14 MAINTENANCE MECHANICS

ELEVATOR MECHANICS

PROGRAM OF STUDY
5700

VOCATIONAL and TECHNICAL EDUCATION

Québec

MAINTENANCE MECHANICS

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This program of study, *Elevator Mechanics*, is issued in accordance with section 461 of the *Education Act* (R.S.Q., c. I-13.3).

In conformity with the provisions of paragraph (a) of section 23 of the *Act respecting the Conseil supérieur de l'éducation* (R.S.Q., c. C-60), as replaced by section 569 of the *Education Act* (1988, chapter 84), the confessional committees of the Conseil supérieur de l'éducation have given their opinion on this program of study, which has been authorized for teaching Elevator Mechanics in the schools as of July 1, 1994.

Pauline Marois
Minister of Education

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INTRODUCTION

The *Elevator Mechanics* program is based on the orientations for secondary school vocational education adopted by the government in 1986. It was designed on the basis of a new framework for developing vocational education programs that calls for the participation of experts from the workplace and the field of education.

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

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

The duration of the program is 1800 hours, which includes 765 hours spent on the specific competencies required to practise the trade and 1035 hours on general competencies. The program of study is divided into 30 modules, which vary in length from 15 to 120 hours (multiples of 15). The time allocated to the program is to be used not only for teaching but also for evaluation and remedial work.

This document contains two parts. Part I is of general interest and provides an overview of the training plan. It includes a synoptic table of basic information about the modules, a description of the program training goals, the competencies to be developed and the general objectives, and an explanation of operational objectives. Part II is designed primarily for those directly involved in implementing the program. It contains a description of the operational objectives of each module.

In keeping with this broad approach, three accompanying documents will be provided: a teaching guide, an evaluation guide, and a planning guide.

GLOSSARY

Program Training Goals

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

Competency

A set of socio-affective behaviours, cognitive skills or psycho-sensori-motor skills that enable a person to correctly perform a role, function, activity or task.

General Objectives

Instructional objectives that provide an orientation for leading the students to attain one or more related objectives.

Operational Objectives

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

Module of a Program

A component part of a program of study comprising a first-level operational objective and the related second-level operational objectives.

Credit

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

PART I

1. SYNOPTIC TABLE

Number of modules: 30
Duration in hours: 1800
Credits: 120

Elevator Mechanics
CODE: 5700

CODE		TITLE OF THE MODULE	HOURS	CREDITS*
866 101	1.	The Trade and the Training Process	15	1
755 002	2.	Health and Safety on Construction Sites	30	2
866 032	3.	Machine Parts, Materials and Structures	30	2
755 001	4.	Construction Organizations	15	1
866 056	5.	Interpreting Diagrams, Drawings and Specifications	90	6
866 122	6.	Applying Concepts Related to Measuring	30	2
866 074	7.	Machining Operations	60	4
866 133	8.	Oxyacetylene Cutting and Electric Arc Welding	45	3
866 143	9.	Handling, Rigging and Anchoring	45	3
842 174	10.	Conventional, Optical and Computer-Assisted Alignment	60	4
866 155	11.	Maintaining Mechanical Parts Involved in the Transmission of Movement and the Transformation of Momentum	75	5
786 056	12.	Analyzing Direct-Current Circuits	90	6
866 163	13.	Installing Cables and Raceways	45	3
866 176	14.	Installing an Escalator •	90	6
866 188	15.	Installing Elevator Substructures and Equipment •	120	8
786 115	16.	Analyzing Alternating-Current Circuits	75	5
866 195	17.	Direct- and Alternating-Current Motors and Generators	75	5
866 252	18.	Applying Concepts of Hydraulics	30	2
866 193	19.	Installing Hydraulic Elevator Equipment	45	3
866 206	20.	Installing and Starting Up an Elevator Platform •	90	6
866 214	21.	Installing Hoistway Doors and Shaft Accessories •	60	4
866 227	22.	Assembling and Finishing Elevator Cabs •	105	7
842 213	23.	Combinational Logic	45	3
842 304	24.	Sequential Logic	60	4
843 076	25.	Analyzing Solid State Circuits	90	6
866 232	26.	Installing Programmable Controllers	30	2
866 246	27.	Final Electrical Connections and Adjustments •	90	6
866 281	28.	Applying Job Search Techniques	15	1
866 292	29.	Maintaining and Troubleshooting Mechanized Handling Systems •	30	2
866 308	30.	Disassembling Elevators •	120	8

• Ministry examination
* 15 hours = 1 credit

This program leads to an SSVD in Elevator Mechanics.

2. PROGRAM TRAINING GOALS

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

To develop effectiveness in the practice of a trade.

- To teach students to perform elevator mechanics tasks and activities correctly, at an acceptable level of competence for entry into the job market.

- To prepare students to perform satisfactorily on the job by fostering:
  - the intellectual skills needed to make sound decisions on the job;
  - the intellectual and psychomotor skills needed to assemble and install mechanized handling system equipment and accessories;
  - the intellectual and psychomotor skills needed to install industrial machinery and equipment efficiently;
  - the ability to establish harmonious relationships and to communicate effectively at work;
  - a sense of professional ethics;
  - a constant concern for occupational health and safety;
  - attention to detail and precision when performing various tasks;
  - the ability to work well under pressure and in small spaces.

To ensure integration into the job market.

- To familiarize students with the trade of elevator mechanic.

- To familiarize students with their rights and responsibilities as workers.

- To foster a concern for clients' rights and expectations.

To foster personal development and the acquisition of occupational knowledge.

- To foster independence, a sense of responsibility and the desire to succeed.

- To foster the ability to learn, to obtain information and to develop work methods.

- To help students understand the principles underlying the techniques used.

- To help students acquire good work habits and develop the desire for excellence.

To ensure job mobility.

- To help students develop a positive attitude toward technological change and new situations.

- To help students develop creativity, initiative and the spirit of entrepreneurship.

- To prepare students for a creative job search.

3. COMPETENCIES

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

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

The grid of learning focuses shows the relationship between the general competencies on the horizontal axis and the specific competencies on the vertical axis. The symbol (△) indicates a correlation between a specific competency and a step in the work process. The symbol (○) indicates a correlation between a general and a specific competency.

The symbols (▲) and (●) indicate that these relationships have been taken into account in the formulation of objectives intended to develop specific competencies related to the trade or occupation.

The logic used in constructing the grid influences the course sequence. Generally speaking, this sequence follows a logical progression in terms of the complexity of the learning involved and the development of the students' autonomy. The vertical axis of the grid shows the competencies directly related to the practice of a specific trade or occupation. These competencies are arranged in a relatively fixed order; therefore, the modules should be taught, insofar as possible, in the order represented on the grid. The modules including the general competencies on the horizontal axis should be taught in relation to those on the vertical axis. This means that some modules are prerequisite to others, while other modules are taught concurrently.

GRID OF LEARNING FOCUSES IN *ELEVATOR MECHANICS*		FIRST-LEVEL OPERATIONAL OBJECTIVES	DURATION (IN HOURS)	WORK PROCESS (major steps)								GENERAL COMPETENCIES (related to technology, subjects, personal development, etc.)																						TOTALS	
	SPECIFIC COMPETENCIES (directly related to the practice of the specific occupation)			Read and interpret drawings and technical manuals	Plan the work	Determine the appropriate safety measures	Install, handle, rig and assemble scaffolds	Do the work	Check and start up the equipment	Clean up the work area	Write reports and complete worksheets	Apply concepts related to health and safety on construction sites	Determine the use of machine parts, materials and metal structures	Learn about the organizations in the construction industry	Interpret diagrams, drawings and specifications	Apply concepts related to measuring	Perform machining operations at a bench using equipment	Apply oxyacetylene-cutting and electric arc welding techniques	Handle, rig and anchor materials, parts and machines	Apply conventional, optical and computer-assisted alignment methods	Apply techniques for maintaining mechanical parts involved in the trasmission of movement and the transformation of momentum	Analyze a direct-current circuit	Install cables and raceways	Analyze an alternating-current circuit	Apply principles related to direct and alternating-current motors, generators, gearless motors and SCRs and their control circuits	Apply concepts and principles of hydraulics	Apply concepts of combinational logic	Apply concepts of sequential logic	Analyze solid state circuits	Install and connect a programmable controller	Prepare a job search	NUMBER OF OBJECTIVES	DURATION (IN HOURS)
MODULES	MODULES											2	3	4	5	6	7	8	9	10	11	12	13	16	17	18	23	24	25	26	28		
	FIRST-LEVEL OCCUPATIONAL OBJECTIVES											S1	B1	S1	B1	B1	B1	B1	B1	B1	B1	B1	B1	B1	B2	B2	B2	B2	B2	B2	S2	20	
	DURATION											30	30	15	90	30	60	45	45	60	75	90	45	75	75	30	45	60	90	30	15		1035
1	Determine their suitability for the trade and the training process	S1	15	△	△	△	△	△	△	△	△	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
14	Install, adjust and start up an operational ascalator	B1	90	▲	▲	▲	▲	▲	▲	▲	▲	●	●		●	●	●	●	●	●	●	●	●	●	○		○	○		○			
15	Install the substructure of an elevator and the machine room equipment	B1	120	▲	▲	▲	▲	▲	△	▲	△	●	●		●	●	●	●	●	●	●	○	●	○	○		○	○					
19	Install hydraulic elevator equipment	B2	45	▲	▲	▲	▲	▲	▲	▲	▲	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
20	Install and start up an elevator platform	B2	90	▲	▲	▲	▲	▲	▲	▲	△	●	●		●	●	●	○	●	●	●	●	●	●	●		○	○					
21	Install hoistway doors and shaft accessories	B2	60	▲	▲	▲	▲	▲	△	▲	△	●	●		●	●	●	●	●	○	○	●	○	●	○				○				
22	Assemble a car, install electrical accessories and finish the interior	B2	105	▲	▲	▲	▲	▲	△	▲	△	●	●		●	●	●	○	●	○	○	●	○	●	○		○	○	○				
27	Make the final electrical connections and adjustments	B2	90	▲	▲	▲	▲	▲	▲	▲	▲	●	○		●	●	●	○	○	●	●	●	●	●	●		●	●	●	●			
29	Maintain and troubleshoot operational mechanized handling systems	B2	30	▲	▲	▲	▲	▲	▲	▲	▲	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
30	Disassemble an elevator	B2	120	▲	▲	▲	▲	▲		▲		●			●	○			○														
NUMBER OF OBJECTIVES		10																													30	
DURATION (IN HOURS)			765																														1800

S: Situational objectives

B: Behavioural objective

△ Correlation between a step and a specific competency

▲ Correlation to be taught and evaluated

○ Correlation between a general and a specific competency

● Correlation to be taught and evaluated

BLOCKS

1
2

4. GENERAL OBJECTIVES

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

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

- Determine their suitability for the trade and the training process.
- Learn about the organizations in the construction industry.
- Prepare a job search.

To develop in the students the competencies required to safely practise the trade of elevator mechanic.

- Apply concepts related to health and safety on construction sites.

To develop in the students the competencies required to carry out trade-related tasks.

- Determine the use of machine parts, materials and metal structures.
- Interpret diagrams, drawings and specifications.
- Apply concepts related to measuring.
- Perform machining operations at a bench and using equipment.
- Apply oxyacetylene-cutting and electric arc welding techniques.
- Handle, rig and anchor materials, parts and machines.

To develop in the students the competencies required to carry out tasks of medium complexity.

- Apply conventional, optical and computer-assisted alignment methods.
- Apply techniques for maintaining mechanical parts involved in the transmission of movement and the transformation of momentum.
- Analyze a direct-current circuit.
- Install cables and raceways.
- Analyze an alternating-current circuit.
- Apply concepts of combinational logic.
- Apply concepts of sequential logic.
- Analyze solid state circuits.
- Apply concepts and principles of hydraulics.

To develop in the students the competencies required to carry out more complex tasks related to the installation of traction-type elevators.

- Install the substructure of an elevator and the machine room equipment.
- Apply principles related to direct- and alternating-current motors, generators, gearless motors and SCRs and their control circuits.
- Install and start up an elevator platform.
- Install hoistway doors and shaft accessories.
- Assemble a cab, install electrical accessories and finish the interior.
- Install and connect a programmable controller.
- Make the final electrical connections and adjustments.

To develop in the students the competencies required to carry out more complex tasks related to mechanized handling systems other than traction-type elevators.

- Install, adjust and start up an operational escalator.
- Install hydraulic elevator equipment.
- Maintain and troubleshoot operational mechanized handling systems.
- Disassemble an elevator.

5. FIRST- AND SECOND-LEVEL OPERATIONAL OBJECTIVES

5.1 DEFINITION

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

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

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

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

Second-level operational objectives are intermediate teaching/learning targets deemed prerequisite for attaining first-level objectives. They are grouped according to the specifications (see 5.2 A) or the phases (see 5.2 B) of the first-level objective.

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

- learning involving prerequisite knowledge

- learning involving competencies

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

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

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

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

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

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

5.2 HOW TO READ FIRST-LEVEL OPERATIONAL OBJECTIVES

A. How to Read a Behavioural Objective

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

1. The **expected behaviour** states a competency in terms of the general behaviour that the students are expected to have acquired by the end of the module.

2. The **conditions for performance evaluation** define what is necessary or permissible to the students during evaluation designed to verify whether or not the students have attained the objective. This means that the conditions for evaluation are the same wherever and whenever the program is taught.

3. The **general performance criteria** define the requirements by which to judge whether or not the results obtained are generally satisfactory.

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

4. The **specifications of the expected behaviour** describe the essential elements of the competency in terms of specific behaviours.

5. The **specific performance criteria** define the requirements for each of the specifications of behaviour. They ensure a more enlightened decision on the attainment of the objective.

6. The **field of application** defines the limits of the objective, where necessary. It indicates cases where the objective applies to more than one task, occupation or field.

B. How to Read a Situational Objective

Situational objectives consist of six components:

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

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

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

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

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

5. The **participation criteria** describe the requirements the students must fulfil, which are usually related to each phase of the learning context. They focus on how the students take part in the activities rather than on the results obtained. Participation criteria are normally provided for each phase of the learning context.

6. **The field of application** defines the limits of the objective, where necessary. It indicates cases where the objective applies to more than one task, occupation or field.

PART II

MODULE 1: THE TRADE AND THE TRAINING PROCESS

CODE: 866 101 **Duration: 15 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

EXPECTED OUTCOME

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

SPECIFICATIONS

At the end of this module, the students will:

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

LEARNING CONTEXT

PHASE 1: **Information on the Trade**

- Learning about the job market in elevator mechanics, i.e. work environments (types of companies, products), job prospects, wages, opportunities for advancement and transfer, candidate selection and women workers in the field, through visits, interviews, reference materials, and so on.

- Learning about the nature and requirements of the trade, i.e. tasks, working conditions, evaluation criteria and rights and responsibilities of workers, through visits, interviews, reference materials, and so on.

- Presenting the information gathered at a group meeting and discussing their views on the trade, i.e. advantages, disadvantages, requirements.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

LEARNING CONTEXT

PHASE 2: **Information on and Participation in the Training Process**

- Discussing the skills, aptitudes and knowledge required to practise the trade.

- Becoming familiar with the training process, i.e. program of study, training process, evaluation methods, certification of studies.

- Discussing how the training program prepares them for work as elevator mechanics.

- Sharing their initial reactions to the trade and the training process.

PHASE 3: **Evaluation and Confirmation of Career Choice**

- Preparing a report in which they:
  - specify their preferences, aptitudes and interests with respect to elevator mechanics;
  - assess their career choice by comparing the nature and requirements of the trade with their preferences, aptitudes and interests.

INSTRUCTIONAL GUIDELINES

The teacher should:

- Create a climate that favours the students' personal growth and integration into the job market.
- Encourage the students to engage in discussions and express their opinions.
- Motivate the students to take part in the suggested activities.
- Help the students to arrive at an accurate perception of the trade.
- Provide the students with the means to assess their career choice honestly and objectively.
- Organize visits to companies that are representative of the workplace in elevator mechanics.
- Make available all pertinent reference materials, e.g. information on the trade, training programs, guides.
- Organize a meeting with specialists in the field.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

PARTICIPATION CRITERIA

PHASE 1:

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

PHASE 2:

- Give their opinions on some requirements for practising the trade.
- Study the documents provided.
- Listen attentively to explanations.
- Adequately express their views on the training program during a group meeting.
- Clearly express their opinions.

PHASE 3:

- Write a report that:
  - sums up their preferences and aptitudes;
  - clearly explains how they arrived at their career choice.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before undertaking any of the activities:

1. Be receptive to information about the trade and the training process.
2. Be willing to share their views on the trade with the other members of the group.

Before undertaking the activities of Phase 1:

3. Find information.
4. Determine how to record and present information.
5. Distinguish between *task* and *work station*.
6. Explain the term *entry-level qualifications*.
7. Explain the main rules governing group discussion.

Before undertaking the activities of Phase 2:

8. Differentiate between the skills, aptitudes, attitudes and knowledge required to practise a trade.
9. Describe the nature, purpose and content of a program of study.

Before undertaking the activities of Phase 3:

10. Differentiate between preferences, and aptitudes and interests.
11. Describe the main parts of a report confirming their career choice.

MODULE 2: HEALTH AND SAFETY ON CONSTRUCTION SITES

CODE: 755 002 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

EXPECTED OUTCOME

By participating in the required activities of the learning context according to the indicated criteria, the students will be able to
apply concepts related to health and safety on construction sites.

SPECIFICATIONS

At the end of this module, the students will:

- Be familiar with the laws and regulations governing health and safety on construction sites.
- Be familiar with the roles and responsibilities of safety representatives and safety officers.
- Be familiar with the hazards and safety measures related to the performance of certain tasks.
- Be familiar with the hazards and safety measures related to the construction site itself.
- Be familiar with the hazards and safety measures related to the use of certain products.
- Know what to do in the event of an accident.

LEARNING CONTEXT

PHASE 1: **Information**

- Becoming familiar with the objective of the unit and companion guide.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

LEARNING CONTEXT

PHASE 2: **Learning**

- Gathering information on the topic covered.
- Forming and expressing opinions on the topic.
- Asking questions.
- Identifying the main concepts and the underlying principles of safe behaviour.
- Assessing their adherence to these principles.

PHASE 3: **Reinforcement**

- Reviewing the main concepts of the unit.
- Answering a series of questions.
- Correcting the answers and discussing them if necessary.

INSTRUCTIONAL GUIDELINES

The teacher should:

- Ensure access to a suitable room and proper materials.
- Present the material in an interesting manner.
- Encourage students to participate in group discussions.
- Make good use of teaching materials (e.g. tables, transparencies, films, videotapes, cards).

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

PARTICIPATION CRITERIA

- Participate in at least 18 of the 20 units, units 1 and 2 being compulsory.
- Listen attentively.
- Stick to the topic during discussions.
- Ask pertinent questions and give appropriate answers.
- Do the exercises conscientiously.
- Correct any errors.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before undertaking the activities of Phase 1:

1. Be receptive to information related to health and safety.
2. Be willing to share their knowledge with the other members of the group.

Before undertaking the activities of Phase 2:

3. Gather information.
4. Determine a way of presenting information.
5. Explain the main rules governing group discussion.

Before undertaking the activities of Phase 3:

6. Describe the method of answering a series of questions.

MODULE 3: MACHINE PARTS, MATERIALS AND STRUCTURES

CODE: 866 032 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
determine the use of machine parts, materials and metal structures
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using:
  - machine drawings, sketches, diagrams and assembly charts
  - reference manuals, tables and illustrations
  - machines or equipment
  - mechanical assemblies such as speed reducers, speed regulators and escalators
  - assemblies on demonstration panels including screws, nuts, keys, springs and pins
  - materials such as cast iron, copper, plastic and steel
  - profile samples and other commercial structural forms

GENERAL PERFORMANCE CRITERIA

- Concern for quality/price ratio
- Accurate calculations
- Accurate use of English and French terminology
- Appropriate use of materials, machine parts and profiles
- Quick identification of materials or parts required for a given need

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Select machine parts.	- Appropriate selection of parts or substitutes: • standards • code • forms
B. Select materials.	- Appropriate selection of materials or substitutes: • colour code • classification • standards • symbols
C. Select metal structural members.	- Appropriate selection of members or substitutes: • forms • dimensions • classification • code

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to select machine parts (A):

1. Show concern for the accuracy of information gathered and transmitted.
2. Show concern for the quality/price ratio.
3. Show concern for proper terminology.
4. Be familiar with the main threaded parts used in elevator mechanics.
5. Know how to use measuring instruments (tape measure, ruler, template) correctly.
6. Be familiar with the main unthreaded parts.

Before learning how to select materials (B):

7. Be familiar with manufacturers' codes for the classification of materials.
8. Be familiar with the main materials used in elevator mechanics.

Before learning how to select metal structural members (C):

9. Be familiar with the types of profiles or other commercial forms used in structural assembly.
10. List the parts of a metal structure and the assembly techniques.
11. Be familiar with the physical conditions to which materials must be resistant.
12. Know how to read and interpret technical data, nomographs, equipment layouts, catalogues and manuals.

MODULE 4: CONSTRUCTION ORGANIZATIONS

CODE: 755 001 **Duration: 15 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

EXPECTED OUTCOME

By participating in the required activities of the learning context according to the indicated criteria, the students will be able to
learn about the organizations in the construction industry.

SPECIFICATIONS

During this module, the students will:

- Identify the main roles and responsibilities of employer and union organizations and associations:
  - describe the construction industry, its characteristics and its economic importance
  - name the employer associations and identify their roles and responsibilities
  - name the representative union associations and identify their roles and responsibilities
  - list the main functions of the Commissaire de la construction, the Conseil d'arbitrage and the Régie des entreprises de construction du Québec
  - describe the structure and composition of the Commission de la construction du Québec (CCQ) and be familiar with its main functions
  - list the powers of the CCQ and the provisions regarding violation of the *Act respecting labour relations, vocational training and manpower management in the construction industry* or related regulations
- Describe the laws and regulations governing labour relations in the construction industry:
  - be familiar with the *Act respecting labour relations, vocational training and manpower management in the construction industry* and its field of application
  - be familiar with the labour relations and the laws and regulations related to the construction industry

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

SPECIFICATIONS (cont.)

- describe the provisions of *An Act respecting manpower vocational training and qualifications*
- describe the main provisions of *An Act respecting complementary social benefits plans in the construction industry*

LEARNING CONTEXT

PHASE 1: **Information**

- Becoming familiar with the objective of the unit and companion guide.

PHASE 2: **Learning**

- Gathering information on the topic covered.

- Expressing opinions on the topic covered and asking questions.

PHASE 3: **Reinforcement**

- Reviewing the main concepts of the unit.

- Answering a series of questions individually.

- Correcting the answers in a group.

INSTRUCTIONAL GUIDELINES

The teacher should:

- Ensure access to a suitable room and proper materials.
- Present the material in an interesting manner.
- Encourage students to participate in group discussions.
- Use tables and illustrations.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

PARTICIPATION CRITERIA

- Participate in seven out of the nine units.
- Listen attentively.
- Stick to the topic during discussions.
- Ask pertinent questions and give appropriate answers.
- Do the exercises conscientiously.
- Correct any errors.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before undertaking the activities of Phase 1:

1. Be receptive to related information.
2. Be willing to share their knowledge with the other members of the group.

Before undertaking the activities of Phase 2:

3. Explain the main rules governing group discussion.

Before undertaking the activities of Phase 3:

4. Describe the method of answering a series of questions.

MODULE 5: INTERPRETING DIAGRAMS, DRAWINGS AND SPECIFICATIONS

CODE: 866 056 **Duration: 90 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
interpret diagrams, drawings and specifications
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using:
  - drawings and diagrams
  - the manufacturer's manuals
  - maintenance and installation manuals written in English and French
  - reference manuals
  - CSA and ISO standards
  - general layouts, an isometric view and an exploded view containing welding, structural, hydraulic, electrical, machining, plumbing and electronic symbols
  - electrical and hydraulic circuit diagrams
  - a calculator

GENERAL PERFORMANCE CRITERIA

- Systematic observance of work method
- Concern for detail
- Accurate analysis and interpretation of drawings, specifications and manuals
- Observance of CSA and ISO standards

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Draw lines and geometric figures.	- Appropriate drawing method and technique
B. Identify the size and shape of a part on a machine or un a mechanized handling system.	- Appropriate: • dimensions • shape
C. Produce freehand sketches of a machine part or assembly: • orthogonal projections • full or partial cross-sections	- Appropriate: • layout of views • method • techniques - Appropriate selection of views, cross-sections and scale
D. Dimension sketches in metric and imperial units.	- Observance of rules for writing dimensions - Accurate dimensions
E. Interpret drawings or diagrams including: • orthogonal projections • simple auxiliary views • cross-sections • isometric projections • notes • title blocks	- Accurate interpretation of information on the drawing - Observance of standards
F. Identify the following on drawings: • materials • machining, plumbing, hydraulic, structural, welding, electrical and electronic symbols	- Accurate identification of materials and symbols

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
G. Locate the following on drawings: • machine parts and structural members • dimensions • clearances and tolerances • electrical, electronic and hydraulic components	- Accurate location
H. Establish the following on the basis of a drawing: • assembly and disassembly sequences • assembly techniques • the operating sequence of electrical, hydraulic and electronic circuits	- Logical operations - Appropriate choice of techniques
I. Interpret the following basic drawings: • electrical • hydraulic • electronic • structural	- Accurate interpretation

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to draw lines and geometric figures (A) and to identify the size and shape of a part on a machine or un a mechanized handling system (B):

1. Draw freehand letters and numbers in block lettering.
2. Use pencils, rulers and templates.
3. Be familiar with the various types of lines.
4. Show concern for gathering and transmitting information accurately.

Before learning how to produce freehand sketches of a machine part or assembly:
- **orthogonal projections**
- **full or partial cross-sections (C):**

5. List the types of cross-sections.
6. Be familiar with the hatching used to represent materials in cross-sections.
7. Show concern for producing clear and neat sketches and diagrams.
8. Select the number of views required to represent an object, a part or an assembly.

Before learning how to dimension sketches in metric and imperial units (D):

9. Recognize the notes used on sketches.

Before learning how to interpret drawings or diagrams including:
- **orthogonal projections**
- **simple auxiliary views**
- **cross-sections**
- **isometric projections**
- **notes**
- **title blocks (E):**

10. Make the connection between the abstract (drawing) and the concrete (parts, systems).
11. Locate on the drawing the information provided in the title blocks.
12. Identify the different standardized dimensioning symbols.
13. Define the concept of tolerance and the types of adjustments.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to identify the following on drawings:
- **materials**
- **machining, plumbing, hydraulic, structural, welding, electrical and electronic symbols (F):**

14. Identify the symbols for structural members, machine parts and components (e.g. screws, bolts).
15. Match the symbolic hatching in cross-sections with materials.

Before learning how to establish the following on the basis of a drawing:
- **assembly and disassembly sequences**
- **assembly techniques**
- **the operating sequence of electrical, hydraulic and electronic circuits (H):**

16. Interpret the information on the list of materials.
17. Describe the mechanical operation of a system and the functions of its components.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to interpret the following basic drawings:

- **electrical**
- **hydraulic**
- **electronic**
- **structural (I):**

18. Look for information in specifications, manufacturers' manuals and reference manuals (*Machinery's Handbook*).
19. Recognize technical English and French terminology.

MODULE 6: APPLYING CONCEPTS RELATED TO MEASURING

CODE: 866 122 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
apply concepts related to measuring
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using:
  - drawings, sketches and specifications
  - measuring instruments
  - tools and equipment

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of work method
- Accurate measurements and calculations
- Appropriate use of tools and equipment

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Interpret drawings and sketches.	- Accurate interpretation of: • symbols • tolerances • dimensions • positions • instructions
B. Select the measuring instruments.	- Appropriate selection of instruments
C. Calibrate direct-reading measuring instruments.	- Accurate calibration
D. Measure mechanical parts of various geometric shapes.	- Accurate measurements - Appropriate techniques
E. Locate and measure the position of equipment in a workshop: • moving sidewalks • escalators • conduits • hydraulic units	- Accurate measurements - Appropriate techniques - Observance of safety rules
F. Check the conformity of the dimensions of parts with those on the sketches or drawings.	- Appropriate comparison of dimensions
G. Clean, maintain and store measuring instruments.	- Appropriate storage and maintenance of instruments

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to interpret drawings and sketches (A) and to select the measuring instruments (B):

1. Be familiar with the units of measurement in the metric and imperial systems.

Before learning how to measure mechanical parts of various geometric shapes (D):

2. Check the accuracy of squares and dial gauges.
3. Convert the readings of a precision instrument to another scale.
4. Consult tables of specifications for the dimensions and geometric shapes of parts.
5. Show concern for the accuracy of measurements and the quality of work.
6. Determine the condition of given surfaces by comparing them to a roughness standard.

Before learning how to clean, maintain and store measuring instruments (G):

7. Recognize defective instruments.

MODULE 7: MACHINING OPERATIONS

CODE: 866 074 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
perform machining operations at a bench and using equipment
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Following instructions
- Using:
  - drawings and sketches
  - nomographs or charts
  - textbooks, manuals and catalogues
  - ferrous metals (carbon steel, cast steel SAE 1020 or cast iron) and non-ferrous metals (aluminium, bronze or brass)
  - non-metal materials (plastic or nylon)
  - the appropriate tools, equipment and accessories, such as portable and sensitive drills, hand and power saws and grinding wheels
  - measuring instruments
  - safety equipment

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of work method
- Clean, careful work
- Observance of tolerances (0.000" or 0.00 mm)
- Accurate measurements
- Accurate calculations (metric and imperial units)
- Appropriate use of tools and equipment
- Concern for quality/price ratio

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Interpret the working drawing and the instructions.	- Accurate interpretation
B. Select the tools, equipment and accessories.	- Appropriate selection of tools, equipment and accessories
C. Select the materials.	- Appropriate selection of materials
D. Apply occupational health and safety rules.	- Appropriate safety measures
E. Perform operations such as the following, using different tools and materials: • measuring • marking out • sawing • filing • sharpening • drilling • grinding • tapping • threading • reaming • broaching • removing screws, bolts and taps	- Conformity with drawings, sketches and instructions - Appropriate methods, techniques and dimensions
F. Clean and store the equipment and clean up the work area.	- Proper cleaning and storage

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to interpret the working drawing and the instructions (A):

1. Recognize the components represented on the drawing (e.g. shapes, dimensions).

Before learning how to select the tools, equipment and accessories (B) and to select the materials (C):

2. Be familiar with tools, equipment, clamps, accessories and cutting fluids.

Before learning how to apply occupational health and safety rules (D):

3. Develop safe work habits.

Before learning how to perform operations such as the following, using different tools and materials:
- **measuring**
- **marking out**
- **sawing**
- **filing**
- **sharpening**
- **drilling**
- **grinding**
- **tapping**
- **threading**
- **reaming**
- **broaching**
- **removing screws, bolts and taps (E):**

4. Become aware of the importance of effective communication in the workplace.
5. Become aware of the importance of using correct terminology.
6. Become aware of the need for accuracy when working.
7. Solve mathematical problems related to the task.
8. Measure dimensions, angles or slopes in imperial or metric units.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to clean and store the equipment and clean up the work area (F):

9. Recognize a defective tool.

MODULE 8: OXYACETYLENE CUTTING AND ELECTRIC ARC WELDING

CODE: 866 133 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
apply oxyacetylene-cutting and electric arc welding techniques
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Following instructions
- Using:
  - a drawing
  - unprepared pieces of metal (thickness: ¼ to ½ in. or 6 to 12 mm)
  - profiles (2 to 4 in. or 50 to 100 mm)
  - an oxyacetylene welding machine
  - an electric arc welding machine
  - safety equipment

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Appropriate use of tools and equipment
- Accurate adjustment of welding machines
- Appropriate techniques
- Conformity with instructions and standards
- Clean, careful work

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Interpret the work plan.	- Accurate interpretation of symbols - Accurate interpretation of information
B. Apply occupational health and safety rules.	- Appropriate safety measures
C. Prepare the metal.	- Appropriate dimensions - Appropriate finish
D. Set up a welding machine to perform oxyacetylene-cutting operations.	- Appropriate set-up techniques - Appropriate selection of accessories - Accurate adjustment of pressure
E. Perform horizontal and vertical oxyacetylene-cutting operations on metal.	- Conformity with drawing or sketch - Appropriate cutting technique - Cuts appropriately cleaned
F. Assess the quality of the cuts.	- Conformity with main parameters - Good judgment
G. Set up an electric arc welding machine.	- Appropriate set-up technique - Appropriate selection of accessories - Accurate adjustment of welding machine
H. Select the electrodes.	- Appropriate selection of electrodes
I. Perform electric arc welding operations such as tacking and flat position welding.	- Accurate interpretation of instructions - Accurate position of plates - Appropriate techniques - Welds appropriately cleaned
J. Assess the quality of the weld by sight.	- Conformity with main parameters - Good judgment

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
K. Clean and store the equipment and clean up the work area.	- Appropriate storage of machines, tools and accessories - Clean work area

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to interpret the work plan (A):

1. Recognize the meaning of the welding symbols.

Before learning how to apply occupational health and safety rules (B):

2. Be familiar with the safety codes.
3. Be familiar with the methods of transporting and storing bottles of oxygen and acetylene.
4. Describe the hazards of using gas welding and cutting machines.

Before learning how to set up a welding machine to perform oxyacetylene-cutting operations (D):

5. Check the condition of the equipment and accessories.
6. Differentiate between the types of manual cutting torches.

Before learning how to perform horizontal and vertical oxyacetylene-cutting operations on metal (E):

7. Determine the adjustment parameters of the regulators according to the thickness of the metal.
8. Show constant concern for successful cuts.

Before learning how to assess the quality of the cuts (F):

9. List the qualities and defects of a cut.

Before learning how to set up an electric arc welding machine (G):

10. Determine the adjustment parameters of the machine according to the thickness of the metal to be welded.
11. Be familiar with the main types of electrodes.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to perform electric arc welding operations such as tacking and flat position welding (I):

12. Describe the things to watch for during welding.

Before learning how to assess the quality of the weld by sight (J):

13. Describe the qualities of a well-executed weld.
14. Describe the causes of improper welds and name the appropriate corrective measures.

Before learning how to clean and store the equipment and clean up the work area (K):

15. List the operations necessary for the regular maintenance of the equipment.

MODULE 9: HANDLING, RIGGING AND ANCHORING

CODE: 866 143 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
handle, rig and anchor materials, parts and machines
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working in pairs
- Following instructions
- Using:
  - installation manuals
  - drawings, diagrams and sketches
  - nomographs and charts
  - tools, machines and accessories such as simple levers, hoists, cranes, steel cables, slings, trolleys, roller guide shoes and shackles
  - different types of anchors and tools
  - industrial equipment such as machines, escalators, hydraulic units and moving sidewalks

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of work method
- Appropriate methods and techniques
- Appropriate use of tools and equipment
- Conformity with drawings and specifications
- Observance of handling standards

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Interpret the work plan.	- Accurate interpretation of information - Determination of safety measures
B. Solve problems related to physics (e.g. using levers).	- Understanding and use of appropriate methods - Accurate calculations
C. Determine the centre of gravity and estimate loads using the metric and imperial systems of measurement.	- Accurate location of centre of gravity - Accurate estimate of loads
D. Apply occupational health and safety rules.	- Appropriate safety measures
E. Select the appropriate supports, hoisting appliances and handling equipment.	- Appropriate selection according to needs
F. Check the equipment and supports before using them.	- Conformity with requirements - Good judgment
G. Assemble scaffolding.	- Observance of sequence of assembly operations - Solid and well-anchored assembly
H. Sling loads.	- Conformity with established standards
I. Handle parts, heavy equipment and hazardous products.	- Safe handling on vertical and horizontal planes
J. Fasten and anchor materials and machines to concrete, metal and plaster.	- Appropriate choice of anchors - Quality fastening and anchoring
K. Maintain supports and tools.	- Appropriate maintenance

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to interpret the work plan (A):

1. Define the safety factor in handling, rigging and anchoring.
2. Define handling, rigging and anchoring.
3. Read and interpret manufacturers' manuals and delivery documents.

Before learning how to solve problems related to physics (e.g. using levers) (B) and to determine the centre of gravity and estimate loads using the metric and imperial systems of measurement (C):

4. Apply the appropriate formulas to calculate volume and weight.

Before learning how to check the equipment and supports before using them (F):

5. Identify the parts subject to breakage.

Before learning how to assemble scaffolding (G):

6. Recognize the different types of scaffolds.
7. List the steps involved in assembling and disassembling scaffolds.
8. Identify accidents likely to occur during assembly and disassembly of scaffolds.
9. Be familiar with the different anchors used in scaffolding.

Before learning how to sling loads (H):

10. Be familiar with the knots used in handling.
11. Install rope fasteners on the steel cables.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to handle parts, heavy equipment and hazardous products (I):

12. Use crane and overhead crane operator signals.
13. Be familiar with the methods of moving loads on horizontal, vertical and inclined planes.
14. Move a load on a horizontal, vertical or inclined plane.
15. Interpret a data sheet (WHMIS).

Before learning how to fasten and anchor materials and machines to concrete, metal and plaster (J):

16. Be familiar with the different anchor devices and their respective uses.
17. Match materials and tools with the various types of anchors.
18. Use anchoring tools such as air hammers, electric hammers and drilling machines correctly and safely.

Before learning how to maintain supports and tools (K):

19. Locate the defective parts of tools and take preventive measures.
20. Show concern for the cleanliness of work areas, machines, tools and accessories.

MODULE 10: CONVENTIONAL, OPTICAL AND COMPUTER-ASSISTED ALIGNMENT

CODE: 842 174 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
apply conventional, optical and computer-assisted alignment methods
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using:
  - reference manuals
  - drawings or specifications
  - nomographs and formulas
  - operational assembly benches
  - operational machinery or equipment
  - dial gauges
  - laser alignment equipment
  - optical alignment instruments
  - tools and equipment

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of work method
- Appropriate use of tools and equipment
- Accurate calculations
- Observance of tolerances

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Interpret the drawings, specifications and instruction manuals.	- Accurate interpretation of manufacturers' warnings
B. Select the tools and equipment.	- Appropriate selection of tools and equipment
C. Apply occupational health and safety rules.	- Appropriate safety measures
D. Check the parts (e.g. sleeves, motors) or machines to be aligned.	- Observance of alignment conditions
E. Apply the formulas to do calculations.	- Accurate calculations
F. Install the shims under the support points.	- Appropriate installation
G. Align parts or machines using: • a ruler and a thickness gauge • dial gauges • laser alignment equipment • optical alignment instruments	- Conformity with drawings, specifications and instructions - Appropriate techniques
H. Check the work.	- Observance of tolerances

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to interpret the drawings, specifications and instruction manuals (A):

1. Know how to use drawings, specifications and instruction manuals.

Before learning how to select the tools and equipment (B):

2. Recognize defective parts.

Before learning how to apply occupational health and safety rules (C):

3. Show concern for occupational safety.

Before learning how to check the parts (e.g. sleeves, motors) or machines to be aligned (D):

4. Identify the conditions for proper alignment.
5. Identify alignment defects.

Before learning how to align parts or machines using:
• a ruler and a thickness gauge
• dial gauges
• laser alignment equipment
• optical alignment instruments (G):

6. Know how to use laser alignment equipment.
7. Know how to use optical alignment instruments.
8. Show concern for the quality of work.

MODULE 11: MAINTAINING MECHANICAL PARTS INVOLVED IN THE TRANSMISSION OF MOVEMENT AND THE TRANSFORMATION OF MOMENTUM

CODE: 866 155 **Duration: 75 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
apply techniques for maintaining mechanical parts involved in the transmission of movement and the transformation of momentum
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Following instructions
- Given a real or simulated operational problem
- Using:
  - reference manuals or the manufacturer's documents
  - lubrication charts
  - maintenance manuals
  - operational units involved in the transmission of movement and the transformation of momentum
  - measuring instruments
  - safety equipment

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Systematic observance of work method
- Accurate, careful work
- Appropriate use of tools and equipment
- Concern for quality/price ratio
- Observance of operating conditions

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Solve basic problems related to physics (e.g. flow, pressure, force).	- Accurate application of formulas - Conversion of data in the metric and imperial systems of measurement
B. Diagnose the problem.	- Accurate diagnosis
C. Read and interpret drawings and reference manuals.	- Accurate location of parts
D. Plan the maintenance work.	- Logical work plan
E. Select the tools and equipment.	- Appropriate choice of tools and equipment
F. Apply occupational health and safety rules.	- Appropriate safety measures
G. Perform maintenance tasks on various units such as: • a speed regulator • a speed reducer • a clutch and brakes • a pumping unit • a hydraulic unit • a compressor • a motor, generator and SCR • a conveyor • a gearless motor	- Conformity with work plan - Accurate interpretation of instructions - Appropriate selection of parts to be maintained - Appropriate assembly and disassembly techniques - Appropriate choice of action: • adjustment • replacement of component • repair
H. Perform tests.	- Appropriate start-up technique - Proper performance of tests
I. Check the operating parameters.	- Accurate measurements - Calculation of parameters - Good judgment
J. Clean up the work area.	- Appropriate storage and neat work area

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
K. Write a report.	- Relevant information - Accurate technical terminology - Correct English

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to diagnose the problem (B):

1. Measure the various mechanical parameters using the metric and imperial systems of measurement.
2. Consult charts related to the adjustment of bearings.
3. Describe the different methods of transmitting movement.
4. Describe the different units involved in the transmission of mechanical energy.
5. List the advantages and disadvantages of the different methods of transmission.
6. Classify the types of solid and liquid lubricants and the types of seals.
7. Recognize various mechanical parts involved in the transmission of movement and the transformation of momentum.

Before learning how to perform maintenance tasks on various units such as:
- **a speed regulator**
- **a speed reducer**
- **a clutch and brakes**
- **a pumping unit**
- **a hydraulic unit**
- **a compressor**
- **a motor, generator and SCR**
- **a conveyor**
- **a gearless motor (G):**

8. Describe the main causes of bearing failure.
9. Consult a lubrication chart.
10. Identify the colours of used oils.
11. Store or recycle used oils.

Before learning how to perform tests (H):

12. Detect the parts of a machine or piece of equipment that could endanger a mechanic during maintenance operations.
13. Show concern for the tension of belts and chains.
14. Describe the methods of ensuring leakproof joints.

MODULE 12: ANALYZING DIRECT-CURRENT CIRCUITS

CODE: 786 056 **Duration: 90 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
analyze a direct-current circuit
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Given the diagram of a series-parallel circuit with six resistors and a power supply

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Logical work method
- Appropriate use of instruments and equipment
- Clean, careful work
- Conformity with *Québec Electrical Code*

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Interpret the circuit diagram.	- Appropriate use of terminology - Correct interpretation of symbols and conventions
B. Calculate values at different points of the circuit.	- Correct application of laws - Accurate calculations
C. Measure values at different points of the circuit.	- Accurate measurements - Observance of safety rules
D. Explain the results.	- Accurate calculation of differences - Acceptable list of reasons for the differences

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to interpret the circuit diagram (A):

1. Describe the atomic structure of matter.
2. Describe the methods of producing electricity.
3. Identify the characteristics of the components of direct-current circuits (power supplies, resistors, capacitors, inductors).
4. Recognize the different groupings of components.

Before learning how to calculate values at different points of the circuit (B):

5. Explain Ohm's Law and the expression of power.
6. Describe the characteristics of direct-current circuits.
7. Describe the characteristics of RC and LR time constants in circuits.
8. Simplify circuits.

Before learning how to measure values at different points of the circuit (C):

9. Check the condition of the circuit components.
10. Assemble the circuit.
11. Describe the characteristics of direct-current measuring instruments.
12. Connect measuring instruments to a circuit.
13. Interpret readings from measuring instruments.

Before learning how to explain the results (D):

14. Identify the possible sources of errors in readings.
15. Define the internal resistance of a power supply.

MODULE 13: INSTALLING CABLES AND RACEWAYS

CODE: 866 163 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
install cables and raceways
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working in pairs
- Following instructions
- Using:
  - a sketch of the installation
  - the *Québec Electrical Code*
  - equipment
  - tools
  - materials
- Performing surface wiring

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Appropriate use of tools and equipment
- Conformity with the *Québec Electrical Code* and the installation sketch
- Economical use of materials
- Clean, careful work

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Plan the installations.	- Appropriate selection of tools, equipment and materials
B. Take safety measures.	- Appropriate safety measures
C. Strip cables and fasten them to the boxes.	- Appropriate stripping method - Appropriate fastening technique - Solid installation
D. Perform preliminary operations on raceways such as: • cutting • boring • threading • bending • assembling	- Accurate measurements - Conformity with instructions - Appropriate techniques - Safe use of tools and equipment
E. Fasten the raceways.	- Appropriate fastening technique - Solid installation - Level raceways
F. Pull the conductors through the raceways.	- Appropriate pulling technique
G. Clean up the work area.	- Appropriate storage and clean work area

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to plan the installations (A):

1. Recognize the different types of cables.
2. Recognize cable boxes and accessories.
3. Recognize the different types of raceways and their accessories.
4. Identify the tables, sections, rules and definitions in the *Québec Electrical Code* that relate to the installation of cables and raceways.
5. Use the mathematical formulas necessary for the installation of cables and raceways.

Before learning how to take safety measures (B):

6. Identify the safety measures and rules to be applied before and during the installation of cables and raceways.

Before learning how to strip cables and fasten them to the boxes (C):

7. Explain the methods used to strip cables.
8. Describe the technique for fastening cables.

Before learning how to perform preliminary operations on raceways such as:
- **cutting**
- **boring**
- **threading**
- **bending**
- **assembling (D):**

9. Measure raceways.
10. Demonstrate the techniques for using the tools and equipment.

Before learning how to fasten the raceways (E):

11. Describe the technique.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to pull the conductors through the raceways (F):

12. Mark the conductors.
13. Describe the techniques for pulling conductors.
14. Transmit information in a satisfactory manner.

Before learning how to clean up the work area (G):

15. Develop an efficient and safe storage method.

MODULE 14: INSTALLING AN ESCALATOR

CODE: 866 176 **Duration: 90 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
install, adjust and start up an operational escalator
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working in pairs
- Using:
  - drawings and specifications
  - the manufacturer's manuals
  - tools and equipment
  - an escalator
  - a moving sidewalk
  - measuring instruments
  - a control panel and accessories

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of work method
- Conformity with manufacturer's recommendations
- Appropriate use of tools and equipment
- Clean, careful work
- Observance of *Safety Code for Elevators*

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Interpret the drawings.	- Accurate interpretation
B. Plan the work.	- Logical operations - Appropriate selection of tools and equipment
C. Apply occupational health and safety rules.	- Appropriate safety measures
D. Position, assemble and permanently install the equipment.	- Conformity with drawings - Accurate location - Safe handling - Appropriate use of tools and equipment - Observance of installation standards - Well-aligned and level installation
E. Make temporary electrical connections.	- Conformity with drawings - Accurate connections - Wires appropriately coded
F. Perform tests, make adjustments and make a final inspection.	- Appropriate start-up method - Appropriate inspection procedure - Appropriate adjustment methods
G. Clean up the work area.	- Appropriate cleaning and storage of tools and equipment - Clean work area
H. Write a report or complete a worksheet.	- Relevant information - Accurate technical terminology - Correct English

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to interpret the drawings (A):

1. Define the operating principles of escalators and moving sidewalks.
2. Be familiar with the characteristics of escalators and moving sidewalks.

Before learning how to plan the work (B):

3. List the steps involved in effective planning.
4. Select the tools and equipment.

Before learning how to apply occupational health and safety rules (C):

5. Be familiar with the main health and safety rules related to escalators and moving sidewalks.

Before learning how to position, assemble and permanently install the equipment (D):

6. Determine the location of the equipment.
7. Sling and handle the equipment safely.
8. Be familiar with the assembly methods and techniques.

Before learning how to make temporary electrical connections (E):

9. Interpret the electrical installation drawings.
10. Identify the raceways, electrical cables and accessories.

Before learning how to perform tests, make adjustments and make a final inspection (F):

11. Describe the methods of aligning and adjusting parts (e.g. chains, belts, gear wheels).
12. Interpret inspection cards.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to write a report or complete a worksheet (H):

13. Be familiar with the method of presenting information.

MODULE 15: INSTALLING ELEVATOR SUBSTRUCTURES AND EQUIPMENT

CODE: 866 188 **Duration: 120 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
install the substructure of an elevator and the machine room equipment
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working in pairs
- Using:
  - drawings and diagrams
  - the manufacturer's manuals
  - an elevator shaft (at least four storeys)
  - elevator guide-rails and pre-assembled supports
  - scaffolding
  - machine room equipment
  - measuring and marking-out instruments

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of work method
- Appropriate use of tools and equipment
- Conformity with drawings and diagrams
- Appropriate alignment and positioning techniques
- Solid installations
- Observance of *Safety Code for Elevators*

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Interpret drawings and installation diagrams for the substructure of a traction-type elevator.	- Correct interpretation of method of installing equipment in shaft - Accurate interpretation of dimensions and positions
B. Calculate the main operating parameters of an elevator.	- Accurate calculations
C. Plan the work.	- Logical operations - Appropriate choice of tools, equipment and materials
D. Apply occupational health and safety rules.	- Appropriate safety measures
E. Determine the position of the guide-rails in the shaft using a plumb line or a laser.	- Accurate marking-out of position of guide-rails - Conformity with drawings and diagrams
F. Handle the guide-rails and supports in the shaft and install scaffolds.	- Appropriate handling and installation methods - Solid scaffolding
G. Install and align the supports and guide-rails.	- Appropriate methods of assembling guide-rails - Appropriate fastening and alignment methods - Solid installations - Observance of tightness standards and tolerances
H. Interpret the installation drawings for the machine room equipment and plan the installation.	- Accurate interpretation of dimensions and symbols - Appropriate location of equipment - Logical operations

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
I. Position and install the following in the machine room: • the pulley brackets • the winch seat and motor bed • the cable guides • a motor generator unit and SCR • a motor winch and pulleys • a controller • a gearless motor	- Conformity with drawings and diagrams - Appropriate techniques and methods - Accurate measurements and appropriate installation of equipment - Accurate alignment
J. Install the raceways and connect the machine room equipment.	- Conformity with drawings and diagrams - Accurate connections
K. Check the positioning and anchoring of the following in the shaft: • the ladder • the buffers • the tensioning pulley	- Conformity with drawings and diagrams - Accurate measurements - Solid installation - Appropriate alignment
L. Clean up the work area.	- Appropriate cleaning and storage of tools and equipment - Clean work area

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to interpret drawings and installation diagrams for the substructure of a traction-type elevator (A):

1. Define a traction-type elevator and describe its main advantages.
2. Be familiar with the operating principle of traction-type elevators and identify their main parts.
3. Be familiar with English and French terminology related to elevators.
4. Interpret the general views of a traction-type elevator.

Before learning how to plan the work (C):

5. Interpret the delivery slips and receive the equipment.

Before learning how to apply occupational health and safety rules (D):

6. Be familiar with the safety rules related to the installation of elevators.
7. Be familiar with the appropriate safety equipment.
8. List the main accidents likely to occur when handling materials.
9. Be familiar with the precautions to be taken.

Before learning how to determine the position of the guide-rails in the shaft using a plumb line or a laser (E):

10. Interpret the assembly and positioning drawings for the guide-rails.
11. Make and install platform guards.
12. Describe the alignment techniques using a plumb line and a laser in an elevator shaft.

Before learning how to handle the guide-rails and supports in the shaft and install scaffolds (F):

13. Prepare the guide-rails.
14. Select and inspect the slinging and handling equipment.
15. Interpret the main handling signals.
16. Be sure of the safety measures to be taken.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to install and align the supports and guide-rails (G):

17. Be familiar with the techniques for installing and aligning elevator supports and guide-rails.

Before learning how to position and install the following in the machine room:
- **the pulley brackets**
- **the winch seat and motor bed**
- **the cable guides**
- **a motor generator unit and SCR**
- **a motor winch and pulleys**
- **a controller**
- **a gearless motor (I):**

18. Describe the techniques for fastening a controller.

Before learning how to install the raceways and connect the machine room equipment (J):

19. Select the different conduits, connections, boxes and anchors necessary for the installation.
20. Describe the wiring and connection techniques.
21. Locate the parts of the *Québec Electrical Code* related to the installation of cables and raceways.

Before learning how to check the positioning and anchoring of the following in the shaft:
- **the ladder**
- **the buffers**
- **the tensioning pulley (K):**

22. Be familiar with the operating principles of buffers.
23. Be familiar with the methods of installing buffers and starting up the equipment after installation.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to clean up the work area (L):

24. Develop a quick and efficient method of cleaning and storing tools and equipment.

MODULE 16: ANALYZING ALTERNATING-CURRENT CIRCUITS

CODE: 786 115 **Duration: 75 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
analyze an alternating-current circuit
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Given the diagram of a series or parallel circuit with one resistor, one inductor and one capacitor

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Appropriate use of tools, equipment and assembly benches
- Clean, careful work
- Logical work method
- Observance of *Québec Electrical Code*

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Interpret the circuit diagram.	- Appropriate use of terminology - Correct interpretation of symbols and conventions
B. Calculate values at different points of the circuit.	- Correct application of laws - Accurate calculations
C. Measure values at different points of the circuit.	- Accurate measurements - Observance of safety rules
D. Explain the results.	- Accurate calculation of differences - Acceptable list of reasons for the differences

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to interpret the circuit diagram (A):

1. Explain how a sine wave is produced.
2. Define the terms associated with alternating current.
3. Describe the characteristics of inductors in alternating-current circuits.
4. Describe the characteristics of capacitors in alternating-current circuits.
5. Describe the characteristics of transformers.

Before learning how to calculate values at different points of the circuit (B):

6. Describe the characteristics of alternating-current circuits.
7. Differentiate among the terms *resistance*, *reactance* and *impedance*.
8. Draw vector diagrams.
9. Calculate the values of a sine wave.
10. Differentiate among the terms *real power, reactive power, apparent power* and *power factor.*
11. Describe the characteristics of series and parallel resonant circuits.
12. Check the condition of circuit components.

Before learning how to measure values at different points of the circuit (C):

13. Explain the safety precautions to be taken when assembling circuits, connecting instruments and taking readings.
14. Assemble the circuit.
15. Use alternating-current measuring instruments.
16. Interpret readings from measuring instruments.

Before learning how to explain the results (D):

17. Identify the possible sources of errors in readings.

MODULE 17: DIRECT- AND ALTERNATING-CURRENT MOTORS AND GENERATORS

CODE: 866 195 **Duration: 75 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
apply principles related to direct- and alternating-current motors, generators, gearless motors and SCRs and their control circuits
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Following instructions
- Using:
  - a drawing
  - the *Québec Electrical Code*
  - tools, equipment and materials
  - conduits ready to be installed
  - an installed control panel
  - an alternating-current motor on a base connected to a direct-current generator

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Appropriate use of tools and equipment
- Attention to characteristics of motor and generator
- Conformity with the *Québec Electrical Code*
- Clean, careful work

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Interpret technical specifications of direct- and alternating-current motors, generators and SCRs.	- Accurate interpretation of technical parameters
B. Explain the operating principles of direct- and alternating-current motors, generators and SCRs.	- Understanding of operating principles
C. Apply occupational health and safety rules.	- Appropriate safety measures
D. Make the electrical connections for direct- and alternating-current motors, generators and SCRs and install control devices.	- Appropriate connections - Appropriate fastening technique
E. Check the operation of the control circuits of the direct- and alternating-current motors, generators and SCRs.	- Observance of verification procedure - Correct use of measuring instruments - Operation in conformity with parameters
F. Clean up the work area.	- Appropriate storage and clean work area

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to interpret technical specifications of direct- and alternating-current motors, generators and SCRs (A):

1. Be familiar with the different parts of direct- and alternating-current motors, generators and SCRs.
2. Classify the types of direct- and alternating-current motors, generators and SCRs.

Before learning how to explain the operating principles of direct- and alternating-current motors, generators and SCRs (B):

3. Differentiate between direct- and alternating-current motors on the one hand, and direct- and alternating-current generators and SCRs on the other.
4. Apply concepts of magnetism and electromagnetism.

Before learning how to apply occupational health and safety rules (C):

5. Be familiar with the safety rules stipulated in the *Québec Electrical Code*.

Before learning how to make the electrical connections for direct- and alternating-current motors, generators and SCRs and install control devices (D):

6. Recognize the parts of the *Québec Electrical Code* that relate to the installation of motors, generators, controls and SCRs.
7. Determine the main symbols and parts of a drawing for installing motors, generators, SCRs and controls.
8. Use the mathematical formulas necessary for the installation of motors, generators, SCRs and controls.
9. Prepare the tools, equipment and materials.
10. Install the control panel, the boxes and the electrical components.
11. Describe the techniques for connecting the different types of motor, generator and SCR controls.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to check the operation of the control circuits of the direct- and alternating-current motors, generators and SCRs (E):

12. Power motors, generators and SCRs.
13. Diagnose an operational problem.
14. Maintain motors, generators and SCRs and their controls.

MODULE 18: APPLYING CONCEPTS OF HYDRAULICS

CODE: 866 252 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

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

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using:
  - diagrams or drawings
  - nomographs and charts
  - tools and equipment
  - measuring instruments
  - hydraulic test and assembly benches
  - components, connections and conduits

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of work method
- Clean, careful work
- Appropriate use of tools and equipment
- Accurate calculations
- Conformity with drawings or diagrams

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Interpret the diagrams or drawings.	- Accurate interpretation of symbols
B. Calculate the main parameters of a circuit.	- Accurate calculation of pressure and flow
C. Select the components, connections and conduits.	- Appropriate selection according to diagram
D. Apply occupational health and safety rules.	- Appropriate safety measures
E. Assemble simple hydraulic circuits.	- Appropriate techniques and methods
F. Measure and adjust the operating parameters.	- Accurate measurements - Correct adjustment of parameters
G. Troubleshoot and adjust basic circuits.	- Appropriate use of measuring and control instruments - Accurate adjustment of parameters - Appropriate troubleshooting
H. Perform tests.	- Observance of operating conditions - Location of leaks - Leakproof circuit

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to assemble basic hydraulic circuits (E):

1. Explain the operation of hydraulic circuits.
2. Use the tools, equipment and instruments correctly and safely.
3. Draw basic diagrams.

Before learning how to troubleshoot and adjust basic circuits (G):

4. Maintain hydraulic units.

MODULE 19: INSTALLING HYDRAULIC ELEVATOR EQUIPMENT

CODE: 866 193 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
install hydraulic elevator equipment
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working in pairs
- Using:
  - drawings, diagrams and specifications
  - the manufacturer's installation manuals
  - the hydraulic unit of an elevator
  - a control panel and accessories
  - electrical and hydraulic conduits
  - measuring instruments

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of work method
- Appropriate use of tools and equipment
- Installation in conformity with manufacturer's specifications
- Observance of *Safety Code for Elevators*

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Interpret the manufacturer's drawings.	- Accurate interpretation of installation method - Accurate interpretation of dimensions
B. Plan the work.	- Logical operations - Appropriate selection of tools and equipment
C. Apply occupational health and safety rules.	- Observance of safety measures
D. Handle the equipment.	- Appropriate selection of handling equipment - Appropriate techniques
E. Determine the location of the equipment in the shaft.	- Conformity with drawings - Accurate measurement of location
F. Check the positioning of the cylinder and piston and install the platform.	- Appropriate installation and alignment techniques and methods - Accurate alignment - Conformity with drawings
G. Check the installation of the equipment in the machine room and connect it temporarily.	- Conformity with drawing - Accurate connection
H. Check the installation of the platform and start it up temporarily.	- Conformity with drawing - Appropriate safety measures - Appropriate start-up method
I. Clean up the work area.	- Appropriate cleaning and storage of tools and equipment - Clean work area
J. Write a report or complete a worksheet.	- Accurate technical terminology - Correct English

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to interpret the manufacturer's drawings (A):

1. Describe the operation of a hydraulic elevator and identify its main parts.
2. Be familiar with the English and French terminology related to elevators.
3. Be familiar with the main electrical and hydraulic symbols.

Before learning how to plan the work (B):

4. Consult the manufacturer's instructions.
5. Check the elevator equipment.

Before learning how to apply occupational health and safety rules (C):

6. Use the tools and equipment correctly and carefully.
7. Identify the hazards and safety precautions related to the installation of hydraulic elevators.

Before learning how to handle the equipment (D):

8. Determine the required handling equipment and scaffolding.
9. Determine the centre of gravity of the loads.

Before learning how to determine the location of the equipment in the shaft (E):

10. Apply concepts of related to the measurement, marking out and alignment of equipment in a shaft.
11. Be familiar with the techniques for fastening and aligning elevator supports and guide-rails.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to check the positioning of the cylinder and piston and install the platform (F):

12. Be familiar with the techniques for anchoring supports, guide-rails, bases and buffers.
13. Be familiar with the techniques for assembling cylinders.
14. Be familiar with the techniques for polishing piston seals after assembly.
15. Describe the method used to check the straightness of a cylinder.
16. Be familiar with the technique for installing the main elevator cylinder and piston seals.
17. Be familiar with the method of positioning and aligning cylinders with their guide-rails.
18. Be familiar with the method of concreting the cylinder base.
19. Interpret the data sheets for corrosion inhibitors.

Before learning how to check the installation of the equipment in the machine room and connect it temporarily (G):

20. Be familiar with the parts and accessories of a hydraulic unit.
21. Understand the operation of hydraulic and electrical circuits.
22. Be familiar with the different conduits, connections and anchors used to install the equipment.
23. Describe the techniques for fastening, wiring and connecting the equipment to the electrical panel.

Before learning how to check the installation of the platform and start it up temporarily (H):

24. Interpret the assembly drawing of the platform.
25. Be familiar with the methods of starting up a hydraulic unit.
26. Use measuring instruments and devices to measure pressure, flow, force, velocity and current.
27. Describe the methods of checking the system's power source.
28. Diagnose minor operational problems.
29. Adjust and check the various components of a hydraulic circuit in an elevator.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to clean up the work area (I):

30. List the operations necessary to clean up the work area.

MODULE 20: INSTALLING AND STARTING UP AN ELEVATOR PLATFORM

CODE: 866 206 **Duration: 90 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
install and start up an elevator platform
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working in pairs
- Using:
  - drawings, diagrams and specifications
  - the manufacturer's manuals
  - tools and equipment
  - a pre-assembled elevator platform
  - an assembled counterweight
  - measuring instruments and devices, e.g. a tachometer, a multimeter, a level, a measuring tape

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of work method
- Appropriate installation techniques
- Appropriate use of tools and equipment
- Conformity with manufacturer's specifications
- Observance of *Safety Code for Elevators*

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Interpret the manufacturer's installation drawings.	- Accurate interpretation of assembly drawings
B. Plan the work.	- Logical operations - Appropriate selection of tools and equipment
C. Apply occupational health and safety rules.	- Appropriate safety measures
D. Handle the equipment in the elevator shaft.	- Appropriate selection of equipment - Careful verification of equipment and hoisting appliances - Safe handling
E. Assemble and install the uprights, the platform and the counterweight.	- Conformity with drawings - Appropriate assembly methods and techniques - Solid assembly - Appropriate techniques for handling and installing hoisting ropes - Observance of standards, clearances and tolerances
F. Temporarily connect the controls and accessories to the control panel in the machine room.	- Conformity with drawings - Accurate connections
G. Start up the platform temporarily.	- Observance of start-up conditions
H. Measure the operating parameters.	- Accurate measurements
I. Adjust the platform.	- Appropriate techniques and methods - Adjustment in conformity with manufacturer's standards

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
J. Clean up the work area.	- Appropriate cleaning and storage of tools and equipment - Clean work area

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to interpret the manufacturer's installation drawings (A):

1. Read the manufacturer's terms and technical notes.

Before learning how to plan the work (B):

2. Check the tools, equipment and materials.

Before learning how to handle the equipment in the elevator shaft (D):

3. Define the characteristics of steel cables.
4. Use appropriate handling signals.

Before learning how to assemble and install the uprights, the platform and the counterweight (E):

5. Be familiar with the method of assembling uprights, platforms and counterweights.
6. Be familiar with the method of installing steel cables for elevators.
7. Be familiar with the techniques for making and installing safety barriers.

Before learning how to temporarily connect the controls and accessories to the control panel in the machine room (F) and to start up the platform temporarily (G):

8. Identify the steps involved in the installation.
9. Use measuring instruments (e.g. a multimeter).
10. Be familiar with the methods of powering and checking circuits.

MODULE 21: INSTALLING HOISTWAY DOORS AND SHAFT ACCESSORIES

CODE: 866 214 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
install hoistway doors and shaft accessories
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working in pairs
- Using:
  - drawings, diagrams and specifications
  - the manufacturer's installation manuals
  - lubrication charts
  - a landing
  - tools and equipment
  - an assembled platform installed in a shaft
  - door frames and hoistway doors
  - fascias
  - lubricants
  - measuring instruments

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of work method
- Appropriate use of tools and equipment
- Attention to floor levels and squaring
- Observance of manufacturer's specifications
- Lubrication in conformity with maintenance manual specifications
- Clean work area
- Observance of *Safety Code for Elevators*

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Interpret the manufacturer's installation drawings.	- Accurate interpretation of assembly procedures
B. Plan the work.	- Logical operations - Appropriate selection of tools, equipment and lubricants
C. Apply occupational health and safety rules.	- Appropriate safety measures - Barrier safely installed
D. Handle: • hoistway doors • door frames • control tapes • fascias	- Appropriate selection of handling equipment - Appropriate handling techniques - Safe handling
E. Install and adjust the door frames, doors and accessories.	- Appropriate assembly, squaring, alignment and levelling techniques and methods - Appropriate fastening techniques
F. Install and connect the control tape, controls, accessories and travelling cable in the shaft.	- Conformity with drawings and diagrams - Appropriate fastening techniques - Accurate connections - Wires appropriately coded
G. Install the fascias.	- Conformity with drawings and diagrams - Accurate adjustments
H. Clean and lubricate all the components and equipment in the shaft.	- Conformity with lubrication chart - Appropriate techniques
I. Clean up the work area.	- Appropriate cleaning and storage of tools and equipment - Clean work area

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to interpret the manufacturer's installation drawings (A) and to plan the work (B):

1. Be familiar with the symbols.
2. Check and select the tools, equipment and materials.

Before learning how to apply occupational health and safety rules (C):

3. Know how to use the appropriate safety equipment.
4. Adopt safe work methods.

Before learning how to handle:
- **hoistway doors**
- **door frames**
- **control tapes**
- **fascias (D):**

5. Be familiar with the methods for handling these accessories.

Before learning how to install and adjust the door frames, doors and accessories (E):

6. Be familiar with fastening methods.

Before learning how to install and connect the control tape, controls, accessories and travelling cable in the shaft (F):

7. Explain the principles of micro-switch and roller controls.
8. Be familiar with the techniques for aligning control tapes.
9. Interpret the coding of wires.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to clean and lubricate all the components and equipment in the shaft (H):

10. Interpret a lubrication chart.

MODULE 22: ASSEMBLING AND FINISHING ELEVATOR CABS

CODE: 866 227 **Duration: 105 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
assemble a cab, install electrical accessories and finish the interior
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working in pairs
- Using:
  - drawings and assembly specifications
  - the manufacturer's manuals
  - tools and equipment
  - an assembled platform installed in the shaft
  - a partially assembled elevator cab
  - elevator cab accessories
  - measuring instruments

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of work method
- Conformity with manufacturer's specifications
- Appropriate use of tools and equipment
- Clean, careful work
- Observance of *Safety Code for Elevators*

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Interpret the drawings.	- Accurate interpretation of information in assembly drawings
B. Plan the work.	- Logical order of operations - Appropriate selection of tools, equipment and materials
C. Apply occupational health and safety rules.	- Appropriate safety measures
D. Assemble the cab and connect all the accessories.	- Proper assembly - Appropriate technique and method of installing accessories - Appropriate technique for making electrical connections
E. Finish the interior of the cab.	- Appropriate selection of tools and accessories - Appropriate assembly techniques and methods - Well-installed coverings - Clean work
F. Clean up the work area.	- Appropriate cleaning and storage of tools and equipment - Clean work area

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to plan the work (B):

1. Be familiar with the steps involved in assembling the cab.
2. Interpret the logic of the operations involved in assembling an elevator cab.
3. Select the handling equipment and tools.

Before learning how to apply occupational health and safety rules (C):

4. Identify the hazards and safety measures related to the installation of elevator cabs and their accessories.

Before learning how to assemble the cab and connect all the accessories (D):

5. Be familiar with the techniques for assembling and balancing a cab and its counterweight.
6. Understand the operating principles of the doors of an elevator cab.
7. Interpret the drawings for the electrical connections of the control panel of an elevator cab.
8. Identify the parts of the *Québec Electrical Code* that relate to the installation of alarm and security systems.
9. Determine the types of connections according to the drawing and control panel of the cab.
10. Describe the techniques for checking electrical circuits.

Before learning how to finish the interior of the cab (E):

11. Identify different materials used to finish the interior of elevator cabs and be familiar with the methods of installing them.

Before learning how to clean up the work area (F):

12. List the operations required to clean up.

MODULE 23: COMBINATIONAL LOGIC

CODE: 842 213 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
apply concepts of combinational logic
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Following instructions
- Using:
  - a system or assembly diagram
  - the manufacturer's manuals
  - data sheets
  - logic components
  - tools and instruments
  - assembly materials

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Attention to materials
- Observance of work method
- Conformity with circuit parameters at start-up
- Operation in conformity with diagrams
- Appropriate interpretation of symbols

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Apply concepts of Boolean algebra.	- Observance of rules
B. Do conversions between number bases.	- Accurate conversions
C. Construct truth tables.	- Observance of rules - Accurate results
D. Reduce equations using the Karnaugh method.	- Reduction to at most four variables - Accurate results
E. Apply occupational health and safety rules.	- Appropriate safety measures
F. Assemble basic circuits.	- Conformity with diagrams and instructions - Neat work
G. Clean up the work area.	- Clean work area and components placed in logical order

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to apply concepts of Boolean algebra (A):

1. Define the various laws of Boolean algebra.

Before learning how to do conversions between number bases (B):

2. Solve conversion problems in various numbering systems.

Before learning how to construct truth tables (C):

3. Be familiar with the various cells or components.
4. Explain the basic logic functions and their truth table.

Before learning how to reduce equations using the Karnaugh method (D):

5. Explain Karnaugh's rules.
6. Write the equations on the basis of groupings.
7. Translate the equations into diagrams.

Before learning how to apply occupational health and safety rules (E):

8. Explain the purpose of the main occupational health and safety rules.

Before learning how to assemble basic circuits (F):

9. Assemble and disassemble components.

Before learning how to clean up the work area (G):

10. List the operations necessary for cleaning up the work area.

MODULE 24: SEQUENTIAL LOGIC

CODE: 842 304 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
apply concepts of sequential logic
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Following instructions
- Using:
  - reference manuals
  - the manufacturer's data sheets
  - a system diagram
  - logic components
  - tools and instruments
  - assembly materials

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Neat circuits or diagrams
- Attention to materials
- Conformity with circuit parameters at start-up
- Operation in conformity with diagrams

FIRST-LEVEL OPERATIONAL OBJECTIVE

BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Select the different components.	- Selection appropriate to application
B. Draw diagrams.	- Neat diagrams - Observance of rules - Observance of sequence
C. Apply occupational health and safety rules.	- Appropriate safety measures
D. Assemble circuits.	- Conformity with diagrams and instructions - Attention to characteristics of components - Circuit operating properly
E. Clean up the work area.	- Clean work area and appropriate storage of components

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to select the different components (A):

1. Interpret the symbols.
2. Identify the components.
3. Describe the role of the various components.

Before learning how to draw diagrams (B):

4. Describe the different start, run and stop modes.

Before learning how to apply occupational health and safety rules (C):

5. Explain the main occupational health and safety rules.

Before learning how to assemble circuits (D):

6. Use the tools and equipment correctly and carefully.
7. Install the components correctly.
8. Show concern for the proper operation of the components.

Before learning how to clean up the work area (E):

9. List the operations necessary for cleaning up the work area.

MODULE 25: ANALYZING SOLID STATE CIRCUITS

CODE: 843 076 **Duration: 90 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
analyze solid state circuits
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Following instructions
- Using:
  - data sheets for electronic and optoelectronic components
  - circuit diagrams
  - basic supply, amplifier and oscillation circuits
  - electronic and optoelectronic components
  - tools and measuring instruments

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Appropriate use of tools and instruments
- Appropriate terminology
- Accurate interpretation of circuit characteristics and parameters

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Explain the functions of diodes, transistors and integrated circuits.	- Accurate explanation of functions - Appropriate use of terminology
B. Read and interpret diagrams of basic: • supply circuits • amplifier circuits • oscillation circuits	- Correct identification of components and the characteristics of their parameters - Accurate identification of circuit functions
C. Select electronic and optoelectronic components.	- Appropriate selection of components - Attention to characteristics
D. Apply occupational health and safety rules.	- Appropriate safety measures - Environmentally friendly disposal of pollutants
E. Measure and calculate the parameters of the circuits.	- Accurate measurements and calculations
F. Diagnose circuit problems.	- Accurate diagnosis - Appropriate corrective measures
G. Clean up the work area.	- Clean work area and appropriate storage of components

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to explain the functions of diodes, transistors and integrated circuits (A):

1. Describe the basic characteristics of semiconductor materials.
2. Describe the characteristics of bipolar transistors.
3. Describe the characteristics of field effect transistors.
4. Describe the characteristics of linear integrated circuits.
5. Describe the characteristics of regulator circuits.
6. Describe the characteristics of amplifiers.

Before learning how to read and interpret diagrams of basic:
- **supply circuits**
- **amplifier circuits**
- **oscillation circuits (B):**

7. Describe the functions of rectifier circuits.
8. Describe the functions of filter circuits.
9. Explain how power supplies work.
10. Explain how amplifier circuits work.
11. Explain how oscillation circuits work.

Before learning how to select electronic and optoelectronic components (C):

12. Identify the two basic groups of optoelectronic components.
13. Be familiar with the terminology and units of measurement related to optoelectronic components.
14. Be familiar with the most common electronic components.
15. Identify and calculate the main characteristics of light.
16. Differentiate between the two main techniques for measuring light.
17 Identify the basic function of photosensitive components.
18. Identify the operating principle of four photosensitive components.
19. Describe the basic operating principle of light-emitting diodes.
20. Describe the construction of light-emitting diodes.
21. State the advantages of light-emitting diodes in comparison with other sources of light.
22. Describe the basic operating principle of liquid crystal displays.
23. Describe the construction of liquid crystal displays.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to apply occupational health and safety rules (D):

24. Explain the usefulness of the main occupational health and safety rules.

Before learning how to measure and calculate the parameters of the circuits (E):

25. Use the measuring instruments.

Before learning how to diagnose circuit problems (F):

26. Interpret the input and output parameters of the different circuits.
27. Check the operating condition of the solid state components.

Before learning how to clean up the work area (G):

28. List the operations involved in the regular and preventive maintenance of measuring instruments and equipment.

MODULE 26: INSTALLING PROGRAMMABLE CONTROLLERS

CODE: 866 232 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
install and connect a programmable controller
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Following instructions
- Using:
  - drawings
  - the manufacturer's instructions
  - tools, equipment and material
  - a programmable controller
  - an input module
  - an output module

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Appropriate use of tools and equipment
- Conformity with drawing
- Clean, careful work

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Interpret the drawings.	- Accurate interpretation of symbols - Accurate location of components - Accurate interpretation of circuit diagram
B. Plan the installation.	- Creation of work plan - Organization of operations - Selection of necessary tools and equipment
C. Apply occupational health and safety rules.	- Appropriate safety measures
D. Prepare the tools, equipment and materials.	- Safe handling - Appropriate verification and preparation
E. Locate and attach the control panel, controller and devices.	- Accurate location - Appropriate fastening techniques - Solid installation
F. Run the wires and make the electrical connections.	- Wiring in conformity with drawings - Economical use of materials - Appropriate connections
G. Check, and correct if necessary, the electrical power supply of the controller and the control circuit of the inputs and outputs.	- Appropriate voltage - Operational control circuit
H. Clean up the work area.	- Appropriate storage and clean work area

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to interpret the drawings (A):

1. Describe the operating principle and use of programmable controllers.
2. Recognize the basic components of a programmable controller.
3. Recognize the main symbols and parts of a drawing for installing a programmable controller and a circuit diagram.

Before learning how to plan the installation (B):

4. Use the concepts related to the direct and alternating currents required to install a programmable controller.
5. Use the concepts related to electronics, combinatory logic and sequential logic required to install a programmable controller.
6. Use the concepts of professional communication required to install a programmable controller.

Before learning how to prepare the tools, equipment and materials (D):

7. Recognize the precautions to be taken when handling programmable controllers.

Before learning how to locate and attach the control panel, controller and devices (E):

8. Describe the fastening techniques.

Before learning how to run the wires and make the electrical connections (F):

9. Describe the techniques for running wires and making connections.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to check, and correct if necessary, the electrical power supply of the controller and the control circuit of the inputs and outputs (G):

10. Describe the methods of checking the power supply and the control circuit of the inputs and outputs.

MODULE 27: FINAL ELECTRICAL CONNECTIONS AND ADJUSTMENTS

CODE: 866 246 **Duration: 90 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
make the final electrical connections and adjustments
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Using:
  - plans and specifications
  - the manufacturer's installation manuals
  - tools and equipment
  - an installed elevator and escalator
  - electrical control panels
  - a programmable controller
  - measuring instruments (e.g. multimeter, level)

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of work method
- Conformity with manufacturer's specifications
- Appropriate use of tools and equipment
- Clean, careful work
- Observance of *Safety Code for Elevators*

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Interpret the plans.	- Accurate interpretation of monitoring plan
B. Plan the work.	- Logical order of operations - Appropriate selection of tools, equipment and materials
C. Apply occupational health and safety rules.	- Appropriate safety measures
D. Make the final electrical connections.	- Appropriate identification codes - Appropriate connection technique
E. Make the final adjustments to the mechanical equipment in the shaft, the cab and the switches.	- Appropriate adjustment of parameters - Appropriate technique for balancing the cab
F. Perform tests and make a final inspection.	- Appropriate start-up procedure - Observance of operating conditions - Inspection in accordance with government standards
G. Clean up the work area.	- Appropriate cleaning and storage of tools and equipment
H. Write a report or complete a worksheet.	- Relevant information - Accurate technical terminology - Correct English

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to plan the work (B):

1. Be familiar with the tools, equipment, measuring instruments and materials.

Before learning how to apply occupational health and safety rules (C):

2. Be familiar with the main safety measures to be taken when adjusting, checking and starting up the equipment.

Before learning how to make the final electrical connections (D):

3. Know how to use the tools, equipment and measuring instruments.
4. Identify the safety circuits.
5. Be familiar with the different types of alarm and telephone systems and their components.
6. Connect a programmable controller to a control panel.
7. Check the input and output signals of a controller and a control panel.

Before learning how to make the final adjustments to the mechanical equipment in the shaft, the cab and the switches (E):

8. Be familiar with the static balancing methods used to balance the cab and its counterweight.
9. Adjust doors, guide rolls and accessories.
10. Interpret verification records.

Before learning how to perform tests and make a final inspection (F):

11. Be familiar with the test methods and operating conditions.
12. Interpret inspection cards.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to write a report or complete a worksheet (H):

13. Complete material requisitions.
14. Modify plans and sketches.

MODULE 28: APPLYING JOB SEARCH TECHNIQUES

CODE: 866 281 **Duration: 15 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

EXPECTED OUTCOME

By participating in the required activities of the learning context according to the indicated criteria, the students will be able to
prepare a job search.

SPECIFICATIONS

At the end of this module, the students will:

- Identify the steps involved in creating a job search plan.
- Be familiar with various models of résumés and letters of introduction and recognize their main objectives.
- Be familiar with the attitudes and behaviours to adopt or avoid during a selection interview.

LEARNING CONTEXT

PHASE 1: **Planning a Job Search**

- Becoming familiar with the sources of information to be consulted during a job search.

- Setting out the steps involved in a job search.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

LEARNING CONTEXT

PHASE 2: **Carrying Out the Job Search**

- Identifying the parts and objectives of a letter of introduction and a résumé.
- Learning about various models of letters of introduction and résumés and recognizing the strengths and weaknesses of these documents with respect to the targeted job.
- Identifying the attitudes and behaviours to adopt or avoid during a selection interview.
- Finding various means of following up job search procedures.

PHASE 3: **Assessing Their Potential**

- Determining their strengths and weaknesses with respect to each step of the job search and finding means of compensating for their weaknesses.

INSTRUCTIONAL GUIDELINES

The teacher should:

- Provide the students with the material resources and models necessary to help them with their task.
- Explain how to use the reference materials.
- Direct the students to resource people who can help them with their job search.
- Ensure that the students understand the importance of preparing for a job search.
- Encourage the students to share their ideas and cooperate with each other.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

PARTICIPATION CRITERIA

PHASE 1

- Consult the sources of information made available to them.
- Discuss the information they have gathered, its relevance and the logical sequence of operations to undertake during a job search.

PHASE 2

- Examine the various models of letters of introduction and résumés provided.
- Discuss the importance of these documents with respect to the target job.
- Discuss the attitudes and behaviours to adopt or avoid during a selection interview.

PHASE 3

- Discuss their strengths and weaknesses with respect to each step in the job search.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before undertaking the activities of Phase 1:

1. Identify effective tools for gathering information (e.g. worksheets, schedules, agendas).

Before undertaking the activities of Phase 2:

2. Be familiar with the objectives of a selection interview.
3. Identify various types of selection interviews.

MODULE 29: MAINTAINING AND TROUBLESHOOTING MECHANIZED HANDLING SYSTEMS

CODE: 866 292 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
maintain and troubleshoot operational mechanized handling systems
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working alone
- Following specific instructions
- Using:
  - plans and specifications
  - the manufacturer's technical manuals
  - the history of the equipment
  - a traction-type or hydraulic elevator, an escalator and a moving sidewalk
  - measuring devices such as a sound level meter, an alignment computer, a viscometer and a multimeter
  - replacement parts
  - tools and equipment

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Observance of work method
- Conformity with manufacturer's specifications
- Appropriate use of tools and equipment
- Clean, careful work
- Observance of *Safety Code for Elevators*

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
A. Interpret the plans, mechanical and electrical sketches and the maintenance records.	- Accurate interpretation of dimensions and symbols - Accurate interpretation of maintenance sequences and information
B. Plan the work.	- Logical operations - Appropriate selection of tools and equipment
C. Apply occupational health and safety rules.	- Appropriate safety measures
D. Check the general operation of the equipment.	- Appropriate verification method
E. Interpret noises and vibrations.	- Appropriate techniques - Accurate interpretation of information
F. Diagnose problems related to various handling systems.	- Appropriate use of instruments - Accurate diagnosis
G. Remove, install and replace components.	- Appropriate techniques - Appropriate selection of components
H. Clean, lubricate and adjust components.	- Accurate adjustment of components - Appropriate selection of lubricants
I. Perform tests and make a final inspection.	- Observance of test methods and operating conditions
J. Clean up the work area.	- Appropriate cleaning and storage of tools and equipment - Clean work area

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
K. Write reports and complete worksheets.	- Accurate technical terminology - Relevant and complete information - Maintenance records, diagrams and plans updated - Correct English

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to interpret the plans, mechanical and electrical sketches and the maintenance records (A) and to plan the work (B):

1. Consult the history of the equipment.
2. Be familiar with the components of the various systems.
3. Explain the operating sequence of various mechanical systems.

Before learning how to apply occupational health and safety rules (C) and to check the general operation of the equipment (D):

4. Know how to use the tools, instruments and accessories.
5. Obtain authorization.

Before learning how to interpret noises and vibrations (E) and to diagnose problems related to various handling systems (F):

6. Check the alignment and levelness of the components, machine parts and accessories.
7. Test the voltage, amperage, pressure, and so on.

Before learning how to remove, install and replace components (G) and to clean, lubricate and adjust components (H):

8. Describe the appropriate method of removing, installing and adjusting components.
9. Check the lubrication and hydraulic unit systems.
10. Ensure that replacement parts are available.

MODULE 30: DISASSEMBLING ELEVATORS

CODE: 866 308 **Duration: 120 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
disassemble an elevator
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Working in pairs
- Using:
  - drawings and diagrams
  - the manufacturer's technical manuals
  - tools and equipment
  - scaffolding
- Given a complete elevator installed in a shaft

GENERAL PERFORMANCE CRITERIA

- Observance of occupational health and safety rules
- Conformity with drawings and diagrams
- Observance of work method
- Strict application of work techniques
- Appropriate use of tools and equipment
- Concern for economy
- Correct updating of inventory
- Clean, careful work

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Interpret the assembly drawings and specifications for an elevator.	- Accurate interpretation of drawings and specifications
B. Plan the disassembly.	- Logical disassembly operations - Appropriate selection of tools, equipment and materials
C. Apply occupational health and safety rules.	- Appropriate safety measures
D. Disconnect and remove the wiring from the shaft and the cab.	- Observance of identification code - Observance of disconnection techniques - Retrieval of materials - Appropriate storage of cable
E. Disassemble the cab and its accessories.	- Observance of handling techniques - Appropriate storage of materials
F. Disassemble the doors and door frames.	- Appropriate storage of materials
G. Disassemble the platform and its accessories.	- Safe handling of materials - Appropriate storage of materials
H. Disassemble the elevator's substructure.	- Observance of scaffolding techniques - Observance of slinging and handling techniques - Appropriate identification and storage of guide-rails
I. Disassemble the elevator's machine room.	- Observance of identification code - Observance of disconnection techniques - Safe handling of materials - Retrieval of materials

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	**SPECIFIC PERFORMANCE CRITERIA**
J. Clean up the work area.	- Appropriate cleaning and storage of tools and equipment - Clean work area

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to interpret the assembly drawings and specifications for an elevator (A) and to plan the disassembly (B):

1. Collect the information related to the systems to be disassembled.
2. Determine the sequence of disassembly operations.

Before learning how to apply occupational health and safety rules (C):

3. Be familiar with the techniques for fastening and handling the equipment.

Before learning how to disconnect and remove the wiring from the shaft and the cab (D):

4. Lock the equipment in accordance with the *Québec Electrical Code*.
5. Be familiar with the techniques for identifying wires.
6. Be familiar with the techniques for retrieving and storing materials (WHMIS).

Before learning how to disassemble the cab and its accessories (E) and to disassemble the doors and door frames (F):

7. Determine the sequence of operations for disassembling the cab and the doors.
8. Be familiar with the disassembly techniques.
9. Be familiar with the appropriate storage techniques.

Before learning how to disassemble the platform and its accessories (G):

10. Determine the sequence of operations for disassembling the platform.
11. Be familiar with the disassembly techniques.
12. Determine a technique for identifying and storing materials.

SECOND-LEVEL OPERATIONAL OBJECTIVES

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

Before learning how to disassemble the elevator's substructure (H):

13. Determine the sequence of operations for disassembling the substructure of traction-type or hydraulic elevators.
14. Be familiar with the techniques for disassembling both types of mechanized handling systems.
15. Be familiar with the techniques and procedures for installing scaffolding in an elevator shaft.
16. Determine a technique for identifying and storing materials.

Before learning how to disassemble the elevator's machine room (I):

17. Determine the sequence of operations on the basis of the drawings and diagrams.
18. Use techniques for disconnecting wiring.
19. Be familiar with the techniques for disassembling a hydraulic unit.

Éducation

Québec

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