one large pile or a series of smaller piles</li> <li>• Correct use of dump body controls</li> </ul>  |
| 5 Finish up at the end of the work period. | <ul style="list-style-type: none"> <li>• Proper parking of dump truck</li> <li>• Correct technique for turning off the engine</li> <li>• Proper checking and maintenance of truck</li> <li>• Proper completion of:               <ul style="list-style-type: none"> <li>– log of driving and work hours</li> <li>– inspection sheet</li> </ul> </li> </ul> |

*For the overall competency*

- Defensive driving
- Fuel-efficient driving
- Coordination and precision of manoeuvres
- Control over truck
- Compliance with *Highway Safety Code*
- Observance of delivery deadlines
- Truck's capacity taken into account
- Correct techniques for stopping and braking
- Compliance with occupational health and safety regulations



