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BUILDINGS AND PUBLIC WORKS

PLUMBING AND HEATING

PROGRAM OF STUDY
5648

VOCATIONAL and TECHNICAL EDUCATION

Québec

BUILDINGS AND PUBLIC WORKS

PLUMBING AND HEATING

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BUILDING MECHANICS

PLUMBING AND HEATING

PROGRAM OF STUDY 5648

March 1995

The *Plumbing and Heating* program leads to the Secondary School Vocational Diploma (SSVD) and prepares the student to practise the trade of

PIPEFITTER
in Plumbing and Heating

Direction générale de la formation professionnelle et technique

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This program of study, *Plumbing and Heating,* is issued in accordance with Section 461 of the *Education Act.*

It has been approved by the Confessional committees of the Conseil supérieur de l'éducation in conformity with the provisions of paragraph (a) of Section 23 of the *Act respecting the Conseil supérieur de l'éducation,* as replaced by Section 569 of the *Education Act* (1988, Chapter 84).

This program has been authorized for teaching Plumbing and Heating in the schools as of July 1, 1989.

TABLE OF CONTENTS

INTRODUCTION

The *Plumbing and Heating* 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 1 500 hours. This includes 750 hours spent on the specific competencies required to practise the trade and 750 hours on general competencies. The program of study is divided into 26 modules, which vary in length from 15 to 120 hours (multiples of 15). The time allocated to the program is to be used not only for teaching but also for evaluation and remedial work. The modules are organized into three blocks; the first two are 525 hours each, and the last one is 450 hours.

This document contains two parts. Part I is of general interest and provides an overview of the training plan. Its five chapters include 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: 26
Duration in hours: 1 500
Credits: 120

Plumbing and Heating
Code: 5648

CODE		TITLE OF THE MODULE	HOURS	CREDITS*
807 012	1.	The Trade and the Training Process	30	2
807 022	2.	Piping Mathematics	30	2
807 216	3.	Piping Mechanics	90	6
807 222	4.	Plumbing Systems	30	2
807 248	5.	The Québec *Plumbing Code*	120	8
805 096	6.	Drainage Systems	90	6
805 104	7.	Venting Systems	60	4
755 002	8.	Health and Safety on Construction Sites	30	2
755 001	9.	Organizations Involved in Construction	15	1
807 042	10.	Handling Materials and Equipment	30	2
807 243	11.	Welding Operations	45	3
805 164	12.	Installing a Hot- and Cold-Water Supply System	60	4
807 063	13.	Plumbing Fixtures and Accessories	45	3
807 253	14.	Solving Problems Related to Water Heaters	45	3
807 083	15.	Repairing Plumbing Systems	45	3
807 264	16.	Pumping Systems	60	4
807 271	17.	Communicating in the Workplace	15	1
807 284	18.	Heating Systems	60	4
807 295	19.	One-Pipe Heating Systems	75	5
807 305	20.	Heat and Fluid Mechanics	75	5
807 317	21.	Control Devices	105	7
807 327	22.	Direct- and Reversed-Return Hot-Water Heating Systems	105	7
807 338	23.	Low-Pressure Steam Heating Systems	120	8
807 344	24.	Repairing Heating Systems	60	4
807 353	25.	Interpreting Plans and Specifications	45	3
807 361	26.	Job-Search Techniques	15	1

* 15 hours = 1 credit
--- Blocks are separated by a dotted line.
This program leads to a Secondary School Vocational Diploma in Plumbing and Heating.

2. PROGRAM TRAINING GOALS

The training goals of the *Plumbing and Heating* 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 plumbing and heating 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 cognitive skills needed to install plumbing and heating systems properly and to diagnose problems in the different systems;
  - a concern for good working relationships and effective communication;
  - the development of professional ethics;
  - a constant concern for health and safety at work;
  - attention to detail and precision and a concern for neatly finished work.

To ensure integration into the work force.

- To familiarize students with the rights and responsibilities of workers.
- To familiarize students with the job market in general and the plumbing and heating trade in particular.

To foster the development of professional knowledge and attitudes.

- To foster independence, a sense of responsibility, and a desire to succeed.
- To foster a concern for excellence.
- To help students understand the principles underlying basic techniques.
- To teach students good work methods and to instill a sense of discipline.

To ensure job mobility within the trade.

- To help students develop a positive attitude toward technological change and new situations.
- To enhance students' ability to learn, make inquiries and gather information.
- To teach effective job-search skills.

3. COMPETENCIES

The competencies to be developed in the *Plumbing and Heating* 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

PLUMBING AND HEATING

SPECIFIC COMPETENCIES (directly related to the practice of the specific occupation)		FIRST-LEVEL OPERATIONAL OBJECTIVES	DURATION (IN HOURS)	WORK PROCESS (major steps)							GENERAL COMPETENCIES (technology, personal development, etc.)															TOTALS	
				Determine the work to be done	Select the tools and materials	Prepare the work area	Carry out the work	Carry out the required testing	Finish the work	Fill out invoices and inform the client	Apply basic mathematical concepts to piping	Apply the basic techniques of piping mechanics	Apply basic concepts related to plumbing systems	Apply Québec *Plumbing Code* regulations	Apply concepts of health and safety on construction sites	Be familiar with the organizations involved in construction	Handle materials and equipment	Perform welding operations	Solve problems related to the operation of water heaters	Communicate in the workplace	Apply concepts related to the operation of heating systems	Apply concepts related to heat and fluid mechanics	Install control devices	Interpret plans and specifications	Apply job-search techniques	NUMBERS OF OBJECTIVES	DURATION (IN HOURS)
MODULE	MODULE										2	3	4	5	8	9	10	11	14	17	18	20	21	25	26		
	FIRST-LEVEL OPERATIONAL OBJECTIVES										B	B	B	B	S	S	B	B	B	S	B	B	B	B	S	15	
	DURATION (IN HOURS)										30	90	30	120	30	15	30	45	45	15	60	75	105	45	15		750
1	Determine their suitability for the trade and the training process	S	30								○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
6	Install a drainage system	B	90	▲	▲	▲	▲	▲	▲	△	●	●	●	●	●		●	○		○							
7	Install a venting system	B	60	▲	▲	△	▲	▲	▲	△	●	●	●	●	●		●	○		○							
12	Install a hot- and cold-water supply system	B	60	▲	▲	△	▲	▲	▲	△	●	●	●	●	●		●	●	○	○							
13	Install and service plumbing fixtures and accessories	B	45	△	▲	△	▲	△	△	△	○	●	○	●	●		○	●		○							
15	Repair, modify and service plumbing systems	B	45	▲	▲	△	▲	△	△	▲	●	●	●	●	●		○	●	○	○							
16	Perform tasks related to pumping systems and plumbing in rural residences	B	60	△	▲	△	▲	△	△	△	●	●	○	●	●		○	○		○							
19	Install perimeter and Monoflo heating systems	B	75	▲	▲	△	▲	▲	▲	▲	●	●		○	●		●	●		●	●	○	○	○			
22	Install direct- and reversed-return hot-water heating systems	B	105	▲	▲	△	▲	▲	▲	△	●	●		○	●		●	●		○	●	○	●	●			
23	Install low-pressure steam heating systems	B	120	▲	▲	△	▲	▲	▲	△	●	●		○	●		●	●		○	●	○	●	●			
24	Repair heating systems	B	60	▲	▲	△	▲	▲	▲	▲	●	●		○	●		●	●		●	●	●	●	○			
NUMBER OF OBJECTIVES		11																								26	
DURATION (IN HOURS)			750																								1500

S: Situational objective

B: Behavioural objective

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

BLOCKS

1
2
3

4. GENERAL OBJECTIVES

The general objectives of the *Plumbing and Heating* 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 perform plumbing and heating procedures.

- Apply basic mathematical concepts to piping.
- Apply the basic techniques of piping mechanics.
- Apply basic concepts related to plumbing systems.
- Handle materials and equipment.
- Apply Québec *Plumbing Code* regulations.
- Apply concepts related to heat and fluid mechanics.
- Perform welding operations.
- Solve problems related to the operation of water heaters.
- Interpret plans and specifications.
- Apply concepts related to the operation of heating systems.
- Install control devices.

To develop in the students the competencies required to install drainage, venting and hot- and cold-water supply systems.

- Install a drainage system.
- Install a venting system.
- Install a hot- and cold-water supply system.
- Install and service plumbing fixtures and accessories.

To develop in the students the competencies required to install heating systems.

- Install perimeter and Monoflo heating systems.
- Install direct- and reversed-return hot-water heating systems.
- Install low-pressure steam heating systems.

To develop in the students the competencies required to service and repair plumbing and heating systems.

- Repair, modify and service plumbing systems.
- Repair heating systems.

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.
- Communicate in the workplace.
- Be familiar with the organizations involved in construction.
- Apply job-search techniques.

To develop in the students the competencies required to perform plumbing tasks in rural residences.

- Perform tasks related to pumping systems and plumbing in rural residences.

To develop in the students the competencies required to safely perform plumbing and heating tasks.

- Apply concepts of health and safety on construction sites.

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: 807 012 **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
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 and available opportunities for entrepreneurship.
- Understand the training process.
- Confirm their career choice.

LEARNING CONTEXT

PHASE 1: **Information on the Trade**

- Learning about the job market in plumbing and heating: potential areas of work, job prospects, wages, advancement and transfer opportunities.
- Learning about the nature and requirements of the job (e.g. tasks, working conditions).
- Learning about the possibility of self-employment or creating their own business.
- Presenting the information collected at a group meeting and discussing individual views of the trade.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

LEARNING CONTEXT

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

- Discussing the skills, aptitudes and knowledge needed to practise the trade.
- Becoming familiar with the training plan: the program of study, the training process, evaluation methods, certification of studies.
- Discussing the training program and how it relates to work in plumbing and heating.

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

- Assessing their career choice by comparing the different facets and requirements of the trade with their own preferences, aptitudes and interests.
- Writing a report presenting the results of their evaluation.

INSTRUCTIONAL GUIDELINES

The teacher should:

- Create an atmosphere conducive to personal growth and professional development.
- Encourage students to engage in discussions and express their opinions.
- Encourage students to participate in learning activities.
- Help students to acquire an accurate perception of the trade.
- Help students assess their career choice honestly and objectively.
- Organize field trips to establishments that hire pipefitters.
- Make suitable reference material available to the students (e.g. information on the trade and training programs, handbooks).
- Arrange for students to meet with trade specialists.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

PARTICIPATION CRITERIA

PHASE 1:

- Collect information on most of the topics to be covered.
- Express their views on the trade at a group meeting, interrelating the information they have collected.

PHASE 2:

- Give their opinions on the requirements of the plumbing and heating trade.
- Express their views on the training program at a group meeting.

PHASE 3:

- Write a report that:
  - sums up their preferences, interests and aptitudes;
  - explains clearly 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 aware of the importance of sharing their perception of the trade with the other members of the group.

Before undertaking the activities of Phase 1:

2. Gather information.
3. Determine a way of taking down and presenting information.
4. Explain the expression *competencies required to enter the job market.*
5. Explain the principal rules of group discussion.

Before undertaking the activities of Phase 2:

6. Distinguish skills from aptitudes and knowledge required to practise a trade.
7. Describe the nature, function and content of a program of study.

Before undertaking the activities of Phase 3:

8. Distinguish personal preferences from aptitudes and interests.
9. Describe the main elements of a report confirming a career choice.

MODULE 2: PIPING MATHEMATICS

Code: 807 022 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

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

CONDITIONS FOR PERFORMANCE EVALUATION

- Given diagrams and problems to be solved
- Using a calculator
- Without referring to course notes or manuals

GENERAL PERFORMANCE CRITERIA

- Appropriate use of mathematical formulas
- Appropriate use of the metric and imperial systems of measurement

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Measure the lengths and diameters of different types of pipes.	- Error tolerance in measurement of length: 2 mm or 1/8"
B. Calculate simple and complex offsets.	- Exact calculation of lengths by mathematical operations including fractions of an inch - Exact calculation of lengths based on angles measured in the metric and imperial systems
C. Use formulas to calculate areas, volumes and capacities.	- Appropriate use of formulas and rules of equivalence: • in the metric system • in the imperial system

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 measure the lengths and diameters of different types of pipes (A):

1. Identify units of measure in both the metric and imperial systems.
2. Use a tape measure.
3. Show concern for precision.

Before learning how to calculate simple and complex offsets (B):

4. Perform mathematical operations with fractions.
5. Apply the rule of three.
6. Apply the Pythagorean theorem.
7. Locate a constant in a technical guide.
8. Calculate carefully.

Before learning how to use formulas to calculate areas, volumes and capacities (C):

9. Differentiate among the most common units of area and volume in the metric and imperial systems.

MODULE 3: PIPING MECHANICS

Code: 807 216 **Duration: 90 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

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

CONDITIONS FOR PERFORMANCE EVALUATION

- Following an assembly diagram
- Using technical notes
- Using various materials, such as copper pipes (L or M type) - max. 1" (25 mm), steel pipes - max. 1" (25 mm), fittings, threaded steel Ts, dielectric union, copper elbows, lubricants, flux and tin
- Using the appropriate tools

GENERAL PERFORMANCE CRITERIA

- Appropriate use of tools: pipe vises, pipe cutters, reamers, threading dies, pipe wrenches, welding torches
- Leakproof assembly
- Observance of health and safety rules

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR		SPECIFIC PERFORMANCE CRITERIA
A.	Draw and interpret diagrams.	- Correct interpretation of symbols and other information contained in a diagram - Respect for the basic rules for free-hand drawing of diagrams: • dimensions • symbols - Conformity of the diagram with what it represents or with the instructions received
B.	Choose tools, materials and safety equipment.	- Choice of materials in accordance with assembly technique - Choice in accordance with work to be done
C.	Prepare the pipes and fittings for assembly.	- Accurate measurement of lengths - Accurate marking - Clean cut - Inside of pipe evenly reamed
D.	Thread and assemble steel pipes.	- Correct thread lengths and position - Correct use of lubricants - Correct tightening techniques
E.	Cut grooves and assemble steel pipes.	- Correct position and depth of groove - Correct assembly techniques
F.	Weld copper pipes.	- Correct cleaning techniques - Correct application of solder on the pipe and in the joint - Correct heating technique

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
G. Widen, bend and assemble copper pipes.	- Absence of bulges - Correct widening technique - Correct amount of tightening - Even pipe diameter
H. Assemble copper pipes using compression joints.	- Correct amount of tightening
I. Assemble cast iron bell and spigot pipes.	- Correct installation of pipe rings - Correct amount of tightening - Correct use of bell pipe assembly techniques: • by seal • using molten lead
J. Join plastic pipes.	- Correct sanding of the parts to be joined - Uniform application of solvent on the two parts - Correct 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 draw and interpret diagrams (A):

1. List the main information contained in a diagram.
2. Be familiar with the symbols used.

Before learning how to choose tools, materials and safety equipment (B):

3. List the main properties of copper.
4. Explain electrolysis.
5. Identify copper pipes.
6. Identify the different types of steel.
7. Identify different types of galvanized and black steel pipes.
8. List the main properties of cast iron.
9. Identify the cast iron pipes.
10. List the main properties of plastic.
11. Identify different types of plastic pipes.
12. Identify copper fittings.
13. Describe the characteristics of ferrous and non-ferrous fittings.
14. Identify flanges and gaskets.
15. Identify steel fittings.
16. Identify plastic fittings.
17. Identify cast iron fittings.
18. Recognize the different lubricants for joints.
19. Recognize the solvents for plastic pipes.
20. Use a tape measure.
21. Describe the characteristics of pipe cutters and pipe vises.
22. Describe the characteristics of reamers.
23. Describe the characteristics of the different dies.
24. Describe the characteristics of groove cutters.
25. Describe the characteristics of pipe wrenches and extractors.

MODULE 4: PLUMBING SYSTEMS

Code: 807 222 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

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

CONDITIONS FOR PERFORMANCE EVALUATION

- Using any relevant reference material
- Using sketches and diagrams illustrating common plumbing problems (e.g. backflow of a floor drain, siphoning problems, water volume problems)

GENERAL PERFORMANCE CRITERIA

- Correct terminology

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Diagnose simple problems related to the operation of: • a drainage system • a venting system • a drinking-water supply system	- Accurate evaluation of the extent of the problem - Accurate explanation of the probable causes - Appropriate corrective measures for the various problems
B. Interpret the instruction diagrams of sprinkler systems.	- Correct location of the fire-service connection - Accurate measurement of pipe diameters - Correct identification of the components of the backflow preventer and of the protection device for the drinking-water system
C. Interpret the diagram of a compressed-air distribution system.	- Correct identification of the components of the system - Description of the function of each component
D. Interpret the colour codes of gas supply systems.	- Accurate interpretation of the colour codes - Accurate description of the main dangers related to the various gases

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 simple problems related to the operation of:

- **a drainage system**
- **a venting system**
- **a drinking-water supply system (A):**

1. Recognize the parts of a drainage system.
2. Indicate the functions of the different parts of a drainage system.
3. Explain the operation of a drainage system.
4. Be familiar with the different vents.
5. Be familiar with the parts of vents.
6. Describe the relation between venting systems and drainage systems.
7. Name the supply sources of a drinking-water system.
8. Explain how energy is transferred to produce hot water.
9. Indicate the functions of the parts of a drinking-water supply system.
10. Describe the drainage of a drinking-water supply system.

Before learning how to interpret the instruction diagrams of sprinkler systems (B):

11. Name the main types of sprinkler systems.
12. Indicate the functions of the parts of a sprinkler system.

Before learning how to interpret the colour codes of gas supply systems (D):

13. Describe the different applications of special piping systems.

MODULE 5: THE QUÉBEC *PLUMBING CODE*

Code: 807 248 **Duration:** 120 hours

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
apply Québec *Plumbing Code* regulations
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Using sketches and building plans
- Based on questions dealing with common situations in the plumbing trade (residential and commercial), such as connecting a drain branch, a garage catch basin or an air-cushion device

GENERAL PERFORMANCE CRITERIA

- Correct application of Québec *Plumbing Code* provisions concerning work, materials, piping and installation of various plumbing systems
- Accurate calculations based on piping diameters

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Explain the general and administrative provisions of the Québec *Plumbing Code* concerning the execution of work.	- Appropriate explanation of the general and administrative provisions concerning: • plans and specifications • inspections and tests • notices of defects • end of work • workmanship • nuisances • equivalent methods
B. Choose the plumbing materials and fixtures: • for a residential building • for a commercial building	- Appropriate application of regulations concerning: • fixtures • traps and interceptors
C. Choose the kind of piping for different plumbing systems.	- Appropriate application of standards regarding piping used in plumbing systems - Appropriate application of standards regarding fittings used in plumbing systems
D. Apply the regulations concerning drainage systems.	- Appropriate application of standards and regulations concerning: • subsoil drains • soil and waste stacks • branch-pipes • drains • connection, location andinstallation of fixtures • layout of pipes • slopes • traps • interceptors • catch basins - Accurate determination of diameters

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR		SPECIFIC PERFORMANCE CRITERIA
E.	Apply the regulations concerning venting systems.	- Appropriate application of standards and regulations concerning: • ventilation of siphons • stack vents and vent stacks • various vents • layout of vents - Accurate determination of the diameters of the vents
F.	Apply the regulations concerning storm drains.	- Appropriate application of standards concerning the installation and diameters of storm drains - Accurate calculations
G.	Apply the regulations concerning hot- and cold-water supply systems.	- Appropriate application of standards and regulations concerning: • layout of pipes • the danger of contaminating water • water supply tanks - Accurate determination of the diameters and capacity of a water supply system
H.	Apply the regulations concerning plumbing systems in hospitals.	- Appropriate application of standards concerning the installation, venting and drainage of fixtures in hospitals
I.	Apply the regulations concerning public swimming pools.	- Appropriate application of standards concerning the installation of swimming pool drains, drainage tanks and water-supply piping

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 general and administrative provisions of the Québec *Plumbing Code* concerning the execution of work (A):

1. Be aware of the role of the Québec *Plumbing Code* with regard to health and safety.
2. Define the main terms used in the Québec *Plumbing Code*.
3. Describe the scope and limitations of the Québec *Plumbing Code* provisions.

MODULE 6: DRAINAGE SYSTEMS

Code: 805 096 **Duration: 90 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
install a drainage system
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Referring to the *Safety Code for the Construction Industry*
- Referring to the Québec *Plumbing Code*
- Using a diagram of a drainage system including the following elements: building drain, drain branch, stack, fixture branch
- Observing safety rules

GENERAL PERFORMANCE CRITERIA

- Observance of health and safety rules
- Observance of Québec *Plumbing Code* standards
- Observance of work methods and techniques
- Installation in conformity with diagram
- Leakproof installations
- Uniform levelling

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Determine the work to be done: • interpret a diagram of a drainage system • determine the sequence of tasks	- Accurate interpretation of symbols and data applicable to drainage systems - Logical sequence of tasks: • observance of the work process
B. Choose tools, materials and equipment.	- Appropriate choice of tools, materials and equipment: • presence of all the necessary tools, materials and equipment • choice appropriate to type of installation • choice appropriate to type of building • choice in accordance with diagram
C. Prepare the work area: • ensure that work area is safe • install the equipment • install supports, hangers and couplings	- Area free of obstacles that may cause injuries or accidents - Installation in accordance with Safety Code standards - Accurate calculations to determine the location of supports
D. Carry out the work: • dig trenches • position pipes and fittings along the trenches • install drains, drain branches and soil and waste stacks	- Observance of plans and specifications regarding the layout of the pipes: correct circuit and levels - Appropriate positioning of all the necessary parts - Appropriate slopes - Solid, leakproof and well-supported installations - Installation appropriate to type of piping - Accurate determination of locations of fixture outlets

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
E. Carry out the required testing: • isolate sections of a drainage system • carry out the tests • make necessary corrections • make sure the system works	- Sections appropriately isolated - Appropriate testing: • water test • smoke test - Appropriate techniques for: • dismantling joints • replacing a section - System completely leakproof
F. Finish the work: • cover the pipes • clean up the work area • put away materials, tools and equipment	- Pipes entirely covered - Appropriate levelling - Neatness of work area - Materials, tools and equipment stored in their proper place

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 determine the work to be done:
- **interpret a diagram of a drainage system**
- **determine the sequence of tasks (A):**

1. Be familiar with the different types of drains.
2. Be familiar with the different types of sewers.

Before learning how to carry out the work:
- **dig trenches**
- **position pipes and fittings along the trenches**
- **install drains, drain branches and soil and waste stacks (D):**

3. Differentiate among drills.
4. Show concern for safety at work.
5. Use equipment to install a drainage system.
6. Be familiar with the parts of a sewer.
7. Be familiar with the parts of drains, branches, and soil and waste stacks.

Before learning how to carry out the required testing:
- **isolate sections of a drainage system**
- **carry out the tests**
- **make necessary corrections**
- **make sure the system works (E):**

8. Differentiate among the types of tests required by the Québec *Plumbing Code*.

MODULE 7: VENTING SYSTEMS

Code: 805 104 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
install a venting system
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Using a venting system installation diagram
- Referring to the *Safety Code for the Construction Industry*
- Referring to the Québec *Plumbing Code*
- On a residential drainage system

GENERAL PERFORMANCE CRITERIA

- Observance of health and safety rules
- Observance of Québec *Plumbing Code* standards
- Observance of work methods and techniques
- Installation in conformity with diagram
- Leakproof installation

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR

A. Determine the work to be done:
   - interpret a diagram for installing a venting system
   - determine the sequence of tasks

SPECIFIC PERFORMANCE CRITERIA

- Accurate interpretation of symbols and data applicable to venting systems
- Logical sequence of tasks:
  - observance of work process

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
B. Choose tools and materials.	- Appropriate choice of tools and materials: • presence of all the necessary tools and materials • choice appropriate to type of installation • choice appropriate to type of building • choice in accordance with diagram specifications
C. Carry out the work: • determine the circuit of the pipes • cut holes in surfaces • position hangers and supports • install the venting system - vents - vent branches - vent stacks	- Optimal circuit based on data contained in the plans and specifications (economy of time and materials) - Circuit accurately marked - Structure not weakened by holes - Appropriate reinforcement of the structure (if necessary) - Size of holes appropriate to the size of pipes - Correct use of step ladders and scaffolding - Correct handling techniques - Installation in accordance with manufacturers' standards - Solid and leakproof installation - Slopes in the direction of the drainage system
D. Carry out the required testing: • isolate sections of a venting system • carry out the tests • make necessary corrections • make sure the system works	- Sections appropriately isolated - Appropriate testing for: • water-tightness • air-tightness - Appropriate techniques for: • dismantling joints • replacing a section - System completely leakproof
E. Finish the work: • clean up work area • put away materials and tools	- Neatness of work area - Materials and tools stored in their proper place

MODULE 8: 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 of 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 the various health and safety representatives.
- Be aware of the hazards and safety measures related to performing certain tasks.
- Be aware of the hazards and safety measures related to the construction site itself.
- Be aware of the hazards and safety measures related to using certain products.
- Know what to do in the event of an accident.

LEARNING CONTEXT

PHASE 1: **Information**

- Becoming familiar with the objectives of the program and the companion guide.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

LEARNING CONTEXT

PHASE 2: **Learning**

- Gathering information on the topic covered in the unit.
- Forming and expressing an opinion on the topic.
- Asking questions.
- Identifying the main concepts and the underlying principles of safe behaviour.
- Assessing their own observance of these principles.

PHASE 3: **Reinforcement**

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

INSTRUCTIONAL GUIDELINES

The teacher should:

- Use a suitable room and appropriate materials.
- Present the material in a dynamic manner.
- Involve students in discussions.
- Make adequate 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.
- Pay attention in class.
- Stick to the topic during discussions.
- Ask pertinent questions and give appropriate answers.
- Do the exercises conscientiously.
- Correct the exercises.

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 relating to health and safety.
2. Express an interest in sharing 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 principal rules of group discussion.

Before undertaking the activities of Phase 3:

6. Describe the technique for answering a questionnaire.

MODULE 9: ORGANIZATIONS INVOLVED IN CONSTRUCTION

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
be familiar with the organizations involved in construction.

SPECIFICATIONS

At the end of this module, the students will:

- Identify the main roles and responsibilities of employers' organizations and union associations.
- Describe the laws and regulations governing labour relations in the construction industry.

LEARNING CONTEXT

PHASE 1: **Information**

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

PHASE 2: **Learning**

- Assimilating information on the topic covered in the unit.
- Expressing opinions on the topic and asking questions.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

LEARNING CONTEXT

PHASE 3: **Reinforcement**

- Reviewing the main concepts of the unit.
- Answering a questionnaire.
- Correcting the answers as a group.

INSTRUCTIONAL GUIDELINES

The teacher should:

- Use a suitable room and appropriate materials.
- Present the material in a dynamic manner.
- Involve students in discussions.
- Use charts and illustrations.

PARTICIPATION CRITERIA

- Participate in 7 out of 9 units.
- Stick to the topic during discussions.
- Ask pertinent questions and give appropriate answers.
- Do the exercises conscientiously.
- Correct the exercises.

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 concerning organizations involved in construction.
2. Express a desire to share their knowledge with the other members of the group.

Before undertaking the activities of Phase 2:

3. Explain the principal rules of group discussion.

Before undertaking the activities of Phase 3:

4. Describe the technique for answering a questionnaire.

MODULE 10: HANDLING MATERIALS AND EQUIPMENT

Code: 807 042 **Duration: 30 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
handle materials and equipment
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Referring to the *Safety Code for the construction industry*
- In various situations specific to plumbing and heating
- Using handling equipment, e.g. hoists, winches, slings, jacks, rollers
- Using scaffolding equipment, e.g. standard-frame scaffold, platform scaffold

GENERAL PERFORMANCE CRITERIA

- Observance of sequence of operations for various manoeuvres
- Observance of health and safety rules
- Observance of techniques for using handling equipment
- Observance of signalling codes for the manoeuvres

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

	SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A.	Choose handling and scaffolding equipment.	- Choice in accordance with objects to be handled - Thorough inspection of equipment
B.	Move loads horizontally.	- Appropriate use of equipment (rollers, blocks) - Application of ergonomic principles
C.	Install a ladder and a stepladder.	- Appropriate slant in accordance with Safety Code standards - Spread and locking device in accordance with Safety Code standards
D.	Erect a tubular two-section scaffold.	- Correct sequence of operations - Appropriate installation • level • stable • appropriate use of material
E.	Hoist objects.	- Strength of knots - Observance of procedures - Installation of equipment in accordance with Safety Code standards
F.	Dismantle a scaffold.	- Correct sequence of operations
G.	Store handling equipment.	- Equipment stored in accordance with manufacturers' standards
H.	Select machine parts.	- Selection in accordance with specifications
I.	Select hangers and supports.	- Selection appropriate for weight and type of structures

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 choose handling and scaffolding equipment (A):

1. Identify different types of hoists and their parts.
2. Explain how hoists work.
3. Be familiar with different types of winches and their parts.
4. Describe how motorized and manual winches work.
5. Differentiate between cables and slings.
6. Explain the main reasons why cables break.
7. Determine the condition of slings by looking at them.
8. Differentiate among the different types of ladders and stepladders.
9. Be familiar with different types of scaffolding used on construction sites.
10. Name the parts of a scaffold.

Before learning how to hoist objects (E):

11. Explain the principles of the use of slings.

Before learning how to select machine parts (H):

12. Look for information in manufacturers' manuals.

Before learning how to select hangers and supports (I):

13. Become aware of the effect of their choices on their workmanship.

MODULE 11: WELDING OPERATIONS

Code: 807 243 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

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

CONDITIONS FOR PERFORMANCE EVALUATION

- Following oral instructions
- Using copper and steel pipes
- Using an oxyacetylene (OA) welding machine and an AC/DC welding machine
- Using silver threads
- Using shielded bronze filler rods for braze welding and shielded filler rods for arc welding
- Observing safety rules

GENERAL PERFORMANCE CRITERIA

- Observance of health and safety rules
- Appropriate use of equipment and tools
- Observance of prescribed time limits

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Prepare the work: • determine the welding process for the job • choose materials, equipment and tools • set up welding machines • prepare surfaces to be welded	- Correct differentiation among the processes - Appropriate choice of process based on type of work - Appropriate choice of filler rods (type, number and diameter) - Set-up of welding machine in accordance with welding process used - Appropriate use of flux and tools - Appropriate application of cleaning method • grinding • sanding • using steel wool
B. Carry out the work: • make welds on copper piping using silver • perform oxygen-cutting, OA and arc welding operations: - on flat iron - on corner iron - on steel pipe	- Use of appropriate techniques - Observance of health and safety standards - Absence of overlap - Appropriate distribution of filler material - Adequate penetration of filler material (about 50% of thickness) - Sufficient wetting of parts - Uniform width of surface bead - Appropriate selection of nozzle - Clean, even cut - Appropriate gas pressure - Electric arc appropriately struck - Regularity of grooves - Absence of undercut on 60% of length - Appropriate width of bead

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
C. Finish the work: • clean weld beads • assess the quality of the welds visually • store welding machines	- Weld cleanly done: • absence of slag - Accurate assessment of weld quality - Thorough detection of flaws - Appropriate storage of the different types of welding machines in conformity with environmental standards - Safe handling and transportation

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 prepare the work:
- **determine the welding process for the job**
- **choose materials, equipment and tools**
- **set up welding machines**
- **prepare surfaces to be welded (A):**

1. Differentiate between OA and braze welding.
2. Differentiate among sources of heat.
3. Describe the characteristics of silver brazing.
4. Describe the main characteristics of gases used in oxyacetylene welding.
5. Describe the process of assembling parts for arc welding.
6. List the advantages and disadvantages of the different welding processes.
7. Describe the properties of silver alloys.
8. Describe the composition of various filler rods.
9. Identify the equipment required for oxyacetylene welding.
10. Be familiar with different types of electric-arc welding machines.

Before learning how to carry out the work:
- **make welds on copper piping using silver**
- **perform oxygen-cutting, OA and arc welding operations**
  - **on flat iron**
  - **on corner iron**
  - **on steel pipe (B):**

11. Use certain indicators to recognize the melting point of silver.
12. Use an oxyacetylene welding torch safely.
13. Recognize by colour the appropriate temperature of the parts to be welded.
14. Use materials economically.
15. Detect flaws in an oxygen cutting job.
16. Name the main types of joints.
17. Describe the basic conditions for arc welding.

MODULE 12: INSTALLING A HOT- AND COLD-WATER SUPPLY SYSTEM

Code: 805 164 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
install a hot- and cold-water supply system
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Referring to the *Safety Code for the Construction Industry*
- Referring to the Québec *Plumbing Code*
- Based on an installation diagram representing a two-residence building and containing the following information:
  - the type of pipes to use
  - the diameter of the pipes
  - the positioning of fixtures
- Using the necessary materials and tools
- Using protective clothing and equipment

GENERAL PERFORMANCE CRITERIA

- Observance of health and safety rules
- Observance of Québec *Plumbing Code* standards
- Observance of work techniques and methods
- Installation in conformity with diagram
- Leakproof installations
- Absence of problems during expansion and contraction
- Observance of handling techiques

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Determine the work to be done: • interpret plans and specifications • determine the sequence of tasks	- Accurate interpretation of symbols and data applicable to hot- and cold-water supply systems - Logical sequence of tasks: • observance of work process
B. Choose tools, materials, fixtures and accessories.	- Appropriate choice of tools, materials, fixtures and accessories: • presence of all the necessary tools, materials, fixtures and accessories • choice appropriate to type of installation • choice appropriate to type of building • choice in accordance with plans and specifications
C. Carry out the work: • connect the building's water main to the aqueduct system • determine the circuit of the pipes in accordance with the fixtures to be connected • install the hot- and cold-water supply system - cold-water pipes - hot-water pipes - hot-water recirculation - fixture branches	- Connection in accordance with plan specifications - Appropriate diameters and lengths of pipes - Pipes supported along their entire length - Quality of welded joints - Observance of plan specifications - Optimal circuit based on data contained in plan and specifications - Accurate marking - Solid and leakproof installations

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
D. Carry out the required testing: • isolate sections of a hot- and cold-water supply system • carry out the tests • make necessary corrections	- Sections appropriately isolated - Appropriate testing for: • water-tightness • air-tightness - Appropriate techniques for: • dismantling joints • replacing a section • repairing or replacing an accessory
E. Install shock absorbers on pipes.	- Installation in accordance with plan
F. Install a water heater and its accessories.	- Installation in accordance with manufacturer's standards
G. Finish the work: • clean up work area • put away materials and tools	- Neatness of work area - Materials and tools stored in their proper place

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 carry out the work:

- **connect the building's water main to the aqueduct system**
- **determine the circuit of the pipes in accordance with the fixtures to be connected**
- **install the hot- and cold-water supply system:**
  - **cold-water pipes**
  - **hot-water pipes**
  - **hot-water recirculation**
  - **fixture branches (C):**

1. Use the necessary tools for installing a hot- and cold-water supply system.
2. Name the parts of a hot- and cold-water supply system.
3. Determine the height of the pipe outlet.
4. Determine the diameters of the pipes.

Before learning how to install shock absorbers on pipes (E):

5. Describe the characteristics of the different types of shock absorbers.

Before learning how to install a water heater and its accessories (F):

6. Select a water heater and accessories.

MODULE 13: PLUMBING FIXTURES AND ACCESSORIES

Code: 807 063 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
install and service plumbing fixtures and accessories
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Using plumbing fixtures and accessories such as toilets with flush tanks, kitchen sinks with faucets
- Using the appropriate tools, such as a ball-peen hammer, metal saw, and so on
- Following plans and specifications
- Using manufacturers' catalogues
- Referring to the Québec *Plumbing Code*

GENERAL PERFORMANCE CRITERIA

- Observance of Québec *Plumbing Code* standards
- Observance of health and safety rules
- Installations in accordance with manufacturers' standards
- Leakproof installations

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Mark locations for plumbing fixtures.	- Correct locations for the various fixtures
B. Choose plumbing fixtures and accessories.	- Appropriate choice of fixtures and accessories according to the situation and specifications
C. Install plumbing fixtures and accessories.	- Installation in accordance with manufacturers' standards - Solid and neatly finished installations
D. Service plumbing fixtures and accessories.	- Use of appropriate servicing techniques • accurate adjustment of level, temperature and pressure • Appropriate replacement of defective parts

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 mark locations for plumbing fixtures (A):

1. Be familiar with the main types of plumbing fixtures and accessories.
2. Research the standards applicable to the location of the different plumbing fixtures and accessories.

Before learning how to install plumbing fixtures and accessories (C):

3. Drill holes in various surfaces.

Before learning how to service plumbing fixtures and accessories (D):

4. Use tools and materials to service plumbing fixtures and accessories.
5. Take the necessary safety measures when working.
6. Work carefully and meticulously.

MODULE 14: SOLVING PROBLEMS RELATED TO WATER HEATERS

Code: 807 253 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
solve problems related to the operation of water heaters
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Based on a problem concerning a residential water heater (e.g. changing a thermostat)
- Using an electric meter
- Using appropriate tools
- Using a connection diagram

GENERAL PERFORMANCE CRITERIA

- Observance of health and safety rules
- Observance of instructions for using the instruments
- Water heater in good working order

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR		SPECIFIC PERFORMANCE CRITERIA
A.	Determine the causes of temperature problems in a water heater.	- Correct identification of causes of problems: • appropriate verifications made • correct diagnoses
B.	Adjust and replace temperature-control devices on a water heater.	- Appropriate techniques for adjusting and replacing devices - Water heater in good working order
C.	Determine the causes of pressure problems in a water heater.	- Correct identification of causes of problems: • temperature checked • pressure gauged • pressure-control system of piping checked
D.	Adjust and replace pressure-control or protective devices on a water heater.	- Appropriate techniques for replacing devices - Ajustment of pressure taking into account the safety valve
E.	Replace a residential water heater.	- Observance of laws and regulations - Observance of replacement procedure - Verification that the water heater is working well

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 determine the causes of temperature problems in a water heater (A):

1. Be familiar with the different sources of electricity.
2. Explain the nature of electricity.
3. Interpret the laws of electrical currents.
4. Distinguish between the characteristics of alternating and direct current.
5. Name the components of an electric circuit.
6. Interpret electric circuits.
7. Describe the operation of the different temperature-control devices on a water heater.
8. Use an electric meter.

Before learning how to determine the causes of pressure problems in a water heater (C):

9. Explain the relationship between temperature and pressure.
10. Use a pressure gauge.
11. Describe the operation of the different pressure-control devices that ensure safety on a water heater.

MODULE 15: REPAIRING PLUMBING SYSTEMS

Code: 807 083 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
repair, modify and service plumbing systems
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- On a functional residential drainage system requiring a change such as the addition or moving of a fixture
- Referring to *Safety Code for the Construction Industry*
- Referring to the Québec *Plumbing Code*
- Based on an invoice to be filled out
- Using the appropriate tools

GENERAL PERFORMANCE CRITERIA

- Observance of health and safety rules
- Observance of Québec *Plumbing Code* standards
- Observance of work methods and techniques
- Leakproof installation

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Determine the work to be done: • determine the nature of the problems • determine the sequence of tasks	- Accurate diagnosis - Logical sequence of tasks according to the situation

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
B. Choose tools, materials and products.	- Appropriate choice according to the nature of the work - Presence of all the necessary tools (e.g. augers, pipe wrench, plungers, welding torch) - Presence of all the necessary materials and products
C. Carry out the work: • make necessary repairs • make necessary changes • service a drainage, venting and hot- and cold-water supply system	- Precautions taken against the presence of chemicals in the pipes - Appropriate correction of defects: • solid and leakproof drainage, venting and hot- and cold-water supply systems • drainage, venting and hot- and cold-water supply systems in good working order - New circuit for the piping: • in conformity with Québec *Plumbing Code* • optimal circuit (economical use of time and materials) - Observance of checking procedures - Appropriate listing of defects - Observance of manufacturers' specifications - Equipment in optimal working condition - Neatness of work
D. Fill out an invoice.	- Complete list of work done and materials used - Other information included: dates, hours worked, hourly rate, cost of materials, annotations, etc.

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 determine the work to be done:
- **determine the nature of the problems**
- **determine the sequence of tasks (A):**

1. List situations requiring changes to a plumbing system.
2. Use maintenance cards for a drainage, venting and hot-and cold-water supply system.
3. Explain the function of lubricants in maintenance.

Before learning how to carry out the work:
- **make necessary repairs**
- **make necessary changes**
- **service a drainage, venting and hot- and cold-water supply system (C):**

4. Explain the dangers caused by the presence of chemicals in the pipes.
5. Become aware of the importance of neatness when working for clients.

Before learning how to fill out an invoice (D):

6. Use a price list.

MODULE 16: PUMPING SYSTEMS

Code: 807 264 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
perform tasks related to pumping systems and plumbing in rural residences
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Based on charts of performance curves and flow tables
- Based on a plumbing diagram representing a building sub-drain, branches, a parking lot, a storage area and bathrooms
- Based on the following situation: a camping lot for 175 persons; the well is 30 m deep; 8" (203 mm) in diameter; the distance between the well and the pump is 10 m
- Using the Québec *Plumbing Code*

GENERAL PERFORMANCE CRITERIA

- Observance of health and safety rules
- Observance of manufacturers' standards
- Observance of the standards of the ministère de l'Environnement du Québec
- Solid and leakproof installations

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Choose a pump: • lift • feed • circulating • booster • liquid transfer pump	- Accurate identification of the pump characteristics necessary: • flow • static and friction head - Observance of Québec *Plumbing Code* provisions - Accurate reading of charts - Appropriate choice of pumps
B. Install a pumping system.	- Installation in accordance with specifications - Observance of start-up procedure - Appropriate functioning of system - Observance of assembly techniques
C. Repair a pumping system.	- Accurate diagnosis - Quality of repair: • appropriate choice of part • correct installation of new part • accurate adjustment of parts
D. Plan the installation of a septic tank.	- Accurate calculations - Appropriate choice of installation - Comprehensive planning - Observance of standards pertaining to septic tanks
E. Choose a water-softening system.	- Choice appropriate for purpose - Accurate description of the effects of the chemical products and the different procedures used in the treatment of drinking water

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 choose a pump:

- **lift**
- **feed**
- **circulating**
- **booster**
- **liquid transfer pump (A):**

1. Calculate the pressure per foot of a column.
2. Distinguish among the different types of pumps and their parts.
3. Describe the various applications of pumping systems.
4. Be familiar with the different types of sources of water.

Before learning how to install a pumping system (B):

5. Be familiar with the components of the transmission system.
6. Name the accessories of a pumping system.

Before learning how to repair a pumping system (C):

7. Describe the principal problems of a pumping system.

Before learning how to plan the installation of a septic tank (D):

8. Differentiate among types of septic tanks.
9. Choose the location for a septic tank.

MODULE 17: COMMUNICATING IN THE WORKPLACE

Code: 807 271 **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
communicate in the workplace.

SPECIFICATIONS

At the end of this module the students will:

- Know the basic principles of communication.
- Apply communication principles and techniques suitable for their work context.
- Be aware of their strengths and weaknesses as communicators.

LEARNING CONTEXT

PHASE 1: **Familiarization with the Basic Principles of Communication**

- Learning about the components of the communication process.
- Making a list of obstacles to communication and of factors that facilitate effective communication.
- Learning about the characteristics of non-verbal communication.
- Examining their own ways of communicating, by considering situations experienced in their personal life and in a work context.

FIRST-LEVEL OPERATIONAL OBJECTIVES
SITUATIONAL OBJECTIVE

LEARNING CONTEXT

PHASE 2: **Application of Communication Techniques**

- Experimenting with situations involving relations with fellow workers, supervisors, and clients and in which they have to:
  - interpret technical messages
  - explain technical problems verbally
  - give their opinion on problems related to the poor performance of a plumbing or heating system
  - write service memos and compte rendus
  - calm tense situations
- Analyzing the operations of a work team with communication problems and suggesting ways to improve the situation.
- In learning situations, analyzing the effect of good communication on the productivity of a work team.

PHASE 3: **Evaluating Their Ability to Communicate**

- Evaluating their strengths and weaknesses as communicators, with fellow workers, supervisors and clients.
- Evaluating the abilities they have developed in this module.
- Identifying ways to improve their communication skills.

INSTRUCTIONAL GUIDELINES

The teacher should:

- Create a climate of trust and openness.
- Make frequent use of role-playing techniques and simulation to create learning situations characteristic of the working milieu.
- Use appropriate group leadership techniques to favour discussion.
- Offer encouragement and support to students having communication difficulties.
- Make sure that participants in the discussions respect the rights and feelings of other participants.
- Make sure that the examples used and the situations created are representative of the working milieu.
- Favour work in small groups and make sure that all students have a chance to participate and then to observe the various learning situations.
- Provide checklists to help students observe and analyze the learning situations.
- Help students evaluate the learning situations and provide them with appropriate tools, such as questionnaires and checklists.

FIRST-LEVEL OPERATIONAL OBJECTIVES
SITUATIONAL OBJECTIVE

PARTICIPATION CRITERIA

PHASE 1:

- Collect information on the different subjects to be discussed.
- Point out at least one strength and one weakness in their ability to communicate.

PHASE 2:

- Carry out all the activities, following the instructions that accompany them.

PHASE 3:

- Present the result of their self-evaluation, indicating:
  - at least two weaknesses and two strengths in their communication skills
  - two skills acquired in the course of this module
- Indicate at least two things they could do to improve their communication skills.

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 aware of the importance of communication in the workplace.
2. Describe how to note observations in a journal.
3. Explain what a learning situation is.

Before undertaking the activities of Phase 2:

4. Explain what role-playing involves.
5. Describe the means of communication used in plumbing and heating.
6. Distinguish between an argument and an opinion.

MODULE 18: HEATING SYSTEMS

Code: 807 284 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

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

CONDITIONS FOR PERFORMANCE EVALUATION

- Using tables, diagrams and sketches of various heating systems
- Using all relevant reference material as well as their course notes

GENERAL PERFORMANCE CRITERIA

- Pertinent explanations of the ways in which different heating systems work
- Use of appropriate terminology

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Choose one or more sources of energy for heating.	- Choice taking into account economic and ecological factors - Good choice given the heating system in question and the energy sources available - Accurate description of the advantages and disadvantages of the different source of energy
B. Using diagrams and sketches, explain the operation of heating systems: • using hot water • using steam • using warm air	- Accurate description of the role of the main components of each system - Accurate description of the operation of each system
C. Explain briefly the operation of different heat pumps.	- Accurate description of the role of the main components of a heat pump - Accurate identification of the causes of the main problems
D. Explain the operation of a cooled-water heating system.	- Accurate description of the role of the main components of systems: • using a water-cooled condenser (cooling tower) • using an air-cooled condenser - Accurate explanation of system operation

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 choose one or more sources of energy for heating (A):

1. Describe the procedure for using different sources of energy.
2. Become aware of the risks inherent in the different energy sources.
3. Calculate the cost of using the various energy sources.

Before learning how to explain, using diagrams and sketches, the operation of heating systems:

- **using hot water**
- **using steam**
- **using warm air (B):**

4. Describe briefly the evolution of heating systems.
5. Identify the the roles of generators, conveyors and heat exchangers.
6. Describe the properties of water, air and steam.

Before learning how to explain briefly the operation of different heat pumps (C):

7. Explain the basic concepts of thermodynamics.
8. Be familiar with different types of heat pumps.
9. List the components of a heat pump.

MODULE 19: ONE-PIPE HEATING SYSTEMS

Code: 807 295 **Duration: 75 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
install perimeter and Monoflo heating systems
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Using a diagram of a perimeter or Monoflo hot-water heating system
- Referring to technical notes and manufacturers' specifications
- Using the necessary equipment (e.g. boiler, heating units)
- Using the appropriate materials, fixtures and accessories
- Using the appropriate tools and equipment

GENERAL PERFORMANCE CRITERIA

- Observance of health and safety rules
- Observance of information contained in the diagram
- Appropriate use of tools, equipment and instruments
- Functional installation:
  - leakproof pipes
  - solid fastenings and joints
  - correct adjustment of flow, pressure and temperature

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR		SPECIFIC PERFORMANCE CRITERIA
A.	Prepare the work: • interpret the diagram of a two-zone heating system: perimeter and Monoflo • plan the sequence of operations	- Accurate interpretation of diagram: correct location of piping and accessories - Observance of sequence of operations
B.	Establish the list of materials, tools and handling equipment.	- Complete list of necessary materials - Correct estimation of quantities - Appropriate choice of tools and equipment
C.	Install the boiler.	- Boiler on level - Boiler correctly installed as regards supply and exhaust pipes
D.	Install scaffolding and handle and install the heating units.	- Sturdy scaffolding: • foundations • installation in accordance with standards - Handling in accordance with standards for hoists, cables, slings and platforms - Careful handling of heating units - Installation of heating units in accordance with standards
E.	Install the pipes.	- Correct installation of hangers and supports - Installation of the two loops (perimeter and Monoflo) in accordance with diagrams - Compliance with installation standards - Correct connection of the heating units

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR		SPECIFIC PERFORMANCE CRITERIA
F.	Install the accessories (thermometer, manometer, expansion tank, control mechanism, etc.).	- Installation in accordance with the diagram and with specifications - Leakproof installation
G.	Complete the installation of the boiler.	- Connection of sources of oil and of electricity in accordance with standards - Correct connection of the exhaust pipe
H.	Start up the system.	- Accurate check for leaks in oil supply system - Complete check of working order of system - Accurate adjustment of pressure and temperature
I.	Finish the work.	- Proper storage - Neatness of work area - Accurate explanations given to client concerning work done

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 prepare the work:
- **interpret the diagram of a two-zone heating system: perimeter and Monoflo**
- **plan the sequence of operations (A):**

1. Explain the operation of a perimeter heating system and a Monoflo system.

Before learning how to establish a list of materials, tools and handling equipment (B):

2. Distinguish the function of various accessories:
   - the oil tank
   - the oil supply system
   - the hot water circuit
3. Describe the methods for using various manual, mechanical and power tools.

Before learning how to complete the installation of the boiler (G):

4. Cut sheet metal piping.

Before learning how to start up the system (H):

5. Describe the operating principle of a pressure regulation mechanism.

MODULE 20: HEAT AND FLUID MECHANICS

Code: 807 305 **Duration: 75 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

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

CONDITIONS FOR PERFORMANCE EVALUATION

- Using a plan for a single-family dwelling
- Referring to technical documentation, e.g. manufacturers' specifications, tables, charts
- Based on learning situations in which the students calculate heat loss and select:
  - heating units
  - boilers
  - oil-fired burners

GENERAL PERFORMANCE CRITERIA

- Observance of health and safety rules
- Observance of regulations concerning air quality and energy efficiency
- Accurate interpretation of symbols
- Appropriate use of charts and tables
- Observance of energy efficiency standards

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR		SPECIFIC PERFORMANCE CRITERIA
A.	Calculate the heat losses of a building.	- Observance of traditional and empirical methods - Accurate selection of data
B.	Select an oil-fired boiler.	- Appropriate selection, based on the requirements of the system
C.	Select an oil-fired burner.	- Selection in accordance with specifications
D.	Select heating units.	- Appropriate selection, based on heat losses and the specific function of the space
E.	Choose the draught method for the ventilating system.	- Appropriate choice, based on: • the requirements of the situation • the characteristics and operating principles of a natural draught and a mechanical draught
F.	Determine the capacity of a circulating pump.	- Accurate calculation - Accurate determination of capacity - Accurate interpretation of charts
G.	Select the flow control valves for circulation by gravity.	- Appropriate selection of valves, based on the requirements of the system

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 calculate the heat losses of a building (A):

1. Determine the heat gains and losses of a building.
2. Use resistance and coefficient tables.
3. Calculate surface areas, volumes and perimeters.
4. Use charts showing the air changes in buildings.

Before learning how to select an oil-fired boiler (B):

5. Differentiate among boilers.
6. Determine the capacity of a boiler.

Before learning how to select an oil-fired burner (C):

7. Differentiate between the characteristics of an atmospheric burner and a forced draught (power) burner.
8. Explain the operating principle of different types of burners.
9. Explain the role of a combustion chamber.

Before learning how to determine the capacity of a circulating pump (F):

10. Understand the terminology specific to calculations concerning circulating pumps.
11. List the elements required to perform the various calculations.
12. Describe the operation of a circulating pump.
13. Select the location of the circulating pump.

Before learning how to select the flow control valves for circulation by gravity (G):

14. Explain the principle of gravity.

MODULE 21: CONTROL DEVICES

Code: 807 317 **Duration: 105 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

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

CONDITIONS FOR PERFORMANCE EVALUATION

- Using wiring diagrams
- Using an electric meter
- Using a functional heating system or a simulator with at least two zones
- Referring to the appropriate technical documentation
- Using the appropriate tools and materials
- Observing safety rules

GENERAL PERFORMANCE CRITERIA

- Observance of health and safety rules
- Observance of the applicable laws and regulations
- Appropriate use of tools and instruments
- Observance of energy efficiency standards

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Interpret the mechanical and wiring diagrams of the various devices.	- Accurate interpretation of information contained in the diagrams - Appropriate choice of devices based on the requirements

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR		SPECIFIC PERFORMANCE CRITERIA
B.	Sketch the connection circuits of the various devices.	- Functional sketch - Clear and logical layout - Correct use of symbols
C.	Determine the locations for the various control devices.	- Locations in accordance with manufacturer's specifications - Appropriate choice of materials (connectors, wires, tools, etc.)
D.	Install the control devices.	- Accurate and sturdy installation - Correct direction and angle - Neat installation - Solid fastenings
E.	Establish the electrical connections.	- Solid connections - Neat connections - Connections in conformity with the Québec *Electrical Code* and the diagram
F.	Start up the system.	- Observance of start-up procedures
G.	Calibrate control devices.	- Calibration based on the devices to be measured - Adjustments made according to instructions
H.	Check the operation of the devices and adjust them if necessary.	- Observance of checking procedures - All devices checked - Adjustment in accordance with the specifications for each device - Adjustment accurate and in accordance with the information in the operation diagram

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 mechanical and wiring diagrams of the various devices (A):

1. Explain the operation of an electromechanical relay.
2. List the characteristics of the different control devices.
3. State the purpose and characteristics of various types of thermostats.
4. State the purpose of various limit controls.
5. Differentiate among the various types of transformers used in heating systems.
6. Identify the main types of relays.
7. Identify the purpose of protective relays and flame detectors.
8. Describe the purpose of a water-level and alarm device.
9. List different types of water circulation controls.
10. Describe the characteristics and purpose of printed circuits.
11. Explain the operation of control devices.
12. Identify the mechanical and wiring diagrams of the different devices.
13. Be familiar with different circuits (dual-energy, electrical and oil-fired)

Before learning how to install the control devices (D):

14. List the precautions to take when installing the various control devices.

Before learning how to establish the electrical connections (E):

15. Determine which wiring to use in the heating system.
16. Be familiar with the different types of connectors.
17. Recognize, by sight, the sizes of the electric wires commonly used in heating.
18. Be concerned with safe work habits.

MODULE 22: DIRECT- AND REVERSED-RETURN HOT-WATER HEATING SYSTEMS

Code: 807 327 **Duration: 105 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
install direct- and reversed-return hot-water heating systems
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following a diagram of direct- and reversed-return hot-water heating systems
- Referring to manufacturers' specifications and technical notes
- Using oil and electricity as energy sources
- Using the appropriate equipment and accessories
- Using the necessary materials, e.g. pipes, fittings, supports, hangers
- Using the appropriate tools, equipment and instruments
- Observing safety rules

GENERAL PERFORMANCE CRITERIA

- Observance of health and safety rules
- Observance of information contained in diagram
- Appropriate use of tools, equipment and instruments
- Functional installation:
  - leakproof piping
  - solid fastenings and joints
  - correct adjustment of flow, pressure and temperature

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Determine the work to be done: • interpret the diagram • plan the sequence of operations	- Accurate interpretation of the information contained in the diagram - Observance of logical sequence of operations
B. Select materials, tools and equipment, and handle equipment.	- Selection of materials based on the system to be installed - Selection of tools based on sizes of pipes and equipment - Handling of moving equipment in accordance with safety standards
C. Install the system: • position the boiler • fasten the hangers and supports • install the piping • position the heating units and accessories • connect the accessories and piping to the boiler and heating units	- Level positioning of boiler - Appropriate choice of hangers and supports based on pipes and accessories - Solid fastenings - Precise measurements (1/8" or 3.8 mm) - Appropriate slope - Positionings in accordance with diagram, specifications and regulations - Solid joints
D. Perform the necessary tests: • check the system for leaks • connect the energy sources to the system • start up the system • regulate the heat distribution system	- Leakproof joints - Appropriate expansion joint - System completely watertight - Oil and electricity connections in accordance with installation standards - System correctly regulated
E. Finish the work: • put away the materials • clean up the work area	- Materials appropriately stored - Neatness of 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 determine the work to be done:
- **interpret the diagram**
- **plan the sequence of operations (A):**

1. Name the components of direct- and reversed-return hot-water heating systems.
2. Explain the operation of direct- and reversed-return hot-water heating systems.
3. Recognize the importance of good planning.

Before learning how to select materials, tools and equipment, and handle equipment (B):

4. State the types of pipes and fittings required to install direct- and reversed-return systems.
5. Describe the methods for using various manual, mechanical and power tools.
6. Be familiar with basic materials.
7. Identify the different types of handling equipment.

Before learning how to install the system:
- **position the boiler**
- **fasten the hangers and supports**
- **install the piping**
- **position the heating units and accessories**
- **connect the accessories and piping to the boiler and heating units (C):**

8. Maintain the tools used for fastening and joining.
9. Recognize the codes on the pipes by sight.
10. Show concern for precision.
11. Interpret heating unit installation standards.
12. Calculate the expansion of the piping in order to determine the opening of the expansion joint.

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 the necessary tests:
- **check the system for leaks**
- **connect the energy sources to the system**
- **start up the system**
- **regulate the heat distribution system (D):**

13. List the safety measures to be taken when connecting the energy sources.
14. Describe how to fill a heating system.
15. Differentiate among the methods for evacuating the air.
16. Use measuring instruments.

MODULE 23: LOW-PRESSURE STEAM HEATING SYSTEMS

Code: 807 338 **Duration: 120 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
install low-pressure steam heating systems
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Following plans and specifications for an oil-fired low-pressure steam heating system
- Referring to instruction manuals, manufacturers' specifications, and pressure and heat tables
- Using the necessary equipment and accessories, e.g. boiler, steam-trap, condensate reservoir, control devices
- Using the materials listed in the specifications
- Using the appropriate tools, equipment and instruments
- Observing safety rules

GENERAL PERFORMANCE CRITERIA

- Observance of health and safety rules
- Observance of information in plans and specifications
- Appropriate use of tools, equipment and instruments
- Accurate adjustment of pressure and temperature

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Determine the work to be done: • interpret plans, specifications, and pressure and heat tables • plan the work	- Accurate interpretation of terminology and symbols - Observance of sequence of operations
B. Select tools, materials and equipment.	- Appropriate selection based on the different operations
C. Install the system: • assemble the piping • attach the heating units and accessories • connect the heating units and accessories to the piping • connect the energy sources to the heating units	- Hangers and supports appropriately fastened - Measurements in accordance with plan - Positioning in accordance with manufacturer's specifications - Heating units and accessories solidly attached - Sturdy mechanical connections - Electrical connections in accordance with regulations - Correct installation procedure
D. Check the system for leaks: • start up the system • check the operation of the system	- Thorough checking of the piping - Correct checking procedures - Boiler filled according to the capacity of the system - Accurate adjustment of the burner flame - Adjustment in accordance with specifications
E. Finish the work: • put away the tools, equipment and materials • clean up the work area	- Tools, equipment and materials appropriately stored - Neatness of 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 determine the work to be done:
- **interpret plans, specifications, and pressure and heat tables**
- **plan the work (A):**

1. Be familiar with the symbols and terminology applicable to steam.
2. Identify different pressures.
3. Differentiate between the concepts of heat and temperature.
4. Describe the operation of a steam heating system.

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

5. Be familiar with the pipes required for installing a steam heating system.
6. Differentiate between expansion and anti-vibration joints.
7. Identify the different types of fittings.
8. Identify the different types of boilers.
9. Describe the operation of the heating units in a steam heating system.

Before learning how to install the system:
- **assemble the piping**
- **attach the heating units and accessories**
- **connect the heating units and accessories to the piping**
- **connect the energy sources to the heating units (C):**

10. Explain the standards regarding the positioning of the different accessories.
11. Identify steam-traps.
12. Position control devices on the boiler.
13. Identify heating units.
14. Determine the openings of the expansion joints.
15. Describe the main procedures for making mechanical and electrical connections.
16. List the precautions to take when connecting the energy sources.

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 system for leaks:
- **start up the system**
- **check the operation of the system (D):**

17. Describe the methods for adjusting the various accessories and controls.
18. Use measuring instruments.

MODULE 24: REPAIRING HEATING SYSTEMS

Code: 807 344 **Duration: 60 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

To demonstrate the required competency, the students must
repair heating systems
in accordance with the following conditions, criteria and specifications.

CONDITIONS FOR PERFORMANCE EVALUATION

- Using an oil-fired hot-water or steam heating system with mechanical problems, e.g. defective motors, circulating pumps, burners, boilers, valves, control devices
- Referring to instruction manuals, manufacturer's specifications, charts and technical notes
- Using the necessary materials, tools, instruments and equipment
- Using charts
- Observing safety rules
- Using the necessary tools, i.e. a smoke detector, draft gauge, CO_2 gauge

GENERAL PERFORMANCE CRITERIA

- Observance of the *Code d'installation des appareils de combustion au mazout (B-139-M-91)*
- Observance of health and safety rules
- Observance of the work process
- Observance of information in plan and specifications
- Observance of energy efficiency standards
- System in optimal working condition

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Determine the work to be done: • maintenance • repairs - diagnose the problem - obtain approval for the repairs - plan the repair work	- Correct sequence of operations for preventive maintenance - Correct troubleshooting method - Accurate identification of the problem and its causes - Correct solution determined - Clear explanation of the problem - Accurate estimate of costs - Appropriate sequence of operations based on type of repair - Appropriate selection of heating units and accessories: • based on their characteristics • based on their capacity - Inspection of tools in accordance with specifications and maintenance standards
B. Select the tools and instruments.	- Appropriate choice of tools and instruments
C. Do the maintenance work: • inspect the boiler, burner, oil pump and heat exchanger • clean the heat exchanger, combustion chamber and smoke flue • adjust the accessories • check the circuits, fluids, smoke flue and exhaust pipe for leaks	- Thorough inspection: • flow of combustible appropriate to capacity of boiler and combustion chamber • appropriate oil pressure • electrodes adjusted in accordance with check valve and spray angle • appropriate fan speed for required airflow

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
C. (cont'd) Do the maintenance work: • inspect the boiler, burner, oil pump and heat exchanger • clean the heat exchanger, combustion chamber and smoke flue • adjust the accessories • check the circuits, fluids, smoke flue and exhaust pipe for leaks	• angle and flow of jet in accordance with manufacturer's specifications and appropriate to the combustion chamber and the capacity of the burner • check valve appropriate to oil flow and solidly fastened • thorough cleaning of equipment - Accurate adjustment in accordance with manufacturer's specifications - Appropriate inspection of gasket and sleeve - System completely leakproof - Solid connections
D. Do the repairs: • discontinue the energy sources • correct the problem • install a dual-energy boiler • reconnect the heating unit, piping and accessories • restore the oil and electricity • start up the system • regulate the heating units and accessories	- Interruption of oil and electricity in accordance with standards and regulations - Corrections appropriate to problem and in accordance with manufacturers' standards - Solid connections - Nothing broken during repair - Installation in accordance with manufacturer's specifications - Leakproof installation - Restoration of oil and electricity in accordance with standards and regulations - Appropriate procedure for filling boiler - Thorough evacuation of air - Appropriate adjustment for types of heating units and accessories

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR		SPECIFIC PERFORMANCE CRITERIA
E.	Perform an efficiency test.	- Accurate analysis of combustion quality - Observance of testing procedure - Appropriate adjustments
F.	Adjust the combustion of an oil-fired burner.	- Maximum combustion - Observance of manufacturer's specifications
G.	Finish the work: • put away the materials • clean up the work area	- Materials stored appropriately - Neatness of work area
H.	Inform the client.	- Appropriate information based on the work done
I.	Write an invoice.	- Complete and accurate information

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 determine the work to be done:
- **maintenance**
- **repairs**
  - **diagnose the problem**
  - **obtain approval for the repairs**
  - **plan the repair work (A):**

1. Check the operation of the defective parts.
2. Estimate the cost of repairs.
3. Adopt a calm and courteous attitude.
4. Interpret plans and specifications related to the modification of a heating system.
5. Identify the different types of boilers.
6. Determine the capacity of a boiler.

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

7. Be familiar with the tools and instruments used for maintenance.

Before learning how to do the maintenance work:
- **inspect the boiler, burner, oil pump and heat exchanger**
- **clean the heat exchanger, combustion chamber and smoke flue**
- **adjust the accessories**
- **check the circuits, fluids, smoke flue and exhaust pipe for leaks (C):**

8. Explain the principles of combustion.
9. Describe the characteristics of a combustion chamber.
10. Describe the roles of a draught control and a draught accelerator.
11. Use measuring instruments.
12. Describe the operating principles of the different types of burners.
13. Explain the role of the nozzle.
14. Interpret the causes of burner malfunction.
15. Describe the functions of cleaning products and tools.
16. Be concerned with precision and neatness.
17. Identify the different accessories and control devices.
18. Recognize different gases by their odour.

MODULE 25: INTERPRETING PLANS AND SPECIFICATIONS

Code: 807 353 **Duration: 45 hours**

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

EXPECTED BEHAVIOUR

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

CONDITIONS FOR PERFORMANCE EVALUATION

- According to plans and specifications for the heating and plumbing system of a medium-sized commercial building
- Following the teacher's instructions concerning the location and description of the plumbing and heating fixtures and accessories
- Without other documentation

GENERAL PERFORMANCE CRITERIA

- Accurate interpretation of the information in the plans
- Careful handling of the plans
- Use of the appropriate terminology

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
A. Interpret the general information in a plan.	- Accurate interpretation of: • the title box • the legends • the tables of specifications

FIRST-LEVEL OPERATIONAL OBJECTIVE
BEHAVIOURAL OBJECTIVE

SPECIFICATIONS OF THE EXPECTED BEHAVIOUR	SPECIFIC PERFORMANCE CRITERIA
B. Determine on a plan the location of the pipes, fixtures and accessories for the plumbing and heating system.	- Accurate determination of the locations on the plan
C. Determine the location in a building of the elements of a heating and plumbing network represented in a plan.	- Accurate location in building of the elements depicted in the plan
D. Gather information from a plan concerning the number of fixtures necessary.	- Accurate interpretation of the symbols for the fixtures - Appropriate information gathered - Accurate identification of the number of fixtures
E. Gather information from a plan concerning a problem and infer the probable cause(s) of the problem.	- Identification of information pertaining to the problem - Appropriate diagnosis
F. On the basis of the plan, calculate the lengths of the pipes and the number of joints that will be necessary.	- Accurate interpretation of the symbols - Correct use of scales - Accurate calculations
G. Interpret the plumbing and heating sections of a set of specifications.	- Accurate identification of the complementary information in the plan - Accurate transposition of the information in the specifications to the list of materials - Accurate interpretation of technical information: • types of accessories and materials • manufacturer's name • equivalent products • technique for installing or assembling elements

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 general information in a plan (A):

1. Recognize the importance of reading plans attentively.
2. Describe the rules for handling building plans.
3. Be familiar with the most common forms and classification systems used with building plans.
4. Be familiar with the components of a set of plans.
5. Distinguish among various sorts of plans according to their purpose.

Before learning how to determine on a plan the location of the pipes, fixtures and accessories for the plumbing and heating system (B):

6. Be familiar with the ways in which the parts of a heating and plumbing system are represented on plans.
7. Develop spatial perception.
8. Be familiar with the various lines and symbols on a plumbing-heating plan.

Before learning how to interpret the plumbing and heating sections of a set of specifications (G):

9. Explain the usefulness of the specifications for a building project.
10. Describe the components of a set of heating and plumbing specifications.
11. Differentiate among plumbing fixtures on the basis of their size and distance from the joints.

MODULE 26: JOB-SEARCH TECHNIQUES

Code: 807 361 **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 learn how to
apply job-search techniques.

SPECIFICATIONS

At the end of this module, the students will:

- Be familiar with the steps involved in planning a job search.
- Know how to gather information on jobs from a variety of sources.

LEARNING CONTEXT

PHASE 1: **Preparation for a Job Search**

- Learning about the steps involved in looking for a job.
- Learning about sources of information to consult when looking for a job.
- Learning about the hiring criteria used by employers in various types of establishments.
- Making a list of potential employers.
- Experimenting with interview techniques.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

LEARNING CONTEXT

PHASE 2: **Applying a Job-Search Plan**

- Planning the steps involved in the job search.
- Writing a curriculum vitae and a cover letter.
- Carrying out the steps specified in their job-search plan.
- Recording in a journal the steps in their job-search plan and the steps carried out.

PHASE 3: **Evaluating Their Job-Search Experience**

- On the basis of their journal, evaluating the pertinence of the documents used and the steps carried out.

INSTRUCTIONAL GUIDELINES

The teacher should:

- Provide students with reference materials and examples useful for their job search.
- Explain how to use sources of reference.
- Help students establish contact with resource persons who can help them in their job search.
- Give students the time and means to try out their job-search plans.
- Monitor every step of the students' job search.
- Encourage discussion and cooperation among students.
- Encourage students to show initiative and to make decisions based on their own needs.

FIRST-LEVEL OPERATIONAL OBJECTIVE
SITUATIONAL OBJECTIVE

PARTICIPATION CRITERIA

PHASE 1:

- Consult the information sources.
- Gather information.

PHASE 2:

- Write a cover letter and a curriculum vitae observing the rules governing the form and content of such documents (presenting appropriate information on their work experience, education and training, competence, and personal background).
- Submit a journal recording the steps in their job-search plan and the steps carried out.

PHASE 3:

- Evaluate their experience.

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 2:

1. Explain how the characteristics of the job market may influence their chances of employment.