

Apprenticeship and Industry Training

Apprenticeship Curriculum Guide

Ironworker Metal Building Systems Erector



Apprenticeship
and Industry
Training

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Description of the Trade

Ironworkers (Metal Building Systems Erector) tradespeople fabricate, construct, and join scaffolding, structural steel buildings, bridges, ornamental ironworks, and pre-cast structures.

They erect structural steel components, install conveyors and robotic equipment, and sometimes perform reconstructive work on existing structures.

In general, Ironworker (Metal Building Systems Erector) tradespeople:

- interpret drawings and specifications to lay out the work;
- unload and stack steel units so each piece can be hoisted as required;
- erect and install scaffolding, construction cranes, derricks, and other hoisting equipment;
- assemble rigging (cables, pulleys, hooks) to move heavy equipment and materials;
- attach cables from a crane or derrick and direct crane operators with hand signals or radios;
- position steel units, align holes, and insert temporary bolts;
- check the alignments and join steel parts by bolting them; and
- assemble and erect pre-fabricated metal structures.

Apprenticeship Education Entrance Requirements

Apprenticeship education entrance requirements will **NOT** prevent an individual from registering into an apprentice education program as an apprentice; however, they will restrict that individual's ability to register for the classroom instruction portion of the training until those requirements have satisfied the education entrance requirement for that trade. The minimum education entrance requirements for the Ironworker (Metal Building Systems Erector) are:



- English 10-2 and Math 10-3
- OR a pass mark in all five Canadian General Educational Development (GED) tests or Canadian Adult Education Credential tests
- OR an Apprenticeship and Industry Training entrance examination.

To increase an individual's chances of success in classroom instruction for the Ironworker (Metal Building Systems Erector) Apprenticeship Education Program, successful completion of English 30-2, Math 30-3, Physics 20 OR Chemistry 20 OR Science 20 are recommended.

What to expect

Apprenticeship is a training program that combines on-the-job and in-classroom training for a specific profession designated as a trade.

It may be a new form or model of learning to some individuals, however, has been the cornerstone to large portions of Alberta's industry training and economy for almost a century.

In the process of progressing through an apprenticeship education program, the learner experiences both the theoretical and practical components of their chosen discipline and will be assessed in both the classroom and working environments.

The following apprenticeship pathway to certification infographic is a visual representation of what a learner can expect while progressing through the Ironworker Metal Building Systems Erector program.

Apprenticeship Pathway to Certification

Apply

Register (Pre-Apprenticeship)

- Choose a program.
- Meet the apprenticeship eligibility requirements.
- Complete the application and include any prior learning assessments.



Learn

Meet education entrance requirements or successfully complete the entrance exam.

- Continue as a sponsored or un-sponsored apprentice.
- Register for in-classroom instruction.

Sponsored Apprentices

Ironworker Metal Building Systems Erector Period 1

- Classroom Instruction: 180 hours
- Competence-based assessments
- On-the-job learning: 1620 hours (sponsored)

Ironworker Metal Building Systems Erector Period 2

- Classroom Instruction: 180 hours
- Competence-based assessments
- On-the-job learning: 1620 hours (sponsored)

Un-sponsored Apprentices

NOTE: Un-sponsored apprentices must find a Sponsor and complete an Apprenticeship Education Agreement to complete the requirements of an Apprenticeship Education Program.

Ironworker Metal Building Systems Erector Period 1

- Classroom Instruction: 180 hours
- Competence-based assessments

Ironworker Metal Building Systems Erector Period 2

- Classroom Instruction: 180 hours
- Competence-based assessments

Earn

Certification (sponsored apprentice)

- Post Secondary Education Credential
- Journeyman Certificate



Core Competences

The foundation of an apprenticeship education program is defined by its core competences. These competences are what the training will focus on as the learner progresses through the Ironworker (Metal Building Systems Erector) Apprenticeship Education Program.

A core competence is an observable skill that is demonstrated by the learner. Competences are identified by industry subject matter experts and cover the job-related tasks and activities that an Ironworker (Metal Building Systems Erector) will be required to perform in the course of their employment.

Determining Success

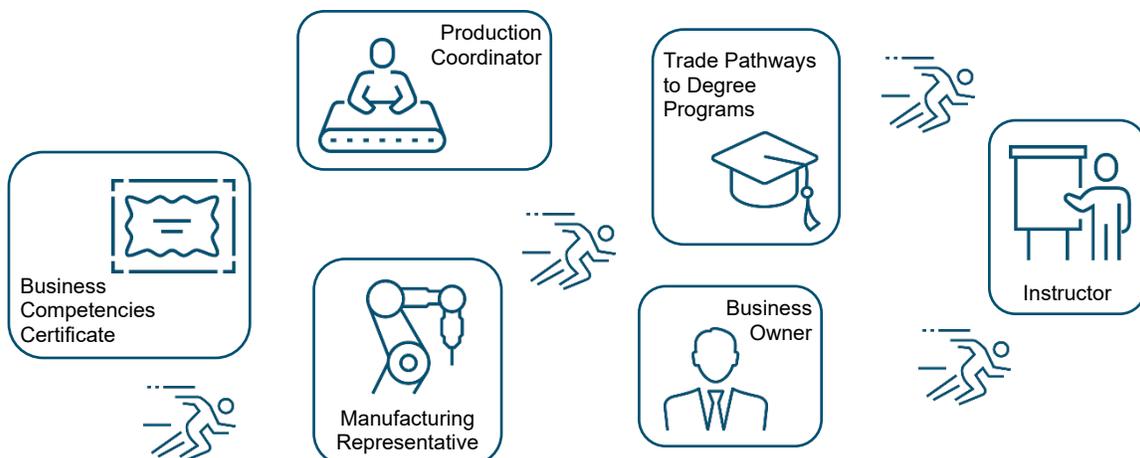
Grades for the theory component of classroom instruction are calculated and based on a cumulative weighted average. To complete a period of classroom instruction successfully, an apprentice must achieve a minimum cumulative weighted average of 65% across all sections in the classroom instruction component of their apprenticeship education program with no grades below 50% in any one section.

Lab and shop components are calculated as a cumulative weighted average requiring a minimum of 65% with a minimum grade of 65% in each section.

Thriving

Successful completion of the Ironworker (Metal Building Systems Erector) Apprenticeship Education Program is an accomplishment that should be celebrated and can continue to be a successful provider and career choice for a lifetime.

It can also become a useful lever that opens doors leading to future career choice enhancers and/or create alternate professions pathways. This may include some of the following:



Defined Learning

Core competence (Major category)

The section introduction paragraph outlines the intent of the skill set listed below and how it connects to other skill sets such as competency groups and competency levels in the case of a multi-period group (i.e., Electrical I, Electrical II).

The major category is the grouping of work-related tasks that combine to form an identifiable portion of the trade.

Competence statement

This statement is a core competence as identified by industry. It is followed by the **weighting**, which provides and supports a guideline for instructional focus and assessment structure.



NOTE: Competence Statements will be identified by this symbol.

Weighting %

Each competence is assigned a weighting (in percent) by industry to reflect the amount of available time that is dedicated to it, on average, in the learning environment. This percentage is then converted to hours based on the total hours available for the entire training period. All percentages will total 100%.

Example: Core Competence

Foundational Skills, Job Responsibilities, and Procedures	27%
Tools, Equipment, and Instruments	9%
Drawing and Specifications	10%
Rigging: Hoisting, Lifting, and Load-Moving	28%
Cutting and Fabrication	26%
TOTAL	100%

Supporting competence

A supporting competence is a skill that supports the learning of the competence statement. This competence is a teachable skill that can be assessed to measure the abilities and progress of the learner (see Taxonomy).

It also has an assigned weighting (in percent) that will total 100%, however is derived based on the assigned core competence percentage.

Example: Supporting Competence (Drawing and Specifications) - 10%

Interpret drawings	22% (of 10%)
Interpret specifications	22% (of 10%)
Layout projects using drawings and/or specifications	56% (of 10%)
TOTAL	100% of 10%

Taxonomy

Taxonomies are a cognitive framework of learning behaviors organized hierarchically in categories: knowledge, comprehension, application, analysis, evaluation, and synthesis. Taxonomy is used as a tool to identify and create learning objectives that define and measure the learning experience for all stakeholders involved.

For the purposes of Alberta's apprenticeship education programs, **supporting competences** are classified into three of these categories; Taxonomy I – **Know it**, Taxonomy II – **Do it**, and Taxonomy III – **Solve it**.

These categories identify the type of skill set that will be applied to be successful.

Some supporting competences have multiple taxonomies that will require the training to address different skill sets.



NOTE: A Taxonomy verb list is attached in the appendix to demonstrate the level and/or complexity of a given taxonomy.

- Taxonomy I competences focus on recollection of facts, definitions, and principles.
- Taxonomy II competences are a procedural application of knowledge (i.e. reference to a step-by-step process).
- Taxonomy III competences deal with critical thinking and problem solving (i.e. diagnosis and analysis).

Course Content Overview



The term **“In Context”** indicates that the supporting competence will become integrated learning and/or utilized as a component of the competence statement. It will **not** have an assigned weighting and will **not** be assessed as an examination item.

PERIOD ONE COURSE CONTENT

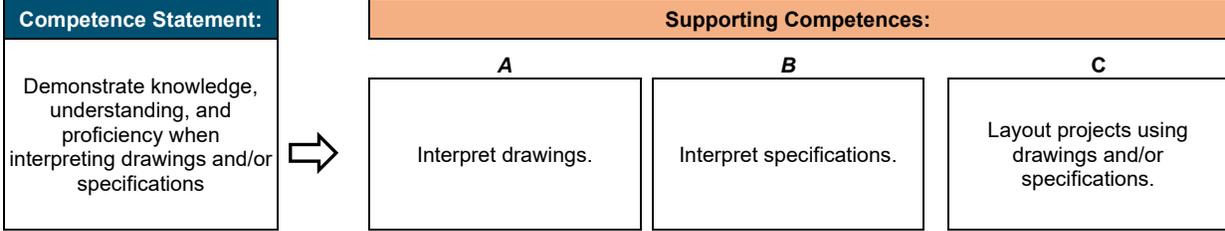
CORE COMPETENCE ONE: *Foundational Skills, Job Responsibilities, and Procedures*

Competence Statement:	Supporting Competences:		
Apply foundational skills essential to convey and receive critical training and workplace information.	A	B	C
	Apply applicable standards, regulations, and codes.	Select, use, and maintain personal protective equipment.	Demonstrate safety awareness and safe work practices.
	D	E	F
	Organizes work. <i>In Context</i>	Apply quality workmanship practices.	Demonstrate numeracy.
	G	H	
	Demonstrate digital literacy. <i>In Context</i>	Demonstrate climbing and working at heights.	

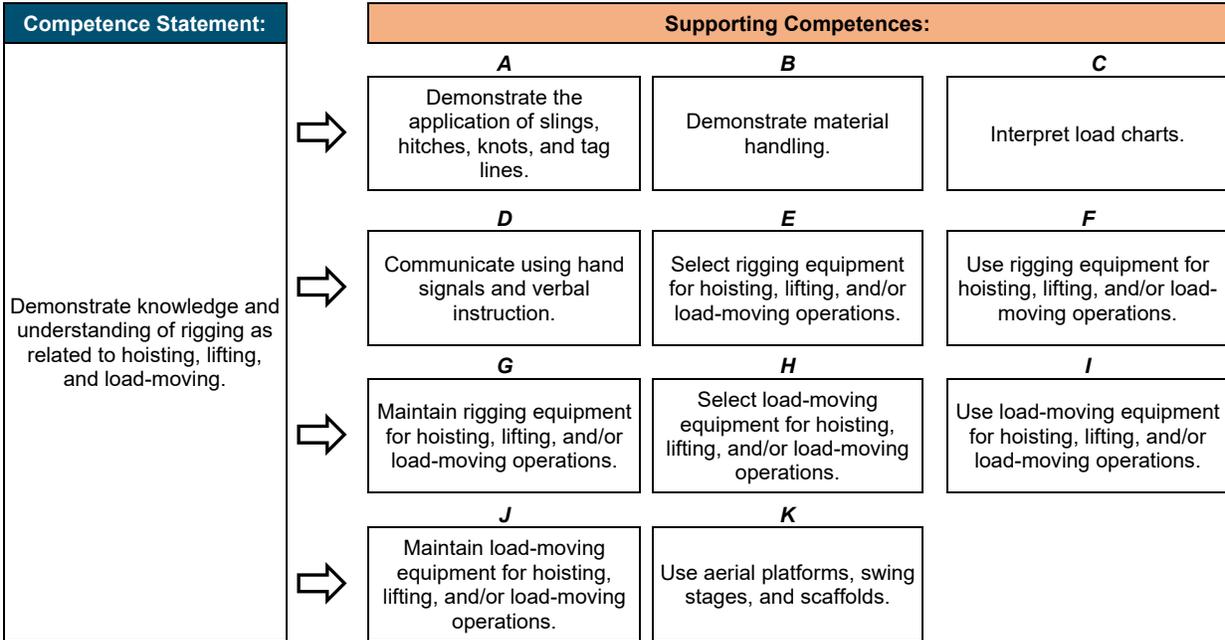
CORE COMPETENCE TWO: *Tools, Equipment, and Instruments*

Competence Statement:	Supporting Competences:		
Demonstrate knowledge, understanding, and proficiency regarding the use and maintenance of tools, equipment, and instruments.	A	B	C
	Select, use, and maintain hand tools.	Select, use, and maintain power tools.	Select, use, and maintain speciality tools.
	D	E	
	Select, use, and maintain instruments.	Select, use, and maintain equipment.	

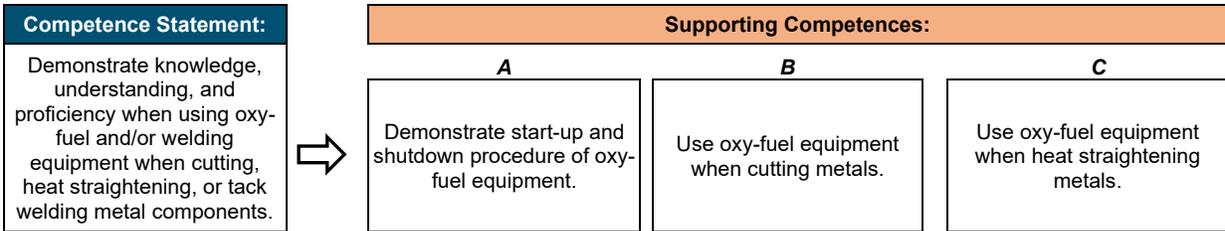
CORE COMPETENCE THREE: Drawings and Specifications



CORE COMPETENCE FOUR: Rigging: Hoisting, Lifting, and Load-Moving



CORE COMPETENCE FIVE: Cutting and Fabrication



PERIOD TWO COURSE CONTENT

CORE COMPETENCE ONE: *Foundational Skills, Job Responsibilities, and Procedures*

Competence Statement:	Supporting Competences:		
<p>Apply foundational skills essential to convey and receive critical training and workplace information.</p>	A	B	C
	Apply applicable standards, regulations, and codes.	Select, use, and maintain personal protective equipment.	Demonstrate safety awareness and safe work practices.
	<i>In Context</i>	<i>In Context</i>	<i>In Context</i>
	D	E	F
	Organizes work.	Apply quality workmanship practices.	Demonstrate numeracy.
	<i>In Context</i>	<i>In Context</i>	<i>In Context</i>
	G	H	
	Demonstrate digital literacy.	Demonstrate climbing and working at heights.	
<i>In Context</i>			

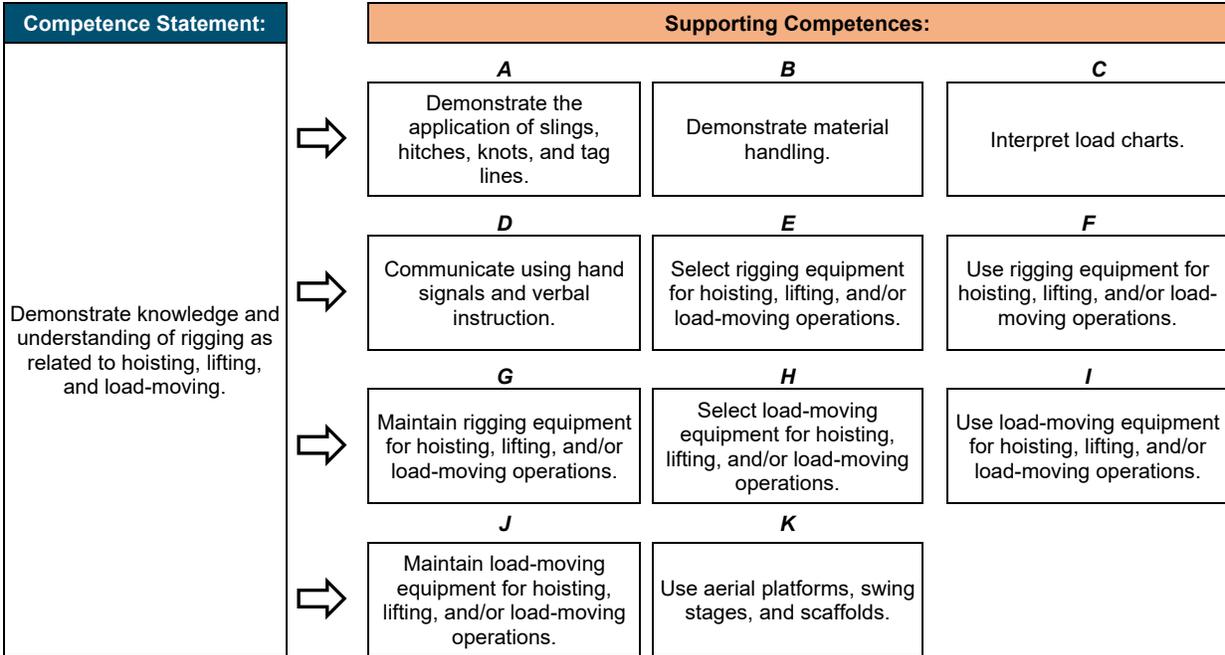
CORE COMPETENCE TWO: *Tools, Equipment, and Instruments*

Competence Statement:	Supporting Competences:		
<p>Demonstrate knowledge, understanding, and proficiency regarding the use and maintenance of tools, equipment, and instruments.</p>	A	B	C
	Select, use, and maintain hand tools.	Select, use, and maintain power tools.	Select, use, and maintain speciality tools.
	<i>In Context</i>	<i>In Context</i>	<i>In Context</i>
	D	E	
	Select, use, and maintain instruments.	Select, use, and maintain equipment.	
	<i>In Context</i>	<i>In Context</i>	

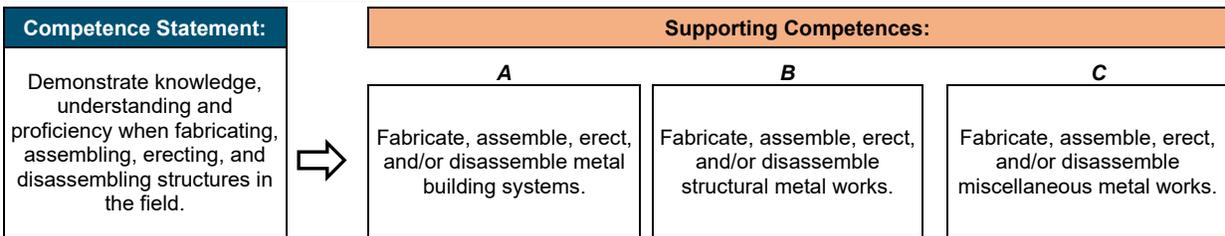
CORE COMPETENCE THREE: *Drawings and Specifications*

Competence Statement:	Supporting Competences:		
<p>Demonstrate knowledge, understanding, and proficiency when interpreting drawings and/or specifications.</p>	A	B	C
	Interpret drawings.	Interpret specifications.	Estimate labour and material requirements for projects.
	D		
	Lay out projects using drawings and/or specifications.		

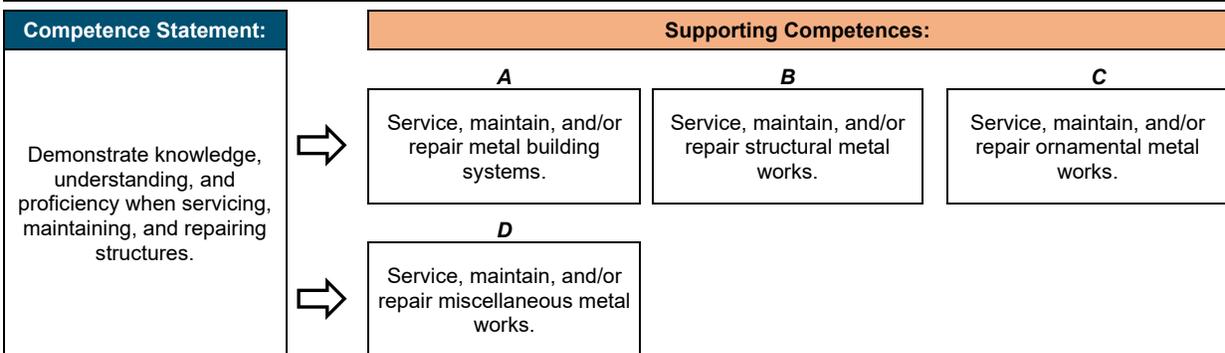
CORE COMPETENCE FOUR: Rigging: Hoisting, Lifting, and Load-Moving



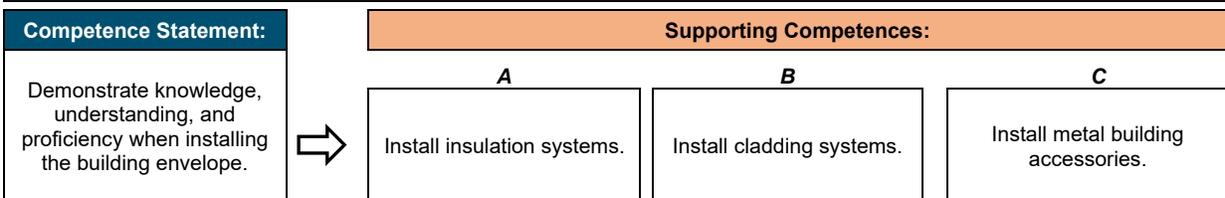
CORE COMPETENCE FIVE (a): Structures



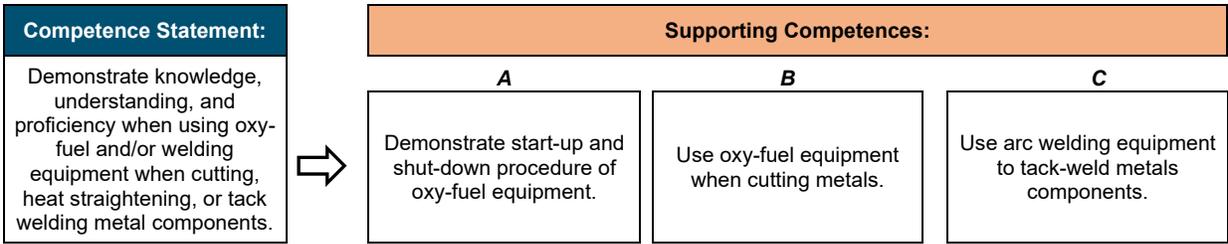
CORE COMPETENCE FIVE (b): Structures



CORE COMPETENCE FIVE (c): Structures



CORE COMPETENCE SIX: *Cutting and Fabrication*



Period One Course Content

(6 weeks – 180 hours)

Period One Core Competences	Weighting
Foundational Skills, Job Responsibilities, and Procedures	27%
Tools, Equipment, and Instruments	9%
Drawings and Specifications	10%
Rigging: Hoisting, Lifting, and Load-Moving	28%
Cutting and Fabrication	26%

Core Competence 1: Foundational Skills, Job Responsibilities, and Procedures Weighting - 27%



An Ironworker utilizes a host of foundational skills and abilities that will enable them to understand and perform their job responsibilities and apply procedures for everyday activities.

These skills are absorbed, practiced, and honed through a combination of personal and professional learning environments and are essential tools in the learner’s working portfolio.

They will assist the learner in making rational decisions and displaying positive behaviours to deal effectively with the demands and challenges of everyday life.

These supporting competences are observed, studied, and performed in all periods of the apprenticeship education program.



Apply foundational skills essential to convey and receive critical training and workplace information.

Core Competence 1: Foundational Skills, Job Responsibilities, and Procedures

Supporting Competence	Taxonomy	Weighting
1A. Apply applicable standards, regulations, and codes.	I, II	16%
1B. Select, use, and maintain personal protective equipment.	I, II	8%
1C. Demonstrate safety awareness and safe work practices.	I, II	18%
1D. Organizes work.		In Context
1E. Apply quality workmanship practices.	I	2%
1F. Demonstrate numeracy.	I, II, III	50%
1G. Demonstrate digital literacy.		In Context
1H. Demonstrate climbing and working at heights.	I, II	6%

Core Competence 2: Tools, Equipment, and Instruments

Weighting – 9%



An Ironworker employs a variety of tools, equipment, and instruments throughout their working day. These items extend an individual’s ability to perform activities and functions. Tools come in many forms and configurations and require training and knowledge to utilize them in a safe, effective, and intended manner.

This section will focus on knowledge and procedures associated with tools, equipment, and instruments. Components of this section will be dispersed, integrated, and incorporated throughout all periods of the apprenticeship education program.

CS

Demonstrate knowledge, understanding, and proficiency regarding the use and maintenance of tools, equipment, and instruments.

Core Competence 2: Tools, Equipment, and Instruments

Supporting Competence	Taxonomy	Weighting
2A. Select, use, and maintain hand tools.	I, II	33%
2B. Select, use, and maintain power tools.	I, II	33%
2C. Select, use, and maintain speciality tools.	I, II	12%

Core Competence 2: Tools, Equipment, and Instruments

Supporting Competence	Taxonomy	Weighting
2D. Select, use, and maintain instruments.	I, II	11%
2E. Select, use, and maintain equipment.	I, II	11%

Core Competence 3: Drawings and Specifications

Weighting – 10%



An Ironworker frequently utilizes drawings and specifications to complete projects. These documents provide multiple details, which may include clear instruction for the construction, maintenance, or repair of a project or its components, dimensions of a projects individual or collective components, or a list of material required for the project. These documents are developed with a universal language that is learned and understood by skilled trade’s professional.

This period will focus on the knowledge associated with the interpretation and relationship between drawings and specifications and will further instruct the learner in the sketching of objects.



Demonstrate knowledge, understanding, and proficiency when interpreting drawings and/or specifications.

Core Competence 3: Drawings and Specifications

Supporting Competence	Taxonomy	Weighting
3A. Interpret drawings.	I	22%
3B. Interpret specifications.	I	22%
3C. Lay out projects using drawings and/or specifications.	I, II	56%

Core Competence 4: Rigging: Hoisting, Lifting, and Load-Moving

Weighting – 28%



An Ironworker completes many activities that require detailed knowledge of the fundamental principles and practicalities associated with the task of rigging.

This period will focus and instruct the learner in the knowledge and procedures associated with hoisting, lifting, and/or load-moving.



Demonstrate knowledge and understanding of rigging as related to hoisting, lifting, and load moving.

Core Competence 4: Rigging: Hoisting, Lifting, and Load-Moving

Supporting Competence	Taxonomy	Weighting
4A. Demonstrate the application of slings, hitches, knots, and tag lines.	I, II	18%
4B. Demonstrate material handling.	I, II	12%
4C. Interpret load charts.	I	6%
4D. Communicate using hand signals and verbal instruction.	I, II	6%
4E. Select rigging equipment for hoisting, lifting, and/or load-moving operations.	I	6%
4F. Use rigging equipment for hoisting, lifting, and/or load-moving operations.	I, II	6%
4G. Maintain rigging equipment for hoisting, lifting, and/or load-moving operations.	I	2%
4H. Select load-moving equipment for hoisting, lifting, and/or load-moving operations.	I	6%
4I. Use load-moving equipment for hoisting, lifting, and/or load-moving operations.	I, II	8%
4J. Maintain load-moving equipment for hoisting, lifting, and/or load-moving operations.	I	6%
4K. Use aerial platforms, swing stages, and scaffolds.	I, II	24%

Core Competence 5: Cutting and Fabrication

Weighting – 26%



An Ironworker may be assigned an activity that requires the use of heat, either to facilitate a straightening procedure or to accurately cut a specified length or shape from a metal stock material.

This period will focus on the knowledge and procedures to utilize oxy-fuel cutting equipment in a safe and efficient manner and provide the learner with a fundamental understanding associated with practices of heating and cutting metals.



Demonstrate knowledge, understanding, and proficiency when using oxy-fuel and/or welding equipment when cutting, heat straightening, or tack welding metal components.

Core Competence 5: Cutting and Fabrication

Supporting Competence	Taxonomy	Weighting
5A. Demonstrate start-up and shutdown procedure of oxy-fuel equipment.	I, II	42%
5B. Use oxy-fuel equipment when cutting metals.	I, II	50%
5C. Use oxy-fuel equipment when heat straightening metals.	I, II	8%

Period Two Course Content

(6 weeks – 180 hours)

Period Two Core Competences	Weighting
Foundational Skills, Job Responsibilities, and Procedures	3%
Tools, Equipment, and Instruments	In Context
Drawings and Specifications	28%
Rigging: Hoisting, Lifting, and Load-Moving	20%
Structures: a	8%
Structures: b	7%
Structures: c	6%
Cutting and Fabrication	28%

Core Competence 1: Foundational Skills, Job Responsibilities, and Procedures

Weighting – 3%



An Ironworker utilizes a host of foundational skills and abilities that will enable them to understand and perform their job responsibilities and apply procedures for everyday activities.

These skills are absorbed, practiced, and honed through a combination of personal and professional learning environments and are essential tools in the learner's working portfolio.

They will assist the learner in making rational decisions and displaying positive behaviors to deal effectively with the demands and challenges of everyday life.

These supporting competences are observed, studied, and performed in all periods of the apprenticeship education program.



Apply foundational skills essential to convey and receive critical training and workplace information.

Core Competence 1: Foundational Skills, Job Responsibilities, and Procedures

Supporting Competence	Taxonomy	Weighting
1A. Apply applicable standards, regulations, and codes.		In Context
1B. Select, use, and maintain personal protective equipment.		In Context
1C. Demonstrate safety awareness and safe work practices.		In Context
1D. Organizes work.		In Context
1E. Apply quality workmanship practices.		In Context
1F. Demonstrate numeracy.		In Context
1G. Demonstrate digital literacy.		In Context
1H. Demonstrate climbing and working at heights.	I, II	100%

Core Competence 2: Tools, Equipment, and Instruments

Weighting – In Context



An Ironworker employs a variety of tools, equipment, and instruments throughout their working day. These objects extend an individual’s ability to perform activities and functions. Tools come in many forms and configurations and require training and knowledge to utilize them in a safe, effective, and intended manner.

This section will focus on knowledge and procedures associated with tools, equipment, and instruments. Components of this section will be dispersed, integrated, and incorporated throughout all periods of the apprenticeship education program.



Demonstrate knowledge, understanding and proficiency regarding the use and maintenance of tools, shaping/ shearing equipment, and instruments.

Core Competence 2: Tools, Equipment, and Instruments

Supporting Competence	Taxonomy	Weighting
2A. Select, use, and maintain hand tools.		In Context
2B. Select, use, and maintain power tools.		In Context
2C. Select, use, and maintain speciality tools.		In Context
2D. Select, use, and maintain instruments.		In Context
2E. Select, use, and maintain equipment.		In Context

Core Competence 3: Drawings and Specifications

Weighting – 28%



An Ironworker must accurately interpret information found in drawings and specifications. This will require knowledge associated with the formation and symbolism found on drawings or specifications, the procedure utilized to develop or layout information, and/or employing critical thinking when making precise calculations or estimates related to the drawings or specifications.



Demonstrate knowledge, understanding, and proficiency when interpreting drawings and/or specifications.

Core Competence 3: Drawings and Specifications

Supporting Competence	Taxonomy	Weighting
3A. Interpret drawings.	I, II	20%
3B. Interpret specifications.	I, II	30%
3C. Estimate labour and material requirements for projects.	I, II, III	12%
3D. Lay out projects using drawings and/or specifications.	I, II	38%

Core Competence 4: Rigging: Hoisting, Lifting, and Load Moving

Weighting – 20%



An Ironworker must be able to hoist, lift and/or move objects and materials in a safe and effective manner. They are expected to interpret relevant information to guide them through the selection and use of rigging and its associated components.

This period of the apprenticeship education program will enable the learner to recall detailed information and procedures to performing structural and ornamental rigging operations.



Demonstrate knowledge and understanding of rigging as related to hoisting, lifting, and load-moving.

Core Competence 4: Rigging: Hoisting, Lifting, and Load-Moving

Supporting Competence	Taxonomy	Weighting
4A. Demonstrate the application of slings, hitches, knots, and tag lines.	I, II	11%
4B. Demonstrate material handling.	I, II	8%
4C. Interpret load charts.	I, II	8%
4D. Communicate using hand signals and verbal instruction.	I, II	6%
4E. Select rigging equipment for hoisting, lifting, and/or load-moving operations.	I, II	11%
4F. Use rigging equipment for hoisting, lifting, and/or load-moving operations.	I, II	14%
4G. Maintain rigging equipment for hoisting, lifting, and/or load-moving operations.	I	3%
4H. Select load-moving equipment for hoisting, lifting, and/or load-moving operations.	I, II	11%
4I. Use load-moving equipment for hoisting, lifting, and/or load-moving operations.	I, II	14%
4J. Maintain load-moving equipment for hoisting, lifting, and/or load-moving operations.	I	3%
4K. Use aerial platforms, swing stages, and scaffolds	I, II	11%

Core Competence 5: Structures



Ironworkers often work with metal building systems and their structural components. This period of the apprenticeship education program will focus on the peripheral knowledge and procedures associated with the installation and erection of metal building systems and structural metal works.

Core Competence 5a: Structures

Weighting – 8%



Demonstrate knowledge, understanding, and proficiency when fabricating, assembling, erecting, and disassembling structures in the field.

Core Competence 5a: Structures

Supporting Competence	Taxonomy	Weighting
5aA. Fabricate, assemble, erect, and/or disassemble metal building systems.	I, II	43%
5aB. Fabricate, assemble, erect, and/or disassemble structural metal works.	I, II	43%
5aC. Fabricate, assemble, erect, and/or disassemble miscellaneous metal works.	I	14%

Core Competence 5b: Structures

Weighting – 7%



Demonstrate knowledge, understanding, and proficiency when servicing, maintaining, and repairing structures.

Core Competence 5b: Structures

Supporting Competence	Taxonomy	Weighting
5bA. Service, maintain, and/or repair metal building systems.	I	33%
5bB. Service, maintain, and/or repair structural metal works.	I	33%
5bC. Service, maintain, and/or repair ornamental metal works.	I	17%
5bD. Service, maintain, and/or repair miscellaneous metal works.	I	17%

Core Competence 5c: Structures
Weighting – 6%

	<p>Demonstrate knowledge, understanding, and proficiency when installing the building envelope.</p>
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Core Competence 5c: Structures

Supporting Competence	Taxonomy	Weighting
5cA. Install insulation systems.	I	25%
5cB. Install cladding systems.	I, II	25%
5cC. Install metal building accessories.	I, II, III	50%

Core Competence 6: Cutting and Fabrication
Weighting – 28%

	<p>An Ironworker may be assigned an activity that requires the use arc welding equipment to tack weld metal components together to temporarily hold them in place.</p> <p>This period will focus on the knowledge and procedures to utilize arc-welding equipment in a safe and effective manner.</p>
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	<p>Demonstrate knowledge, understanding, and proficiency when using oxy-fuel and/or welding equipment when cutting, heat straightening, or tack welding metal components.</p>
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Core Competence 6: Cutting and Fabrication

Supporting Competence	Taxonomy	Weighting
6A. Demonstrate start-up and shut-down procedure of oxy-fuel equipment.	I, II	4%
6B. Use oxy-fuel equipment when cutting metals.	I	36%
6C. Use arc welding equipment to tack-weld metals components.	I, II	60%

Taxonomy verb list

This is a list of common verbs used to demonstrate the level and/or complexity of a given taxonomy. It is only intended as a guide and is not meant to exclude additional verbs.

Taxonomy I (*Recall It*)

Verbs

Identify	Explain
Describe	

Taxonomy II (*Do It*)

Verbs

Apply	Perform
Sketch	Install
Draw	Calibrate
Inspect	Analyze
Interpret	Design
Calculate	

Taxonomy III (*Know It*)

Verbs

Demonstrate	Repair
Operate	Grow
Maintain	Troubleshoot
Commission	Build
Service	Use



Apprenticeship
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