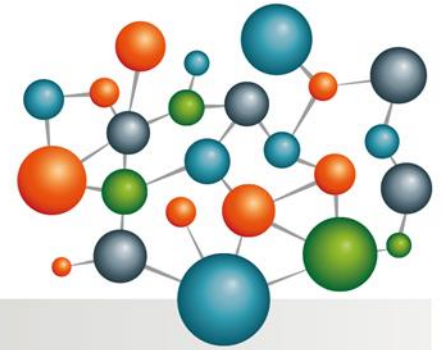


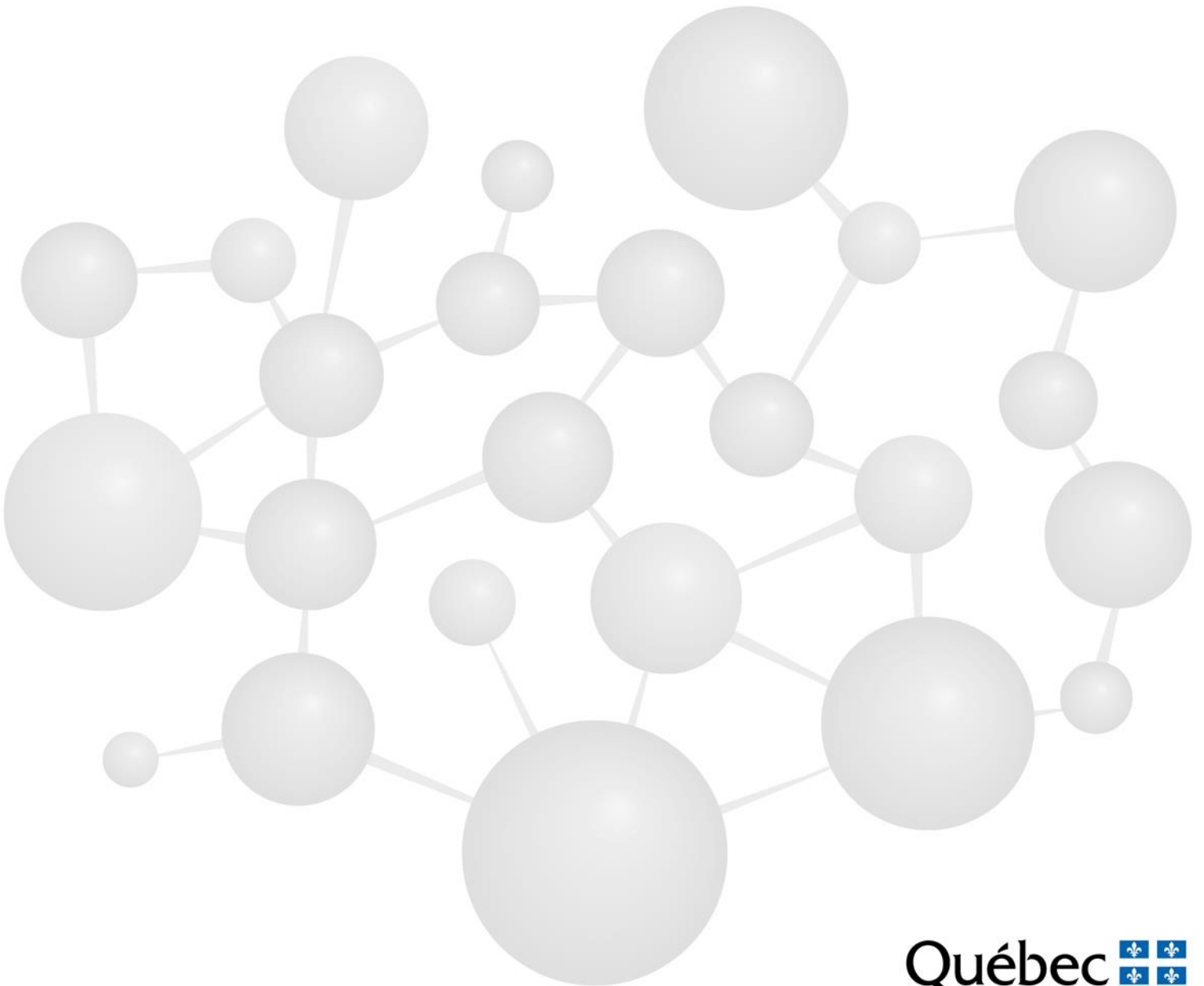
# PROGRAM OF STUDY

## STRUCTURAL AND ARCHITECTURAL ASSEMBLY (DVS 5864)

Training sector  
METALLURGICAL TECHNOLOGY



MINISTÈRE DE L'ÉDUCATION



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# Introduction to the Program

In vocational training, a program of study presents the competencies required to practise a given trade or occupation at entry level on the job market. The training provided allows students to acquire a degree of versatility that will be useful in their career and personal development.

A program is a coherent set of competencies to be developed. It outlines the knowledge and broad orientations to be favoured during training. The competencies correspond to the tasks of the trade or occupation or to activities related to work, vocational or personal life, depending on the case. Learning is acquired in a specific achievement context and targets the ability to act, succeed and evolve.

According to the *Education Act*,<sup>1</sup> every program “shall include compulsory objectives and contents and may include optional objectives and contents that shall be enriched or adapted according to the needs of students who receive the services.” For behavioural competencies, the compulsory components include the statement of the competency, the elements of the competency, the achievement context and the performance criteria; for situational competencies, they include the corresponding components.

For information purposes, programs also provide a grid of competencies, educational aims, a summary of competency-related knowledge and know-how, and guidelines. They also specify the suggested duration of each competency. All optional components of a program may be enriched or adapted according to the needs of the students, the environment and the workplace.

## Program Components

### Program Goals

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

### Educational Aims

Educational aims are broad orientations to be favoured during training in order to help students acquire intellectual or motor skills, work habits or attitudes. Educational aims usually address important aspects of career and personal development that have not been explicitly included in the program goals or competencies. They serve to orient appropriate teaching strategies to contextualize students' learning, in keeping with the dimensions underlying the practice of a trade or occupation. They help guide educational institutions in implementing the program.

### Competency

A competency is the ability to act, succeed and evolve in order to adequately perform tasks or activities related to one's working or personal life, based on an organized body of knowledge and skills from a variety of fields, perceptions, attitudes, etc.

A competency in vocational training can be defined in terms of a behaviour or a situation, and includes specific practical guidelines and requirements for learning.

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<sup>1</sup> *Education Act*, CQLR, c. I-13.3, s. 461.

## 1. Behavioural Competency

A behavioural competency describes the actions and the results expected of the student. It consists of the following features:

- The *statement of the competency* is the result of the job analysis, the orientations and general goals of vocational training and other determinants.
- The *elements of the competency* correspond to essential details that are necessary in order to understand the competency and are expressed in terms of specific behaviours. They refer to the major steps involved in performing a task or to the main components of the competency.
- The *achievement context* corresponds to the situation in which the competency is exercised at entry-level on the job market. The achievement context attempts to recreate an actual work situation but does not describe a learning or evaluation situation.
- The *performance criteria* define the requirements to be respected. They may refer to elements of the competency or to the competency as a whole. When associated with a specific element, performance criteria are used to judge whether a competency has been acquired. When associated with the competency as a whole, the criteria describe the requirements for performing a task or activity and provide information on the expected level of performance or the overall quality of a product or service.

## 2. Situational Competency

A situational competency describes the situation in which students are placed to acquire learning, and allows for actions and results to vary from one student to another. It consists of the following features:

- The *statement of the competency* is the result of the job analysis, the orientations and general goals of vocational training and other determinants.
- The *elements of the competency* outline the essential aspects of the competency and ensure a better understanding of the competency with respect to the expected outcome. The elements of the competency are fundamental to the implementation of the learning situation.
- The *learning context* provides a broad outline of the learning situation designed to help the students develop the required competency. It is normally divided into three key phases of learning: information, participation and synthesis.
- The *instructional guidelines* provide reference points and means for teachers to ensure that learning takes place and that the context in which it occurs is always the same. These guidelines may include general principles or specific procedures.
- The *participation criteria* describe requirements that the students must meet when participating in learning activities. They focus on how the students take part in the activities rather than on the results obtained. Participation criteria are normally provided for each phase of the learning situation.

## Competency-Related Knowledge and Know-How

Competency-related knowledge and know-how, together with related guidelines, are provided for information purposes. Competency-related knowledge and know-how define the essential and meaningful learning that students must acquire in order to apply and continue to develop the competency. They are in keeping with the job market and are accompanied by guidelines that provide information about the field of application, level of complexity and learning content. They generally encompass learning associated with knowledge, skills, strategies, attitudes, perceptions, etc.

## **Duration**

The total duration of the program is compulsory and must be observed. It consists of teaching time, which includes time for the evaluation of learning and for enrichment or remedial activities, depending on the students' needs. The duration indicated for a given competency refers to the amount of time needed to develop the competency.

The amount of teaching time corresponds to the amount of time allotted to training, which is established during program development as the average amount of time needed to acquire a competency and evaluate learning. This duration is helpful in organizing training.

## **Credit**

A credit is a unit used for expressing the quantitative value of each competency. One credit corresponds to 15 hours of training.

# **Aspects of Program Implementation**

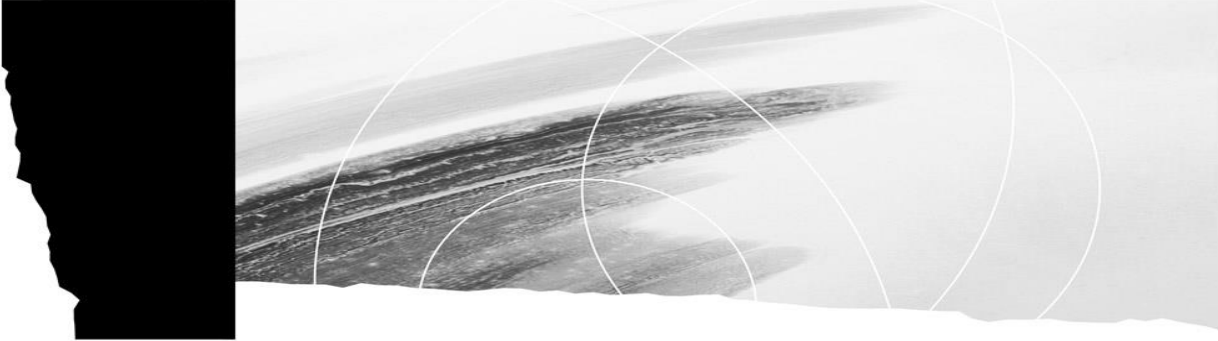
## **Program-Based Approach**

The program-based approach is founded on a comprehensive view of a program of study and its components (e.g. goals, educational aims, competencies). It requires concerted action among all players involved, from the initial stages of program design and development, to program implementation and evaluation. It consists in ensuring that all of the actions and activities proposed are based on the same aims and take into account the same orientations. For students, the program-based approach makes training more meaningful, since it presents learning as a coherent whole.

## **Competency-Based Approach**

In vocational training, the competency-based approach is based on a teaching philosophy that is designed to help students mobilize their personal sets of resources in order to act, succeed and evolve in different contexts, according to established performance levels with all the required knowledge and know-how (e.g. skills, strategies, attitudes, perceptions). The competency-based approach is carried out in situations that are relevant to the students' working life and personal life.





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5864

**Structural and Architectural Assembly**

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Year of approval: 2019

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<b>Certification:</b>	Diploma of Vocational Studies
<b>Number of credits:</b>	82
<b>Number of competencies:</b>	20
<b>Total duration:</b>	1 230 hours

---

To be eligible for admission to the *Structural and Architectural Assembly* program, candidates must meet one of the following requirements:

- Persons holding a Secondary School Diploma or its recognized equivalent.

OR

- Persons who are at least 16 years of age on September 30 of the school year in which they begin their training must meet the following condition: they must have obtained Secondary III credits in language of instruction, second language and mathematics in programs established by the Minister, or have been granted recognition of equivalent learning.

OR

- Persons who are at least 18 years of age upon entry into the program must have the following functional prerequisites: the successful completion of the general development test and ENG-2102-4 and MTH-3053-2, or recognition of equivalent learning.

OR

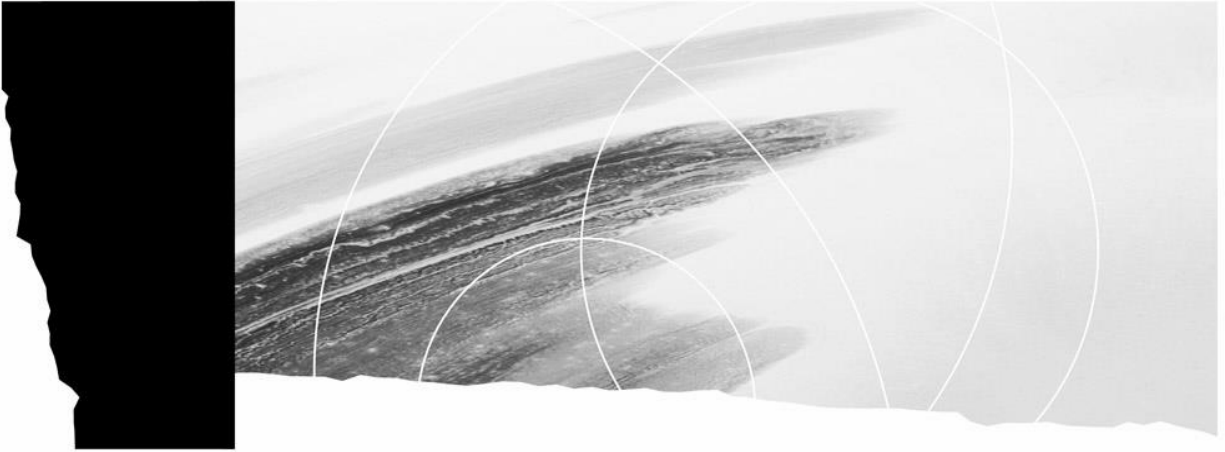
- Persons who have obtained Secondary III credits in language of instruction, second language and mathematics in programs established by the Minister are required to pursue, concurrently with their vocational training, Secondary Cycle Two general education courses in programs established by the Minister.

The duration of the program is 1 230 hours, which includes 570 hours spent on the specific competencies required to practise the trade and 660 hours on general, work-related competencies. The program of study is divided into 20 competencies which vary in length from 15 to 120 hours. The total hours allocated to the program include time devoted to teaching, evaluation of learning and enrichment or remedial activities.

## Specifics of the Program

Successful completion of some or all of the program competencies may, at their request, entitle students to certifications issued by recognized authorities.

<b>Competency</b>	<b>Code</b>	<b>Number</b>	<b>Hours</b>	<b>Credits</b>
The Trade and the Training Process	802651	1	15	1
Health and Safety on Construction Sites	754992	2	30	2
Plans and Elevations	801424	3	60	4
Cutting and Gouging	801434	4	60	4
Mechanical Assembly of Metallic and Composite Materials	801444	5	60	4
Electric Arc Welding in the Flat Position Using Covered Rods (SMAW)	801456	6	90	6
Access and Rescue Equipment	801465	7	75	5
Handling, Rigging and Lifting	801476	8	90	6
Erecting Structures	801488	9	120	8
Electric Arc Welding in the Horizontal Position Using Covered Rods (SMAW)	801492	10	30	2
Installing and Removing Joists and Decking	801503	11	45	3
Electric Arc Welding in the Vertical Position Using Covered Rods (SMAW)	801515	12	75	5
Installing and Removing Prefabricated Components	801523	13	45	3
Modifying Structural Elements	801535	14	75	5
Ornamental Coverings	801544	15	60	4
Electric Arc Welding in the Overhead Position Using Covered Rods (SMAW)	801554	16	60	4
Assembling and Installing Mezzanines and Accesses	801565	17	75	5
Assembling and Installing Stairs	801576	18	90	6
Modifying Architectural Elements	801584	19	60	4
Organizations Involved in the Construction Industry	754991	20	15	1



## **Part I**

---

**Program Goals**

**Educational Aims**

**Statements of the Competencies**

**Grid of Competencies**

**Harmonization**



## Program Goals

The *Structural and Architectural Assembly* program prepares students to practise the trade of ironworker.

Ironworkers work in all four sectors of the construction industry.

They erect structural elements, install and remove beams, decking and prefabricated parts, install ornamental coverings, and assemble and install staircases, mezzanines and accesses.

They also modify structural and architectural elements. They work mainly with metal, in particular plates and structural shapes, but also with concrete and composite materials.

Ironworkers follow plans and comply with current standards. They use access, lifting, handling, cutting and welding equipment. They use alignment, levelling, assembly, bolting and tightening instruments and specialized tools.

They must be able to work at heights and must be extremely cautious.

The program goals of the *Structural and Architectural Assembly* program are based on the general goals of vocational training. These goals are as follows:

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

## Educational Aims

The aim of the *Structural and Architectural Assembly* program is to help students develop attitudes and behaviours that representatives from education and the field deem essential to the practice of the trade:

- Foster the development of teamwork skills.
- Foster the development of organizational and planning skills.
- Help strengthen their attentiveness, accuracy and precision.
- Foster the development of the ability to anticipate and visualize the final product.

# Statements of the Competencies

## List of Competencies

- Determine their suitability for the trade and the training process.
- Prevent threats to health, safety and physical well-being on construction sites.
- Process the information in plans.
- Perform cutting and gouging operations.
- Perform mechanical assembly tasks on metallic and composite materials.
- Weld in the flat position using shielded metal arc welding with covered rods (SMAW).
- Use access and rescue equipment.
- Perform handling, rigging and lifting operations.
- Erect a structure.
- Weld in the horizontal position using shielded metal arc welding (SMAW) and covered rods.
- Install and remove joists and decking.
- Weld in the vertical position using shielded metal arc welding (SMAW) and covered rods.
- Install and remove prefabricated components.
- Modify structural elements.
- Install ornamental coverings.
- Weld in the overhead position with shielded metal arc welding (SMAW) and covered rods.
- Assemble and install mezzanines and accesses.
- Assemble and install stairs.
- Modify architectural elements.
- Become familiar with the organizations involved in the construction industry.

## Grid of Competencies

The grid of competencies shows the relationship between general competencies, which correspond to work-related activities, and specific competencies, which are required to practise the particular trade or occupation.

The general competencies appear on the horizontal axis and the specific competencies, on the vertical axis. The symbol (○) indicates a correlation between a general and a specific competency. Shaded symbols indicate that these relationships have been taken into account in the acquisition of specific competencies. The logic used in constructing the grid influences the course sequence. Generally speaking, this sequence follows a logical progression in terms of the complexity of the learning involved and the development of the students' autonomy. The vertical axis presents the specific competencies in the order in which they should be acquired and serves as a point of departure for determining how all of the competencies will be taught.

**GRID OF COMPETENCIES**

Structural and Architectural Assembly	Competency number	Type of objective	Hours	GENERAL COMPETENCIES												TOTAL
				Determine their suitability for the trade and the training process	Prevent threats to health, safety and physical well-being on construction sites	Process the information in plans	Perform cutting and gouging operations	Perform mechanical assembly tasks on metallic and composite materials	Weld in the flat position using shielded metal arc welding with covered rods	Use access and rescue equipment	Perform handling, rigging and lifting operations	Weld in the horizontal position using shielded metal arc welding with covered rods	Weld in the vertical position using shielded metal arc welding with covered rods	Weld in the overhead position with shielded metal arc welding (SMAW) and covered rods	Become familiar with the organizations involved in the construction industry	
				1	2	3	4	5	6	7	8	10	12	16	20	
<b>Competency number</b>				1	2	3	4	5	6	7	8	10	12	16	20	
<b>Type of objective</b>				S	S	B	B	B	B	B	B	B	B	B	S	
<b>Hours</b>				15	30	60	60	60	90	75	90	30	75	60	15	660
Erect a structure	9	B	120	○	●	●	○	●	○	●	●	○	○	○	○	
Install and remove joists and decking	11	B	45	○	●	●	●	●	●	●	●	●	○	○	○	
Install and remove prefabricated components	13	B	45	○	●	●	●	●	●	●	●	●	○	○	○	
Modify structural elements	14	B	75	○	●	●	●	●	●	●	●	●	●	○	○	
Install ornamental coverings	15	B	60	○	●	●	●	●	●	○	●	●	●	○	○	
Assemble and install mezzanines and accesses	17	B	75	○	●	●	●	●	●	●	●	●	●	●	○	
Assemble and install stairs	18	B	90	○	●	●	●	●	●	●	●	○	●	●	○	
Modify architectural elements	19	B	60	○	●	●	●	●	●	●	●	●	●	●	○	
<b>Duration of training</b>			570													1230

Links between the general competencies and the specific competencies

- : Existence of a link
- : Application of a link

## Harmonization

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

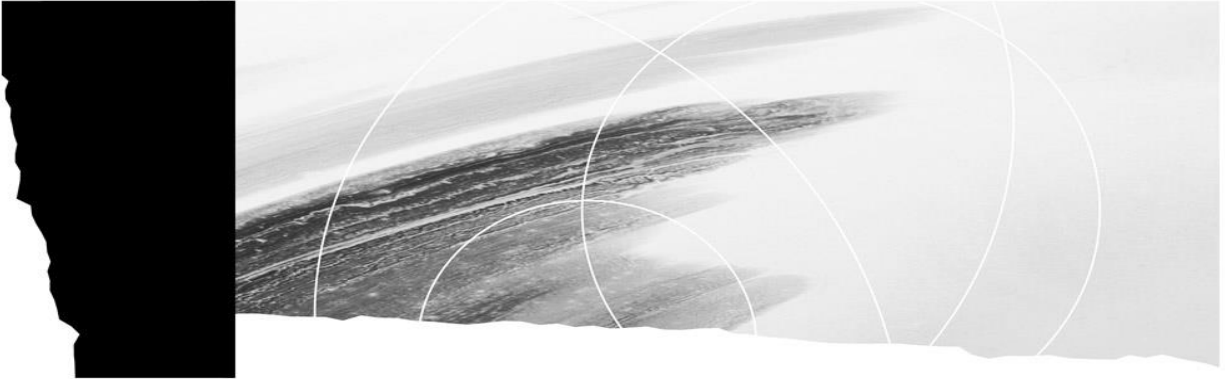
Harmonization establishes consistency between training programs and is especially important in ensuring that the tasks of a trade or occupation are clearly identified and described. Harmonization makes it possible to identify tasks requiring competencies that are common to more than one program. Even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

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

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

Harmonization of the *Structural and Architectural Assembly* program has resulted in identifying competencies that are shared with other programs. Detailed information on the harmonization of this program and its results is presented in the document entitled *Tableaux d'harmonisation Montage structural et architectural*.





## **Part II**

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### **Program Competencies**



Competency 1          Duration 15 hours          Credit 1

### ***Situational Competency***

---

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

Determine their suitability for the trade and the training process.

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

- Be familiar with the nature of the trade.
- Understand the training program.
- Evaluate their career choice.

#### **Learning Context**

---

##### **Information Phase**

- Learning about the job market in structural and architectural assembly: sectors, types of metals and other materials, types of products assembled and installed
- Learning about the nature and requirements of the trade: tasks, working conditions, health and safety risks
- Sharing the information gathered during a group discussion and discussing their perception of the trade: advantages, disadvantages, requirements

##### **Participation Phase**

- Discussing the skills, attitudes and knowledge required to practise the trade
- Identifying the different characteristics of the training process (competencies, evaluation methods, certification of studies)
- Making connections between the program of study and the characteristics of the trade
- Sharing their initial reactions to the trade and the training process

##### **Synthesis Phase**

- Producing a report in which they:
  - specify their aptitudes and their interest in the trade of ironworker
  - assess their career choice by comparing the aspects and requirements of the trade with their aptitudes and interests

#### **Instructional Guidelines**

---

- Create an atmosphere conducive to personal fulfilment and career integration
- Foster discussion and encourage students to express their opinions
- Help students acquire an accurate understanding of the trade by giving them the means to gather all the necessary information
- Provide students with the means to assess their career choice honestly and objectively

---

**Participation Criteria**

---

**Information Phase**

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

**Participation Phase**

- Carefully read the documents made available to them
- Listen attentively to explanations
- Discuss the requirements for practising the trade
- Express their views on the program of study during a group discussion, relating them to the trade

**Synthesis Phase**

- Write a report in which they:
  - sum up their interests and aptitudes with respect to the trade
  - explain how they arrived at their career choice, making the required connections

---

**Suggestions for Competency-Related Knowledge and Know-How**

---

The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each phase of the learning context, along with their attendant guidelines.

**Information Phase**

- Characteristics of structural and architectural assembly
- Sectors:
  - Residential
  - Commercial and institutional
  - Industrial
  - Civil engineering
- General description of the trade and its foreseeable evolution
- Structural and architectural assembly tasks and operations
- Work context
- Standards and codes

**Participation Phase**

- General skills and behaviour required to perform the tasks
- General and specific skills of apprentice ironworkers upon entry into the job market
- Characteristics of the formative and summative evaluation of the program's competencies

**Synthesis Phase**

- Importance of assessing their career choice
- Characteristics and qualities of a report confirming their career choice

Competency 2                      Duration 30 hours                      Credits 2

## ***Situational Competency***

---

### **Statement of the Competency**

Prevent threats to health, safety and physical well-being on construction sites.

### **Elements of the Competency**

- Develop a responsible attitude with regard to health and safety risks.
- Be aware of the importance of complying with occupational health and safety standards and regulations.
- Recognize dangerous situations or risky behaviours and the applicable preventive measures.

### **Learning Context**

---

#### **Information Phase**

- Learning about the risks inherent in construction sites
- Learning about the standards and regulations respecting health and safety on construction sites
- Learning about the measures to take in the event of an emergency
- Thinking about the importance of acquiring proficiency in occupational health and safety

#### **Participation Phase**

- Participating in situations in which risks must be prevented and dangers eliminated with respect to the environment, facilities, equipment and machinery, materials and tools, energy sources, etc.
- Participating in activities allowing them to recognize the risks related to moving loads and working in awkward positions
- Participating in activities allowing them to recognize symbols and signals associated with risk prevention (hazardous products, roadwork, transportation of hazardous materials, etc.)
- Comparing risky behaviours observed on a construction site and identifying the basic principles of safe behaviour

#### **Synthesis Phase**

- Presenting a report containing:
  - a summary of their newly acquired knowledge and skills
  - an assessment of their attitude with respect to occupational health and safety
  - their goals and means of improvement

### **Instructional Guidelines**

---

- Provide the necessary information sources
- If applicable, invite resource people specializing in certain aspects of occupational health and safety
- Make the best use of audiovisual materials
- Make extensive use of learning situations that reflect the reality of construction sites

- Prevent students from performing unsafe acts during simulations
- Encourage all students to participate in discussions
- Guide the students in their self-assessment by providing them with the tools needed (e.g. questionnaire) to help them analyze their experience and set personal objectives

### Participation Criteria

---

#### Information Phase

- Consult the sources of information made available to them
- Describe the benefits of complying with health and safety standards and regulations

#### Participation Phase

- Participate in the suggested activities and take them seriously
- State the principles of safe behaviour
- Make a list of the risks associated with construction sites and the applicable preventive measures

#### Synthesis Phase

- Present a report containing:
  - a summary of their newly acquired knowledge and skills
  - an assessment of their attitude with respect to occupational health and safety
  - their goals and means of preserving their own health, safety and physical well-being and those of others on a construction site

### Suggestions for Competency-Related Knowledge and Know-How

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The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each phase of the learning context, along with their attendant guidelines.

#### Information Phase

- Importance of information about health and safety on construction sites
- The most common threats to health, safety and physical well-being on construction sites
- Sources of information about health and safety on construction sites and gathering of information
- Roles and responsibilities with regard to health and safety on construction sites
- Health and safety regulatory framework
- Current certifications and regulations
- Benefits of complying with health and safety rules
- Prevention of illnesses and accidents

Competency 3      Duration 60 hours      Credits 4

### ***Behavioural Competency***

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

Process the information in plans.

#### **Achievement Context**

- Given structural and architectural plans
- Using measuring and marking-out instruments: levels, theodolites, tape measures, chalk lines, etc.

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

#### **Performance Criteria**

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1. Identify the information in plans.

- Accurate interpretation of dimensions, units of measurement and scales
- Appropriate recognition of symbols
- Appropriate recognition of the different types of views
- Relevant connections between the views
- Accurate distinction between the different types of lines

2. Locate the work.

- Accurate identification of the benchmark
- Proper transposition of data
- Proper determination of the necessary leader lines and elevations

3. Create leader lines and elevations.

- Appropriate choice and use of measuring and marking-out instruments
- Accurate readings and sightings
- Accurate calculations
- Accurate positioning of leader lines and elevations
- Use of shims in accordance with the requirements set out in the *Safety Code for the Construction Industry*
- Compliance with the data contained in the plan

*For the competency as a whole:*

- Accurate interpretation of units of measurement
- Appropriate use of reference axes
- Appropriate squaring using measurements and instruments
- Thorough measurement check

### **Suggestions for Competency-Related Knowledge and Know-How**

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The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

1. Identify the information in plans.
  - Dimensions and units of measurement: metric and Imperial systems, angles, etc.
  - Scales: 1/20, 1/4 in. = 1 ft., etc.
  - Symbols: elevation, orientation, hatching, etc.
  - Top, elevation, sectional and detail views
  - Types of lines: dotted, solid, bold, phantom, etc.
  
2. Locate the work.
  - Benchmark and survey data
  - Transposition of data contained in the structural and architectural plan and determination of benchmarks and elevations
  - Use of reference axes and squaring using measurements and instruments
  
3. Create leader lines and elevations.
  - Inspection and use of levels, theodolites, tape measures and chalk lines
  - Formula for calculating elevations
  - Create leader lines and elevations
  - Shims (minimum surface area, position, height, etc.) and *Safety Code for the Construction Industry*
  - Use of reference axes and squaring using measurements and instruments

Competency 4      Duration 60 hours      Credits 4

***Behavioural Competency***

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**Statement of the Competency**

Perform cutting and gouging operations.

**Achievement Context**

- On metal and composite plates and structural shapes
- Given instructions
- Using mechanical equipment: bevelling machine, rail-mounted torch, grinder, reciprocating saw, circular saw, portable band saw, etc.
- Using oxygen cutting, plasma cutting and arc gouging equipment and accessories
- Using personal and collective protective gear

**Elements of the Competency**

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**Performance Criteria**

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- |  |  |
|--|--|
| 1. Plan the work.  | <ul style="list-style-type: none"> <li>• Accurate interpretation of instructions</li> <li>• Appropriate choice of tools and accessories</li> <li>• Proper use of personal and collective protective gear</li> </ul>  |
| 2. Make straight, curved and angular cuts using mechanical tools.                              | <ul style="list-style-type: none"> <li>• Proper positioning of material</li> <li>• Appropriate use of mechanical tools</li> <li>• Appropriate use of cutting oils or lubricants</li> <li>• Appropriate use of abrasives and blades</li> </ul>  |
| 3. Drill and make straight, curved and angular cuts using oxygen and plasma cutting equipment. | <ul style="list-style-type: none"> <li>• Proper assembly of cutting machine</li> <li>• Appropriate adjustment of settings</li> <li>• Regularity of drag lines</li> <li>• Compliance with requirements associated with the application of oxygen and plasma cutting techniques</li> <li>• Compliance with procedure for starting up and shutting down oxygen cutting equipment</li> </ul> |
| 4. Perform arc gouging operations.   | <ul style="list-style-type: none"> <li>• Proper assembly of gouging equipment</li> <li>• Appropriate adjustment of intensity</li> <li>• Appropriate choice of electrode</li> <li>• Depth and width of grooves in compliance with requirements</li> <li>• Compliance with arc gouging requirements</li> </ul>   |
| 5. Finish the job.   | <ul style="list-style-type: none"> <li>• Proper disassembly of workstation</li> <li>• Proper storage of equipment and accessories</li> <li>• Cleanliness of work area</li> </ul>   |

*For the competency as a whole:*

- Accurate conversion of units of measurement
- Appropriate inspection of equipment and accessories
- Proper replacement of damaged cables, hoses and accessories
- Appropriate work posture
- Precise marking out of cutting lines
- Precise cuts
- Quality of deburring
- Proper and thorough inspection of cuts and gouges
- Compliance with work methods
- Compliance with specifications
- Compliance with occupational health and safety rules

### **Suggestions for Competency-Related Knowledge and Know-How**

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The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

1. Plan the work.
  - Instructions: types of cuts, measurements, tolerances, etc.
  - Choice of tools and accessories based on their availability, the type of material, the requirements of the job, thicknesses, etc.
  - Personal and collective protective gear: hard hat, glasses, mask, face shield, gloves, welder's jacket, screen, fume collector, etc.
2. Make straight, curved and angular cuts using mechanical tools.
  - Positioning of plates and structural shapes, and use of bench, vises, clamps, self-locking pliers, etc.
  - Operation of mechanical tools (bevelling machine, rail-mounted torch, grinder, reciprocating saw, shearer, circular saw, etc.) and associated safety rules
  - Types of abrasive disks and types of materials to be cut
  - Use of lubricants for portable band saw
  - Blades and drills: length, number of teeth and types of materials to be cut or drilled
  - Cutting and drilling defects: irregularity, burrs, deformation, diameter, etc.
3. Drill and make straight, curved and angular cuts using oxygen and plasma cutting equipment.
  - Oxygen cutting equipment: cylinder, hose, torch, tips, regulator, etc.
  - Thickness of materials and types of tips
  - Replacement of hose connectors or clamps
  - Assembly of machine based on polarity and type of gas
  - Oxygen cutting and drilling parameters: pressure of acetylene and oxygen
  - Procedure for starting up and shutting down an oxygen cutting equipment and safety instructions (e.g. leak test)

- Plasma cutting equipment: torch, shielding, tips, electrode, O-ring, etc.
  - Plasma cutting and drilling parameters: air pressure and intensity of electric current
  - Cut and travel feed
  - Cutting and drilling defects: irregularity, burrs, deformation, melting of steel, diameter, etc.
4. Perform arc gouging operations.
- Gouging equipment: welding lead, air hose, electrode holder, etc.
  - Replacement of welding lead connectors or clamps and use of heat shrinkable tubing
  - Assembly of equipment based on polarity
  - Adjustment of intensity based on the diameter of the electrode
  - Choice of electrode diameter based on the thickness to gouge
  - Safety instructions for arc gouging
  - Gouging defects: irregular depths, deformation, perforation, etc.
5. Finish the job.
- Importance of disassembling the machine, putting things away and cleaning up the work area



Competency 5      Duration 60 hours      Credits 4

***Behavioural Competency***

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**Statement of the Competency**

Perform mechanical assembly tasks on metallic and composite materials.

**Achievement Context**

- Working with sheets, plates, structural shapes and composite materials
- Given instructions, standards and clamping procedures
- Using anchors, bolts, screws, etc.
- Using measuring and marking-out instruments: self-levelling levels, laser levels, tape measures, chalk lines, etc.
- Using hand and power tools: pliers, clamps, hammers, drills, etc.
- Using assembly tools: drift pins, bull pins, connecting bars, spud wrenches, etc.
- Using standard and specialized tightening tools: manual wrenches, reamers and electric, pneumatic and hydraulic bolters
- Using personal and collective protective gear

**Elements of the Competency**

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1. Plan the work.

- Accurate interpretation of instructions, standards and clamping procedures
- Appropriate choice of tools
- Selection of appropriate materials

2. Install anchors.

- Choice of type of anchor based on substrate characteristics and load
- Accurate establishment of reference points
- Correct diameter and depth of holes
- Proper determination of tightening sequence
- Appropriate torque
- Installation in compliance with requirements
- Compliance with manufacturer's installation standards

3. Mechanically attach sheet metal.

- Proper overlap of sheets
- Proper alignment of fasteners
- Absence of warping
- Solid assembly

4. Bolt and tighten joining elements.

- Appropriate handling of reamer
- Proper alignment of elements

- Compliance with requirements regarding the length of the bolts
  - Proper determination of tightening sequence
  - Proper pretightening of elements
  - Use of tension-control bolts or tightening in compliance with requirements
5. Glue metallic and composite materials.
- Appropriate preparation of materials
  - Proper alignment of materials
  - Compliance with manufacturer's instructions for using glues
6. Finish the job.
- Proper cleaning of tools
  - Proper storage of tools
  - Cleanliness of work area

*For the competency as a whole:*

- Appropriate inspection of tools
- Appropriate use of tools
- Solid assembly
- Compliance with work methods
- Compliance with occupational health and safety rules

### **Suggestions for Competency-Related Knowledge and Know-How**

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The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

1. Plan the work.
  - Instructions: types of assemblies, measurements, tolerances, etc.
  - Choice of measuring and marking-out instruments, hand and power tools, and assembly and tightening tools based on type of assembly, instructions, standards and tightening procedures
  - Characteristics of sheets, plates and structural shapes of ferrous or non-ferrous metal or composite materials
2. Install anchors.
  - Types and technical properties of mechanical and chemical anchors: classification, capacity, load resistance, etc.
  - Types and characteristics of anchoring surfaces: concrete, concrete blocks, wood, plasterboard, composite materials, etc.
  - Position of anchors on floor, wall and ceiling
  - Use of measuring tools: level, square, tape measure, etc.
  - Choice of drills or drill bits based on type of anchor and type of surface
  - Use of drilling and tightening tools
  - Use of wood screws or metal screws: specifications, classification, load resistance, etc.

3. Mechanically attach sheet metal.
  - Types of sheets and their technical characteristics: alloy, classification, etc.
  - Use of wood, metal or concrete screws: specifications, classification, load resistance, etc.
  - Use of powder actuated nailer
4. Bolt and tighten joining elements.
  - Types of mechanical screws and nuts and their technical characteristics: classification, gauge, bolt diameter, tension-control bolts, tension, shear, etc.
  - Determination of tightening sequence based on number of bolts and pattern
  - Use of assembly tools, reamers, and standard and specialized tightening tools
  - Pretightening, tightening and turn of the nut
5. Glue metallic and composite materials.
  - Types of glues and their properties: polyurethane, epoxy, neoprene (contact glue), and load resistance
  - Preparation of materials: cleaning and buffing, protection of materials and surfaces, etc.
  - Manufacturer's instructions for using glues: specifications, types of surface, drying time, etc.
6. Finish the job.
  - Importance of putting things away and cleaning up the work area



Competency 6

Duration 90 hours

Credits 6

***Behavioural Competency***

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**Statement of the Competency**

Weld in the flat position using shielded metal arc welding with covered rods (SMAW).

**Achievement Context**

- Working on steel plates and structural shapes
- Given a plan, a welding procedure and Canadian Welding Bureau standards
- Using shielded metal arc welding, covered rods and welding accessories
- Using a bevelling machine, a rail-mounted torch and a grinder
- Using personal and collective protective gear

**Elements of the Competency**

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**Performance Criteria**

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|--|--|
| 1. Plan the work.                            | <ul style="list-style-type: none"> <li>• Accurate interpretation of plan, standards and welding procedure</li> <li>• Appropriate choice of rods</li> <li>• Proper use of personal and collective protective gear</li> </ul>  |
| 2. Prepare the plates and structural shapes. | <ul style="list-style-type: none"> <li>• Bevelling of plates and structural shapes in compliance with requirements</li> <li>• Positioning of plates and structural shapes based on the type of assembly and welding position</li> </ul>  |
| 3. Prepare the welding machine.              | <ul style="list-style-type: none"> <li>• Appropriate inspection of equipment and accessories</li> <li>• Proper replacement of damaged cables and accessories</li> <li>• Proper assembly of welding machine</li> </ul>  |
| 4. Tack weld in the flat position.           | <ul style="list-style-type: none"> <li>• Appropriate use of tacking techniques</li> <li>• Proper and thorough inspection of tack welds</li> <li>• Welding in compliance with standards</li> </ul>  |
| 5. Make welding passes in the flat position. | <ul style="list-style-type: none"> <li>• Proper determination of welding sequence</li> <li>• Appropriate use of welding techniques</li> <li>• Proper cleaning of joints between passes</li> <li>• Proper and thorough inspection of weld beads</li> <li>• Weld beads in compliance with standards</li> </ul> |

6. Finish the job.
- Proper disassembly of welding machine
  - Equipment and welding accessories properly put away
  - Cleanliness of work area

*For the competency as a whole:*

- Appropriate adjustment of intensity
- Appropriate work posture
- Appropriate use of methods for controlling thermal deformation
- Compliance with standards for classifying rods and materials
- Compliance with welding procedure
- Compliance with work methods
- Compliance with occupational health and safety rules

### **Suggestions for Competency-Related Knowledge and Know-How**

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The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

1. Plan the work.
  - Welding plans: types of assemblies, dimensions, symbols, etc.
  - Applicable standards and tolerances
  - Welding procedures: types of joints, base and filler metals, angles, bevels, diameters, welding positions, etc.
  - Choice of rods based on classification, welding position, type of material, the mechanical properties of the rods, type of assembly, thicknesses, etc.
  - Characteristics of welding in the flat position
  - Personal and collective protective gear: hard hat, glasses, mask, face shield, gloves, welder's jacket, screen, fume collector, etc.
2. Prepare the plates and structural shapes.
  - Use of a bevelling machine, a rail-mounted torch and a grinder
  - Bevel angle based on welding process
  - Cleaning of plates and removal of carbon deposits
  - Types of assemblies: butt-to-butt, butt-to-butt with backplate, surfacing, T-joint
3. Prepare the welding machine.
  - Welding accessories: wire brushes, flux hammers, etc.
  - Electric arc welding machine with covered rods (SMAW): welding cables, ground clamps, electrode holder, etc.
  - Assembly of machine based on polarity
  - Replacement of welding lead connectors or clamps and use of heat shrinkable tubing

4. Tack weld in the flat position.
  - Sequence of tack welds for plates and structural shapes based on the material's metallurgical properties, type of assembly, thicknesses, etc.
  - Tacking techniques: striking the arc, arc length, electrode angle, etc.
  - Adjustment of intensity based on thickness, electrode type and diameter, etc.
  - Tack weld defects: porosity, lack of fusion, slag inclusion
5. Make welding passes in the flat position.
  - Determination of welding sequence for plates and structural shapes based on type of assembly, bead size and depths
  - Welding techniques based on position, electrode angle, arc length, travel speed, etc.
  - Weld defects: lack of fusion, porosity, undercuts, slag inclusion, excessive buildup, shallowness, irregular drag lines, dimensions, etc.
6. Finish the job.
  - Importance of disassembling the machine, putting things away and cleaning up the work area



Competency 7      Duration 75 hours      Credits 5

***Behavioural Competency***

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**Statement of the Competency**

Use access and rescue equipment.

**Achievement Context**

- Given scaffolding plans and instructions
- Using access equipment: scaffolding elements, boom lift, scissor lift
- Using personal and collective protective gear

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

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- |  |  |
|--|--|
| 1. Plan the work.                                | <ul style="list-style-type: none"> <li>• Accurate interpretation of instructions</li> <li>• Appropriate choice of type of access equipment</li> </ul>  |
| 2. Establish a safety perimeter.                 | <ul style="list-style-type: none"> <li>• Identification of all potential obstacles and hazards in the work area</li> <li>• Proper installation of safety devices</li> </ul>  |
| 3. Prepare the location of the access equipment. | <ul style="list-style-type: none"> <li>• Proper clearing of area</li> <li>• Identification of signs of land subsidence</li> <li>• Appropriate preparation of base</li> <li>• Appropriate choice and positioning of sills</li> </ul>  |
| 4. Assemble and disassemble scaffolding.         | <ul style="list-style-type: none"> <li>• Accurate interpretation of the scaffolding plan</li> <li>• Proper establishment of list of necessary scaffolding elements</li> <li>• Appropriate alignment and levelling of scaffolding elements</li> <li>• Proper installation of anchors</li> <li>• Proper installation of accesses</li> <li>• Effective coordination of work with other team members</li> <li>• Systematic inspection of scaffolding during and after installation</li> <li>• Compliance with assembly and disassembly steps and procedures</li> </ul> |
| 5. Use a boom lift and a scissor lift.           | <ul style="list-style-type: none"> <li>• Systematic inspection of the mechanical elements of the boom lift and scissor lift</li> <li>• Systematic inspection of the boom lift and scissor lift's safety devices</li> <li>• Appropriate use of controls</li> <li>• Precise manoeuvres in compliance with manufacturer's standards</li> </ul>  |

- Appropriate positioning of boom lift and scissor lift
  - Compliance with start-up and shutdown procedures
6. Rescue a person hanging from a safety harness at a height.
- Appropriate use of rescue equipment
  - Compliance with procedure for rescuing from height
7. Finish the job.
- Proper cleaning of access equipment
  - Proper storage of scaffolding elements
  - Cleanliness of work area

*For the competency as a whole:*

- Adoption of cautious attitudes and behaviours
- Compliance with load capacities
- Compliance with standards
- Compliance with occupational health and safety rules

### **Suggestions for Competency-Related Knowledge and Know-How**

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The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

1. Plan the work.
  - Choice of type of access equipment based on height, span, space, etc.
2. Establish a safety perimeter.
  - Sources of risk (fall, power lines, wind, etc.), potential obstacles and hazards in the work area (confined space, enclosed space, clutter, etc.)
  - Safety measures and devices: cones, flagging tape, warning signs, etc.
3. Prepare the location of the access equipment.
  - Soil bearing capacity
  - Choice of location based on aerial obstacles, clutter, etc.
  - Types of bases and sills
4. Assemble and disassemble scaffolding.
  - Current certifications and regulations
  - Types of scaffolding and components: swing stage, metal frame, ringlock (rosette), tube and clamp, etc.
  - Assembly plan, assembly and disassembly procedures
  - Use of cables and knot tying
  - Installation of accesses (stairs, landings, protective devices)

- Anchoring and guying methods
  - Inspection of the installation and its various components
  - Shifting of mobile scaffolding
5. Use a boom lift and a scissor lift.
- Current certifications and regulations
  - Characteristics and uses of boom lift and scissor lift
  - Inspection and verification of hydraulic components, cables, etc.
  - Range, positioning, techniques and manufacturer's standards
6. Rescue a person hanging from a safety harness at a height.
- Current certifications and regulations
  - Rescue equipment: National Fire Protection Association (NFPA), American National Standards Institute (ANSI) or CSA Group standards, rope access, compatibility with personal protective gear, inspection and maintenance procedures, etc.
  - Content of procedure for rescuing from height: suspension trauma, response time, appropriate actions, first aid, etc.
  - Rescue-related stress
7. Finish the job.
- Importance of putting things away and cleaning up the work area



Competency 8                      Duration 90 hours                      Credits 6

### ***Behavioural Competency***

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

Perform handling, rigging and lifting operations.

#### **Achievement Context**

- Given drawings and lifting procedures
- Given instructions
- Using handling and lifting equipment: telescopic forklift, winches, grip hoist (tirefor), chain hoists
- Using handling and lifting accessories: slings, shackles, jacks, lifting beams (spreader beams), vacuum lifting disks, etc.
- Working with crane operators
- Using personal and collective protective gear

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

#### **Performance Criteria**

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- |   |   |
|---|---|
| <p>1. Plan the handling and lifting operations.</p>                                   | <ul style="list-style-type: none"> <li>• Accurate interpretation of drawings and lifting procedures</li> <li>• Accurate interpretation of instructions</li> <li>• Appropriate choice of handling and lifting equipment</li> <li>• Appropriate determination of pathway</li> </ul>   |
| <p>2. Establish a safety perimeter.</p>   | <ul style="list-style-type: none"> <li>• Identification of all potential obstacles and hazards in the work area</li> <li>• Proper installation of safety devices</li> </ul>   |
| <p>3. Sling or rig loads.</p>   | <ul style="list-style-type: none"> <li>• Appropriate use of formulas for calculating sling tension</li> <li>• Correct load estimate</li> <li>• Appropriate choice of lifting accessories</li> <li>• Thorough inspection of lifting accessories</li> <li>• Appropriate choice and use of fastening methods</li> <li>• Solid installation of vacuum lifting disks</li> <li>• Appropriate choice and tying of knots</li> </ul> |
| <p>4. Move loads on a vertical, horizontal or inclined plan alone or with others.</p> | <ul style="list-style-type: none"> <li>• Appropriate use of reeving techniques</li> <li>• Appropriate use of winches, grip hoist (tirefor) and chain hoists</li> <li>• Effective collaboration with crane operator</li> <li>• Appropriate use of lifting signals</li> <li>• Compliance with techniques for moving loads</li> </ul>  |

5. Use a telescopic forklift.
  - Systematic inspection of the mechanical elements of the forklift
  - Systematic inspection of the forklift's safety features
  - Stability of load
  - Appropriate use of controls
  - Precise manoeuvres in compliance with manufacturer's standards
  - Compliance with start-up and shutdown procedures
  
6. Finish the job.
  - Proper cleaning of handling and lifting equipment and accessories
  - Handling and lifting accessories properly put away
  - Cleanliness of work area

*For the competency as a whole:*

- Adoption of cautious attitudes and behaviours
- Appropriate determination of centres of gravity
- Appropriate use of lifting charts
- Appropriate use of tag lines and handling and lifting accessories
- Effective coordination of work with other team members
- Undamaged state of material, equipment and components
- Compliance with load capacities
- Compliance with standards
- Compliance with occupational health and safety rules

### **Suggestions for Competency-Related Knowledge and Know-How**

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The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

1. Plan the handling and lifting operations.
  - Lifting plans and procedures: appropriate equipment, attachment methods, charts, steps in the process
  - Choice of type of handling and lifting equipment based on load, height, span, available space, etc.
  - Determination of pathways based on the layout of the area and the availability of tools and equipment

2. Establish a safety perimeter.
  - Sources of risk (fall, power lines, wind, etc.), potential obstacles and hazards in the work area (confined space, enclosed space, clutter, etc.).
  - Safety measures and devices: cones, flagging tape, warning signs, etc.
3. Sling or rig loads.
  - Calculation of sling tension: use of trigonometry, the rule of three, geometry and dimensions (volume and area), conversion of units of measure, etc.
  - Characteristics and properties of slings: steel and synthetic cables
  - Characteristics and properties of cables made of natural fibres and cables made of synthetic fibres
  - Characteristics of handling accessories: pulleys, shackles, turnbuckles, etc.
  - Inspection and verification of handling accessories: tears, fraying, wear, deformation, cracks, etc.
  - Attachment methods depending on the load: vertical, basket, choke, multi-sling, etc.
  - Characteristics of vacuum lifting disks (pump and clamp models)
  - Types of knots and their characteristics: bowline knots, double sheet bends, clove hitches, half hitches, etc.
4. Move loads on a vertical, horizontal or inclined plan alone or with others.
  - Characteristics of square and lace reeving: number of strands, strength ratio
  - Characteristics and lifting capacity of winches, grip hoist (tirefor) and chain hoists
  - Types of cranes: conventional, hydraulic (telescopic), tower, etc.
  - Standardized and non-standardized lifting signals
  - Determination of techniques for moving loads based on centre of gravity, area layout, pathways, availability of tools and equipment, etc.
  - Lever effect
  - Safety factors
5. Use a telescopic forklift.
  - Current certifications and regulations
  - Characteristics and operation of a telescopic forklift
  - Inspection and verification points: hydraulic components, cables, etc.
  - Range, positioning, techniques and manufacturer's standards
6. Finish the job.
  - Importance of putting things away and cleaning up the work area



Competency 9      Duration 120 hours      Credits 8

### ***Behavioural Competency***

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

Erect a structure.

#### **Achievement Context**

- Given plans and instructions
- Given standards
- Using tools: measuring instruments, hand and power tools, assembly and bolting tools, etc.
- Using access, handling and lifting equipment
- Using structural elements
- Using personal and collective protective gear

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

#### **Performance Criteria**

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- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Plan the work.</li> <li>2. Help set up the site.</li> <li>3. Prepare the anchor bases.</li> <li>4. Erect structural elements.</li> <li>5. Fasten the structural elements.</li> </ol> | <ul style="list-style-type: none"> <li>• Accurate interpretation of plans, standards and instructions</li> <li>• Proper determination of work methods</li> <li>• Appropriate choice of tools and equipment</li> <li>• Proper determination of sequence of operations</li> <li>• Proper preparation of tools and equipment</li> <li>• Proper establishment of safety perimeters</li> <li>• Appropriate reception and placement of equipment</li> <li>• Accurate establishment of elevations</li> <li>• Proper inspection and correction of anchors</li> <li>• Choice of shim thickness based on required elevations</li> <li>• Proper arrangement of shims</li> <li>• Pre-assembly of structural elements in compliance with requirements</li> <li>• Appropriate installation of safety devices</li> <li>• Correct preliminary plumbing of elements</li> <li>• Appropriate arrangement of bolts</li> <li>• Positioning of structural elements in compliance with requirements</li> <li>• Installation of guy wires in compliance with requirements</li> <li>• Appropriate adjustment of structural elements</li> <li>• Installation of all bolts on structure</li> <li>• Final plumbing of elements in compliance with requirements</li> </ul> |
|--|---|

- Compliance with verticality tolerances for peripheral and intermediate columns
  - Compliance with tightening sequence and torque
  - Removal of all temporary guy wires
  - Proper removal of safety devices
6. Help take down the site.
- Proper storage of tools and equipment
  - Proper removal of safety perimeters
  - Proper cleanup of work area

*For the competency as a whole:*

- Appropriate use of safety devices and fall protection
- Appropriate choice and execution of handling and lifting techniques
- Choice of bolts based on the thickness of the elements to be assembled
- Appropriate use of tools and equipment
- Effective coordination of work with other team members
- Compliance with standards, plans and instructions
- Compliance with assembly sequence
- Compliance with occupational health and safety rules

### **Suggestions for Competency-Related Knowledge and Know-How**

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The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

1. Plan the work.
  - Types of structures: buildings (commercial, industrial, heavy residential), megadomes, chimneys, towers, wind turbines, etc.
  - Interpretation of plans (see Competency 3)
  - Standards: *Safety Code for the Construction Industry* and Canadian Institute of Steel Construction
  - Specific instructions for the construction site in question
  - Determination of work methods based on the configuration of the location, priorities, availability of tools and materials, etc.
  - Choice of measuring instruments, hand and power tools, assembly and tightening tools, and access, handling and lifting equipment based on work method and type of structure
2. Help set up the site.
  - Preparation of tools and equipment (see competencies 5, 7 and 8)
  - Establishment of safety perimeters (see competencies 2, 7 and 8)
  - Inspection, handling and placement of equipment in the work area based on construction requirements, priorities and the progress of the work

3. Prepare the anchor bases.
  - Establishment of elevations and arrangement of shims (see Competency 3)
  - Condition of anchors: presence of concrete, damaged threads, etc.
  - Correction of anchors in compliance with applicable standards: straightening, cleaning
4. Erect structural elements.
  - Pre-assembly and positioning of structural elements: columns, beams, braces, girts, etc.
  - Cable systems: minimum cable diameter, arrangement of posts, number of cable clips, cable height, etc.
  - Methods of installing vertical and horizontal cables
  - Distribution of bolts to prevent swivelling
  - Temporary guy wires and safety requirements
5. Fasten the structural elements.
  - Adjustment of structural elements: squareness, parallelism, angles
  - Use of a vertical level or alignment tool for peripheral and intermediate columns
  - Bolting and torque (see Competency 5)
  - Procedures for removing safety devices
6. Help take down the site.
  - Importance of putting things away and cleaning up the work area



Competency 10      Duration 30 hours      Credits 2

***Behavioural Competency***

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**Statement of the Competency**

Weld in the horizontal position using shielded metal arc welding (SMAW) and covered rods.

**Achievement Context**

- Working on steel plates and structural shapes
- Given a plan, a welding procedure and Canadian Welding Bureau standards
- Using shielded metal arc welding (SMAW), covered rods and welding accessories
- Using a bevelling machine, a rail-mounted torch and a grinder
- Using personal and collective protective gear

**Elements of the Competency**

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**Performance Criteria**

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- |  |  |
|--|--|
| 1. Plan the work.                                  | <ul style="list-style-type: none"> <li>• Accurate interpretation of plan, standards and welding procedure</li> <li>• Appropriate choice of rods</li> <li>• Proper use of personal and collective protective gear</li> </ul>  |
| 2. Prepare the plates and structural shapes.       | <ul style="list-style-type: none"> <li>• Bevelling of plates and structural shapes in compliance with requirements</li> <li>• Positioning of plates and structural shapes based on type of assembly and welding position</li> </ul>  |
| 3. Prepare the welding machine.                    | <ul style="list-style-type: none"> <li>• Appropriate inspection of equipment and accessories</li> <li>• Proper replacement of damaged cables and accessories</li> <li>• Proper assembly of welding machine</li> </ul>  |
| 4. Tack weld in the horizontal position.           | <ul style="list-style-type: none"> <li>• Appropriate use of tacking techniques</li> <li>• Proper and thorough inspection of tack welds</li> <li>• Welding in compliance with standards</li> </ul>  |
| 5. Make welding passes in the horizontal position. | <ul style="list-style-type: none"> <li>• Proper determination of welding sequence</li> <li>• Appropriate use of welding techniques</li> <li>• Proper cleaning of joints between passes</li> <li>• Proper and thorough inspection of weld beads</li> <li>• Weld beads in compliance with standards</li> </ul> |
| 6. Finish the job.                                 | <ul style="list-style-type: none"> <li>• Proper disassembly of welding machine</li> <li>• Equipment and welding accessories properly put away</li> <li>• Cleanliness of work area</li> </ul>   |

*For the competency as a whole:*

- Appropriate adjustment of intensity
- Appropriate work posture
- Appropriate use of methods for controlling thermal deformation
- Compliance with standards for classifying rods and materials
- Compliance with welding procedure
- Compliance with work methods
- Compliance with occupational health and safety rules

### **Suggestions for Competency-Related Knowledge and Know-How**

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The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

1. Plan the work.
  - Welding plans: types of assemblies, dimensions, symbols, etc.
  - Applicable standards and tolerances
  - Welding procedures: types of joints, base and filler metals, angles, bevels, diameters, welding positions, etc.
  - Choice of rods based on classification, welding position, type of material, the mechanical properties of the rods, type of assembly, thicknesses, etc.
  - Characteristics of welding in the horizontal position
  - Personal and collective protective gear: hard hat, glasses, mask, face shield, gloves, welder's jacket, screen, fume collector, etc.
2. Prepare the plates and structural shapes.
  - Use of a bevelling machine, a rail-mounted torch and a grinder
  - Bevel angle based on the welding process
  - Cleaning of plates and removal of carbon deposits
  - Types of assemblies: butt-to-butt, butt-to-butt with back plate, surfacing and T-joint
3. Prepare the welding machine.
  - Welding accessories: wire brushes, flux hammers, etc.
  - Electric arc welding machine with covered rods (SMAW): welding cables, ground clamps, electrode holder, etc.
  - Assembly of machine based on polarities
  - Replacement of welding lead connectors or clamps and use of heat shrinkable tubing
4. Tack weld in the horizontal position.
  - Sequence of tack welds based on the material's metallurgical properties, type of assembly, thicknesses, etc.
  - Tacking techniques: striking the arc, arc length, electrode angle, etc.
  - Adjustment of intensity based on thickness, electrode type and diameter, etc.
  - Tack weld defects: porosity, lack of fusion, slag inclusion

5. Make welding passes in the horizontal position.
  - Determination of welding sequence for plates and structural shapes based on type of assembly, bead size and depths
  - Welding techniques based on position, electrode angle, arc length, travel speed, etc.
  - Weld defects: lack of fusion, porosity, undercuts, slag inclusion, excessive buildup, shallowness, irregular grade lines, dimensions, etc.
  
6. Finish the job.
  - Importance of disassembling the machine, putting things away and cleaning up the work area



Competency 11      Duration 45 hours      Credits 3

***Behavioural Competency***

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**Statement of the competency**

Install and remove joists and decking.

**Achievement Context**

- Working as part of a team
- Given plans and instructions
- Given standards
- Using tools: measuring instruments, hand and power tools, assembly and clamping tools, specialized tools, etc.
- Using welding equipment
- Using access, handling and lifting equipment
- Using joists, perimeter trim angles, bridging, steel decking, openings, etc.
- Using personal and collective protective gear

**Elements of the Competency**

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**Performance Criteria**

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- |                          |   |
|--------------------------|---|
| 1. Plan the work.        | <ul style="list-style-type: none"> <li>• Accurate interpretation of plans, standards and instructions</li> <li>• Proper determination of work methods</li> <li>• Appropriate choice of tools and equipment</li> </ul>   |
| 2. Help set up the site. | <ul style="list-style-type: none"> <li>• Proper preparation of tools and equipment</li> <li>• Proper establishment of safety perimeters</li> <li>• Appropriate reception and placement of equipment</li> </ul>  |
| 3. Install the beams.    | <ul style="list-style-type: none"> <li>• Appropriate arrangement of packs of joists on the structure</li> <li>• Correct positioning of joists, bridging, perimeter trim angles and openings</li> <li>• Compliance with joist assembly sequence</li> <li>• Compliance with requirements regarding the length of the bolts</li> <li>• Compliance with tightening sequence and torque</li> <li>• Proper welding of Nelson studs</li> </ul> |
| 4. Install the decking.  | <ul style="list-style-type: none"> <li>• Appropriate installation of safety devices for decking</li> <li>• Accurate location of starting point</li> <li>• Appropriate arrangement of packs of decking sheets on the structure</li> <li>• Proper cutting of decking sheets</li> <li>• Proper positioning and alignment of decking sheets</li> </ul>  |

- Compliance with temporary fastening requirements
  - Proper mechanical assembly or welding of decking sheets
  - Accurate cutting of openings
  - Proper removal of safety devices for decking
5. Remove the decking.
- Appropriate stabilization of steel structure
  - Appropriate fastening of safety devices for decking
  - Cutting or removal of assembly elements in compliance with requirements
  - Methodical removal of decking sheets
  - Compliance with procedure and decking disassembly sequence
  - Proper removal of safety devices for decking
6. Remove the joists.
- Appropriate installation of safety devices
  - Removal of assembly elements in compliance with requirements
  - Methodical removal of joists
  - Compliance with procedure and joists removal sequence
  - Proper removal of safety devices
7. Help take down the site.
- Proper storage of tools and equipment
  - Proper removal of safety perimeters
  - Proper cleanup of work area

*For the competency as a whole:*

- Appropriate use of safety devices and fall protection
- Appropriate choice and execution of handling and lifting techniques
- Appropriate use of tools and equipment
- Effective coordination of work with other team members
- Compliance with standards, plans and instructions
- Compliance with disassembly plan and load requirements
- Compliance with occupational health and safety rules

### Suggestions for Competency-Related Knowledge and Know-How

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The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

1. Plan the work.
  - Intermediate joist and tie-joist
  - Components of a joist: chords, seats, vertical and diagonal lattices
  - Types of decking: roof, floor, acoustic, composite, etc.
  - Interpretation of plans (see Competency 3)
  - Standards: *Safety Code for the Construction Industry* and Canadian Institute of Steel Construction
  - Specific instructions for the construction site in question
  - Determination of work methods based on the configuration of the location, priorities, availability of tools and materials, etc.
  - Choice of measuring instruments, hand and power tools, assembly and tightening tools, and access, handling and lifting equipment based on work method and type of structure
2. Help set up the site.
  - Preparation of tools and equipment (see competencies 4, 5, 6, 7 and 8)
  - Establishment of safety perimeters (see competencies 2, 7 and 8)
  - Inspection, handling and placement of equipment in the work area based on construction requirements, priorities and the progress of the work
3. Install the beams.
  - Arrangement of packs of joists on the structure: reduced handling and safety requirements
  - Function of bridging and perimeter trim angles
  - Types of openings: drain, access, chimney, etc.
  - Assembly sequence of intermediate and tie-joists
  - Requirements concerning the length of bolts and application of tightening sequence and torque (see Competency 5)
  - Role of studs in concrete slabs
  - Stud welding (see Competency 6)
4. Install the decking.
  - Installation and removal of safety devices for decking: horizontal lifeline with automatic recall, double retractable lifeline, personal lifeline with automatic recall, etc.
  - Location of starting point and squareness
  - Arrangement of packs of decking sheets on structure: reduced handling and safety requirements
  - Cutting of decking sheets (see Competency 4)
  - Temporary fastening of decking sheets and weather safety requirements
  - Mechanical assembly or welding of decking sheets (see competencies 5, 6, 7, 8 and 10)
5. Remove the decking.
  - Installation and removal of safety devices for decking (see preceding item)
  - Cutting of decking and fastening of safety devices
  - Cutting or removal of assembly elements (see competencies 4 and 5)
  - Disposal of decking sheets
  - Safe removal procedure and sequence in reverse order of installation

6. Remove the joists.
  - Methods of stabilizing the steel structure and safety requirements
  - Installation and removal of safety devices: cable systems, minimum cable diameter, arrangement of posts, number of cable clips, cable height, etc.
  - Removal of assembly elements (see Competency 5)
  - Reuse or disposal of removed joist
  - Sequence of operations based on the disassembly plan
  
7. Help take down the site.
  - Importance of putting things away and cleaning up the work area

Competency 12      Duration 75 hours      Credits 5

***Behavioural Competency***

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**Statement of the Competency**

Weld in the vertical position using shielded metal arc welding (SMAW) and covered rods.

**Achievement Context**

- Working on steel plates and structural shapes
- Given a plan, a welding procedure and Canadian Welding Bureau standards
- Using an electric arc welding machine, covered rods and welding accessories
- Using a bevelling machine, a rail-mounted torch and a grinder
- Using personal and collective protective gear

**Elements of the Competency**

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**Performance Criteria**

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- |  |  |
|--|--|
| 1. Plan the work.                                | <ul style="list-style-type: none"> <li>• Accurate interpretation of plan, standards and welding procedure</li> <li>• Appropriate choice of rods</li> <li>• Proper use of personal and collective protective gear</li> </ul>  |
| 2. Prepare the plates and structural shapes.     | <ul style="list-style-type: none"> <li>• Bevelling of plates and structural shapes in compliance with requirements</li> <li>• Positioning of plates and structural shapes based on type of assembly and welding position</li> </ul>  |
| 3. Prepare the welding machine.                  | <ul style="list-style-type: none"> <li>• Appropriate inspection of equipment and accessories</li> <li>• Proper replacement of damaged cables and accessories</li> <li>• Proper assembly of welding machine</li> </ul>  |
| 4. Tack weld in the vertical position.           | <ul style="list-style-type: none"> <li>• Appropriate use of tacking techniques</li> <li>• Proper and thorough inspection of tack welds</li> <li>• Welding in compliance with standards</li> </ul>  |
| 5. Make welding passes in the vertical position. | <ul style="list-style-type: none"> <li>• Proper determination of welding sequence</li> <li>• Appropriate use of welding techniques</li> <li>• Appropriate welding in the vertical up and vertical down positions</li> <li>• Proper cleaning of joints between passes</li> <li>• Proper and thorough inspection of weld beads</li> <li>• Weld beads in compliance with standards</li> </ul> |

6. Finish the job.
  - Proper disassembly of welding machine
  - Equipment and welding accessories properly put away
  - Cleanliness of work area

*For the competency as a whole:*

- Appropriate adjustment of intensity
- Appropriate work posture
- Appropriate use of methods for controlling thermal deformation
- Compliance with standards for classifying rods and materials
- Compliance with welding procedure
- Compliance with work methods
- Compliance with occupational health and safety rules

### **Suggestions for Competency-Related Knowledge and Know-How**

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The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

1. Plan the work.
  - Welding plans: types of assemblies, dimensions, symbols, etc.
  - Applicable standards and tolerances
  - Welding procedures: types of joints, base and filler metals, angles, bevels, diameters, welding positions, etc.
  - Choice of rods based on classification, welding position, type of material, the mechanical properties of the rods, type of assembly, thicknesses, etc.
  - Characteristics of welding in the vertical position
  - Personal and collective protective gear: hard hat, glasses, mask, face shield, gloves, welder's jacket, screen, fume collector, etc.
2. Prepare the plates and structural shapes.
  - Use of a bevelling machine, a rail-mounted torch and a grinder
  - Bevel angle based on the welding process
  - Cleaning of plates and removal of carbon deposits
  - Types of assemblies: butt-to-butt-, butt-to-butt with backplate, surfacing and T-joint
3. Prepare the welding machine.
  - Welding accessories: wire brushes, flux hammers, etc.
  - SMAW welding machine: welding cables, ground clamps, electrode holder, etc.
  - Assembly of machine based on polarity
  - Replacement of welding lead connectors or clamps and use of heat shrinkable tubing

4. Tack weld in the vertical position.
  - Sequence of tack welds based on the material's metallurgical properties, type of assembly, thicknesses, etc.
  - Tacking techniques: striking the arc, arc length, electrode angle, etc.
  - Adjustment of intensity based on thickness, electrode type and diameter, etc.
  - Tack weld defects: porosity, lack of fusion and slag inclusion
  
5. Make welding passes in the vertical position.
  - Determination of welding sequence for plates and structural shapes based on type of assembly, bead size and depths
  - Characteristics of passes in the vertical up and down positions
  - Welding techniques based on position, electrode angle, arc length, travel speed, vertical up or down weld, etc.
  - Weld defects: lack of fusion, porosity, undercuts, slag inclusion, excessive buildup, shallowness, irregular grade lines, dimensions, etc.
  
6. Finish the job.
  - Importance of disassembling the machine, putting things away and cleaning up the work area



Competency 13      Duration 45 hours      Credits 3

***Behavioural Competency***

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**Statement of the Competency**

Install and remove prefabricated components.

**Achievement Context**

- Working as part of a team
- Given plans and instructions
- Given standards
- Using tools: measuring and marking-out instruments, hand and power tools, assembly and clamping tools, specialized tools, etc.
- Using welding equipment
- Using access, handling and lifting equipment
- Using structural or architectural prefabricated concrete, metal or composite components: architectural panels, hollow-core slabs, bridge girders, parking structures, noise barriers, etc.
- Using personal and collective protective gear

**Elements of the Competency**

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**Performance Criteria**

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- |  |  |
|--|--|
| 1. Plan the work.                        | <ul style="list-style-type: none"> <li>• Accurate interpretation of plans, standards and instructions</li> <li>• Proper determination of work methods</li> <li>• Appropriate choice of tools and equipment</li> <li>• Proper determination of sequence of operations</li> </ul>  |
| 2. Help set up the site.                 | <ul style="list-style-type: none"> <li>• Proper preparation of tools and equipment</li> <li>• Proper establishment of safety perimeters</li> <li>• Appropriate reception and placement of equipment</li> </ul>   |
| 3. Prepare the base for the components.  | <ul style="list-style-type: none"> <li>• Appropriate installation of safety devices</li> <li>• Accurate establishment of elevations</li> <li>• Choice of shim thickness based on the elevations required</li> <li>• Proper arrangement of shims</li> <li>• Proper mechanical assembly or welding of fasteners</li> </ul> |
| 4. Install the prefabricated components. | <ul style="list-style-type: none"> <li>• Precise positioning of components</li> <li>• Proper mechanical assembly, welding or anchoring of components</li> <li>• Proper removal of safety devices</li> </ul>  |

5. Remove the prefabricated components.
  - Appropriate stabilization of structure
  - Appropriate fastening of safety devices
  - Cutting or removal of assembly elements in compliance with requirements
  - Compliance with procedure and component removal sequence
  - Compliance with disassembly plan and load requirements
  - Proper removal of safety devices
  
6. Help take down the site.
  - Proper storage of tools and equipment
  - Proper removal of safety perimeters
  - Proper cleanup of work area

*For the competency as a whole:*

- Appropriate use of safety devices and fall protection
- Accurate establishment of reference lines
- Appropriate choice and execution of handling and lifting operations involving two pieces of lifting equipment
- Appropriate use of tools and equipment
- Effective coordination of work with other team members
- Compliance with standards, plans and instructions
- Compliance with occupational health and safety rules

### **Suggestions for Competency-Related Knowledge and Know-How**

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The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

1. Plan the work.
  - Using structural or architectural prefabricated concrete, metal or composite components: architectural panels, hollow-core slabs, bridge girders, parking structures, noise barriers, etc.
  - Interpretation of plans (see Competency 3)
  - Standards: *Safety Code for the Construction Industry* and Canadian Institute of Steel Construction
  - Specific instructions for the construction site in question
  - Determination of work methods based on the configuration of the location, priorities, availability of tools and materials, etc.
  - Choice of measuring and marking-out instruments, hand and power tools, assembly and tightening tools, and access, handling and lifting equipment based on work method and type of structure

2. Help set up the site.
  - Preparation of tools and equipment (see competencies 4, 5, 6, 7, 8 and 10)
  - Establishment of safety perimeters (see competencies 2, 7 and 8)
  - Inspection, handling and placement of equipment in the work area based on construction requirements, priorities and the progress of the work
3. Prepare the base for the components.
  - Installation of safety devices: cable systems, minimum cable diameter, arrangement of posts, number of cable slips, cable height, etc.
  - Establishment of elevations and arrangement of shims (see Competency 3)
  - Fasteners specific to prefabricated components
  - Mechanical assembly or welding of fasteners (see competencies 5, 6 and 10)
4. Install the prefabricated components.
  - Marking out of reference points and positioning of components (see Competency 3)
  - Assembly sequence and temporary stabilization
  - Mechanical assembly, welding or anchoring of components (see competencies 5, 6 and 10)
5. Remove the prefabricated components.
  - Stabilization of structure using guy wires
  - Installation and removal of safety devices: cable systems, minimum cable diameter, arrangement of posts, number of cable clips, cable height, etc.
  - Cutting or removal of assembly elements (see competencies 4 and 5)
  - Importance of disassembly plan, removal procedure and sequence and load requirements for occupational health and safety
6. Help take down the site.
  - Importance of putting things away and cleaning up the work area



Competency 14      Duration 75      hours      Credits 5

## ***Behavioural Competency***

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### **Statement of the Competency**

Modify structural elements.

### **Achievement Context**

- Given plans, shop drawings, instructions and work permits
- Given standards
- Using tools: measuring and marking-out instruments, hand and power tools, assembly and clamping tools, specialized tools, etc.
- Using welding equipment
- Using access, handling and lifting equipment
- Using structural elements of buildings or civil engineering works, connectors or supports
- Using personal and collective protective gear

### **Elements of the Competency**

### **Performance Criteria**

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. Plan the work.</li> </ol>                           | <ul style="list-style-type: none"> <li>• Accurate interpretation of plans, shop drawings, standards, instructions and work permits</li> <li>• Proper determination of work methods</li> <li>• Appropriate choice of tools and equipment</li> <li>• Proper determination of sequence of operations</li> </ul>  |
| <ol style="list-style-type: none"> <li>2. Help set up the site.</li> </ol>                    | <ul style="list-style-type: none"> <li>• Proper preparation of tools and equipment</li> <li>• Proper establishment of safety perimeters</li> <li>• Appropriate reception and placement of equipment</li> </ul>  |
| <ol style="list-style-type: none"> <li>3. Perform the necessary disassembly tasks.</li> </ol> | <ul style="list-style-type: none"> <li>• Appropriate fastening of safety devices</li> <li>• Proper installation of supports or guy wires</li> <li>• Proper removal of components by unbolting, cutting or gouging</li> <li>• Orderly performance of work</li> <li>• Appropriate arrangement of disassembled components</li> <li>• Compliance with disassembly plan and load requirements</li> </ul> |
| <ol style="list-style-type: none"> <li>4. Make the modifications.</li> </ol>                  | <ul style="list-style-type: none"> <li>• Proper adaptation or preparation of bases</li> <li>• Appropriate adaptation or installation of structural elements, connectors or supports</li> <li>• Proper mechanical assembly, welding or anchoring of components</li> <li>• Modifications in compliance with requirements</li> <li>• Proper removal of safety devices</li> </ul>                       |

5. Help take down the site.
  - Proper storage of tools and equipment
  - Proper removal of safety perimeters
  - Proper cleanup of work area

*For the competency as a whole:*

- Appropriate use of safety devices and fall protection
- Appropriate choice and execution of handling and lifting techniques
- Appropriate use of tools and equipment
- Effective coordination of work with other team members
- Absence of damage to adjacent elements
- Compliance with standards, plans, instructions and work permits
- Compliance with occupational health and safety rules

### **Suggestions for Competency-Related Knowledge and Know-How**

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The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

1. Plan the work.
  - Types of modifications: expansion, reinforcement, change in elevation, etc.
  - Interpretation of plans (see Competency 3)
  - Shop drawings for the parts to be added or modified
  - Standards: *Safety Code for the Construction Industry* and Canadian Institute of Steel Construction
  - Specific instructions for the construction site in question
  - Types of work permits: general, hot work, confined space, etc.
  - Determination of work methods based on the configuration of the location, priorities, availability of tools and materials, etc.
  - Choice of measuring and marking-out instruments, hand and power tools, assembly and tightening tools, and access, handling and lifting equipment based on work method and type of structural element
2. Help set up the site.
  - Preparation of tools and equipment (see competencies 4, 5, 6, 7, 8, 10 and 12)
  - Establishment of safety perimeters (see competencies 2, 7 and 8)
  - Inspection, handling and placement of equipment in the work area based on construction requirements, priorities and the progress of the work
3. Perform the necessary disassembly tasks.
  - Cable systems or other safety devices
  - Supports and guy wires and safety requirements
  - Use of bolting, cutting or gouging tools (see competencies 4 and 5)
  - Use of lifting equipment for disassembly purposes

- Sequence of operations based on type of modifications, disassembly plan and load requirements
  - Reuse or disposal of disassembled components
4. Make the modifications.
- Adaptation or preparation of bases: establishment of levels and installation of shims, if applicable (see Competency 3)
  - Adaptation or installation of structural elements, connectors or supports: change in location, addition of a component, etc.
  - Mechanical assembly, welding or anchoring of components (see competencies 4, 5, 6, 10 and 12)
5. Help take down the site.
- Importance of putting things away and cleaning up the work area



Competency 15      Duration 60 hours      Credits 4

## ***Behavioural Competency***

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### **Statement of the Competency**

Install ornamental coverings.

### **Achievement Context**

- Given plans and instructions
- Using tools: measuring instruments, hand and power tools, clamping tools, etc.
- Using welding equipment
- Using handling and lifting equipment
- Using coverings: corner guards, kickplates, backsplashes, supports, etc.
- Using personal and collective protective gear

### **Elements of the Competency**

### **Performance Criteria**

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- |                                   |  |
|-----------------------------------|--|
| 1. Plan the work.                 | <ul style="list-style-type: none"> <li>• Accurate interpretation of plans and instructions</li> <li>• Proper determination of work methods</li> <li>• Appropriate choice of tools and equipment</li> </ul>                       |
| 2. Help set up the site.          | <ul style="list-style-type: none"> <li>• Proper preparation of tools and equipment</li> <li>• Proper establishment of safety perimeters</li> <li>• Appropriate reception and placement of equipment</li> </ul>                   |
| 3. Prepare the covering elements. | <ul style="list-style-type: none"> <li>• Accurate determination of dimensions of surfaces to be covered</li> <li>• Precise marking out and cutting of covering elements</li> </ul>   |
| 4. Prepare the installation.      | <ul style="list-style-type: none"> <li>• Accurate establishment of elevations</li> <li>• Proper and solid installation of anchors</li> </ul>   |
| 5. Install the covering elements. | <ul style="list-style-type: none"> <li>• Proper mechanical assembly or welding of elements</li> <li>• Solid installation</li> <li>• Compliance with tolerances</li> <li>• Appropriate protection of adjacent surfaces</li> </ul> |
| 6. Finish the job.                | <ul style="list-style-type: none"> <li>• Uniform polishing of covering elements</li> <li>• Identification of all defects</li> <li>• Proper correction of defects</li> </ul>  |
| 7. Help take down the site.       | <ul style="list-style-type: none"> <li>• Proper storage of tools and equipment</li> <li>• Proper removal of safety perimeters</li> <li>• Proper cleanup of work area</li> </ul>  |

*For the competency as a whole:*

- Appropriate choice and execution of handling and lifting techniques
- Appropriate use of tools and equipment
- Effective coordination of work with other team members
- Absence of damage to adjacent elements
- Attractive appearance
- Compliance with plans and instructions
- Compliance with occupational health and safety rules

### **Suggestions for Competency-Related Knowledge and Know-How**

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The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

1. Plan the work.
  - Using ornamental coverings: corner guards, kickplates, backsplashes, supports, etc.
  - Types of materials used for decorative coverings: stainless steel, aluminum, galvanized steel, etc.
  - Interpretation of plans (see Competency 3)
  - Specific instructions for the construction site in question
  - Determination of work methods based on the configuration of the location, priorities, availability of tools and materials, etc.
  - Choice of measuring and marking-out instruments, hand and power tools, assembly and tightening tools, and access, handling and lifting equipment based on work method and type of covering
2. Help set up the site.
  - Preparation of tools and equipment (see competencies 4, 5, 6, 8, 10 and 12)
  - Establishment of safety perimeters (see competencies 2 and 8)
  - Inspection, handling and placement of equipment in the work area based on construction requirements, priorities and the progress of the work
3. Prepare the covering elements.
  - Measurement of surfaces to be covered
  - Use of marking-out and cutting tools (see competencies 3 and 4)
4. Prepare the installation.
  - Establishment of elevations (see Competency 3)
  - Installation of anchors (see Competency 5)
5. Install the covering elements.
  - Mechanical assembly or welding of elements (see competencies 5, 6, 10 and 12)
  - Importance of tolerances and protecting adjacent surfaces
  - Other installation method: tungsten inert gas shielded arc welding

6. Finish the job.
  - Use of a grinder, polishing pastes and disks, cleaning products, etc.
  - Importance of finishing work and attractive appearance for users
7. Help take down the site.
  - Importance of putting things away and cleaning up the work area



Competency 16      Duration 60 hours      Credits 4

***Behavioural Competency***

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**Statement of the Competency**

Weld in the overhead position with shielded metal arc welding (SMAW) and covered rods.

**Achievement Context**

- Working on steel plates and structural shapes
- Given a plan, a welding procedure and Canadian Welding Bureau standards
- Using an electric arc welding machine, covered rods and welding accessories
- Using a bevelling machine, a rail-mounted torch and a grinder
- Using personal and collective protective gear

**Elements of the Competency**

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**Performance Criteria**

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- |  |  |
|--|--|
| 1. Plan the work.                                | <ul style="list-style-type: none"> <li>• Accurate interpretation of plan, standards and welding procedure</li> <li>• Appropriate choice of rods</li> <li>• Proper use of personal and collective protective gear</li> </ul>  |
| 2. Prepare the plates and structural shapes.     | <ul style="list-style-type: none"> <li>• Bevelling of plates and structural shapes in compliance with requirements</li> <li>• Positioning of plates and structural shapes based on type of assembly and welding position</li> </ul>  |
| 3. Prepare the welding machine.                  | <ul style="list-style-type: none"> <li>• Appropriate inspection of equipment and accessories</li> <li>• Proper replacement of damaged cables and accessories</li> <li>• Proper assembly of welding machine</li> </ul>  |
| 4. Tack weld in the overhead position.           | <ul style="list-style-type: none"> <li>• Appropriate use of tacking techniques</li> <li>• Proper and thorough inspection of tack welds</li> <li>• Welding in compliance with standards</li> </ul>  |
| 5. Make welding passes in the overhead position. | <ul style="list-style-type: none"> <li>• Proper determination of welding sequence</li> <li>• Appropriate use of welding techniques</li> <li>• Proper cleaning of joints between passes</li> <li>• Proper and thorough inspection of weld beads</li> <li>• Weld beads in compliance with standards</li> </ul> |
| 6. Finish the job.                               | <ul style="list-style-type: none"> <li>• Proper disassembly of welding machine</li> <li>• Equipment and welding accessories properly put away</li> <li>• Cleanliness of work area</li> </ul>   |

*For the competency as a whole:*

- Appropriate adjustment of intensity
- Appropriate work posture
- Appropriate use of methods for controlling thermal deformation
- Compliance with standards for classifying rods and materials
- Compliance with welding procedure
- Compliance with work methods
- Compliance with occupational health and safety rules

### **Suggestions for Competency-Related Knowledge and Know-How**

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The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

1. Plan the work.
  - Welding plans: types of assemblies, dimensions, symbols, etc.
  - Applicable standards and tolerances
  - Welding procedures: types of joints, base and filler metals, angles, bevels, diameters, welding positions, etc.
  - Choice of rods based on classification, welding position, type of material, the mechanical properties of the rods, type of assembly, thicknesses, etc.
  - Characteristics of welding in the overhead position
  - Personal and collective protective gear: hard hat, glasses, mask, visor, gloves, welder's jacket, screen, fume collector, etc.
2. Prepare the plates and structural shapes.
  - Use of a bevelling machine, a rail-mounted torch and a grinder
  - Bevel angle based on the welding process
  - Cleaning of plates and removal of carbon deposits
  - Types of assemblies: butt-to-butt, butt-to-butt with backplate, surfacing and T-joint
3. Prepare the welding machine.
  - Welding accessories: wire brushes, slag hammers, etc.
  - Welding machine: welding cables, ground clamps, electrode holder, etc.
  - Assembly of machine based on polarity
  - Replacement of welding lead connectors or clamps and use of heat shrinkable tubing
4. Tack weld in the overhead position.
  - Sequence of tack welds based on the material's metallurgical properties, type of assembly, thicknesses, etc.
  - Tacking techniques: striking the arc, arc length, electrode angle, etc.
  - Adjustment of intensity based on thickness, electrode type and diameter, etc.
  - Tack weld defects: porosity, lack of fusion, slag inclusion

5. Make welding passes in the overhead position.
  - Determination of welding sequence for plates and structural shapes based on type of assembly, bead size and depths
  - Welding techniques based on position, electrode angle, arc length, travel speed, etc.
  - Weld defects: lack of fusion, porosity, undercuts, slag inclusion, excessive buildup, shallowness, irregular grade lines, dimensions, etc.
  
6. Finish the job.
  - Importance of disassembling the machine, putting things away and cleaning up the work area



Competency 17      Duration 75 hours      Credits 5

***Behavioural Competency***

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**Statement of the Competency**

Assemble and install mezzanines and accesses.

**Achievement Context**

- Working as part of a team
- Given plans and instructions
- Given standards
- Using tools: measuring and marking-out instruments, hand and power tools, assembly and clamping tools, etc.
- Using welding equipment
- Using access, handling and lifting equipment
- Given sections, structural shapes, covering sheets, railings and a ladder
- Using personal and collective protective gear

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

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- |   |   |
|---|---|
| 1. Plan the work.                               | <ul style="list-style-type: none"> <li>• Accurate interpretation of plans, instructions and mezzanine standards</li> <li>• Proper determination of work methods</li> <li>• Appropriate choice of tools and equipment</li> <li>• Proper determination of sequence of operations</li> </ul> |
| 2. Help set up the site.                        | <ul style="list-style-type: none"> <li>• Proper preparation of tools and equipment</li> <li>• Proper establishment of safety perimeters</li> <li>• Appropriate reception and placement of equipment</li> </ul>  |
| 3. Prepare the installation.                    | <ul style="list-style-type: none"> <li>• Accurate establishment of elevations</li> <li>• Proper and solid fastening of anchors</li> </ul>   |
| 4. Assemble and install the mezzanine elements. | <ul style="list-style-type: none"> <li>• Precise positioning of sections, structural shapes, knee braces and covering sheets</li> <li>• Precise squaring of mezzanine</li> <li>• Proper mechanical assembly or welding of elements</li> </ul>   |
| 5. Install a ladder.                            | <ul style="list-style-type: none"> <li>• Precise positioning of ladder</li> <li>• Proper mechanical assembly or welding of ladder in place</li> </ul>   |
| 6. Install the railing.                         | <ul style="list-style-type: none"> <li>• Precise levelling and positioning of railing</li> <li>• Precise cutting and assembly of railing</li> <li>• Proper mechanical assembly or welding of railing in place</li> <li>• Precise welding of railing connectors</li> </ul>                 |

7. Finish the job.
  - Uniform grinding of connectors
  - Identification of all defects
  - Proper correction of defects
  - Proper application of necessary protective coating
  
8. Help take down the site.
  - Proper storage of tools and equipment
  - Proper removal of safety perimeters
  - Proper cleanup of work area

*For the competency as a whole:*

- Appropriate use of fall protection devices
- Appropriate choice and execution of handling and lifting techniques
- Appropriate use of tools and equipment
- Effective coordination of work with other team members
- Compliance with standards, plans and instructions
- Compliance with assembly sequence
- Compliance with occupational health and safety rules

### **Suggestions for Competency-Related Knowledge and Know-How**

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The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

1. Plan the work.
  - Mezzanines: suspended, structural, cantilever, etc.
  - Ladders with or without cages
  - Interpretation of plans (see Competency 3)
  - Standards: *Building Code, Safety Code for the Construction Industry, etc.*
  - Specific instructions for the construction site in question
  - Determination of work methods based on the configuration of the location, priorities, availability of tools and materials, etc.
  - Choice of measuring and marking-out instruments, hand and power tools, assembly and tightening tools, and access, handling and lifting equipment based on work method and type of mezzanine or access
  
2. Help set up the site.
  - Preparation of tools and equipment (see competencies 4, 5, 6, 7, 8, 10, 12 and 16)
  - Establishment of safety perimeters (see competencies 2, 7 and 8)
  - Inspection, handling and placement of equipment in the work area based on construction requirements, priorities and the progress of the work

3. Prepare the installation.
  - Establishment of elevations (see Competency 3)
  - Installation of anchors (see Competency 5)
4. Assemble and install the mezzanine elements.
  - Positioning of sections, structural shapes, knee braces and covering sheets based on the plan
  - Squaring of mezzanine and use of level, tape measure, etc.
  - Proper assembly or welding of elements (see competencies 5, 6, 12 and 16)
5. Install a ladder.
  - Positioning of ladder and use of level, tape measure, etc.
  - Mechanical assembly or welding of ladder in place (see competencies 5, 6, 10, 12 and 16)
6. Install the railing.
  - Positioning of railing and use of level, tape measure, etc.
  - Cutting of connectors (see Competency 4)
  - Gap-free connection of railing
  - Mechanical assembly or welding of railing in place (see competencies 5, 6, 12 and 16)
  - Welding of railing connectors (see competencies 6, 12 and 16)
7. Finish the job.
  - Use of a grinder, cleaning products, etc.
  - Types of protective coatings: primer, standard or specialized paint, etc.
  - Importance of finishing work and appearance for users
8. Help take down the site.
  - Importance of putting things away and cleaning up the work area



Competency 18      Duration 90      hours      Credits 6

## ***Behavioural Competency***

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### **Statement of the Competency**

Assemble and install stairs.

### **Achievement Context**

- Working as part of a team
- Given plans and instructions
- Given standards and codes
- Using tools: measuring and marking-out instruments, hand and power tools, assembly and clamping tools, etc.
- Using welding equipment
- Using access, handling and lifting equipment
- Using steel shapes, stringers, steps, risers, landing sheets, handrails and railings
- Using personal and collective protective gear

### **Elements of the Competency**

### **Performance Criteria**

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- |  |  |
|--|--|
| 1. Plan the work.                            | <ul style="list-style-type: none"> <li>• Accurate interpretation of plans, instructions and stair standards</li> <li>• Proper determination of work methods</li> <li>• Appropriate choice of tools and equipment</li> <li>• Proper determination of sequence of operations</li> </ul>  |
| 2. Help set up the site.                     | <ul style="list-style-type: none"> <li>• Proper preparation of tools and equipment</li> <li>• Proper establishment of safety perimeters</li> <li>• Appropriate reception and placement of equipment</li> </ul>   |
| 3. Assemble and install the staircase frame. | <ul style="list-style-type: none"> <li>• Accurate calculation of position of steel shapes</li> <li>• Precise positioning of interior and exterior stringers and landing</li> <li>• Precise positioning of steps, risers and landing sheets</li> <li>• Precise squaring of staircase elements</li> <li>• Proper mechanical assembly or welding of elements</li> </ul> |
| 4. Install the railings and handrails.       | <ul style="list-style-type: none"> <li>• Precise levelling and positioning of railings and handrails</li> <li>• Precise cutting and assembly of railings and handrails</li> <li>• Proper mechanical assembly or welding of railings and handrails in place</li> <li>• Precise welding of railing and handrail connectors</li> </ul>                                  |

5. Finish the job.
  - Uniform grinding of connectors.
  - Identification of all defects
  - Proper correction of defects
  - Proper application of necessary protective coating
  
6. Help take down the site.
  - Proper storage of tools and equipment
  - Proper removal of safety perimeters
  - Proper cleanup of work area

*For the competency as a whole:*

- Appropriate use of fall protection devices
- Appropriate choice and execution of handling and lifting techniques
- Appropriate use of tools and equipment
- Effective coordination of work with other team members
- Compliance with standards, plans and instructions
- Compliance with assembly sequence
- Compliance with occupational health and safety rules

### **Suggestions for Competency-Related Knowledge and Know-How**

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The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

1. Plan the work.
  - Types of staircases: winding, straight, pre-assembled, disassembled, indoor, outdoor, etc.
  - Interpretation of plans (see Competency 3)
  - Standards: Building Code, Safety Code for the Construction Industry, etc.
  - Specific instructions for the construction site in question
  - Determination of work methods based on the configuration of the location, priorities, availability of tools and materials, etc.
  - Choice of measuring and marking-out instruments, hand and power tools, assembly and tightening tools, and access, handling and lifting equipment based on work method and type of mezzanine or access
  
2. Help set up the site.
  - Preparation of tools and equipment (see competencies 4, 5, 6, 7, 8, 12 and 16)
  - Establishment of safety perimeters (see competencies 2, 7 and 8)
  - Inspection, handling and placement of equipment in the work area based on construction requirements, priorities and the progress of the work

3. Assemble and install the staircase frame.
  - Marking out of reference points and calculation of position of steel shapes (see Competency 3)
  - Order of installation of interior and exterior stringers and landing
  - Order of installation of steps, risers and landing sheets
  - Squaring of staircase elements and use of level, tape measure, etc.
  - Mechanical assembly or welding of elements (see competencies 5, 6, 12 and 16)
4. Install the railings and handrails.
  - Positioning of railings and handrails and use of level, tape measure, etc.
  - Cutting of connectors (see Competency 4)
  - Gap-free assembly of railings and handrails
  - Mechanical assembly or welding of railings and handrails in place (see competencies 5, 6, 12 and 16)
  - Welding of railing and handrail connectors (see competencies 6, 12 and 16)
5. Finish the job.
  - Use of a grinder, cleaning products, etc.
  - Types of protective coatings: primer, standard or specialized paint, etc.
  - Importance of finishing work and appearance for users
6. Help take down the site.
  - Importance of putting things away and cleaning up the work area



Competency 19      Duration 60 hours      Credits 4

### ***Behavioural Competency***

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

Modify architectural elements.

#### **Achievement Context**

- Given plans, shop drawings, instructions and work permits
- Given standards
- Using tools: measuring and marking-out instruments, hand and power tools, assembly and clamping tools, specialized tools, etc.
- Using welding equipment
- Using access, handling and lifting equipment
- Using architectural elements, connectors or supports
- Using personal and collective protective gear

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

#### **Performance Criteria**

- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. Plan the work.</li> <li>2. Help set up the site.</li> <li>3. Perform the necessary disassembly tasks.</li> <li>4. Make the modifications.</li> </ol> | <ul style="list-style-type: none"> <li>• Accurate interpretation of plans, shop drawings, standards, instructions and work permits</li> <li>• Proper determination of work methods</li> <li>• Appropriate choice of tools and equipment</li> <li>• Proper preparation of tools and equipment</li> <li>• Proper establishment of safety perimeters</li> <li>• Appropriate reception and placement of equipment</li> <li>• Proper installation of temporary supports or guy wires</li> <li>• Proper removal of components by unbolting or cutting</li> <li>• Orderly performance of work</li> <li>• Appropriate arrangement of disassembled components</li> <li>• Appropriate adaptation or installation of architectural components, connectors (fasteners) or supports</li> <li>• Proper mechanical assembly, welding or anchoring of components</li> <li>• Modifications in compliance with requirements</li> </ul> |
|--|--|

5. Finish the job.
  - Uniform grinding or polishing of components
  - Identification of all defects
  - Proper correction of defects
  - Proper application of necessary protective coating
  
6. Help take down the site.
  - Proper storage of tools and equipment
  - Proper removal of safety perimeters
  - Proper cleanup of work area

*For the competency as a whole:*

- Appropriate use of fall protection devices
- Appropriate choice and execution of handling and lifting techniques
- Appropriate use of tools and equipment
- Effective coordination of work with other team members
- Absence of damage to adjacent elements
- Attractive appearance
- Compliance with standards, plans, instructions and work permits
- Compliance with occupational health and safety rules

### **Suggestions for Competency-Related Knowledge and Know-How**

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The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each element of the competency, along with their attendant guidelines.

1. Plan the work.
  - Types of modifications: expansion, reinforcement, change in elevation, refinishing, etc.
  - Interpretation of plans (see Competency 3)
  - Shop drawings for the parts to be added or modified
  - Standards: *Safety Code for the Construction Industry* and Canadian Institute of Steel Construction
  - Specific instructions for the construction site in question
  - Types of work permits: general, hot work, confined space, etc.
  - Determination of work methods based on the configuration of the location, priorities, availability of tools and materials, etc.
  - Choice of measuring and marking-out instruments, hand and power tools, assembly and tightening tools, and access, handling and lifting equipment based on work method and type of architectural element
  
2. Help set up the site.
  - Preparation of tools and equipment (see competencies 4, 5, 6, 7, 8, 10, 12 and 16)
  - Establishment of safety perimeters (see competencies 2, 7 and 8)
  - Inspection, handling and placement of equipment in the work area based on construction requirements, priorities and the progress of the work

3. Perform the necessary disassembly tasks.
  - Temporary supports and guy wires, safety requirements
  - Use of bolting and cutting tools (see competencies 4 and 5)
  - Use of lifting equipment for disassembly purposes
  - Sequence of operations based on type of modifications and load requirements
  - Reuse or disposal of disassembled components
4. Make the modifications.
  - Adaptation or installation of architectural elements, connectors or supports: change in location, addition or replacement of a component, etc.
  - Mechanical assembly, welding or anchoring of components (see competencies 4, 5, 6, 10, 12 and 16)
5. Finish the job.
  - Use of a grinder, polishing pastes and disks, cleaning products, etc.
  - Types of protective coatings: primer, standard or specialized paint, etc.
  - Importance of finishing work and appearance for users
6. Help take down the site.
  - Importance of putting things away and cleaning up the work area



Competency 20      Duration 15 hours      Credit 1

## ***Situational Competency***

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### **Statement of the Competency**

Become familiar with the organizations involved in the construction industry.

### **Elements of the Competency**

- Learn about the construction industry.
- Learn about the role of the bodies in the industry and their importance.
- Understand the reality of labour relations in the industry.

### **Learning Context**

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#### **Information Phase**

- Learning about the construction industry
- Learning about the roles and responsibilities of construction industry bodies (employer associations and unions, Commission de la construction du Québec, Commission des normes, de l'équité, de la santé et de la sécurité du travail, etc.)
- Learning about labour relations in the construction industry

#### **Participation Phase**

- Participating in activities allowing them to gain an understanding of:
  - the evolution of the construction industry and future prospects
  - the interdependence of the different trades and occupations
  - the effects of regulations on the work system in the industry
- Exploring the possibility of continuing training in the industry

#### **Synthesis Phase**

- Presenting a report that contains a summary of what they have learned and an assessment of the effect this learning has on their career choice

### **Instructional Guidelines**

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- Provide the necessary sources of information
- Make extensive use of learning situations that reflect the reality of the construction industry
- Foster discussions and encourage all students to participate
- Help students during the synthesis phase by providing them with tools such as a questionnaire

### **Participation Criteria**

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#### **Information Phase**

- Consult the sources of information made available to them

**Participation Phase**

- Participate in all the suggested activities and take them seriously

**Synthesis Phase**

- Present a report that contains a summary of what they have learned and an assessment of the effect this learning has on their career choice

**Suggestions for Competency-Related Knowledge and Know-How**

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The following is a summary of the knowledge, skills, strategies, attitudes and perceptions related to each phase of the learning context, along with their attendant guidelines.

**Information Phase**

- Characteristics and economic importance of the construction industry
- Roles and responsibilities of employer associations: Association de la construction du Québec, Association des constructeurs de routes et grands travaux du Québec, Association des entrepreneurs en construction du Québec, Association provinciale des constructeurs d'habitations du Québec, Corporation des maîtres électriciens du Québec, Corporation des maîtres mécaniciens en tuyauterie du Québec
- Roles and responsibilities of unions: Fédération des travailleurs et travailleuses du Québec, Conseil provincial du Québec des métiers de la construction, Centrale des syndicats démocratiques, Confédération des syndicats nationaux, Syndicat québécois de la construction
- Roles and responsibilities of the Tribunal administratif du travail: structure, constituent elements, functions and powers in the construction industry
- Roles and responsibilities of the Régie du bâtiment du Québec: structure, sections, functions and powers
- Roles and responsibilities of the Commission de la construction du Québec: structure, sections, functions and powers
- Roles and responsibilities of the Commission des normes, de l'équité, de la santé et de la sécurité du travail and the Association sectorielle paritaire: structures, constituent elements, functions and powers

**Participation and Synthesis Phases**

- Importance of sharing their point of view with colleagues: attitude with respect to differing points of view and usefulness in the practice of the trade
- Characteristics of trades and occupations and differences between them
- Characteristics of sectoral collective agreements and differences between them: residential, institutional and commercial, industrial, civil engineering and road works
- Law and regulations governing labour relations in the construction industry. Reasons for these laws and regulations and their impact on working conditions. *Act respecting labour relations, vocational training and workforce management in the construction industry (CQLR, c. R-20). Regulation respecting the vocational training of the workforce in the construction industry. Regulation respecting complementary social benefit plans in the construction industry*
- Benefits of training funds: Fonds de formation des travailleurs de l'industrie de la construction



